



**Department:** Machining / Industrial Machinist Technology  
**Course Title:** Fundamentals of Computer Numerical Controlled (CNC) Machine Controls  
**Section Name:** MCHN 2403 - F50C  
**Semester:** Spring 2015  
**Time:** F50C - MW 06:30 PM - 10:20 PM  
**Classroom:** Sedate Hall 142  
**Instructor:** Carey Taylor  
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**Phone:** 432-335-6475  
**Office Hours:** As Posted

**Course Description:** MCHN 2403 Fundamentals of Computer Numerical Controlled (CNC) Machine Controls (48.0501) (2-6) 4 hours: The student is introduced to programming, setup & safe operation of Computer Numerically Controlled (CNC) machine shop equipment. The student will learn manufacturing terminology, theory, math and metrology as applied to CNC machining. Continued emphasis is placed on shop & machine, housekeeping, preventative maintenance as well as proper use and care of hand tools, layout tools, semi-precision & precision measuring tools.

**End-of-Course Outcomes:** Demonstrate operations of CNC machine controls; compare and contrast the differences between conventional and CNC machines; utilize CNC machine applications for machining operations.

Lab fee required. (ICOs 1, 2, 3, 4, 5) Prerequisite: MCHN 1438 or consent of department chair.

<b>Required Text Book:</b>	<b>1<sup>st</sup> edition</b>	<b>2<sup>nd</sup> edition</b>
	<b>ISBN-13: 978-1-4354-4767-7</b>	<b>ISBN-13: 978-1-2854-4454-3</b>
	<b>ISBN-10: 1-4354-4767-7-0</b>	<b>ISBN-10: 1-2854-4454-X</b>

**Required Equipment:**

- 1. Clear Safety Glasses (Instructor will issue 1<sup>st</sup> pair)**
- 2. 3 Ring Binder, Notebook Paper & Graph Paper, Pencils, and Pens**  
(OC Bookstore has these items)

**All students must have required Text Book & Supplies by the 3<sup>rd</sup> class or arrangements made with Instructor. After the 3<sup>rd</sup> class! All students must have required Text Book & Supplies by the 3<sup>rd</sup> class or arrangements made with Instructor. After the 3<sup>rd</sup> class, students not prepared for class will be dismissed from each class with an Un-excused absence. (See Attendance Policy at the top of Page 4)**

You are encouraged to buy the following *optional* supplies.

1. 6 inch steel rule (M&M Sales or Cameron Tools)
2. Calculator (Scientific calculator or Machinist Calculator Pro are acceptable)
3. Machinery's Handbook
4. Tape Measure (8 ft., 10 ft., 25ft)

**Odessa College’s Institutional Core Objectives (ICOs):**

- 1) *Critical Thinking Skills* - to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information
- 2) *Communication Skills* - to include effective development, interpretation and expression of ideas through written, oral and visual communication
- 3) *Empirical and Quantitative Skills* - to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions
- 4) *Teamwork* - to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal
- 5) *Personal Responsibility* - to include the ability to connect choices, actions and consequences to ethical decision-making
- 6) *Social Responsibility* - to include intercultural competence, knowledge of civic responsibility, and the ability to engage effectively in regional, national, and global communities

**Learning Outcomes for MCHN 1438 (Source: *Odessa College Catalog of Courses*)**

<b>Outcome</b>	<b>ICO</b>
<b>The student will use these skills to use hand tools, power tools, &amp; machine tools to layout and make class projects.</b>	<i>Critical Thinking Skills</i> - to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information
<b>Students will learn and understand industry terminology, interpret machining drawings, and follow written and verbal instructions to setup and machine projects.</b>	<i>Communication Skills</i> - to include effective development, interpretation and expression of ideas through written, oral and visual communication
<b>The student will use numerical data to understand related machine drawings and setup machines to manufacture projects.</b>	<i>Empirical and Quantitative Skills</i> - to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions
<b>Students will develop work skills and habits necessary to work in a manufacturing environment as part of a production team.</b>	<i>Teamwork</i> - to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal
<b>Students will develop ethical choices, actions and consequences for the production and inspection of welded products used in a manufacturing environment.</b>	<i>Personal Responsibility</i> - to include the ability to connect choices, actions and consequences to ethical decision-making
<b>Students will use their skills and knowledge to engage in community outreach and volunteer programs. The students will become effective community citizens through these activities.</b>	<i>Social Responsibility</i> - to include intercultural competence, knowledge of civic responsibility, and the ability to engage effectively in regional, national, and global communities

