

Course: *MENG 141 – Manufacturing Process 1 2020F*

Instructors: **Scott Li**, PhD, P.Eng Lectures
Email: scott.li@camosun.ca
Steve Ferguson, PhD, P.Eng Labs
Email: fergusons@camosun.ca
Salah Elfurjani, PhD Labs
Email: elfurjanis@camosun.ca

Course Description

Students will be introduced to manufacturing processes and basic measuring tools. The safe and effective use of common manufacturing tools (such as manual lathes, milling machines, mill drill, saws, and hand tools) is emphasized. Students then work with machine and hand tools to manufacture a project set by the instructor.

Offered: Fall, 2020
Credit: 3.0
In-Class Workload: 2 Hours Lecture, 3 Hours Lab per week
Out-of-Class Workload: 4 Hours
Prerequisites: N/A

Intended Learning Outcomes

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

1. Interpret drawings and plan operations required to make parts.
2. Operate measuring and layout tools to prepare parts for machining.
3. Select an appropriate hand tool for the task and operate it safely and effectively.
4. Operate machine tools including drill press, grinder, band saw, manual lathe and milling machine, both safely and effectively.
5. Calculate cutting feeds and speeds to operate machine tools at optimum effectiveness.
6. Identify thread forms for diameter, handedness, pitch, and number of starts.
7. Select and use appropriate drills, taps and reamers to create plain and threaded holes.
8. Discuss the purpose of tolerances and calculate appropriate tolerances in manufactured parts.

Required Materials

1. **Textbook:** Technology of Machine Tools, 8th Edition, by Steve Krar etc. 7th Edition of this book will be accepted.
2. **Other:** Face masks (Required), Safety glasses (Required), 6" Digital Caliper (Recommended)

Evaluation & Grading System (Subject to modification, if necessary)

Assignments	20%
Quizzes	15%
Final Exam	10%
Lab Projects	55%
Total	100%

A+	90 - 100%	B-	70 - 72%
A	85 - 89%	C+	65 - 69%
A-	80 - 84%	C	60 - 64%
B+	77 - 79%	D	50 - 59%
B	73 - 76%	F	< 50%

Course Content and Schedule (Subject to modification, if necessary)

Anticipated Lecture Topics (Over the 14 week term)

1. **Drawings:** Read and interpret assembly and part drawings based on drawing geometry and title block information. Development of orthographic projection and the difference between 1st angle and 3rd angle projection. Understand the use of different line types, drawing symbols, annotations and dimensioning methods for both engineering and manufacturing drawings. Interpret technical information presented by different drawing views (detail, auxiliary, section). Both Metric and Imperial units will be covered.
2. **Common Industrial Measuring Equipment:** Rulers, calipers, centre and prick punches, layout equipment. Micrometers, vernier micrometers, verniers. Gauges including: Optical comparator, gauge blocks, sine bars, dial test indicators.
3. **Tolerances:** Definitions of terms including nominal size, basic size, limit dimensions, bilateral tolerance, unilateral tolerance, clearance and force fits. Calculating tolerances. Relationship between tolerance and cost.
4. **Drilling Operations:** Different drilling machines including bench press, radial arm and gang drilling machines. Drill bit types. Drilling, reaming, countersinking, counter-boring, tapping and spot-facing. Feed, speed and time calculations. Work holding devices.
5. **Lathe Types and Equipment:** Various lathe types including: engine, turret, copy and CNC lathes. Work and tool holding equipment including: face plates, collets, three-jaw universal and four-jaw independent chucks. Ancillary equipment including: steady and follower rests, dead and live centre and mandrels.
6. **Turning Operations:** Common operations that can be performed on a lathe including: turning, facing, parting off, thread cutting, knurling, drilling, reaming and tapping. Calculations of turning speeds and feeds and machining time.

7. **Milling Machines:** Differences between the horizontal, vertical and universal milling machines. Description of the types of machining operations that can be carried out on each. Description of the various work and tool holding equipment including: rotary table, dividing head and split collets. Simple indexing calculations. Calculations of milling speeds and feeds and machining time.
8. **Band Saws:** Description of saw blade types. Explanation of set and form. Explanation of various band saw type operations including: high speed, friction and electro band sawing, band filing and polishing.
9. **Abrasives:** Types of abrasive, grit sizes, bond types, grade and structure. Description of various manufacturing processes that use abrasives including: surface, cylindrical, centre less, and plunge grinding, lapping, honing, super-finishing, tumbling and shot-blasting.
10. **Forging and Casting:** Purpose of and differences in forging processes. Explanation of more common casting techniques including: sand, investment, permanent mold, resin shell and die casting. Advantages and limitations of each.
11. **Sheet Metal Forming Operations:** Cutting operations, forming operations and bending operations using shear and break. Precision sheet metal processes and equipment.
12. **Non-Traditional Manufacturing Process (NTMP):** Introduction and applications of more recent manufacturing techniques including: water jet cutting, laser machining, electric discharge machining, rapid prototyping and chemical grinding.

Lab Topics (Over the 14 week term)

Students will obtain hands-on experience working on projects using typical machine shop equipment. Lab experience will reinforce understanding of lecture topics.

College Supports, Services and Policies 

Immediate, Urgent, or Emergency Support

If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @ <http://camosun.ca/about/mental-health/emergency.html>

Or <http://camosun.ca/services/sexual-violence/get-support.html>

College Services

Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at <http://camosun.ca/>

College Policies

Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at <http://camosun.ca/about/policies/>. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment, Medical/Compassionate Withdrawal, Sexual Violence and Misconduct, Student Ancillary Fees, Student Appeals, Student Conduct, and Student Penalties and Fines.

A. Grading Systems <http://camosun.ca/services/student-records/calculating-gpa.html>

B. Temporary Grades <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e1.5.pdf>

- a. Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course.