

CASPER COLLEGE COURSE SYLLABUS
Course Number and Title: MCHT 2780 02 CNC Machining Center

Semester/Year: Fall 2015

Lecture Hours: 2

Lab Hours: 4

Credit Hours: 4

Class Time: Wednesday 1:00 – 4:00 p.m. and Thursday 4:00 – 7:00 p.m.

Room: WT 142

Instructor's Name: Paul Brutsman

Instructor's Contact Information:

Office Phone:
(307) 268-2529 w/voice mail

Email:
pbrutsman@caspercollege.edu

Office Hours: Monday and Wednesday 12:00 p.m. - 1:00 p.m. and 5:30 p.m. – 6:00 p.m.
Tuesday 12:00 p.m. 12:30 p.m. and 3:15 p.m. -3:30 p.m.
Thursday 12:00 p.m. – 12:30 p.m. and 3:15 p.m. -4:00 p.m.

Course Description: An introductory course in 3-axis CNC machining center programming and 2-axis CNC plasma cutter programming. The course is structured so no prior experience with CNC machining center or CNC plasma programming or operation is required. The time will be divided between classroom and shop.

Statement of Prerequisites: None

Institutional Outcomes:

- Demonstrate effective oral and written communication
- Use the scientific method
- Solve problems using critical thinking and creativity
- Demonstrate knowledge of diverse cultures and historical perspectives
- Appreciate aesthetic and creative activities
- Use appropriate technology and information to conduct research
- Describe the value of personal, civic, and social responsibilities
- Use quantitative analytical skills to evaluate and process numerical data

Program Goals: The goal of the Machine Tool department is for students to obtain an education and practical skill development that promotes lifelong learning and insures student success in a career in machining.

Course Goals: To educate the student in CNC mill programming and operation of a HAAS VF1 machining center and G5 Fabricator CNC plasma table. The student will write programs from component prints, input those programs into CNC, and machine the part. The student will also learn machine tooling and setup

Course Objectives: Use of CNC machining center in the manufacturing process.

Methodology: Practical application of theoretical concepts is emphasized in the classroom and lab. Concepts discussed in lecture will be demonstrated and then applied by the students.

Evaluation Criteria:

Homework	60%	A= 90-100%
Quizzes	10%	B= 89-80%
Tests	30%	C= 70-79%
		D= 60-69%
		F= <59%

Casper College may collect samples of student work demonstrating achievement of the above outcomes. Any personally identifying information will be removed from student work.

Required Text, Readings, and Materials: Machining Center Programming and Operation (text and workbook), Mike Lynch, CNC Concepts Inc.

References: Machinery's Handbook, Industrial Press.

Class Policies: Last Date to Change to Audit Status or to Withdraw with a W Grade:

- Refer to Casper College Catalog.
- Late assignments will not receive full credit. A letter grade will be deducted for each day the assignment is late. After four class periods the assignment will not be accepted.
- Cell phone use in the classroom is reserved for emergency purposes only. Please set all phones to vibrate and excuse yourself from the classroom if use is necessary.
- No i-pod or other electronic devices will be used during lecture or in the shop.
- Personal and equipment safety standards will be strictly enforced. It is the individual's responsibility to develop a safe work attitude. Jackets (hoodie) with strings are not allowed in the shop!
- Attendance is very important. It will be very difficult to make up missed class time. Students missing 5 classes will be given the choice of taking an "F" for the class, withdrawing from class or changing to an audit **and** continue to participate.
- Required Supplies: Clip Board, Graph Paper, **Safety Glasses** and 4GB or smaller thumb drive.

Student Rights and Responsibilities: Please refer to the Casper College Student Conduct and Judicial Code for information concerning your rights and responsibilities as a Casper College Student.

Chain of Command: If you have any problems with this class, you should first contact the instructor to attempt to solve the problem. If you are not satisfied with the solution offered by the instructor, you should then take the matter through the appropriate chain of command starting with the Department Head/Program Director, the Dean, and lastly the Vice President for Academic Affairs.