**Odessa College Policies**

**All Academic Policies can be found on the Odessa College Blackboard page for this course. In an attempt to save on paper please review those policies online.**

*As part of the Design for Completion initiative, your Odessa College Student Success Coach and faculty mentor will help you stay focused and on track to complete your educational goals. If an instructor sees that you might need additional help or success coaching, he or she may submit a Retention Alert. You're Student Success Coach or faculty mentor will contact you to work toward a solution.*

## Spring 2015 Calendar

Classes Begin 8 A.M.	Jan 14 (Wed)
Late Registration & Schedule Changes (Add/Drop): till 6 P.M.	Jan 14 (Wed)
Holiday (MLK Jr. Day – Offices & Campus Closed - No Classes)	Jan 19 (Mon)
Census Day	Jan 30 (Fri)
Fall 2015 Registration Begins	March 9 (Mon)
Spring Break	March 9 - 15
Last Class Day	April 30 (Thurs)
Final Exams	May 4-7 (Mon-Thurs)
End of Semester	May 7 (Thurs)
Spring Graduation	May 9 (Sat)

## Course Policies

### **Disclaimer**

This syllabus is tentative and subject to change in any part at the discretion of the instructor. Any changes will be in accordance with Odessa College policies. Students will be notified of changes, if any, in timely manner.

**Original Effort:** The work submitted for this course must be original work prepared by the student enrolled in this course. Efforts will be recognized and graded in terms of individual participation and in terms of ability to collaborate with other students in this course.

**Description of students:** Students enrolled in this course will have a desire to develop skills in the manufacturing and repair industries. This student will be motivated to understand the principles needed to setup and operate Manual Machine Tools for the design and manufacture of machined projects.

**Course Alignment with Industry Standards:** This course follows the guidelines set forth by the TEXAS CAREER TECHNICAL / WORKFORCE EDUCATION MANUAL, “**WECM**”.

**Digital Protocol:** Cell phones must be placed on either *vibrate* or *silent* mode and are to be accessed in emergency cases only. The use of laptops or any other digital device is permitted in order to facilitate note-taking relative to instruction. Back-up and/or additional copies of all assignments submitted is encouraged.

**Computers/printers are available to OC students in the LRC (301-303); therefore, not having access to a computer due to technical issues (crash; corrupted files) will not be considered as an acceptable reason for not completing assignments.** If there is a loss of server connection with Odessa College due to maintenance, then an email will be sent to student with pertinent information and status reports. Assignments submitted electronically need to be **WORD documents (doc or docx)**.

**If using a digital device application for reference purposes during testing, it must be placed in “Airplane” mode.**

## Attendance Policy

Students are expected to attend class regularly. Attendance will be recorded using a “sign-in” sheet. Excessive absences will be grounds for disciplinary action, and will be determined on a case-by-case basis. If you are more than 15 minutes late to class or leave class early without notifying the instructor, this will count as an unexcused absence. Students are permitted **2 absences before a loss of point(s)**. If the student has incurred **7 absences** in the course, the instructor will recommend withdrawing from the course to avoid course failure.

## AVID

This course has been identified as a course by Career, Technical, and Workforce Education as one in which teaching and learning strategies adopted by AVID will be implemented. As a student in the legal program, you will be expected to develop an understanding of the strategies, to model the strategies, to maintain fidelity of implementation, and to examine how these strategies may impact your effectiveness as a professional in your chosen area of occupation, either through coursework or practicum experience as outlined by the course instructor.

## Grading Policy

Please understand that this is a required course for the Machining / Industrial Machinist Technology program in order to prepare you for a successful career in the manufacturing and repair industry. Quality work and active participation is expected and not to be negotiated. As a general policy, grades will be taken in class. Any written assignments or tests will be graded outside of class. You can expect feedback on assignments within a week’s time.

