



**CAMOSUN COLLEGE**  
**Trades and Technology**  
**Electronics and Computer Engineering**

**ECET 190**  
**Electronics Project**  
**Winter 2018**  
**COURSE OUTLINE**

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The calendar description is available on the web @

Camosun.ca

*Please note: This outline will not be kept indefinitely. It is recommended students keep this outline for their records, especially to assist in transfer credit to post-secondary institutions.*

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### 1. Instructor Information

(a) Instructor	Lindsay Stretch
(b) Office hours	TBD
(c) Location	TEC 264
(d) Phone	250-370-4650 <b>Alternative:</b>
(e) E-mail	stretch@camosun.ca
(f) Website	

### 2. Intended Learning Outcomes

Through lecture, reading material and project construction the student will be introduced to some basic construction shop skills commonly required by employers in the electronics industry. Emphasis is on safe and correct use of basic hand and small power tools. The student will construct projects, learn some basic drafting, and design techniques to produce a final working project from specifications that demonstrates quality soldering and shop skills. Evaluation will be based on the competency demonstrated by the student.

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

- ✓ work safely in a shop environment with both hand and power tools
- ✓ design and produce sheet metal panels for mounting electronic devices
- ✓ produce working drawings suitable for production by commercial shops
- ✓ tap threads and/or use threaded inserts to produce threads
- ✓ specify and use various fasteners
- ✓ safely use a grinder for producing tools and sharpening
- ✓ name and describe the characteristics of materials commonly used in the electronics industry
- ✓ demonstrate the correct use of Vernier calipers and micrometers
- ✓ comply with health and safety legislation and industry standards when using shop equipment and soldering
- ✓ describe hazards related to soldering chemicals and materials
- ✓ describe the procedures used for avoiding ESD damage to electronic components
- ✓ demonstrate high reliability soldering and de-soldering techniques to military standards
- ✓ produce a working project from specifications that demonstrates quality soldering and shop skills

### 3. Required Materials

- a. Access to Camosun D2L online (as required)
- b. Handouts (distributed as required)
- c. Student File Share: <\\elexsrv1\ellexpub\ecet 190> or <\\142.31.204.249\ellexpub\ecet 190>

### 4. Course Content

#### 1. Soldering

20hrs

##### 1.1 Introduction

- 1.1.1 Toolbox check
- 1.1.2 Outline hazardous chemicals, materials used in this course.

##### 1.2 Soldering Fundamentals

- 1.2.1 Definitions and background information
- 1.2.2 Soldering fundamentals
- 1.2.3 Hand tool Recommendations
- 1.2.4 Soldering standards
- 1.2.5 Making the solder connection - considerations

##### 1.3 Stripping and tinning wires

- 1.3.1 Wire strippers
- 1.3.2 Wire preparation
- 1.3.3 Tinning

##### 1.4 Soldering to turret terminals

- 1.4.1 Lead wraps
- 1.4.2 Multiple lead connections
- 1.4.3 Soldering turret terminals

##### 1.5 Soldering to cup terminals

- 1.5.1 Wire preparation
- 1.5.2 Solder cup preparation
- 1.5.3 Soldering to solder cups

##### 1.6 Soldering axial lead components

- 1.6.1 Lead preparation
- 1.6.2 Lead bending tools
  - 1.6.2.1 Pliers
  - 1.6.2.2 forming tools
- 1.6.3 Clinches
- 1.6.4 Straight through
- 1.6.5 Semi clinch
- 1.6.6 Full clinch
- 1.6.7 Mounts
- 1.6.8 Flush
- 1.6.9 Vertical
- 1.6.10 Strain relief
- 1.6.11 Component alignment
- 1.6.12 Soldering axial lead components - using combinations of c. and d.

##### 1.7 Soldering TH IC's

- 1.7.1 Lead preparation
- 1.7.2 Insertion techniques
  - 1.7.2.1 Methods
  - 1.7.2.2 Clinches
  - 1.7.2.3 Considerations
- 1.7.3 Soldering IC's to printed circuit boards

- 1.8 Desoldering TH components from printed circuit boards
  - 1.8.1 Common extraction methods
    - 1.8.1.1 Braid
    - 1.8.1.2 Solder pump
    - 1.8.1.3 Heat and pull
    - 1.8.1.4 Continuous vacuum de-soldering machines
  - 1.8.2 Demonstration of continuous vacuum de-soldering tool
  - 1.8.3 De-soldering IC's from printed circuit board
- 1.9 Wire wrapping
  - 1.9.1 Tools
  - 1.9.2 Wrapping techniques
  - 1.9.3 Wire wrapping eight pin DIP sockets
- 1.10 Surface mount soldering
  - 1.10.1 Introduction to Solder paste and re-flow method
  - 1.10.2 Resistors
  - 1.10.3 Capacitors
  - 1.10.4 Transistors
  - 1.10.5 SOIC 's
- 1.11 Surface mount desoldering
  - 1.11.1 Resistor
  - 1.11.2 SOIC
  - 1.11.3 Various other parts
- 1.12 ESD Introduction
- 1.13 Test

## **2. Drafting and CAD**

**10hrs**

- 2.1 Introduction to Drafting
  - 2.1.1 Drafting tools
  - 2.1.2 Orthographic Projection
  - 2.1.3 Multiview drawing
  - 2.1.4 Isometric drawing
  - 2.1.5 Third Angle drawings
  - 2.1.6 Line Types
  - 2.1.7 Dimensioning
  - 2.1.8 Title Block, Revision History, Border
  - 2.1.9 Drawing Scale
  - 2.1.10 Assignment: Complete hand drawings of shop skills practice parts
  - 2.1.11 Intro to CAD drawing software
  - 2.1.12 Assignment: Complete CAD drawings of shop skills practice parts