Academic Dishonesty: (Cheating & Plagiarism) Casper College demands intellectual honesty. Proven plagiarism or any form of dishonesty associated with the academic process can result in the offender failing the course in which the offense was committed or expulsion from school. See the Casper College Student Code of Conduct for more information on this topic.

Official Means of Communication: Casper College faculty and staff will employ the student's assigned Casper College email account as a primary method of communication. Students are responsible to check their account regularly. This is also, where you will find course evaluation links during course evaluation periods.

ADA Accommodations Policy: If you need academic accommodations because of a disability, please inform me as soon as possible. See me privately after class, or during my office hours. To request academic accommodations, students must first consult with the college's Disability Services Counselor located in the Gateway Building, Room 344, (307) 268-2557, bheuer@caspercollege.edu. The Disability Services Counselor is responsible for reviewing documentation provided by students requesting accommodations, determining eligibility for accommodations, and helping students request and use appropriate accommodations.

Course Outline

Week 1

Course Review

Review Syllabus

Review Shop Safety Rules

Introduce Text

Introduce Haas Programming Book

Machine Axis

Cartesian Coordinate System

Incremental vs Absolute

Datums

Tour Shop

Homework

Read Key Concept Number 1, lesson 1 thru lesson 6.

Exercise 1 - 1, 2, 4, 6, 7, 8, 9, 10, 13

Exercise 2 - 6, 7, 8, 9

Exercise 3 - 2, 3, 4, 5, 6, 8, 9, 10

Exercise 4 - 1, 3, 6, 7, 8, 9, 10, 11, 12, 16 (place program zero at lower left corner of workpiece)

Week 2

Introduction to M, G, S and T functions

Modal vs Non-Modal Commands

Feeds and Speeds Amount of Material Removed HP Requirements (optional)

Machine Modes Page 27-30 Haas Operator's Manual

EDIT MEM MDI/DNC HANDLE JOG ZERO RET LIST PROG

GRAPHIC SIMULATION MODE

Shop Demonstration

Machine Startup Procedure

Machine Axis X,Y,Z

Machine Modes

EDIT MDI/DNC HANDLE/JOG ZERO RET LIST PROG LIST

PROG GRAPHIC SIMULATION MODE

Homework

Key Concept #1, Lesson 7 Exercise 5 - 1, 5. Exercise 6 - 1, 3, 13, 15

Study M & G Codes, Haas Work Book page 14 -15

Week 3

Review Homework

Quiz # 1 on M and G Codes

Detailed Discussion of M, G, S and T Functions

Initial Rapid Plane vs Rapid Plane

Format for Writing CNC Program on PC

Microsoft Notepad

First line of program %

Program Commenting (NAME)

Preparatory line

End of Program M30

Last Line of Program %

Using Notepad search feature for Z and O values!

Program in Class

Point to Point Program

Modal vs Non-Modal

Demo of Microsoft NotePad

Machine Controls

Overhead of Machine Startup Procedure

Overhead of Machine Modes

Overhead of X, Y, and Z “zero” for T1

Machine Controls

Demonstration of Machine Startup Procedure

Demonstration of X, Y, and Z “zero” for T1

Demonstration of Feed Rate Override

Demonstration of Spindle Speed Override

Machine Demonstration of Graphics Mode

Homework

Write Program for Part %1 and store on Disk

Key Concept #2, lesson 8.