## Grade Inquiry Policy

It is the responsibility of the individual taking this course to maintain accurate track of assignment submissions and grades. There will be opportunities during the semester to meet with the instructor to discuss your academic progress. Contact the instructor to schedule an appointment. Class time will not be used for grade inquiries. All grades are final.

## Communication Plan

The best way to communicate with the course instructor is via email. Also, check in regularly for announcements, including any changes in the course schedule due to instructor illness or conference attendance. Appointments with the instructor may also be scheduled.

## General Course Requirements

1. Attend class and participate
2. Contribute and cooperate with civility, courtesy and respect.
3. **Submit assignments on time. Late work will not be accepted. Medical and/or family circumstances that warrant an extension on assignments need to be presented to the instructor. Extensions will be allowed at the instructor’s discretion.**

**Grading Scale:**

- “A” = 90-100
- “B” = 80-89
- “C” = 70-79
- “D” = 60-69
- “F” = 0-59

## Incomplete Policy

An 'Incomplete' grade may be given only if:

1. The student has passed all completed work
2. If he/she has completed a minimum of 75% of the required coursework. A grade of an "I" will only be assigned when the conditions for completions have been discussed and agreed upon by the instructor and the student.

## Overview of assignments

<u>Type of Assignment</u>	<u>Percentage</u>
Homework Avg.	15%
Section Quiz Total	15%
Lab Work	50%
Professionalism	10%
Final Exam	<u>10%</u>
Total Grade	100%

## Schedule (Tentative and Subject to Change)

**NIMS Duties & Standards**  
**Odessa College Machine Technology**  
**MCHN 2403 Fundamentals of CNC Machine Controls**

### Duty

#### Area 1 Job Planning and Management

#### Section/Unit

- 1.1 Job Process Planning  
Develop a process plan for a part requiring milling, drilling, turning, or grinding. Fill out an operation sheet detailing the process plan and required speeds and feed.

2.5

### Duty

#### Area 2 Job Execution

- 2.1 Manual Operations: Benchwork  
Hand drill and hand tap holes. Use hand drills, hand taps, tap wrench, files, and abrasives to deburr parts. Use arbor presses to perform press fits. Use bench vises and hand tools appropriately.
- 2.2 Manual Operations: Layout  
Layout the location of hole centers and surfaces within an accuracy of +/- .015.
- 2.3 Turning Operations: Between Centers Turning  
Setup and carry out between centers turning operations for straight turning.
- 2.4 Turning Operations: Chucking  
Setup and carry out chucking operations for turning.
- 2.5 Milling: Square Up a Block  
Setup and perform squaring up the six surfaces of a block to within +/- .002 and .002 over 4.5" squareness.
- 2.6 Vertical Milling  
Setup and operate vertical milling machines. Perform routine milling, and location of hole centers within +/- .005".
- 2.7a Surface Grinding  
Ring test grinding wheels, perform visual safety inspection, mount and dress a grinding wheel in preparation for surface grinding.
- 2.7b Surface Grinding

