COURSE SYLLABUS

COURSE TITLE: ECET 250- Analog Communications

CLASS SECTION:

TERM: 2021F

COURSE CREDITS:4

DELIVERY METHOD(S): Lecture

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

The COVID-19 pandemic has presented many challenges, and Camosun College is committed to helping you safely complete your education. Following guidelines from the Provincial Health Officer, WorkSafe BC, and the B.C. Government to ensure the health and wellbeing of students and employees, Camosun College is providing you with every possible protection to keep you safe. Our measures include COVID Training for students and employees, health checks, infection control protocols including sanitization of spaces, PPE and ensuring physical distancing. For details on these precautions please follow this link: http://camosun.ca/covid19/faq/covid-faqs-students.html. However, if you're at all uncomfortable being on campus, please share your concerns with your Instructor. If needed, alternatives will be discussed.

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. Sahitya Yadav, Kandur

EMAIL: KandurS@camosun.bc.ca

OFFICE: TEC 215

OFFICE HOURS: 2hrs /week

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

Public holidays: labour day , National Day for Truth and Reconciliation, Thanks giving day , Remembrance day

Exam Name	Date and Time
Quiz 1	24th September 2021 at 1PM Week 3 lec 3
Quiz 2	7th October 2021 at 1PM Week 5 lec 3
Term Test 1	21st October 2021 at 1PM Week 7 Lec 3
Quiz 3	12th November 2021 at 2.30PM Week 10 lec 4
Term Test 2	2nd December 2021 at 1PM Week 13 lec 3

PREREQUISITE(S): None
CO-REQUISITE(S): None
EXCLUSION(S): None

COURSE LEARNING OUTCOMES / OBJECTIVES

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

1. Understand basic elements of a communication system
2. Conduct analysis of baseband signals in time domain and frequency domain
3. Demonstrate understanding of various analog modulation and demodulation techniques
4. Analyse the performance of modulation and demodulation techniques in various transmission environments
5. Describe signal power by using power spectral characteristics in AM and FM systems
6. Analyzing/understanding the importance of synchronisation in communication systems
7. Make extensive use of RF test equipment, including spectrum analyzers, and simulation techniques during lab exercises

REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

1. Beasley and Miller, Modern Electronic Communication, 9th Ed.
2. Labs for ECET 250 Analog Communications (available on D2L)
3. ECET 250 Introduction to Analog Communications Part 1 (Available on D2L)
4. ECET 250 Introduction to Analog Communications Part 2 (Available on D2L)
5. Various online resources as needed.

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

Course outline:

1. Introduction
   - 1.1 Communication overview
   - 1.2 Terminology

2. Frequency analysis
   - 2.1 Spectrum analysis
   - 2.2 Introduction to Fourier analysis and Fourier tables[1]
   - 2.3 Spectrum analyzer parameters (span, amplitude, dB, dBm)

3. RF components
   - 3.1 Review of filter types and characteristics[2]
   - 3.2 Transfer functions[3]
   - 3.3 Oscillator types and characteristics
   - 3.4 Mixers and mixer transfer functions

4. Amplitude modulation (AM)
- 4.1 AM waveform
  - 4.1.1 Modulation factor
  - 4.1.2 Bandwidth
  - 4.1.3 Overmodulation
  - 4.1.4 Harmonic distortion
  - 4.1.5 Power
- 4.2 AM transmitters
  - 4.2.1 Mixers
  - 4.2.2 Filters
  - 4.2.3 Oscillators
  - 4.2.4 Low and high level modulation topologies
- 4.3 AM receivers
  - 4.3.1 Tuned radio frequency (TRF) receiver
  - 4.3.2 Superheterodyne block diagram and operation
  - 4.3.3 Frequency conversion
  - 4.3.4 Image frequency
  - 4.3.5 Diode (peak) detector[4]
  - 4.3.6 Bandwidth

5. Noise
- 5.1 Types and sources of noise
- 5.2 Thermal noise
- 5.3 Cascaded noise calculations
- 5.4 Noise factor and signal-to-noise ratio
- 5.5 Cascaded noise factor
- 5.6 Automatic gain control (AGC) in receivers
- 5.7 Signal-to-noise and distortion (SINAD) ratio

