



Rev. 8-24-18

Vincennes University

Indiana Center for Applied Technology (ICAT) - Haas Technical Education Center (HTEC)

Right Skills NOW – CNC Machining

An Accelerated Training Program for Veterans and Civilians

Goals:

1. To provide high quality training on state-of-the-art equipment to help bridge the Advanced Manufacturing “skills gap”.
2. To provide well-rounded entry level skilled CNC Machinists to an industry that is in desperate need.
3. To provide opportunities for students to earn industry recognized *NIMS credentials.
4. To prepare Veterans and Civilian adult learners for gainful employment as CNC Machinists.
5. To provide opportunities for students to earn 24 college credits while earning the 6 NIMS credentials, and to earn a Certificate of Graduation, 30 credit hours, if they successfully complete, or have previously completed the applied math and communications elective requirements.

*NIMS is the acronym for the National Institute for Metalworking Skills

Description:

The Vincennes University Right Skills NOW - CNC Machining program is designed to prepare Veterans, civilian adult learners, and incumbent workers to become well-rounded entry level CNC machinists with upward mobility potential. The curriculum is a combination of machining theory and extensive hands-on training. The duration of the training is 15 weeks or 600 hours. This program is designed as an accelerated program of study around industry recognized NIMS credentials based on skills needed for a career in CNC machining and manufacturing. Depending on the performance of the student in the class, the staff of the VU HTEC will recommend the graduates in one of three entry level categories: A-CNC Machinist, B-CNC Setup and Operator, or C-CNC Operator.

Eligibility:

This program is designed for Veterans, Civilian adult learners, and incumbent workers, recent high school graduates are first referred to Vincennes University's two year Precision Machining Technology program. Entrance requirements include a high school diploma or a GED and to take a VU HTEC Mechanical Aptitude test and Vincennes University Accuplacer test.

Credentials:

Required NIMS Industry Recognized Credentials:

(Earning these credentials IS expected for successful completion of course.)

1. NIMS Measurement, Materials & Safety
2. NIMS Job Planning, Benchwork & Layout
3. NIMS CNC Mill Operator
4. NIMS CNC Lathe Operator
5. NIMS Milling: Programming, Setup and Operations Level 1
6. NIMS Turning: Programming, Setup and Operations Level 1

Optional Industry Recognized Credentials:

Earning these credentials IS NOT required for successful completion of course, but if time and circumstances allow, may be attempted in order to tailor the training to the needs of their employer, or future employer.

1. NIMS Milling: Programming, Setup and Operations Level 2
2. NIMS Turning: Programming, Setup and Operations Level 2
3. Mastercam Mill
4. Mastercam Lathe



Certificate:

Upon successful completion of the 15 week program, in addition to earning NIMS certifications, the trainee will be awarded with a Vincennes University Certificate of Program Completion for the Right Skills NOW - CNC Machining training program and 24 credit hours. Students that successfully complete, or have previously completed the applied math and communications elective requirements will be awarded a Certificate of Graduation from Vincennes University.

Facility:

The Vincennes University HTEC is **NIMS Accredited**. Eligible veterans may use their VA benefits to pay for the training. VU will provide all of the training at the Haas Technical Education Center (HTEC) CNC Training Center which is located in Vincennes in the Indiana Center for Applied Technology (ICAT) on the main campus at Vincennes University. The HTEC lab contains 13 full size Haas CNC machines along with 20 Haas control simulators, and 15 seats of Mastercam CAD/CAM software and miscellaneous manual machines. In addition to the CNC machines and manual machines, the center has a variety of precision measuring tools to train students in the use and care of metrology equipment.

Partners:

The Vincennes University HTEC CNC Training Center is dedicated to providing the highest quality training available for Haas CNC machines and related technologies. The center leverages the support of its many manufacturing partners to provide training on the latest technology available. The list of partners includes: Haas Automation, Renishaw, Mitutoyo, Clodfelter Engineering, Sandvik, Mastercam, Quality Mill Supply, Zeiss, Immerse2Learn, SGS Tools, Techniks, Qual-Chem, RegoFix, Lista, Fifth-Axis, Calculated Industries, and others.

Tuition and Fees:

The cost of the program is \$10,512. This includes all tuition, lab fees, textbooks, materials, hardware, software, training and NIMS testing, and a machinist toolbox and tools with a value of \$1500. If a student already has tools, or would like to waive the tool requirement, the cost of the program is \$9,012.

Campus Housing:

VU housing and meal plans are available for students at a 25% discount. The cost is \$1,904 for a private room, and \$1,356 for the meal plan at 10 meals per week at the Tecumseh Dining Center. Together the cost is \$3,260.

Basic Weekly Schedule:

8:00am – 12.00noon	Lecture / Lab	4.0 hours
12:00am – 1.00pm	Lunch Break	(1.0 hour)
1:00pm – 4:00pm	CNC Lab	3.0 hours
4:00pm – 5:00pm	Work on Assignments	<u>1.0 hours</u>
		8.0 hours per day

Total Training Hours

40 hours per week for 15 weeks = 600 hours

Implementation:

The Right Skills NOW - CNC Machinist program is offered two times per year with starting dates in early January, and September. Class size is limited to 12 students per class to maintain the highest quality of training.

