July 2009

Florida Department of Education
Curriculum Framework

Program Title:	**CNC Machinist**
Specialization Tract:	**Mechanical Design and Fabrication**
Career Cluster:	**Manufacturing**

	PSVC
CIP Number:	0615.080502
Grade Level:	College Credit Certificate
Length:	12 credit hours
SOC Code:	51-4012

I. **MAJOR CONCEPTS AND CONTENT:** The purpose of this program is to prepare students for initial employment with an occupational title as CNC Operator or CNC Machinist, or to provide supplemental training for persons previously or currently employed in these occupations.

II. **PROGRAM STRUCTURE:** This certificate program requires a minimum of 12 credit hours of specialized courses in metal fabrication, manual and CNC machining, and CAD/CAM soft wares. It is part of the Mechanical Design and Fabrication Tract of the A.S./A.A.S. degree in Engineering Technology.

III. **LABORATORY ACTIVITIES:** Laboratory activities are an integral part of the program. The tools, test equipment, materials, processes and safety practices used in these laboratory activities are similar to those used in industry. The activities provide instruction in maintenance techniques, computer aided drafting/design skills, technical communications, maintenance and operation of various industrial components, quality control and testing, material handling protocols, and proper usage of tools and instrumentation.

IV. **SPECIAL NOTE:** SkillsUSA is the appropriate career student organization (CTSO) for providing leadership training and for reinforcing specific vocational skills. Career Student Organizations shall be an integral part of the career instructional program, and the activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, FAC.

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following are required for each student: a training plan, signed by the student, teacher, and employer, which includes instructional objectives and a list of on-the-job and in-school learning experiences; a workstation that reflects equipment, skills and tasks that are relevant to the occupation which the student has chosen as a career goal. The student must receive compensation for work performed.

To be transferable statewide between institutions, this program/course must have been reviewed, and a "transfer value" assigned the curriculum content by the appropriate Statewide Course Numbering System discipline committee. This does not preclude institutions from developing specific program or course articulation agreements with each other.

When a secondary student with a disability is enrolled in a vocational class for which modifications to the curriculum framework have been made, the particular outcomes and student performance standards that the student must master to earn credit must be specified in the student's Individual Educational Plan (IEP). Additional credits may be earned when outcomes and standards are mastered in accordance with the requirements indicated in subsequent IEPs. The job title for which the student is being trained must be designated in the IEP.

V. **FEDERAL AND STATE LEGISLATION** requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Adult students with disabilities must self-identify and request such services. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

VI. **INTENDED OUTCOMES:** After successfully completing the program, the student will be able to:

02.0 Generate and interpret computer-aided drawings.
12.0 Demonstrate proficiency in the principles, concepts and applications in metal fabrication methods.
14.0 Demonstrate proficiency in the set-up and operation of manual and CNC machining centers.
15.0 Demonstrate proficiency in Computer-Aided Drafting/ Computer-Aided Manufacturing (CAD/CAM) software.

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Student Performance Standards

Program Title: **CNC Machinist**
Specialization Tract: **Mechanical Design and Fabrication**

02.0 GENERATE AND INTERPRET COMPUTER-AIDED DRAWINGS - The student will be able to:

02.01 Apply current industrial computer aided-drawing practices.
02.02 Construct geometric figures.
02.03 Create and edit text formatted to industry standards.
02.04 Use and control accuracy-enhancement tools for entity-positioning methods.
02.05 Identify, create, store, and use standard part symbols and libraries.
02.06 Control entity properties by layer, color, and line type.
02.07 Use viewing commands to perform zooming and panning.
02.08 Use Query commands to interrogate database for entity characteristics.
02.09 Plot drawings on media using layout and scale.
02.10 Prepare drawings for flexibility of future editing and minimum file size.
02.11 Apply standard dimensioning rules.
02.12 Demonstrate proficiency importing and exporting various files types.
02.13 Operate related peripheral devices.
02.14 Read and interpret technical drawings to assure conformity of product.
02.15 Demonstrate skill in assessing and reading schematics and drawings.

12.0 DEMONSTRATE PROFICIENCY IN THE PRINCIPLES, CONCEPTS AND APPLICATIONS IN METAL FABRICATION METHODS - The student will be able to:

12.01 Understand professionalism in the manufacturing environment.
12.02 Understand, use and work with precision numbers.
12.03 Interpret mechanical drawings.
12.04 Demonstrate the use of geometric dimensioning and tolerancing.
12.05 Understand materials, and machining processes.
12.06 Demonstrate safe use of hand and power tools.
12.07 Identify the use and process in part layout.
12.08 Demonstrate a working knowledge of metal forming equipment.
12.09 Demonstrate the use of precision steel rulers.
12.10 Demonstrate the use of oxy – fuel cutting.
12.11 Demonstrate acceptable methods in tungsten inert gas welding.
12.12 Demonstrate acceptable methods in gas metal arc welding.