3.3, 3.6

3.2

5.3

5.3

6.3

6.3

3.5; 7.3

	Setup and operate manual surface grinders with a 8" and smaller diameter wheel. Perform routine surface grinding, location of surfaces, and squaring of surfaces. Perform wheel dressing.	7.3
2.8	Drill Press	
	Setup and operate drill presses. Perform routine drill press operations.	4.3
2.9	CNC Programming	
	Using the principles of Cartesian coordinates develop a program for the manufacturer of a simple part.	8.1; 8.3; 8.6
<b>Duty</b>		
<b>Area 3</b>	<b>Quality Control and Inspection</b>	
3.1	Part Inspection	
	Develop an inspection plan and inspect simple parts using precision tools and techniques. Prepare reports on the compliance of the parts.	2.3,2.4,2.5
3.2	Process Control	
	Follow a sampling plan. Inspect the samples for required data. Enter the data on appropriate charts. Graph the data. Respond to the warning conditions indicated by the process charts.	2.5
<b>Duty</b>		
<b>Area 4</b>	<b>Process Adjustment and Improvement</b>	
4.1	Process Adjustment-Single Part Production	
	Analyze the performance of a single-part production process. Formulate process adjustments or improvements where appropriate. Where appropriate, notify supervision of the proposed adjustment and/or improvement. Where authorized, carry out the strategies for process adjustment and/or improvement.	2.5
4.2	Participation in Process Improvement	
	As a member of a process team, analyze the performance of a production process. With the team formulate process adjustments or improvements where appropriate. Where appropriate, notify supervision of the proposed adjustments and/or improvement. Where authorized, carry out the strategies for process adjustment and/or improvement.	1.2; 2.5
<b>Duty</b>		
<b>Area 5</b>	<b>General Maintenance</b>	
5.1	General Housekeeping and Maintenance	
	Keep the duty station clean and safe for work. Keep the tools, workbenches, and manual equipment clean, maintained, and safe for work.	2.1
5.2	Preventative Maintenance, Machine Tools	
	Inspect and assess the general condition of an assigned machine tool. Make routine adjustments as necessary and as authorized. Report problems to supervision which are beyond the scope of authority. Carry out daily, weekly, and/or monthly routine upkeep chores cited on checklists for a given machine tool.	2.8
5.3	Tooling Maintenance	
	Inspect and assess the condition of tooling. Refurbish tooling where appropriate. Refer tooling for repair or regrind where appropriate.	3.3, 5.3, 6.3, 2.8
<b>Duty</b>		
<b>Area 6</b>	<b>Industrial Safety and Environmental Protection</b>	
6.1	Machine Operations and Material Handling	
	Carry out assigned responsibilities while adhering to safe practices in accordance with OSHA requirements and guidelines. Document safety activities as required.	2.1
6.2	Hazardous Materials Handling and Storage	

Handle and store hazardous materials as assigned while adhering to safe practices in accordance with OSHA and EPA requirements and guidelines. Document safety activities as required. 2.1

## **Duty**

### **Area 7 Career Management and Employment Relations**

- 7.1 Career Planning  
Develop and explain a short-term career plan and resume. 1.2
- 7.2 Job Application and Interviewing  
Complete job application form and demonstrate interviewing skills.
- 7.3 Teamwork and Interpersonal Relations  
Demonstrate appropriate interpersonal skills in job performance evaluations, group communication and decision-making, and conflict resolution. 1.2
- 7.4 Organizational Structures and Work Relations  
Identify and explain the major departments or functions in a metalworking company and how they affect production units. 1.2
- 7.5 Employment Relations  
Understand and explain employment rights and responsibilities in metalworking. 2.1

### **Knowledge, Skills, Abilities, and other Characteristics**

## **KSAO**

### **Area 1 Written and Oral Communication**

- 1.1 Reading  
Locates, understands, and interprets written technical and non-technical information in documents commonly found in the metalworking industry. These documents contain short and simple sentences, paragraphs and passages, phrases, quantitative information, specialized vocabulary, graphs, charts, schedules, simple instructions, and multi-step directions. All documents are written in standard English. 1.2
- 1.2 Writing  
Communicates technical and non-technical information, messages, and ideas in writing using standard English commonly found in the metalworking industry. This writing includes the completion of forms, information sheets, reports, group meeting materials, and short memos.
- 1.3 Speaking  
Communicates technical and non-technical detailed information, messages, multi-step directions and ideas through oral communication using standard English and related cues and communication aids in conversations, discussions, group meetings. Understands and responds to listener feedback and asks questions when needed in two-way and group conversations.
- 1.4 Listening  
Listens for, receives, interprets, and recalls specific detail, ideas, and multi-step instructions in verbal presentations, conversations, discussions, and group meetings conducted in standard English and supported by written material and other communication cues and aids. Uses active listening skills in comprehending simple technical and non-technical verbal information.

## **KSAO**

### **Area 2 Mathematics**

- 2.1 Arithmetic  
Performs addition, subtraction, multiplication, and division of whole numbers without a calculator, and performs calculation of fractions and 2.2

decimals, as well as conversion to metric measurement with or without a calculator.

