

This syllabus belongs to: _____
print student name

EL CAMINO COLLEGE

MACHINE TOOL TECHNOLOGY 107

“ADVANCED MANUFACTURING PROCESSES”

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COURSE OUTLINE

A: CATALOG AND CLASS SCHEDULE DESCRIPTION:

1. Class Schedule:

11:30 am – 12:20 pm	M	Lecture	COMM 102
11:30 am – 12:35 pm	W	Lecture	COMM 102
2:00 pm – 4:50 pm	M, W	Lecture	COMM 104

2. Catalog Description:

Lecture: 2 hours Laboratory: 6 hours Units: 4

This course covers the principles and operation of machine tools with an emphasis on advanced manufacturing processes and machines, such as EDM (Electrical Discharge Machines), abrasive water jet machines, and grinding machines. Additional topics will include abrasives, coordinate measuring machines, advanced precision measurement, GD&T (Geometric Dimensioning and Tolerancing), optical comparators, and practices a setups as applied in industry.

NOTE: Letter grade or credit/non-credit option

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

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.

C. MACHINE TOOL TECHNOLOGY 107abcd 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 correctly use metal working hand tools to produce assigned projects or exercises within the tolerances specified on engineering drawings.
3. Measure and layout, utilizing semi-precision and precision measuring tools to produce and inspect assigned projects or exercises within the tolerances specified on engineering drawings.
4. Correctly use power saws, drilling machines, engine lathes, and milling machines to perform supplemental machine tool operations on assigned projects or exercises within the tolerances specified on engineering drawings.
5. Answer objective questions on: fixed gages, comparison measuring instruments, surface finish measurement and electronic measuring instruments.
6. Select and use: cylindrical square, precision height gauge, vernier bevel protractor, gauge blocks and sine bars to produce or inspect assigned projects or exercises within the tolerances specified on engineering drawings.
7. Interpret geometric dimensioned and toleranced engineering drawings to assist in producing assigned projects or exercises to engineering drawing specifications.
8. Correctly solve shop mathematic problems that involve: trigonometry and its application to sine bars, speeds and feeds, engineering drawing interpretation and calculations relating to grinding machines and precision measurement.
9. Identify, select and use coated and bonded abrasives to aid in producing assigned projects or exercises to engineering drawing specifications.
10. Use surface grinders and cylindrical grinders on assigned projects or exercises within the tolerances specified on engineering drawings.
11. Set-up and use a coordinate measuring machine and optical comparator to inspect assigned projects or exercises
12. Set-up and use sinker and wire Electrical Discharge Machines (EDM) to produce assigned projects or exercises to engineering drawing specifications.
13. Set-up and use an abrasive water jet machine to produce assigned projects or exercises to engineering drawing specifications.

D. STUDENT LEARNING OUTCOME:

Record the benefits and downsides of the following processes: Waterjet cutting, EDM wire cutting, Plasma cutting and Laser cutting.

E. RECOMMENDED TEXT:

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

F. 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. Pen or pencil
5. Scientific calculator (trigonometry function capable)
6. Notebook/ 3 ring binder
7. Recommended- shop coat or apron
8. This syllabus

G. EVALUATION INFORMATION:

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

a.	Homework assignments		
b.	Notebook		
c.	Classroom participation		
d.	Mid-term examination		
e.	Final examination	-----	Total 25% of grade
f.	Procedure sheets		
g.	Laboratory work	-----	Total 75% of grade
h.	Extra credit work		

Cell phones may not be used as calculators during quizzes and tests. School property calculators will be made available for these evaluations.

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

Classroom/Lab conduct:

No cell phone use in the classroom
Turn cell phones to vibrate or silent
If you must take a call, excuse yourself from the class
No headphones, music, video or game players during lecture or lab
No personal laptops may be used unless approved for specific assignment use
by the instructor
No loading games or unapproved software onto lab computers

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. 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.
 - e. 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
 - b. Short fill-in
 - c. Matching
 - d. Multiple choice

H. CLASS ROUTINE:

1. Quiz
2. Lecture
3. Sign in for Lab
4. Procedure sheet preparation
5. Procedure sheet submission and machine assignment
6. Tool crib (checkout)
7. Laboratory work
8. Tool crib (return)
9. Sign out and self-evaluation

I. ADMINISTRATIVE CARDS:

1. Emergency Release card
2. Negligent Use & Lockers
3. Safety Glasses acknowledgement

J. LABORATORY WORK ASSIGNMENTS:

1. Exercises:
 - a. Machine use exercises
 - b. Operational process exercises
2. Projects:
 - a. Personalized challenge projects

Possible Topics

- Orientation & Safety
- Review of Fundamentals
 - Speeds & Feeds
- Precision Measurement
 - Manual Measurement Techniques
 - Fixed Gauges
 - Comparison Measuring Instruments
 - Surface Finish Measurements
 - Electronic Measuring Instruments
 - Cylindrical Squares
 - Precision Height Gauges
 - Vernier Bevel Protractors
 - Gauge Blocks & Sine Bars
 - CMM Machines
 - CMM Exercise
 - 3D Scanning
 - 3D Scanning Exercise
- Engineering Drawing Tolerance Interpretation
 - Traditional Tolerancing
 - Geometric Dimensioning and Tolerancing
- Grinding
 - Surface Grinding
 - Surface Grinding Exercise
 - Cylindrical Grinding
 - Tool and Cutter Grinding
- Industrial Robotics
 - Fanuc Cert Cart
 - Motoman SSF2000
 - Motoman HP20
 - Denso
- Advanced Cutting Processes
 - Sinker EDM
 - Sinker EDM Exercise
 - Wire EDM
 - Wire EDM Exercise
 - Laser Cutting
 - Epilog Laser Engraver Cutting Exercise
 - IPG 400W laser
 - Multi-axis Machining
 - 4-axis VF2
 - 5-axis discussion
 - Water Jet Cutting
- Rapid Prototyping
 - Z-corp Z510
 - Stratasys Dimension
 - Makerbot
 - CNC Foamcutting
- CNC Retrofitting
- Shop Math
 - Trigonometry for Sine Bars
 - Speeds and Feeds

Note: Additional or supplementary areas of laboratory work or projects may be added or substituted only with the approval of the instructor. Class schedule is subject to change due to resource availability and requirements. If you have a documented disability and wish to discuss academic accommodations, please contact me as soon as possible.