Key Concept #3, lesson 9 pages 95-107

Week 4

Quiz # 2 on M and G Codes

Review Homework %1

Handout Print for %2

Circular interpolation G02 and G03

MDI Mode

Start Spindle

Pickup tool offset G54 X, Y and Z for Tool 1

Program %1

Load Program into CNC from Floppy

Run Program in Graphics Mode

Run Program in single block. Use Z offset to run program 2" above workpiece

Run program in full sequence

Homework

Key Concept #3, lesson 9 G02 and G03 pages 108-116

Program for Part %2

Week 5

Review Homework %2

Handout Print for part %3

Cutter Centerline Programming

Program %2

Load Program into CNC from Floppy

Run Program in Graphics Mode

Run Program in single block. Use Z offset to run program 2" above workpiece

Run program in full sequence

Homework

Program for part %3

Week 6

Review Homework %3
Handout Print for %4
Work Surface Path Programming
Cutter Compensation G40, G41 and G42
Using Cutter Compensation for Rough and Finish Machining
Tool length Offsets G43
Program %3
 Load Program into CNC from Floppy
 Run Program in Graphics Mode
 Run Program in single block. Use Z offset to run program 2" above
workpiece
 Run program in full sequence
Homework
 Key Concept #4, lesson 10, 11 and 12
 Exercise 10 - 1, 2, 3, 4, 6, 9, 10, 11, 12
 Program for part %4

Week 7

Review Homework %4
Handout Print %5
Drilling Cycles G83, G81 and G73
Canned Cycle Cancel G80
G98 vs G99 Return Planes
Program Format for Multiple Tools
Multiple Tool Length Offsets
Basic Trigonometry
Program Commenting for Multiple Tools
Program Stop M00 and Optional Stop M01
Program %4
 Load Program into CNC from Floppy
 Run Program in Graphics Mode
 Run Program in single block. Use Z offset to run program 2" above
workpiece
 Run program in full sequence
Homework
 Program for part %5

Week 8

Review Homework %5

Handout Print for %6 softjaws

Program %5

Load Program into CNC from Floppy

Run Program in Graphics Mode

Run Program in single block. Use Z offset to run program 2" above workpiece

Run program in full sequence

Homework

Program for part %6

Key Concept Number Six, Lesson 16 pages 201-218

Key Concept Number Five Lesson 14, lesson 15 pages 187-192

Haas Work Book pages 74-80

Week 9

Review Homework %6 Softjaws

Handout Print for %7 (2 softjaws simultaneously using G54 -G59 and subroutines)

Fixture Offsets G54-G59

Demonstration of Picking Up Multiple Fixture Zeros

Subroutines\Subprograms M97 and M98

Program %6 softjaws

Load Program into CNC from Floppy

Run Program in Graphics Mode

Run Program in single block. . Use Z offset to run program 2" above workpiece

Run program in full sequence

Homework

Program for part %7

Key Concept Number Four, Lesson 13

Key Concept Number Six, Lesson 17 to page 230

Haas Work Book Manual 104-108

Week 10

Review Homework %7

Review for Test #1

Program %7

Load Program into CNC from Floppy

Run Program in Graphics Mode

Run Program in single block. Use Z offset to run program 2" above workpiece

Run program in full sequence cutting air only

Homework - Study for Test #1

Week 11

Test #1

Week 12

Review Test #1
Handout final project print
Rigid Tapping G84
Rigid Tapping vs Float Tapping
Tension and Compression/Floating Tap Holder
Rigid tapping calculations
G12/G13 Circular Pocketing and G150 Rectangular Pocketing
Homework
 Haas Manual page 203 -205, 247-250
 Final Project

Week 13

Work on Final Project
Final Project Program
 Load Program into CNC from floppy
 Run Program in graphics mode
 Run Program in single block . Use Z offset to run program 2" above
 workpiece
 Run program in full sequence
Homework
 Final Project

Week 14

Work on Final Project
Final Project Program
 Load Program into CNC from floppy
 Run Program in graphics mode
 Run Program in single block. Use Z offset to run program 2" above
 workpiece
 Run program in full sequence
Homework
 Work on final project

Week 15

Work on Final Project
Program
 Load Program into CNC from floppy
 Run Program in graphics mode
 Run Program in single block . Use Z offset to run program 2" above
 workpiece
 Run program in full sequence
Homework
 Work on final project

Week 16

Finish Final Project

Other topics covered if time allows:

Thread milling with G02 and G03 Canned cycles
subprogramming with incremental mode