

This syllabus belongs to: _____
print student name

EL CAMINO COLLEGE

MACHINE TOOL TECHNOLOGY 101

“INTRODUCTION TO CONVENTIONAL AND CNC MACHINING”

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COURSE OUTLINE

A. CATALOG AND CLASS SCHEDULE DESCRIPTION:

1. Class Schedule:

8:00 pm – 9:00 pm	Mon, Wed	Lecture	Communications 102
9:15 pm – 12:30 pm	Mon, Wed	Lab	Communications 103

2. Catalog Description:

Lecture: 2 hours/week Laboratory: 6 hours/week Units: 4

This introductory course covers the study of basic principles and operation of conventional and CNC (Computer Numerically Controlled) machine tools with an emphasis on: safety, measurement, hand tools, power saws, drilling machines, lathes, milling and grinding machines focusing on practices and set-ups used in industry.

NOTE: Letter grade or credit/non-credit option

Prerequisite: None

B. MACHINE TOOL TECHNOLOGY CURRICULUM:

1. Objectives:

The Machine Tool Technology program prepares students for employment in machine shops, tool rooms, and instrument and experimental laboratories and provides upgrade opportunities for employed industrial personnel. Students gain proficiency in the set-up and operation of drilling machines, lathes, mills, grinders, electrical discharge machines, Computer Numerical Control (CNC) lathes, CNC milling machines, and computer aided manufacturing systems. Competencies will be assessed regularly in accordance with skill

standards established by the National Institute of Metalworking Skills (NIMS). Students completing the program may enter industry as an advanced apprentice machinist or machine operator and anticipate advancement to machinist, tool and die maker, experimental machinist or numerical control programmer.

2. Emphasis:

The major portion of the curriculum is to be utilized in the exploration of machine tool technology with an emphasis on:

- a. Safety
- b. Hand tools
- c. Measurement and layout
- d. Bench work
- e. Power saws
- f. Engine lathes
- g. Milling machines
- h. Numerical Control lathe and milling machines
- i. Grinding machines
- j. Heat treatment

The reading assignments, discussions, demonstrations and laboratory assignments will cover these and related areas of machine tool technology and emphasize their application in a variety of industrial situations.

C. MACHINE TOOL TECHNOLOGY 101 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. Select and use metal working hand tools to produce assigned projects within the tolerances specified on engineering drawings.
3. Measure and layout utilizing semi-precision and precision measuring tools to produce assigned projects within the tolerances specified on engineering drawings.
4. Set up and operate power saws to rough finish assigned work within a minimum of 1/32 of an inch over the dimensions required on engineering drawings.
5. Center drill, drill, ream countersink, counterbore and tap threads to produce assigned work within the tolerances specified on engineering drawings.
6. Set up and operate engine lathes to turn, face, center drill, thread and cut off to produce assigned work within the tolerances specified on engineering drawings.

7. Set up and operate vertical and horizontal milling machines to square stock, mill flat surfaces, side mill, end mill, fly cut, and slot to produce assigned work within the tolerances specified on engineering drawings.
8. Set up and operate grinding machines to sharpen lathe tool bits, and surface grind to produce assigned work within the tolerances specified on engineering drawings.
9. Interpret orthographic projection engineering drawings that incorporate geometric dimensioning and tolerancing to produce assigned work within the tolerances specified on engineering drawings.
10. Solve shop math problems that involve: speeds and feeds, threads, engineering drawing interpretation and calculations relating to machine tools.

D. STUDENT LEARNING OUTCOME:

Given a ground steel block of known and verified dimensions, measure and record the three dimensions of the block using a micrometer to a precision of 0.001 inches.

E. RECOMMENDED TEXT:

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

F. REQUIRED MATERIALS:

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

G. EVALUATION INFORMATION:

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

a. Mid-term examination		
b. Final examinations		_____ Total 25% of grade
c. Homework assignments		
d. Quizzes		
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. Participation points are earned at the start of each class and the end of each class.

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 contribute to evaluation:

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

2. 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

3. 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

4. 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 the 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. Laboratory work is only to be performed with the student's three ring bound notebook including required exercise and project documentation in the work area.

5. Mid-term and final examinations will be of the objective nature, such as:
 - a. True/False
 - b. Short fill in
 - c. Matching
 - d. Multiple choice

H. CLASS ROUTINE:

1. Quiz
2. Lecture
3. Exercise assignment
4. Break
5. Sign in
6. Lab workplan completion
7. Machine assignment
8. Tool crib checkout
9. Laboratory work
10. Clean up
11. Tool crib return
12. Sign out/self evaluation

I. ADMINISTRATIVE PAPERWORK:

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

J. LABORATORY WORK ASSIGNMENTS, PROJECTS AND EXERCISES:

1. Machine setup and operation exercises
2. Tool bit sharpening
3. Turning exercise
4. Letter stamping exercise
5. Stirling engine components
6. Walking robot components
7. 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.

Note: If you have a documented disability and wish to discuss academic accommodations, please contact me as soon as possible.

K. CLASS TOPICS:

1. Orientation and Safety
2. Careers
3. Lab Procedures
4. History of Machine Tools
5. Drawings and Job Planning
6. Measurement
7. Layout
8. Hand Tools
9. Metalcutting Technology
10. Metallurgy and Heat Treatment
11. Plastics
12. Shop Mathematics
13. Power Sawing
14. Lathes
15. Lathe Accessories and Operations
16. Threads
17. Drilling
18. Milling Machines
19. Milling Accessories and Operations
20. Grinding
21. Computer Numerical Control (CNC)
22. CNC programming
23. Trade Tricks

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