

COURSE OUTLINE

ECE 512 – Digital Communications

Term – SUMMER 2020 (202005)

Instructor

Dr. Peter Driessen
Phone: 250-721-8688
E-mail: peter@ece.uvic.ca

Office Hours

Days: Monday
Time: 1:00pm
Location/Platform/link: **same as for class**

Course Objectives

Calendar entry: Transmission and filtering of random signals, analysis of modulation systems, in particular pulse code modulation, phase shift keying, frequency shift keying, etc., design of modems and of CODECs, introduction to noise analysis, information theory and coding.

Learning Outcomes

- a) Understand the basic concepts of energy signals and power signals, autocorrelation function, power spectral density of random signals
- b) Convert an analog source to digital signals by sampling and quantization, analyze quantization error, and compare uniform and non-uniform quantization
- c) Understand pulse coded modulation and other baseband transmission schemes, as well as the different properties of these modulation schemes
- d) Grasp the basic idea of signal space and the concepts of signal distance, orthogonality, energy
- f) Have full knowledge of basic digital modulation schemes such as ASK, PSK, QAM and FSK
- h) Design optimum receivers based on matched filtering and optimum decision rules in additive white Gaussian noise channels
- i) Analyze the performance of various digital modulation schemes
- j) Derive the operating principle of differential encoding/detection and non-coherent receivers

Syllabus

- 1 Signals and spectra
- 2 Formatting and baseband modulation
- 3 Baseband demodulation/detection
- 4 Bandpass modulation and demodulation
- 6 Channel coding
- 9 Modulation and coding tradeoffs
- 10 Synchronization

Online class sessions

Section A01 / CRN 30355

Days: Mondays

Time: 11:30-12:45 and 4:30-6:15

Location/Platform/link: <https://uvic.zoom.us/j/93624601904?pwd=WkwrbIZCWet3Q3FCazRmNHQzNFF3dz09>

Lab B01 / CRN 30325

Days: 4 Tuesdays on 26 May, 9 June, 23 June, 14 July

Time: 2:00-4:50 pm

Location/Platform/link: TBA

Lab B03 / CRN 30326

Days: 4 Thursdays on 29 May, 12 June, 26 June, 17 July

Time: 2:00-4:50 pm

Location/Platform/link: TBA

Required Text

Title: Digital Communications
Author: Bernard Sklar
Publisher: Pearson
Year: 2014

Optional Text

Title:
Author:
Publisher:
Year:

Online Course Delivery:

As this course will be conducted online during this term, students will need to complete assignments/labs online. The students will require access to a computer which has the following software installed

Matlab with RTL hardware support <https://www.mathworks.com/hardware-support/rtl-sdr.html>

GNU Radio <https://wiki.gnuradio.org/index.php/InstallingGR>

RTL-SDR software defined radio USB dongle, may be purchased directly from the ECE department technical staff or ordered online at [AliExpress](https://www.aliexpress.com) or [RTL-SDR.com](https://www.rtl-sdr.com)

References:

Assessment:

Assignments	10 %	Due Dates: TBD
Worksheets	5 %	
Labs	10 %	
Project	15 %	Date: 15 June 2020
Mid-term	10 %	
Final Exam	50 %	

Important: All deadlines and schedules for this course will reference Pacific Daylight Time.

Note: Failure to complete all laboratory requirements will result in a grade of N being awarded for the course.
Failure to pass the final exam will result in a failing grade for the course.

The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Graduate Calendar.

<https://www.uvic.ca/calendar2020-05/grad/index.php#/policy/B13jeiMdE?bc=true&bcCurrent=07%20-%20Grading&bclItem=policies>

Note to Students:

Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by email or the Chair's Secretary to set up an appointment.

Course Withdrawal Deadlines:

- May 16, 2020: Withdrawal with 100% reduction of tuition fees
- June 6, 2020: Withdrawal with 50% reduction of tuition fees
- July 1, 2020: Last day for withdrawal (no fees returned)

Accommodation of Religious Observance:

<https://www.uvic.ca/calendar2020-05/grad/index.php#/policy/SkmigiMOV?bc=true&bcCurrent=17%20-%20Accommodation%20of%20Religious%20Observance&bclItem=policies>

Policy on Inclusivity and Diversity:

Engineering: <https://www.uvic.ca/engineering/about/equity/index.php>

Academic Calendar: <https://www.uvic.ca/calendar2020-05/grad/index.php#/policy/HkQ0pzdAN>

Standards of Professional Behaviour:

You are advised to read the Faculty of Engineering document Standards for Professional Behaviour, which contains important information regarding conduct in courses, labs, and in the general use of facilities.

<http://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf>

Academic Integrity:

Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult the entry in the current Graduate Calendar for the UVic policy on academic integrity.

https://www.uvic.ca/calendar2020-05/grad/index.php#/policy/BJujesM_E?bc=true&bcCurrent=02%20-%20Policy%20on%20Academic%20Integrity&bclItem=policies

Equality:

This course aims to provide equal opportunities and access for all students to enjoy the benefits and privileges of the class and its curriculum and to meet the syllabus requirements. Reasonable and appropriate accommodation will be made available to students with documented disabilities (physical, mental, learning) in order to give them the opportunity to successfully meet the essential requirements of the course. The accommodation will not alter academic standards or learning outcomes, although the student may be allowed to demonstrate knowledge and skills in a different way. It is not necessary for you to reveal your disability and/or confidential medical information to the course instructor. If you believe that you may require accommodation, the course instructor can provide you with information about confidential resources on campus that can assist you in arranging for appropriate accommodation. Alternatively, you may want to contact the Centre for Accessible Learning located in the Campus Services Building: <https://www.uvic.ca/services/cal/>. The University of Victoria is committed to promoting, providing, and protecting a positive, and supportive and safe learning and working environment for all its members.

Course Lecture Notes:

Unless otherwise noted, all course materials supplied to students in this course have been prepared by the instructor and are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by

uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may in some cases constitute a breach of academic integrity as defined in the UVic Calendar.

Sexualized Violence Prevention and Response at Uvic:

UVic takes sexualized violence seriously, and has raised the bar for what is considered acceptable behaviour. We encourage students to learn more about how the university defines sexualized violence and its overall approach by visiting www.uvic.ca/svp. If you or someone you know has been impacted by sexualized violence and needs information, advice, and/or support, please contact the sexualized violence resource office in Equity and Human Rights (EQHR). Whether or not you have been directly impacted, if you want to take part in the important prevention work taking place on campus, you can also reach out:

Where: Sexualized violence resource office in EQHR; Sedgewick C119

Phone: 250.721.8021

Email: svpcoordinator@uvic.ca

Web: www.uvic.ca/svp

Office of the Ombudsperson:

The [Office of the Ombudsperson](https://uvicombudsperson.ca/) is an independent and impartial resource to assist with the fair resolution of student issues. A confidential consultation can help you understand your rights and responsibilities. The Ombudsperson can also clarify information, help navigate procedures, assist with problem-solving, facilitate communication, provide feedback on an appeal, investigate and make recommendations. Phone: 250-721-8357; Email: ombuddy@uvic.ca; Web: <https://uvicombudsperson.ca/>