

# COURSE SYLLABUS



COURSE TITLE: CAD FOR ELECTRONICS  
CLASS SECTION: ECET 231-X01/X02  
TERM: Winter 2023  
COURSE CREDITS: 2  
DELIVERY METHOD(S): In Person

Camosun College campuses are located on the traditional territories of the Lək̓ʷəŋən and W̱SÁNEĆ peoples. We acknowledge their welcome and graciousness to the students who seek knowledge here.  
Learn more about Camosun's [Territorial Acknowledgement](#).

For COVID-19 information please visit <https://legacy.camosun.ca/covid19/index.html>.

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*Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable explanation in advance, you will be removed from the course and the space offered to the next waitlisted student.*

## INSTRUCTOR DETAILS

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NAME: John Yang  
EMAIL: yang@camosun.ca  
OFFICE: TEC 268  
HOURS: To be determined

*As your course instructor, I endeavour to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me. Camosun College is committed to identifying and removing institutional and social barriers that prevent access and impede success.*

## CALENDAR DESCRIPTION

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[INSERT TEXT HERE]

PREREQUISITE(S): ECET 242, 260  
CO-REQUISITE(S):  
EXCLUSION(S):

## COURSE LEARNING OUTCOMES / OBJECTIVES

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- ◆ Be able to draw schematic diagrams (simple, parallel, hierarchical)
- ◆ Be able to find, select, and create schematic components (schematic library editor)
- ◆ Be able to lay out multi-layer printed circuit boards (PCB)
- ◆ Be able to find, select, and create PCB footprints (PCB library editor)
- ◆ Be able to create 3D view of a PCB
- ◆ Be able to manage the PCB project data

- ◆ ECET 231 Course Notes (check it with your instructor)
- ◆ Altium website ([www.altium.com](http://www.altium.com))

The following schedule and course components are subject to change with reasonable advance notice, as deemed appropriate by the instructor.

## TABLE OF CONTENTS

### SECTION I – The Basics of Altium Designer 21

#### 1 ... Introduction to Altium Designer 21 (Week 1)

- 1.1 Review of schematic circuits and printed circuit boards
- 1.2 Introduction to the environment of Altium
- 1.3 A simple schematic circuit capture – **Lab01**

#### 2 ... Schematic capture editor (Week 2)

- 2.1 Elements and tools of the schematic capture editor
- 2.2 10-step procedure of creating schematic captures
- 2.3 How to find desired schematic components (symbols)
- 2.4 How to install proper (schematic) libraries
- 2.5 Electrical rules setting -- for schematic captures
- 2.6 Netlist and bill of materials (BOM)
- 2.7 Project library versus general library
- 2.8 Troubleshoot schematic captures
- 2.9 A de-morgenized logic circuit capture – **Lab02**

#### 3 ... PCB layout editor (Week 3-4)

- 3.1 Elements and tools of the PCB layout editor
- 3.2 10-step procedure of creating PCB layouts
- 3.3 PCB document wizard
- 3.4 How to find desired PCB components (footprints)
- 3.5 How to install proper (PCB) libraries
- 3.6 Import (netlist) changes versus Update PCB
- 3.7 Design rules setting -- for PCB layouts
- 3.8 Manual route versus auto route
- 3.9 Troubleshoot a PCB layout
- 3.10 Reshape a PCB board (re-size)
- 3.11 How to pour polygon
- 3.12 Fabrication outputs versus assembly outputs
- 3.13 A through-hole single-sided PCB design – [Lab03-04](#)

## SECTION II – Library Editors

### 4 ... Schematic Library Editor (Week 5)

- 4.1 What is the schematic library editor?
- 4.2 Elements and tools of the schematic library editor
- 4.3 Three ways to create a schematic component (electrical symbol) – **Lab05**

### 5 ... PCB Library Editor (Week 6)

- 5.1 What is PCB library editor?
- 5.2 Elements and tools of the PCB library editor
- 5.3 Three ways to create a PCB footprint (PCB symbol) – **Lab06**

## SECTION III – Advanced Designs, Considerations, and Data Management

### 6 ... PCB with multiple signal layers & multiple internal planes (Week 7-11)

- 6.1 Parallel format of a multi-channel schematic capture
- 6.2 Hierarchical format of a multi-channel schematic capture – **Lab07-08**
- 6.3 PCB layout with two signal layers (double sided)
- 6.4 PCB layout with two signal layers and two internal planes (power/ground)
- 6.5 Split internal planes – **Lab09-10**
- 6.6 PCB layout with more than two signal layers and/or two internal planes
- 6.7 Layer stack management

