

# ECE511: Error Control Coding

## Course Dates

CRN(s):	Section A01 CRN: 20990 Section A02 CRN: 20991
Term:	2023
Course Start:	2023-01-09
Course End:	2023-04-26
Withdrawal with 100% reduction of tuition fees:	2023-01-22
Withdrawal with 50% reduction of tuition fees:	2023-02-12
Last day for withdrawal (no fees returned):	2023-02-28

## Cross-listed With

Cross-Listed Course(s): ECE405

## Scheduled Meeting Times (M=Mon, T=Tue, W=Wed, R=Thu, F=Fri)

Section:	Location:	Classes Start:	Classes End:	Days of week:	Hours of day:	Instructor:
A01	ECS 130	2023-01-09	2023-04-06	TWF	10:30-11:20	Aaron Gulliver
A02	ECS 130	2023-01-09	2023-04-06	TWF	10:30-11:20	Aaron Gulliver

## Instructor(s)

Name: **Aaron Gulliver**  
Office: EOW 325  
Phone: (250) 721-6028  
Email: agullive at engr dot uvic dot ca

Office Hours:	Comments
Wed 12:30pm-02:30pm	

## Course Description

The channel coding problem; coding approaches and characteristics; linear block codes; bounds on codes; finite fields; cyclic, BCH and Reed-Solomon codes; convolutional codes and the Viterbi algorithm; error control in data storage and transmission systems.

## Learning Outcomes

By the end of this course, students will be able to:

1. Explain the need for error correction in data communication and storage systems.
2. Apply mathematical tools from group and finite field theory in the design of codes.
3. Describe the fundamental limits of error correction.
4. Demonstrate the decoding of block codes including cyclic codes.
5. Explain the operation of a convolutional encoder.
6. Apply the Viterbi algorithm to decode a convolutional code.

## Syllabus

1. Introduction; The channel coding problem
2. Vector spaces; Linear block codes
3. Groups, rings and fields; Primitive and irreducible polynomials
4. Polynomial rings and cyclic codes
5. BCH and Reed-Solomon codes

## 6. Convolutional codes and the Viterbi algorithm

### Textbook

Title:	Essentials of Error-Control Coding
Author:	Jorge Castiñeira Moreira and Patrick Guy Farrell
Publisher/Year:	Wiley/2006

### Assessment

	Weight	Date
5 Assignments	30%	
Mid-term	20%	February 17, 2023
Project	20%	
Final Exam	30%	

### Notes

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/calendar/archives/202301/grad/index.php#/policy/B13jeiMdE?bc=true&bcCurrent=07%20-%20Grading&bcItemtype=policies>

### General Information

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.

Accommodation of Religious Observance: <https://www.uvic.ca/calendar/archives/202301/grad/index.php#/policy/SkmigiMOV?bc=true&bcCurrent=17%20-%20Accommodation%20of%20Religious%20Observance&bcItemtype=policies>

Policy on Inclusivity and Diversity: Engineering: <https://www.uvic.ca/ecs/info-for/diversity-and-inclusion-supports/index.php#ipn-within-our-faculty>, Academic Calendar: <https://www.uvic.ca/calendar/archives/202301/grad/index.php#/policy/HkQ0pzdAN?bc=true&bcCurrent=General%20University%20Policies&bcItemtype=policies>

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.

<https://www.uvic.ca/ecs/assets/docs/student-forms/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/calendar/archives/202301/grad/index.php#/policy/BJujesM\\_E?bc=true&bcCurrent=02%20-%20Policy%20on%20Academic%20integrity&bcItemtype=policies](https://www.uvic.ca/calendar/archives/202301/grad/index.php#/policy/BJujesM_E?bc=true&bcCurrent=02%20-%20Policy%20on%20Academic%20integrity&bcItemtype=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](http://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](mailto:svpcoordinator@uvic.ca) Web: [www.uvic.ca/svp](http://www.uvic.ca/svp)

Office of the Ombudsperson: The Office of the Ombudsperson 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](mailto:ombuddy@uvic.ca), Website: <https://uvicombudsperson.ca/>