

This syllabus belongs to: \_\_\_\_\_  
print student name

**EL CAMINO COLLEGE**

**MACHINE TOOL TECHNOLOGY 105-7681 FA2015**

**“CONVENTIONAL AND CNC MILLING”**

Professor Eric Carlson  
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**COURSE OUTLINE**

A: CATALOG AND CLASS SCHEDULE DESCRIPTION:

1. Class Schedule:

9:15 am – 12:20 pm	Mon, Wed	Lab	ITEC 5
12:40 pm – 1:30 pm	Mon	Lecture	ITEC 18
12:40 pm – 1:45 am	Wed	Lecture	ITEC 18

2. Catalog Description:

Lecture: 2 hours	Laboratory: 6 hours	Units: 4
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In this course, students will study at an advanced level the principles and operation of conventional and Computer Numerically Controlled (CNC) machine tools with an emphasis on the set up and operation of milling machines. Topics will include safety, drilling, milling, tapping, tooling, CNC programming practices, and setups as applied in industry.

NOTE: Letter grade or pass/no pass option

Prerequisite: Machine Tool Technology 46, or 101abcd (or the former Machine Tool Technology 13A) with a minimum grade of C in prerequisite or equivalent.

B. MACHINE TOOL TECHNOLOGY 105 OBJECTIVES:

Upon successful completion of this course, the student will be able to:

1. Correctly use and apply machine safety practices with 100% accuracy.
2. Correctly use hand tools, measuring tools, power saws, engine lathes, drilling machines and grinding machines to perform supplemental machine tool operations on assigned work within the tolerances specified on engineering drawings.
3. Set up and operate vertical and horizontal milling machines to square stock, mill flat surfaces, face mill, side mill, end mill, fly cut, slit, and slot to produce assigned work within the tolerances specified on engineering drawings
4. Set up and operate rotary tables, indexing and dividing heads to produce assigned work within the tolerances specified on engineering drawings.

5. Set up and operate CNC vertical milling machines to produce assigned work within the tolerances specified on engineering drawings.
6. Solve shop mathematic problems involving trigonometry and its application to rotary tables, indexing and dividing heads, dove-tails, compound angles, speeds and feeds, blueprint interpretation and calculations relating to the milling machine.
7. Read, de-bug and edit, CNC vertical milling machine word address programs to produce assigned work within the tolerances specified on engineering drawings.
8. Enter Manual Data Input (MDI) CNC word address milling machine programs to machine vise soft jaws for holding work to produce parts within the tolerances specified on engineering drawings.

C. STUDENT LEARNING OUTCOMES:

SLO #1 Squaring the Block: Given a rough-cut aluminum block, square the block using a milling machine, cutters and measurement tools.

SLO #2 Power Machines: Using proper safety procedures and precautions, students will be able to set up and operate vertical and horizontal milling machines, rotary tables, indexing and dividing heads, and vertical milling machines to produce assigned work within the tolerances specified on engineering drawings.

SLO #3 Soft Jaws Project: Students will be able to read, de-bug and edit CNC vertical milling machine word address programs and to enter Manual Data Input (MDI) CNC word address milling machine programs to produce vise soft jaws for holding work to product parts within the tolerances specified on engineering drawings.

D. RECOMMENDED TEXT:

S.F. Krar, Technology of Machine Tools, (7<sup>th</sup> edition), 2011, McGraw Hill, New York, NY

E. REQUIRED AND RECOMMENDED MATERIALS:

1. Clear safety glasses or goggles- sunglasses and tinted glasses are not permitted
2. Closed toe shoes
3. Material for projects
4. Flexible 6 inch steel rule
5. Scientific calculator (trigonometric function capable)
6. Pen or pencil
7. 3 ring binder and paper for notes
8. Recommended- shop coat or apron
9. This syllabus

F. EVALUATION INFORMATION:

1. The semester's grade evaluation will be based on grades or points received on:

a.	Mid-term examination		
b.	Final examination	-----	Total 25% of grade

c.	Quizzes		
d.	Homework assignments		
e.	Notebook		
f.	Classroom participation		
g.	Self-evaluation		
h.	Laboratory work	-----	Total 75% of grade

Self-evaluation grades count towards student's grades. Students late for class who fill in an 'A' for self-evaluation will have this point eliminated and not counted towards their grade.