### 7 ... PCB 3D Modeling (Week 12)

- 7.1 3D modeling has changed electronics design forever
- 7.2 Creating 3D component bodies in a footprint library
- 7.3 Embedding a 3D STEP model in a footprint – **Lab11**
- 7.4 3D Measuring in Altium Designer

### 8 ... PCB Fabrication Documents (Week 13)

- 8.1 Bill of materials (BOM)
- 8.2 Gerber/ODB++
- 8.3 NC drill setup
- 8.4 Getting the layers stack right
- 8.5 File export centroid
- 8.6 PCB Panelization
- 8.7 How to do “Embedded Board Array” (Panelize) -- procedure
- 8.8 An example from Epec Engineered Technologies

## 9 ... The advanced knowledge of PCB design (Week 14)

- 9.1 Schematic template management
- 9.2 Board layers and Colors management (PCB)
- 9.3 Track width management
- 9.4 Holes and vias management
- 9.5 Solder paste/mask management
- 9.6 Room & Classes management
- 9.7 Mechanical layers management
  
- 9.8 Grounding and de-coupling
- 9.9 EMI/EMC considerations
- 9.10 High speed signal considerations
- 9.11 Differential pair & length matching
- 9.12 PCB Power distribution network (PDN) analyzer – **Lab12\***
- 9.13 BGA components layout – **Lab13\***
  
- 9.14 PCB project management

### Appendix: Protel 2004/DXP shortcut keys

## Labs

- Lab #1 **Introduction to Altium Designer**
- Lab #2 **Simple logic Circuit Schematic Capture**
- Lab #3-4 **Single-sided PCB Layout**
- Lab #5 **Schematic Library Editor – *create schematic symbols***
- Lab #6 **PCB Library Editor – *create PCB footprints***
- Lab #7-8 **Multi-sheet Schematic Design**
- Lab #9-10 **Multi-layer PCB Design**
- Lab #11 **3D PCB Design**
- Lab #12\* **PCB Power Distribution Network (PDN) Analyzer**
- Lab #13\* **BGA PCB Design** (\* when time is allowed)

Students registered with the Centre for Accessible Learning (CAL) who complete quizzes, tests, and exams with academic accommodations have booking procedures and deadlines with CAL where advanced noticed is required. Deadlines scan be reviewed on the [CAL exams page](http://camosun.ca/services/accessible-learning/exams.html). <http://camosun.ca/services/accessible-learning/exams.html>

## EVALUATION OF LEARNING

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DESCRIPTION	WEIGHTING
Quizzes	5%
Labs	45%
Midterm Exam	20%
Final Exam	30%
If you have a concern about a grade you have received for an evaluation, please come and see me as soon as possible. Refer to the <a href="http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf">Grade Review and Appeals</a> policy for more information. <a href="http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf">http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf</a>	TOTAL 100%

## COURSE GUIDELINES & EXPECTATIONS

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### **A passing grade must meet following three criteria:**

- 1) Overall lab mark is equal to or greater than 60%;
- 2) Overall theoretical mark (assignments, tests, final exam) is equal to or greater than 60%;
- 3) The final exam mark is equal to or greater than 50%.

*\* Delay levy (labs/assignments): -10% per day*

## SCHOOL OR DEPARTMENTAL INFORMATION

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- [Electronics and Computer Engineering Department \(link\)](#)
- [School of Trades & Technology \(link\)](#)

## STUDENT RESPONSIBILITY

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Enrolment at Camosun assumes that the student will become a responsible member of the College community. As such, each student will display a positive work ethic, assist in the preservation of College property, and assume responsibility for their education by researching academic requirements and policies; demonstrating courtesy and respect toward others; and respecting expectations concerning attendance, assignments, deadlines, and appointments.

## SUPPORTS AND SERVICES FOR STUDENTS

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Camosun College offers a number of services to help you succeed in and out of the classroom. For a detailed overview of the supports and services visit <http://camosun.ca/students/>.