12.17 Demonstrate acceptable methods to use a dial indicator.
12.18 Explain the use of a height gauge to measure stock.
12.19 Identify aircraft sheet metal tools.
12.20 Demonstrate acceptable methods hand cutting and forming sheet metal.
12.21 Demonstrate the use of layout sheet metal tools.
12.22 Demonstrate acceptable methods using micro-counter sinks.
12.23 Demonstrate acceptable methods of Riveting solid rivets.
12.24 Identify and demonstrate operation of the pneumatic rivet gun.
12.25 Demonstrate the use of a rivet gauge set.
12.26 Demonstrate acceptable methods using a back rivet set.
12.27 Demonstrate acceptable methods using bucking bars.
12.28 Demonstrate the use of rivet squeezers and dimpling.
12.29 Demonstrate acceptable methods in using a blind riveting.
12.30 Identify the axes on a CNC mill.
12.31 Demonstrate hand jog features on a CNC mill & CNC lathe.
12.32 Demonstrate acceptable methods to use an ironworker.
12.33 Demonstrate acceptable methods using a break & shear.
12.34 Demonstrate the use of dial calipers.

14.0 DEMONSTRATE PROFICIENCY IN THE SET-UP AND OPERATION OF MANUAL AND CNC MACHINING CENTERS. - The student will be able to:

14.01 Set up and maintain a manual lathe and mill.
14.02 Demonstrate acceptable processes using a manual lathe and mill.
14.03 Demonstrate acceptable control of machining processes.
14.04 Identify and define the physics of machine cutting metals.
14.05 Demonstrate the characteristics of machining cutting tools.
14.06 Define and identify parameters of cutting tool life.
14.07 Demonstrate efficient parameters in production processes.
14.08 Demonstrate the process to drill and layout holes to a specific size.
14.09 Identify baseline machining layout.
14.10 Identify manual machining procedures used in CNC programming.
14.11 Identify grinding machining practices and processes.
14.12 Identify thread types and tooling used in machining.
14.13 Identify metal alloys and their properties in machining.
14.14 Demonstrate job planning procedures in machining.
14.15 Demonstrate procedures to calculate cutting tool speeds and feeds.
14.16 Demonstrate methods for accessing machine RPM.
14.17 Identify coordinate and primary machining axes.
14.18 Define and describe Absolute and incremental coordinates.
14.19 Identify the five CNC drive components.
14.20 Demonstrate rapid travel and interpolation.
14.21 Identify coordinate and primary machining axes.
14.22 Identify and define industrial machining and turning centers.
14.23 Identify processes for program creation and data management.
14.24 Demonstrate acceptable procedures in starting CNC machines.
14.25 Demonstrate the CNC machine controls for set up and operation.
14.26 Demonstrate acceptable procedures to set up a CNC Machining center.

14.27 Demonstrate acceptable procedures to run programs using a CNC machining center.
14.28 Demonstrate acceptable procedures to generate a CNC program.
14.29 Demonstrate acceptable procedures in CNC job planning.
14.30 Identify cutting tools collets and holding fixtures.
14.31 Identify CNC tooling and applications.
14.32 Define CNC programming code words and conventions.
14.33 Define and demonstrate CNC program fixed cycles.
14.34 Explain basic use of CAD/CAM software and processes.

15.0 DEMONSTRATE PROFICIENCY IN COMPUTER-AIDED DRAFTING/ COMPUTER-AIDED MANUFACTURING (CAD/CAM) SOFTWARE –
The student will be able to:

15.01 Create CAD/CAM geometry for tool path processing.
15.02 Demonstrate procedures to import/export CAD/CAM files.
15.03 Demonstrate contouring using CAM tool path commands.
15.04 Apply pocketing using CAM tool path commands.
15.05 Demonstrate drill cycles using CAM tool path commands.
15.06 Demonstrate thread cycles using CAM tool path commands.
15.07 Demonstrate engraving using CAM tool path commands.
15.08 Construct lettering using CAM tool path commands.
15.09 Demonstrate nesting using CAM tool path commands.
15.10 Describe procedures for CAM post-processing.
15.11 Apply tool path verification for a CAM program.
15.12 Apply job set-up procedures for a CAM program.
15.13 Demonstrate ability to save, copy, delete, and rename computer files with Windows-based programs.
15.14 Create a CNC machining working portfolio.
15.15 Demonstrate the use of back plotting in a cam program.
15.16 Demonstrate how to modify an existing tool path.