## **3. Shop skills**

**20hrs**

- 3.1 Safety rules
- 3.2 Shop rules
- 3.3 Aluminum block project
- 3.4 Hack sawing
- 3.5 Filing
- 3.6 Drilling using drill press
  - 3.6.1 Cutting oil
  - 3.6.2 Feed
  - 3.6.3 Cutting speed
  - 3.6.4 Pilot holes
- 3.7 Sheet metal shear and brake
- 3.8 Tool bins

- 3.9 Tapping
- 3.10 Helicoils
- 3.11 Tin Snips
- 3.12 Cutting D connector holes
- 3.13 Pop rivets
- 3.14 Drilling sheet metal
- 3.15 Nibblers
- 3.16 Switch project
- 3.17 Chassis punches
- 3.18 Specifying machine screws and bolts
  - 3.18.1 Unified thread standards: UNF, UNC, metric
  - 3.18.2 Head style
  - 3.18.3 Drive style
  - 3.18.4 Diameter
  - 3.18.5 Thread style
  - 3.18.6 Length
  - 3.18.7 Drive type
- 3.19 Drilling through a round rod
- 3.20 Grinding
- 3.21 Grinding project
- 3.22 Removing broken bolts
- 3.23 Tapping
  - 3.23.1 Tap drill selection
  - 3.23.2 Tap drill sizing
    - 3.23.2.1 Numbered drill
    - 3.23.2.2 Fractional drill
  - 3.23.3 Tapping hard materials
  - 3.23.4 Tapping acrylic plastic
- 3.24 Common Materials
  - 3.24.1 Steel
  - 3.24.2 Stainless steel
  - 3.24.3 Aluminum
  - 3.24.4 Plastics
  - 3.24.5 Bend allowance
- 3.25 Test

**4. Decade Box Project**

**20hrs**

- 4.1 Kit Check
- 4.2 Drawing and Design
- 4.3 Full scale cardboard prototype
- 4.4 Solder components to project PCB
- 4.5 Testing PCB and Graphing
- 4.6 Fabricating flattened enclosure
- 4.7 Folding enclosure, finishing and assembling
- 4.8 Final enclosure assembly and retesting
- 4.9 Project Report

**Total**

**(5hrs per week x 14 weeks) = 70hrs**

**Holidays**

- Feb 12 – Monday Family Day – College Closed (Week 6)
- Feb 13 – Tuesday Reading Break – College Closed (Week 6)
- April 2 – Monday Easter – College Closed (Week 12)

## 5. Basis of Student Assessment (Weighting)

Soldering	20%
Shop-skills	20%
Drafting Assignments	20%
Final Project	30%
<u>Attendance/Equipment*</u>	<u>10%</u>
<b>Total</b>	<b>100%</b>

**\* A portion of your mark will be based on your respect for the college equipment, the cleanliness of your work station, your participation in the cleaning crew and the cleanliness of the floor around your work station.**

**\* During the course you are responsible for putting all equipment away and keeping your area and the lab tidy. If there is broken or malfunctioning equipment, you are responsible for reporting it. You are required to do a daily inventory (at the beginning of the class) of your hand tools that are in the blue bin and report if any are missing or broken.**

**\* Lab cleanup begins 10 minutes before the end of the class.**

Attendance is mandatory for all classroom/lab activities. It is the student's responsibility to inform the instructor prior to being late or missing a class, or as soon as possible.

Professionalism: "the skill, good judgment, and polite behavior that is expected from a person who is trained to do a job well" (Merriam Webster online). Students will be evaluated on the above as well as their ability to work well in a team.

Assignments and/or Quiz are based on the lecture topics and hands-on lab exercises.

Please note the following:

1. A grade of 60% or better is required in all assessment items above to be able to pass the course.
2. A grade of 60% or better is required in all assessment items above for this course to qualify as a prerequisite.
3. No late materials will be accepted past midnight of the last day of the course, April 10, 2018.
4. No opportunity will be available to write missed quizzes.
5. All late course material is reduced in mark by 50% and then an additional 10% per day

## 6. Grading System

- Standard Grading System (GPA)
- Competency Based Grading System

A. **GRADING SYSTEMS** <http://camosun.ca/about/policies/index.html>

1. **Standard Grading System (GPA)**

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D		1
0-49	F	Minimum level has not been achieved.	0

2. **Competency Based Grading System (Non GPA)**

This grading system is based on satisfactory acquisition of defined skills or successful completion of the course learning outcomes

Grade	Description
COM	The student has met the goals, criteria, or competencies established for this course, practicum or field placement.
DST	The student has met and exceeded, above and beyond expectation, the goals, criteria, or competencies established for this course, practicum or field placement.
NC	The student has not met the goals, criteria or competencies established for this course, practicum or field placement.

B. **Temporary Grades**

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy at <http://camosun.ca/about/policies/index.html> for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	<i>Incomplete:</i> A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	<i>In progress:</i> A temporary grade assigned for courses that are designed to have an anticipated enrollment that extends beyond one term. No more than two IP grades will be assigned for the same course.
CW	<i>Compulsory Withdrawal:</i> A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.

## 7. Recommended Materials or Services to Assist Students to Succeed Throughout the Course

### LEARNING SUPPORT AND SERVICES FOR STUDENTS

There are a variety of services available for students to assist them throughout their learning. This information is available in the College Calendar, Student Services or the College web site at <http://www.camosun.bc.ca>

### STUDENT CONDUCT POLICY

There is a Student Conduct Policy. It is the student's responsibility to become familiar with the content of this policy. The policy is available in each School Administration Office, Registration, and on the College web site in the Policy Section.  
<http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.5.pdf>