

COURSE SYLLABUS



COURSE TITLE: ELEN 147 Semiconductor Devices (II)

CLASS SECTION: DX01

TERM: SUMMER 2023

COURSE CREDITS: 3

DELIVERY METHOD(S): Online

For COVID-19 updates please visit <https://camosun.ca/about/covid-19-updates>.

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

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

NAME: Dr. Raju Sapkota

Email: sapkotar@camosun.ca

OFFICE: TBD

HOURS: By Appointment through Email

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

The objective of this course is to provide the student with both a theoretical and practical foundation in the analysis, design and implementation of linear and non-linear circuits. This course is a continuation of ELEN 144.

PREREQUISITE(S): ELEN 144 & LEN 142

CO-REQUISITE(S):

EQUIVALENCIES:

COURSE LEARNING OUTCOMES / OBJECTIVES

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

Explain the operation of fundamental transistor amplifier circuits

Calculate component values for operational amplifier circuits such as:

- Inverting and Non-inverting amplifier
- Summing amplifier
- Integrating and differentiating applications
- Instrumentation and active filters circuits

Explain the operation of three terminal regulators

Explain fundamental data acquisition concepts such as:

- Quantization concepts
- Digital-to-analog converters (D/A)
- Analog-to-digital converters (A/D)
- Frequency-to-voltage converters (F/V)
- Voltage-to-frequency converters (V/F)

REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

- Information and documents available on the course D2L site
- Electronic Devices, T. L. FLOYD 5th edition ISBN 0-13-649138-3.
- Laboratory Exercises to be provided in class.

COURSE SCHEDULE, TOPICS, AND ASSOCIATED PREPARATION / ACTIVITY / EVALUATION

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

OUTLINE OF TOPICS:

- 1. Operational Amplifier Overview**
 - a. differential inputs
 - b. open Loop Gain, Impedance

- 2. Basic Op Amp Circuit Analysis**
 - a. negative feedback, virtual ground
 - b. closed loop gain
 - c. inverting amplifier
 - d. non inverting amplifier
 - e. voltage follower, current amplifier
 - f. summing amplifier
 - g. input and output impedance of basic circuits
 - h. saturation voltage
 - i. single supply OpAmp
 - j. BJT current boost

3. Integrating and Differentiating amplifiers

- a. integrator circuit and voltage calculations
- b. estimate output waveforms for various inputs
- c. differentiator circuit and voltage calculations
- d. estimate output waveforms for various inputs

4. Differential Amplifiers

- a. differential and common mode voltages
- b. common mode rejection ratio
- c. Amplifier instrumentation amplifier

5. OpAmp Diode Circuits.

- a. precision diode
- b. DC restorer-clamper
- c. voltage limiter-clipper

6. Voltage regulation and Current Limit

- a. voltage regulation
- b. line regulation
- c. OpAmp voltage regulator
- d. current limit
- e. voltage regulator IC

7. Power Amplifier

- a. Types
- b. IC Amplifier

8. Active Filters

Introduction to filter types;

- a. low pass, high pass, band pass and band reject
- b. Sallen Key filter circuit
- c. Filter Bode Plot
 - i. passband
 - ii. cutoff frequency
 - iii. roll off
 - iv. decibels per decade
 - v. 1st order and 2nd order
- d. bandpass filter characteristics

9. Comparators

- a. zero level detector
- b. non zero detector
- c. Schmitt trigger
- d. 555 timer circuit

10. Windows Comparator and 555 Timer

11. Signal Conversion

- a. quantization concepts
- b. analog-to-digital converters (ADC)
- c. digital-to-analog converters (DAC)
- d. frequency-to-voltage converters (FVC)
- e. voltage-to-frequency converters (VFC)
- f. applications

Lab exercises: (might change due to online teaching)

1. Introduction to operational amplifiers
2. Op-Amp single supply operation and current boost
3. Op-Amp integrator and differentiator circuits/Cascading and Summing Amplifiers
4. Instrumentation amplifier
5. Ideal diode circuit, dc restorer circuit and current limiter circuit
6. Linear voltage regulator
7. **Mid-Term (no formal lab)**
8. Active filters
9. Window Comparator
10. Oscillator circuits (555 Timer)
11. Analog to digital converter
12. **Mid-Term (no formal lab)**
13. Digital to analog converter
14. Frequency to voltage converter

HOLIDAYS

- Monday - **May 22nd** - Victoria Day - College closed (Week 4)
- Monday - **July 3rd** - College Closed (Week 9) (due to Canada Day being on Saturday July 1st).
- Monday -**August 7th** - British Columbia Day - College closed (Week 14)

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 notice is required. Deadlines can 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

Students must obtain a minimum of 60% in both the theory and practical portions of the course and a minimum of 50% on the final exam.

Laboratory marks will be based on the completeness of each lab exercise and an instructor evaluation of the student's work.

Final Grade Composition

Assignments	10%
Quizzes	10%
Mid-term I	15%
Mid-term II	15%
Final Exam	40%
Total theory	90%
Laboratory Evaluation	10%
Total	100%

Grading (in accordance with College policy):

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%

SCHOOL OR DEPARTMENTAL INFORMATION

- Check notice board outside TEC 210
- D2L website <http://online.camosun.ca/>
- Division website Trade & Technology www.camosun.ca/tt

STUDENT RESPONSIBILITY

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

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

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

Academic Integrity

Students are expected to comply with all College policy regarding academic integrity; which is about honest and ethical behaviour in your education journey. The following guide is designed to help you understand your responsibilities: <https://camosun.libguides.com/academicintegrity/welcome>
Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.13.pdf> for Camosun's Academic Integrity policy and details for addressing and resolving matters of academic misconduct.

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](#) (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 Progress

Please visit https://www.camosun.ca/sites/default/files/2021-05/e-1.1_0.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" (<https://camosun.ca/registration-records/policies-and-procedures-students/registration-policies-students>) 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://www.camosun.ca/sites/default/files/2021-05/e-2.9.pdf> and camosun.ca/sexual-violence. To contact the Office of Student Support: oss@camosun.ca or by phone: 250-370-3046 or 250-370-3841

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.

Looking for other policies?

The full suite of College policies and directives can be found here: <https://camosun.ca/about/camosun-college-policies-and-directives>

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.