A notebook must be maintained containing this syllabus, all handouts and notes taken. This notebook must be kept "within reach" during lab work for reference, without it the student may not perform lab work and may be subject to dismissal.

Other factors that influence evaluation:

- a. Attendance, attitude and creative involvement
- b. Care and use of equipment
- c. Ability to follow instructions
- d. Mechanical judgment

2. The following scale will be used to determine the final grade for the semester. Remember that lab work counts for 3 times the points as lecture work.

90% - 100% = A  
80% - 89% = B  
70% - 79% = C  
60% - 69% = D  
Below 60% = F

3. Laboratory work criteria:

- a. The primary criteria is the quality of the work produced, which is a function of sizes, fits and finishes as specified by engineering drawing specifications.
- b. The secondary criteria is the quantity or variety of type of work; this does not mean total weight or size, but rather the variety of machine tool operations performed and general difficulty of the product produced.
- c. It will be assumed that all laboratory work submitted for evaluation will represent the student's best efforts.
- d. As a significant portion of the class time will be spent in the laboratory, approximately 75% of the semester's evaluation will be based on this area of work.

4. Mid-term and Final examinations will be of the objective nature, such as:

- |    |               |    |                 |
|----|---------------|----|-----------------|
| a. | True/False    | c. | Matching        |
| b. | Short fill-in | d. | Multiple choice |

G. CLASS POLICIES:

Classroom/Lab conduct:

Cell phones, laptops and personal electronic devices may not be used in the classroom or lab under any circumstances.

Turn cell phones to vibrate or silent

Exit to a common area to use your cell phone.

Students failing to comply with this cell phone policy will have a participation point removed for each violation.

Cell phone may not be used as calculators during class, lab, quizzes or tests. School property calculators will be made available for these evaluations.

No headphones, music, video or game players during lecture or lab

No personal computers, laptops or personal electronic devices may be used unless approved for specific assignment use by the instructor

No loading games or unapproved software onto lab computers

Student attendance policy: Students are expected to attend classes regularly. Students who absences exceed 10% of the scheduled class meeting time may be dropped by the instructor.

Academic Honesty: El Camino College places a high value on the integrity of its student scholars. When an instructor determines that there is evidence of dishonesty in any academic work (including, but not limited to cheating, plagiarism, or theft of exam material), disciplinary action appropriate to the misconduct as defined in BP 5500 may be taken. A failing grade on an assignment in which academic dishonesty has occurred and suspension from the class are among the disciplinary actions for academic dishonesty (AP 5520). Students with any questions about the Academic Honesty or discipline policies are encouraged to speak with their instructor in advance.

Accommodations: It is the policy of the El Camino Community College District to encourage full inclusion of people with disabilities in all programs and services. Students with disabilities who believe that may need accommodations in this class should contact the campus Special Resource Center (310) 660-3295, as soon as possible. This will ensure that students are able to fully participate.

H. CLASS ROUTINE:

1. Sign in
2. Lab worksheet preparation
3. Tool crib (checkout and return)
4. Laboratory work
5. Sign out
6. Break
7. Quiz

8. Lecture

I. ADMINISTRATIVE PAPERWORK:

1. Emergency Release card
2. Safety Glasses Acknowledgement card
3. Entrance survey
4. Inspection Report
5. Safety test
6. Badges
7. Lab workplan/tool checkout list

J. LABORATORY WORK ASSIGNMENTS, PROJECTS AND EXERCISES:

1. Machine setup and operation exercises
2. Milling exercise
3. Stirling engine components
4. Walking robot components
5. Mini mill components
6. Advanced and personalized challenge projects

Note: Additional or supplementary areas of laboratory work or projects may be added or substituted only with the approval of the instructor.

K. CLASS TOPICS:

- CNC safety/ proving programs
- Toolholding
- Workholding
- Manual programming
  - G2 and G3 commands
  - Canned cycles
- Types of milling machines
- Speeds and feeds
- Other shop calculations
  - Trig
- Cutters
  - Cutter materials
  - Endmills
  - Insert cutters
- Advanced topics
  - Mastercam programming
  - Inventor modeling
  - High speed milling
  - Workpiece probing
  - Tool probing
  - Macros/parametric programming
  - 4-axis milling
  - 5-axis milling
  - Machine tending

Note: Class schedule and topics are subject to change due to resource availability and requirements.