Recruitment:

Students will be recruited through industry partner companies, the VA, WorkOne in Indiana, and other employment centers, along with multimedia contact. Ideally, companies will be involved in the candidate selection process from the beginning.

Placement:

Vincennes University will use its own resources along with the resources of its partners, to assist trainees to gain full time employment. Ideally, companies will be involved in the candidate selection process up front, and will hire immediately upon graduation.



Right Skills NOW - CNC Machining Certificate 9365, C.G.

A One-year Program Leading to a Certificate of Graduation

The Right Skills NOW - CNC Machining program is designed for adult learners in a career transition mode. Targeted students are not recently high school graduates but are adult learners of 21 years of age or older, such as military veterans and career industry workers seeking to update their skillset. The program offers high quality training that focuses on bridging the advanced manufacturing skills gap. At the completion of this rigorous 600 hour training program, students may receive 6 to 8 National Institute for Metalworking Skills (NIMS) credentials and become entry level CNC Machinists with upward mobility potential. CNC Machining is a skilled trade that is considered to be a high demand occupation throughout the U.S.

Major Program Requirements for a Certificate of Program Completion (CPC)

- RSNM 101 - Measurement, Materials and Safety - **4 hrs**
- RSNM 101 - Job Planning, Bench work & Layout - **4 hrs**
- RSNM 103 - CNC Mill Operator - **4 hrs**
- RSNM 201 - CNC Lathe Operator - **4 hrs**
- RSNM 202 - Mill: Programming, Setup and Operations Level I - **4 hrs**
- RSNM 203 - Turning: Programing, Setup and Operations Level I – **4 hrs**

Total Hours: 24

Additional Program Requirements for a Certificate of Graduation (CG)

- Communication Elective – COMM 143 or COMM 148 - **3 hrs**
- MATT 107 – Applied Mathematics – **3 hrs**

Total Hours: 30



Textbook: *Precision Machining Technology*

COURSE OUTLINE:

Basic Machine Shop Practices

Introduction to machining, careers, and workplace skills, as well as safety, measurement systems, machining related math, semi-precision and precision measurement, quality assurance and control, process planning, metal composition and classification, heat treatment of metals, maintenance, lubrication and cutting fluids.

Exploration of the basics of hand tools, job planning and part layout, the use of a metal saw, pedestal grinder, and drill press. Understanding of drawings, basic symbols and notation, and how to interpret basic GD&T feature control frames. Introduction to the lathe, milling and surface grinding machine, their setup, tooling and operations. Students will develop process plans, and use workholding fixtures and tools to machine parts. Safety, turning tools, rotating tools, tool holders, speeds and feeds for a variety of operations and critical thinking and problem solving are emphasized. Hands-on experience and practical applications are included.

SECTION 1 - (covered throughout the 600 hours)

Introduction to Machining

Unit 1 – Introduction to Machining

Introduction
Machining defined
History of machining
The role of machining in society
Major machine tools

Unit 2 – Careers in Machining

Introduction
Modern machining careers

Unit 3 – Workplace Skills

Introduction
Personal skills
Technical skills
Training opportunities / methods
Job seeking

SECTION 2 - (100 clock hours total)

Measurement, Materials and Safety

Unit 1 – Introduction to Safety - (10 hrs)

Introduction
General safety guidelines
General Clothing for a Machining environment
Personal protective equipment (PPE)
Housekeeping
Guards and barriers
Handling and lifting
Compressed air safety
Lockout/tagout
Hazardous materials
Fire safety
Safety documentation



Unit 2 - Measurement Systems and Machine Tool Math Overview - (10 hrs)

Introduction

Measurement systems of the of the machining world

Machining mathematic concepts and operations

Unit 3- Semi-Precision Measurement - (10 hrs)

Introduction

What is a semi-precision measurement?

Rules

Calipers

Adjustable squares

Angular measurement

Fixed gages

Unit 4- Precision Measurement - (40 hrs)

Introduction

What is precision measurement?

Care of precision tools

Straight edges

Precision fixed gages

Surface plates

Solid squares

Gage blocks

Vernier measuring tools

Micrometers

Dial and digital measuring tools

Precision transfer or helper-type measuring tools

Measuring tools

Dial and digital indicators

Sine tools

Surface finish measurement

Optical comparators

Toolmaker's microscope

Coordinate measuring machine

Unit 5- Quality Assurance, Process Planning, and Quality Control - (15 hrs)

Introduction

Quality assurance

The process plan

Quality control

Unit 6- Metal composition and classification - (5 hrs)

Introduction

Ferrous metals nonferrous metals

Unit 7- Heat Treatment if Metals - (5 hrs)

Introduction

Hardening

Tempering

Annealing

Normalizing

Heat treatment of nonferrous metals

Heat-treating safety

Hardness scales and testing



Unit 8- Maintenance, Lubrication, and Cutting fluid overview - (5 hrs)

Maintenance
Cutting fluids

SECTION 3 - (100 clock hours total)

Job Planning, Benchwork, and Layout

Unit 1- Understanding Drawings - (40 hrs)