6. Frequency modulation (FM)
- 6.1 FM waveform
  - 6.1.1 Frequency sensitivity
  - 6.1.2 Frequency deviation
  - 6.1.3 Modulation factor
  - 6.1.4 Bandwidth
  - 6.1.5 Bessel tables
  - 6.1.6 Carson's rule
  - 6.1.7 Narrowband and wideband FM
- 6.2 FM transmitters
  - 6.2.1 Frequency mixing and multiplying
  - 6.2.2 Phase-locked loop (PLL) modulator
  - 6.2.3 Direct and indirect transmitters
- 6.3 FM receivers
  - 6.3.1 Slope detector
  - 6.3.2 PLL detector
  - 6.3.3 Limiter
  - 6.3.4 Frequency control
  - 6.3.5 Noise and FM
  - 6.3.6 Pre-emphasis and de-emphasis

7. Single Side Band (SSB)
   - 7.1 SSB transmission
     - 7.1.1 Variations on AM modulation
     - 7.1.2 Power characteristics of a SSB signal
     - 7.1.3 SSB filter method
     - 7.1.4 SSB phase method
   - 7.2 SSB reception
     - 7.2.1 Beat frequency oscillator (BFO)
     - 7.2.2 Double conversion and frequency inversion

8. Transmission lines
   - 8.1 Transmission line model
     - 8.1.1 Types of transmission lines
     - 8.1.2 Distributed transmission line model
     - 8.1.3 Characteristic impedance
     - 8.1.4 Velocity of propagation
     - 8.1.5 Reflections and termination impedance
   - 8.2 Time domain reflectometry (TDR)
   - 8.3 Standing waves
     - 8.3.1 Incident and reflected waves
     - 8.3.2 Standing wave ratio (SWR)
     - 8.3.3 Reflection coefficient
     - 8.3.4 Standing wave power calculations
     - 8.3.5 Input impedance of unmatched lines
     - 8.3.6 Importance of impedance matching
     - 8.3.7 Transformer matching
     - 8.3.8 Quarter-wave ($\lambda/4$) impedance transformer
     - 8.3.9 Matching stub
   - 8.4 Applied transmission line theory
     - 8.4.1 Balanced and unbalanced lines
     - 8.4.2 Baluns
     - 8.4.3 Impedance matching techniques
     - 8.4.4 Transmission line attenuation

9. RF propagation
   - 9.1 Power density
   - 9.2 Gain
   - 9.3 Reflection, refraction and scattering
   - 9.4 Line of Sight, surface wave and ionospheric propagation

10. Antennas
   - 10.1 Antenna characteristics
     - 10.1.1 Radiation pattern
     - 10.1.2 Antenna gain
     - 10.1.3 Antenna impedance
     - 10.1.4 Half-wave ($\lambda/2$) dipole antenna
     - 10.1.5 Quarter-wave ($\lambda/4$) monopole antenna
     - 10.1.6 Counterpoise
     - 10.1.7 Antenna loading
     - 10.1.8 Reciprocity
   - 10.2 Additional antenna types
     - 10.2.1 Folded dipole

10.2.2 Long wire antenna
10.2.3 Loop antennas
10.2.4 Broadside and end-fired arrays
10.2.5 Yagi array
10.2.6 Log periodic array
10.2.7 Phased array and steered beam
10.2.8 Parabolic reflector

Labs (Tentative due to COVID-19):

1. hands on experience with Lab equipment
2. Spectrum analyzer
3. AM function generator
4. Class C AM modulator and mixer
5. AM transmitter SPICE simulation
6. AM receiver SPICE simulation
7. WWV analyses
8. Multiplier DSBSC
9. FM modulator
10. PLL and PLL FM demodulator
11. Crosstalk
12. Time domain reflectometry (TDR)
13. Multisim transmission line model

Lesson Plan:

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

Week	Topic
1	Introduction to Analog communications Signal Analysis Introduction to all lab equipment's
2	Decibels AM Modulation introduction Lab explanation
3	AM Modulation power distribution Quiz 1 Lab explanation
4	AM examples Lab explanation AM transmitter
5	Multiplexing Oscillators Quiz 2 Lab explanation AM reception
6	AM reception Image frequency Lab explanation Noise

Week	Topic
7	SINAD FM modulation and examples SSB Lab explanation Term test 1
8	FM transmitter Lab explanation
9	PM demodulation Lab explanation
10	Quiz 3 Transmission lines Lab explanation
11	TDR Types of transmission lines Lab explanation
12	Crosstalk Effect RF propagation Lab explanation
13	Term test 2 Antennas characteristics Lab explanation
14	Antennas types and radiation pattern Review of all topics for final exam

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

EVALUATION OF LEARNING

Description	Weight %
Quizzes	10
Labs	15
TermTest (1 and 2)	40
Final exam	35
	100

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 Grade Review and Appeals policy for more information. http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf

COURSE GUIDELINES & EXPECTATIONS

Lecture Attendance

To get the most out of this course, students are expected to attend all classes and be on time. It is your responsibility to acquire all information given during a class missed, including notes, hand-outs, changed exam dates etc.

Due Dates and Late Assignments

The due dates are established in accordance with the course and term duration. The purpose of the due dates is to help both you and I to get the assignments done so that they can be assessed in a timely manner. Just as you need time to complete the assignments, I need enough time to grade them. As such, the due dates are fixed (unless you have an approved academic accommodation through CAL) and it is expected that students will hand in assignments on time. Assignment marks, comments, and feedback will be returned to students in a timely manner, usually within 1-3 weeks, depending on the length of the assignment.
All assignments must be handed in by the time indicated (on the assignment, or on D2L). Late assignments may be graded but marks equivalent to 10% of the total value of the assignment will be deducted for each day, inclusive of days on the weekend, past the deadline. If assignments have already been marked and returned, a late assignment will not be accepted. Assignments will not be accepted that are late more than three days, inclusive of days over the weekend.
All labs and lab reports must be completed satisfactorily to obtain credit for the course. Normally, the lab report is due by the start of the lab period in the following week. Late labs will be penalized by 10% per day. You are required to attend and be on time for ALL labs. Failure to attend a lab without a valid excuse may result in being assigned a failing grade for that lab. If you cannot attend a lab (for a valid reason) please inform your lab instructor (ahead of time if possible) and arrange to make it up.

Exam Procedures

All exams must be written at the scheduled times with the exception of students requiring an accommodation by CAL. It is understood that emergency circumstances do occur (e.g. severe illness or family emergency); for such circumstances accommodation may be offered at the discretion of the instructor, provided the student:
a) notifies the instructor in advance of the exam (not after), and
b) provides documented evidence of the circumstance (e.g. medical certificate).

If an exam is missed with an excused absence, it is up to the instructor's discretion as to how the mark will be made up. In most cases, an oral exam will be scheduled for the student as soon as possible.
Be sure not to make travel plans for the end of semester until the final exam schedules are finalized and posted. Please ask any family members who might make travel plans on your behalf to consult you before booking tickets.
Please note: the use of cell phones during a test or quiz is not allowed and may result in a zero for that assessment.

Study Habits

Good and regular study habits are essential to do well in this course. You should plan on a weekly minimum of 5 hours outside of scheduled class time for the completion of readings, assignments and for general studying. Joining a study group can help make this more achievable.
Lecture presentations will be uploaded to the course website. These should be used as a study guide, not as your sole source of information. You will need to write down additional key words for examples and explanations given during lecture and review text and videos to support your understanding. It is also recommended practice to transform lecture notes into a study-friendly format after each lecture, incorporating additional information from your textbook. Study these notes before the next class to prepare yourself for new material, which will often build on previously covered material.

Please take advantage of office hours if you need extra clarification and help.

SCHOOL OR DEPARTMENTAL INFORMATION

Electronics and computer Engineering

Chair:

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/.

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 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 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. To contact the Office of Student Support: 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.