- 2.2 Applications of Geometry  
Understands and applies basic geometric concepts and terminology which form the analytical foundation of job planning and execution including planes perpendicularity, Cartesian coordinates, concentricity, parallelism, straightness, flatness, circularity, and symmetry, etc. 2.2; 3.1
- 2.3 Applications of Algebra  
Uses standard formulas and arithmetic operations to make required calculations with or without a calculator. Can solve for an unknown in a trade formula. 2.2
- 2.4 Applications in Trigonometry  
Uses standard formulas and arithmetic operations to make required calculations with or without a calculator, solving for unknowns in right triangles. 2.2
- 2.5 Applications of Statistics  
Use standard formulas and arithmetic operations to calculate means, medians, modes, and ranges with or without a calculator. 2.2, 2.5

## **KSAO**

### **Area 3 Decision Making and Problem Solving**

- 3.1 Applying Decision Rules  
Can follow a set of instructions laid out in a sequence. Can interpret and follow "if..then..." instructions. 1.2
- 3.2 Basic Problem Solving  
Can establish new responses to unexpected problems of a simple nature. Can formulate the new responses into a sequence of instructions or a set of "if...then..." rules.

## **KSAO**

### **Area 4 Social Skills and Personal Qualities**

- 4.1 Social Skills  
Identify and demonstrate the appropriate social skills and related personal qualities in the performance of major duties requiring cooperative relations with supervisors, team leaders, and team members. 1.2,
- 4.2 Personal Qualities  
Identify and demonstrate the appropriate personal qualities in performing major job duties and maintaining positive employment relations. 1.2

## **KSAO**

### **Area 5 Engineering Drawings and Sketches**

- 5.1 Standard Orthographic Prints  
Interprets orthographic blueprints. 3.1
- 5.2 GD & T Orthographic Prints  
Interprets GDT orthographic prints. 3.1
- 5.3 GD & T Datums, Symbology and Tolerances  
Identify the common symbols, the use of datum references and tolerances used in GD&T 3.1

## **KSAO**

### **Area 6 Measurement**

- 6.1 Basic Measuring Instruments  
Recognizes and applies basic measuring instruments such as rules, protractors, and basic transfer tools such as simple inside and outside calipers. 2.3; 3.2



6.2	Precision Measuring Instruments Recognizes and applies precision measuring instruments such as micrometers, vernier, dial, and electronic calipers, dial indicators, precision transfer tools such as telescoping gages and adjustable parallels.	2.4, 3.2, 5.2, 5.5, 6.3, 6.4, 7.3
6.3	Surface Plate Instruments Recognizes and applies appropriately precision tools and instruments for surface plate work such as precision angle plates and tool blocks, precision transfer gages, and precision height gages.	2.4; 3.2
6.4	Metric Conversion Convert all measurement to metrics.	2.2

**KSAO**

**Area 7 Metalworking Theory**

7.1	Cutting Theory Understands and can explain the ideas of heat, shock, friction, zone of distortion, cutting interface, machinability, cutter presentation, cutter geometry, and chip-holding capacity as they relate to machining applications.	some covered in 4.3; 5.3; 6.2
7.2	Tooling Recognizes a wide variety of cutting tools, tool holding devices, and work holding devices. Understands the appropriate application of these cutters and devices.	4.2; 5.2 5.3; 6.2; 6.3
7.3	Material Properties Recognizes common materials and their principal properties relevant to machining tasks. Recognizes differences between ferrous and non-ferrous, magnetic, and ductile materials. Understands the changes which heat-treat impart to materials.	2.6; 2.7; 4.3
7.4	Machine Tools Recognizes the common classes of machine tools, understands the function of the major subsystems of the machine tools, selects and applies a given machine tool appropriately.	1.1
7.5	Cutting Fluids and Coolants Recognizes, selects, and applies appropriate coolants and coolant delivery systems.	2.8

**KSAO**

**Area 8 Introduction to CNC**

8.1	Word Address Program Codes Develop a knowledge of basic word address programming codes, and Cartesian Coordinates. Understand incremental and absolute positioning and cutter compensation.	8.1; 8.3; 8.6
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