Importance of engineering drawings
Components of engineering drawings
Basic symbols and notation
Tolerance
Classes of fit
Geometric dimensioning and tolerance (GD&T)

Unit 2- Layout - (10 hrs)

Introduction
Layout fluid (layout dye)
Semi-precision layout
Precision layout
Basic layout construction and math
Layout procedure guidelines

Unit 3- Hand tools - (5 hrs)

Introduction
Screwdrivers
Pliers
Hammers
Wrenches
Bench vise
Clamps
Hacksaws
Files
Deburring
Abrasives

Unit 4- Saws and Cutoff Machines - (5 hrs)

Introduction
Power hacksaws
Band sawing machines
Saw blade characteristics and applications
Band saw blade welding
Band saw blade mounting/removal
Blade speed
The abrasive cutoff saw
Metal cutting circular (cold) saws

Unit 5- Offhand Grinding - (5 hrs)

Introduction
Grinder uses
Abrasive belt and disc uses
Grinding wheels
Pedestal grinder setup
Grinding procedures



Unit 6- Drilling, Threading, Tapping, and Reaming - (5 hrs)

Introduction

Benchwork holmaking operations

Threading and tapping

CNC Program, Setup & Operation

CNC turning and milling setup, programming and operation. Students develop process plans, plot points, set tool and work offsets using manual tools and probes, write, load, and edit basic programs. Use turning tools and rotating cutting tools, tool holders, speeds and feeds, and run part programs in the inch and metric coordinate positioning system. Accurate part inspection is emphasized, along with critical thinking and problem solving. Repetitive hands-on experience and practical applications are included. Students advance to programming parts with Mastercam and setting up and running their programs on the CNC machines.

SECTION 4 - (400 clock hours total)

Computer Numerical Control

Unit 1- CNC Basics - (10 hrs)

Introduction

The CNC machine control unit

CNC motion control

Coordinate systems

Positioning systems

Codes

Conversational-type programming

Parts of a CNC program

Unit 2- Introduction to CNC Turning - (10 hrs)

Introduction

Types of turning machines

Tool mounting adapters

Workholding

Process planning

Unit 3- CNC Turning: Programming - (80 hrs)

Introduction

Coordinate positioning for turning

Types of motion for turning

Non axis motion commands

Machining operations

Canned cycles

Unit 4- CNC Turning: Setup and Operation - (80 hrs)

Machine control panel

Workholding setup

Machine and work coordinate systems

Work offset setting

Cutting tools for turning

Program entry for turning

Turning machine operation

Unit 5- Introduction to CNC Milling - (10 hrs)

Introduction

Types of CNC milling machines



Toolholding
Process planning

Unit 6- CNC Milling: Programming - (80 hrs)

Introduction
Coordinate positioning for CNC milling
Speeds and feeds for milling
Machining operations
Sequence numbers
Types of motion for milling
Machining operations
Cutter radius compensation

Unit 7- CNC Milling: Setup and Operation - (80 hrs)

Machine control panel
Workholding setup
Machine and work coordinate systems
Power up and homing
Work offset setting
Cutting tools
Program entry
Machine operation

Unit 8- Computer Aided Design and Computer Aided Machining - (50 hrs)

Introduction
CAD software use
CAM software use



Transitioning service members from their military careers to civilian careers.

Charlie McBride – Veterans Employment Program Director, Indiana Dept. of Workforce Dev.
November 2012

As members of our military return home from duty and resume life as a civilian they face many challenges. One of those challenges is an economy and job market that is struggling. Another is a job market that has dramatically changed from what existed prior to joining the military. This means a prime opportunity to engage these returning service members in a focused training effort that will provide the skills needed to enter a career field. In addition there should be a clear path for future advancement through additional education and expanding job responsibilities that will encourage the veteran to see the career choice as a long-term growth opportunity. Many members of the military have experience in many career areas yet can't qualify for matched civilian careers because the certifications and requirements that are not compatible or transferrable to civilian occupations. While I have no knowledge of training programs designed and offered only to veterans'. A good case can be made for such a program some of the points are listed below:

- Veterans are generally more prepared for a structured training program because of their past training and military structure.
- They are used to learning difficult technical material at a fast pace
- They usually bring several years of experience as would an adult learner with years of work experience.
- They are very focused and goal or mission oriented.
- Many have strong math and technical backgrounds because of the military's use of advanced equipment.
- They are disciplined and methodical in their approach to tasks.
- They have been exposed to many cultures and environments so they tend to be more open to new concepts and ideas.
- Veterans most likely would benefit from a program designed for them since they have had some unique experiences and could get frustrated in a class environment with students straight out of high school. Like adult learners they can find younger students concerns petty and unrealistic.
- Former military are job ready in that they understand the demands of the job market. They only lack the specific training needed to be marketable.
- Returning veterans' have many benefits available to them for training and education both in short and long term educational programs. The critical issue is matching them to a program that will provide a sustainable and enjoyable career.
- These benefits also include tax and pay subsidies for the veteran and employer with OJT and the early phase of employment.



Vincennes University HTEC CNC Training Lab.