Support Service	Website
Academic Advising	<a href="http://camosun.ca/advising">http://camosun.ca/advising</a>
Accessible Learning	<a href="http://camosun.ca/accessible-learning">http://camosun.ca/accessible-learning</a>
Counselling	<a href="http://camosun.ca/counselling">http://camosun.ca/counselling</a>
Career Services	<a href="http://camosun.ca/coop">http://camosun.ca/coop</a>
Financial Aid and Awards	<a href="http://camosun.ca/financialaid">http://camosun.ca/financialaid</a>
Help Centres (Math/English/Science)	<a href="http://camosun.ca/help-centres">http://camosun.ca/help-centres</a>
Indigenous Student Support	<a href="http://camosun.ca/indigenous">http://camosun.ca/indigenous</a>
International Student Support	<a href="http://camosun.ca/international/">http://camosun.ca/international/</a>
Learning Skills	<a href="http://camosun.ca/learningskills">http://camosun.ca/learningskills</a>
Library	<a href="http://camosun.ca/services/library/">http://camosun.ca/services/library/</a>
Office of Student Support	<a href="http://camosun.ca/oss">http://camosun.ca/oss</a>
Ombudsperson	<a href="http://camosun.ca/ombuds">http://camosun.ca/ombuds</a>
Registration	<a href="http://camosun.ca/registration">http://camosun.ca/registration</a>
Technology Support	<a href="http://camosun.ca/its">http://camosun.ca/its</a>
Writing Centre	<a href="http://camosun.ca/writing-centre">http://camosun.ca/writing-centre</a>

If you have a mental health concern, please contact Counselling to arrange an appointment as soon as possible. Counselling sessions are available at both campuses during business hours. If you need urgent support after-hours, please contact the Vancouver Island Crisis Line at 1-888-494-3888 or call 911.

## COLLEGE-WIDE POLICIES, PROCEDURES, REQUIREMENTS, AND STANDARDS

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### Academic Accommodations for Students with Disabilities

The College is committed to providing appropriate and reasonable academic accommodations to students with disabilities (i.e. physical, depression, learning, etc). If you have a disability, the [Centre for Accessible Learning](http://camosun.ca/services/accessible-learning/) (CAL) can help you document your needs, and where disability-related barriers to access in your courses exist, create an accommodation plan. By making a plan through CAL, you can ensure you have the appropriate academic accommodations you need without disclosing your diagnosis or condition to course instructors. Please visit the CAL website for contacts and to learn how to get started:

<http://camosun.ca/services/accessible-learning/>

### Academic Integrity

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.13.pdf> for policy regarding academic expectations and details for addressing and resolving matters of academic misconduct.

### Academic Progress

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.1.pdf> for further details on how Camosun College monitors students' academic progress and what steps can be taken if a student is at risk of not meeting the College's academic progress standards.

### Course Withdrawals Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.2.pdf> for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit <http://camosun.ca/learn/fees/#deadlines>.

### Grading Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf> for further details about grading.

### Grade Review and Appeals

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf> for policy relating to requests for review and appeal of grades.

### Mandatory Attendance for First Class Meeting of Each Course

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable reason in advance, you will be removed from the course and the space offered to the next waitlisted student. For more information, please see the "Attendance" section under "Registration Policies and Procedures" (<http://camosun.ca/learn/calendar/current/procedures.html>) and the Grading Policy at <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf>.

### Medical / Compassionate Withdrawals

Students who are incapacitated and unable to complete or succeed in their studies by virtue of serious and demonstrated exceptional circumstances may be eligible for a medical/compassionate withdrawal. Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.8.pdf> to learn more about the process involved in a medical/compassionate withdrawal.

### Sexual Violence and Misconduct

Camosun is committed to creating a campus culture of safety, respect, and consent. Camosun's Office of Student Support is responsible for offering support to students impacted by sexual violence. Regardless of when or where the sexual violence or misconduct occurred, students can access support at Camosun. The Office of Student Support will make sure students have a safe and private place to talk and will help them understand what supports are available and their options for next steps. The Office of Student Support respects a student's right to choose what is right for them. For more information see Camosun's Sexualized

Violence and Misconduct Policy: <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.9.pdf> and [camosun.ca/sexual-violence](http://camosun.ca/sexual-violence). To contact the Office of Student Support: [oss@camosun.ca](mailto:oss@camosun.ca) or by phone: 250-370-3046 or 250-3703841

### Student Misconduct (Non-Academic)

Camosun College is committed to building the academic competency of all students, seeks to empower students to become agents of their own learning, and promotes academic belonging for everyone. Camosun also expects that all students to conduct themselves in a manner that contributes to a positive, supportive, and safe learning environment. Please review Camosun College's Student Misconduct Policy at <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.5.pdf> to understand the College's expectations of academic integrity and student behavioural conduct.

**Changes to this Syllabus:** Every effort has been made to ensure that information in this syllabus is accurate at the time of publication. The College reserves the right to change courses if it becomes necessary so that course content remains relevant. In such cases, the instructor will give the students clear and timely notice of the changes.