**CHAMP Course Map**

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| **Course Name:** MAC 201 Intro to CNC turning center |
| **Instructor Name:** Community College of Denver | **Date:** |
| **Competencies:****I.      Discuss purpose of CNC lathes.** **II.     Name major parts of a CNC lathe.** **III.    Calculate math issues related to programming CNC lathes.** **IV.     Identify and list Functions of all Controller switches, buttons, and knobs.** **V.      List functions of all G-codes associated with CNC lathes.** **VI.     List functions of all M-codes associated with CNC lathes.** **VII.    Explain the purpose and functions of work coordinate systems.****Topical Outline:****I.      CNC Lathes** **A.      Purpose of CNC Lathes** **B.      CNC Lathe Parts & Accessories** **II.     Related Technical Math** **A.      Polar / Cartesian Coordinate Systems** **B.      XZ Coordinates** **C.      Right Angle Trigonometry** **D.      Absolute / Incremental** **III.    Controller Functions** **A.      Machine Stops** **B.      Machine Overrides** **C.      Machine Modes** **D.      Jog Mode** **E.      Misc. Machine Functions** **IV.     Lathe Letter Address System** **A.      Purpose of the Letter Address System** **B.      G-Codes** **C.      M-Codes** **V.      Machine Set-Up** **A.      Work Holding Techniques** **B.      Work Coordinate Systems** **C.      Locating Program Zero** |

**Course Materials (Text, Edition and any other publisher items)**

**Textbooks and/or Resources:** CNC Programming: Principles and Applications By Michael Mattson ISBN-13 978-1-4180-6099-2

| **Module # and Title** | **Day** | **CCNS Competencies** | **Content, Activities or Challenges****(Learner Interaction****& Engagement)** | **Assessments, Rubrics (Feedback)** | **Publish to OER** |
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| **Module 1: Class intro and machine basics** | Day 1 | COMP I, COMPII, COMP IV | 1. Speaking point: Class rules and syllabus
2. Lecture: Machine power up and down procedures using handout “EM\_Samsung SL 25ASY power up and down procedures.”
3. Cover Ch. 1 (Computer Numerical Control of Machine tools) in book in class
4. Hands-on demonstration: Cover power up and down procedures for machines in machine shop (highlight differences and standards)
5. Lecture on proper fluids using handout”EM\_proper fluids used and levels.”
6. Make students aware that the class will be skipping Chapter 2 in book
 |  | -ID002: CCD Samsung SL 25ASY training manual-EM\_Samsung SL 25ASY power up and down procedures-EM\_ Proper fluids used and levels-Machine Modes Power Point |
| Day 2 | COMP III | 1. Lecture and hands-on demonstration: Home, machine, Absolute, Relative, and Home position on machine
2. Lecture: Tool identification and selection, use handout ID008 Turning insert ID system for reference and “ID007 Top notch grooving insert ID system.”
3. Lecture: ISO material grades for machining, use handouts “ID004 material ID” and “ID008 Stellram ISO grade chart”
 |  | -ID004 material ID-ID006 Stellram\_ISO\_grade\_chart-ID007 Top notch grooving insert ID system-ID008 Turning insert ID system |
| Day 3 |  | 1. Speaking points: controller lay out. Program layout, and Machine alarms using handout “EM\_common alarm clearing”
2. Lecture: Diametric values versus radial
3. Lecture Relative positioning versus Absolute positioning
4. Students will complete comps
 | COMP 1 | -EM\_common alarm clearing-E\_Common Alarms PP |
| Day 4 | COMP VII | 1. Cover Chapter 3 (The NC Programming Process) in text book in class
2. Lecture using “EM\_loading tools” handout and hands on exercise: tool loading and unloading
3. Lecture and hands on demo: Setting tools on center line
4. Lecture and hands on demo: Work coordinate setting
5. Lecture: Machine Spec using “ID005 Machine spec handouts”
 |  | -ID005 Machine Spec handout-EM\_loading tools |
| **Module 2: CNC lathe Program basics** | Day 5 | COMP V, COMP VI | 1. Lecture: Basic M and G codes for 2 axis CNC lathe using MAC 201 Basic M and G codes” handout.
2. Lecture using handout “EM\_loading and unloading programs handout” and demo: Program uploading
3. Cover Ch. 4 (NC materials, tooling and machining processes) in text book
 | QUIZ 1(quiz 1 is over materials and lectures from Module 1) | -EM\_loading and unloading programs handout-MAC 201basic M and G codes- 1,2,3, SAMPLE PROG text file- EM\_Nose radius compWord Document |
| Day 6 |  | 1. Lecture clamp devices and soft jaws using “EM\_chuck jaw cutting handout” to explain soft jaw cutting.
2. Lecture: locating surfaces and part stops
 | HW assign1 | -EM\_Chuck jaw cutting handout |
| Day 7 |  | 1. Cover Chapter 5 (Tool and work piece setup) in class
2. Skip Chapters 6 and 7
3. Cover Chapter 8 (Basic Codes to Control Machine Functions) in class)
4. Practice Basic CNC programming as class guided exercise
5. Students will complete comps
 | COMP 2 |  |
| Day 8 |  | 1. Cover Chapter 10 (Tool Radius Compensation) in class
2. Lecture on TNRC and calculating outer radii and fillets without machine compensation
 | HW assign 2 |  |
| **Module 3: Advanced 2 axis CNC programming** | Day 9 |  | 1. Review all material covered in class before this point in preparation for the mid term
 | QUIZ 2(quiz 2 is over materials and lectures from module 2) |  |
| Day 10 |  | 1. Cover Chapter 12 (Lathe Programming) in text book in class
 | MID TERM |  |
| Day 11 |  | 1. Lecture on lathe canned cycles reference “ID003 G codes canned cycles lathe 2” for example programming
2. Lecture on CNC threading programming
 |  | -ID003 G codes canned cycles lathe 2 |
| Day 12 |  | 1. Lecture on bar jobs versus slug jobs
2. Lecture on part planning
3. Lecture on sub programs
4. Lecture on part catchers
 | Assign HW 3 | EM\_SUB PROGRAMS AND PROGRAM LOOPS |
| **Module 4: Part Planning and small details** | Day 13 |  | 1. Lecture on multiple operation concepts and part blending
2. Lecture on lay down threading inserts versus universal threading inserts
3. Inner diameter work and 90 degree chamfers
4. Students will complete comps
 | COMP 3 | EM\_PART BLENDING |
| Day 14 |  | 1. Lecture on controller differences
2. Hands on demonstration with Anilam and Ikegai machines
 |  | ID001 Anilam CNC programming and operations manual |
| Day 15 |  | 1. Advanced machining, hands on, material catch up
 | Assign HW 4 |  |
| Day 16 |  | 1. Advanced machining, hands on, material catch up,
2. Students will complete comps\*
 | COMP 4, QUIZ 3(quiz 3 is over materials and lectures in modules 3 and 4) |  |
| **Module 5: Review and Final** | Day 17 |  | 1. Advanced machining, hands on, material catch up
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| Day 18 |  | 1. Review all material covered in class in preparation for the final exam
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| Day 19 |  | 1. Final Exam.
 | FINAL EXAM |  |
| Day 20 |  | 1. Machine shop cleaning
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\*= The amount of material that is in this class it is possible that the schedule will have to be adjusted. The last several days of class will be available to complete and review material if the class falls behind. The last several days of class may also be used to complete comps that have not been completed for lack of machines. If the class is up to date with all material advanced machining concepts can been covered such as C and Y axis lathe machining and dual spindles. Advanced machining information will not be tested on.