

Implementation date

Fall 2010

PROGRAM CONCENTRATION:

**Architecture, Construction,
Communications & Transportation**

CAREER PATHWAY:

METALS TECHNOLOGY

COURSE TITLE:

Machining Operations VI

PREREQUISITE:

Machining Operations V

COURSE DESCRIPTION:

The goal of this course is to provide all students with an understanding of CNC (computer numerical control) Milling. Course topics include safety, lathe operations, milling operations, and machine maintenance. The performance standards for this course are based on the National Institute for Metalworking Skills (NIMS) for the topics of the lathe and milling machine. Co-curricula activities of Skills USA are incorporated in the course.

CAREERS

This course will provide instruction for the safe operation and manual programming of computer numerical controlled (CNC) Milling machines. Competencies include: Machine Safety, Command Codes, Program loading, and Machine Setup.

SAFETY

ACCT-MOVI-1. Students will identify the different aspects of machine safety.

- a. Compile a list of general safety rules that apply to chip removal from machines.
- b. Explain the safety measures and problems which apply specifically to automated movements of machine tables with varying heights of work pieces and fixture parts.

COMMAND CODES

ACCT-MOVI-2. Students will identify CNC programming command codes used in writing a CNC lathe program.

- a. Define the various codes and functions used in CNC programming for a milling machine.
- b. Discuss the related machine tool movements resulting from the codes entered into the controller.
- c. Explain the use of “G” and “M” words.
- d. Explain the three main axis of a CNC milling machine.
- e. Interpret blueprints for the correct machining operations.
- f. Write programs using all the computer words needed to set machine feeds, speeds, linear and circular interpolation.
- g. Test the programs and correct any errors.

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Academic standards:

MM2P1. Students will solve problems (using the appropriate technology)

- a. Build new mathematical knowledge through problem solving.
- b. Solve problems that arise in mathematics and in other contexts.
- c. Apply and adapt a variety of appropriate strategies to solve problems.

MM4A2. Students will use the circle to define the trigonometric functions.

- a. Understand and apply the six trigonometric functions of general angles in standard position.
- b. Find values of trigonometric functions using points on the terminal sides of angles in the standard position.
- c. Understand and apply the six trigonometric as functions of arc length on the unit circle.

SPS7. The students will relate transformations and flow of energy within a system.

- b. Investigate molecular motion as it relates to thermal energy changes in terms of conduction, convection, and radiation.

SPS8. Students will determine relationships among force, mass, and motion.

- a. Calculate velocity and acceleration.
- c. Calculate amounts of work and mechanical advantage using simple machines.

PROGRAM LOADING

ACCT-MOVI-3. Students will demonstrate the ability to identify and load programs into the controller.

- a. Describe the methods available to load programs into a controller.
- b. Manually load a program into the controller explaining each function and what the machine reaction should be.
- c. Identify the major functions of a postprocessor.
- d. Demonstrate the setting of the origin point.
- e. Compute the feeds and speeds to establish values for the “F” and “S” words.
- f. Complete math calculations necessary to write a toolpath.

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MACHINE SETUP

ACCT-MOVI-4. Students will demonstrate the ability to set up a machine for a machining process.

- a. Select a program and determine the tooling required, the work holding device, cutting tool/tools, and work supporting accessories required to complete the operation.
- b. Determine the type of material and prepare it for mounting in the work holding device.
- c. Explain how the work will be set up in the milling machine.
- d. Use a dial indicator to align work piece or work holding device.
- e. Explain how to run the program one line at a time to test the process for accuracy and safety.
- f. Use machineable wax for a test work piece to reduce possible damage during the first run.
- g. Analyze the part so clamps and parts of fixtures will not be placed in the path of the cutting tool in the spindle.

Reading Across the Curriculum

Reading Standard Comment

After the elementary years, students engage in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal learning. Students encounter a variety of informational as well as fictional texts, and they experience text in all genres and modes of discourse. In the study of various disciplines of learning (language arts, mathematics, science, social studies), students must learn through reading

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the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas in *context*.

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

CTAE-RC-1 Students will enhance reading in all curriculum areas by:

Reading in All Curriculum Areas

- Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
- Read both informational and fictional texts in a variety of genres and modes of discourse.
- Read technical texts related to various subject areas.

Discussing Books

- Discuss messages and themes from books in all subject areas.
- Respond to a variety of texts in multiple modes of discourse.
- Relate messages and themes from one subject area to messages and themes in another area.
- Evaluate the merit of texts in every subject discipline.
- Examine author's purpose in writing.
- Recognize the features of disciplinary texts.

Building Vocabulary Knowledge

- Demonstrate an understanding of contextual vocabulary in various subjects.
- Use content vocabulary in writing and speaking.
- Explore understanding of new words found in subject area texts.

Establishing Context

- Explore life experiences related to subject area content.
- Discuss in both writing and speaking how certain words are subject area related.
- Determine strategies for finding content and contextual meaning for unknown words.

CTAE Foundation Skills

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The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

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CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.