



### ECE 484 – Audio Signal Processing

Term – Fall 2020 (202009)

#### Instructor

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

#### Office Hours

Days: Monday  
Time: 1:15-2:00  
Link: same as for class

#### Course Objectives

Understand and apply digital signal processing as applied to audio signals.

#### Learning Outcomes

Apply digital audio effects to sound samples and noise and observe the effect

Explain discrete time systems,  $z$  transforms, filter frequency response and pole-zero placement

Design and implement allpass filters, parametric filters, shelving filters, timevarying filters

Design and implement comb filters, fractional delays and delay-based audio effects

Design and implement dynamics processing including compressors, expanders and noise gates.

Explain frequency domain convolution and overlap add of time segments

Compare different methods of convolution by implementing and testing

Design and implement a phase vocoder

Design and implement pitch shifting and time stretching

Demonstrate competence in using MATLAB, Python or C to implement digital audio effects

Plan and execute a course capstone project as part of a team

#### Syllabus

Introduction to digital audio effects and applications. Parametric filters, shelving filters, time- varying filters. Delay structures, delay-based audio effects. Dynamics processing, non-linear processing. Spatial effects, 3D audio, reverberation. Time segment processing, pitch shifting, time stretching. Time-frequency processing, phase vocoder.

A-Section(s): A01 / CRN 11030, A02/CRN 11032

Days: Monday, Thursday  
Time: 11:30-12:50  
Link: bright.uvic.ca

**Required Text**

Title: Audio Effects, Theory ,  
Implementation and Application  
Author: J.D. Reiss, A.P McPherson  
Publisher: ebook in library  
Year: 2015

**Optional Text**

Title: DAFX Digital Audio Effects  
Author: U. Zolzer  
Publisher: Wiley  
Year: 2011 or 2002

**References:**

Notes and readings on [bright.uvic.ca](http://bright.uvic.ca)

**Assessment:**

Assignments:	20%	Due Dates: TBD
Worksheets	10%	
Forum participation	10%	
Mid-term exam 1	20%	Date: 15 October 2020
Mid-term exam 2	20%	Date: 19 November 2020
Final Project	20%	Due Date: 3 December 2020

**Important: All deadlines and schedules for this course will reference Pacific Daylight Time until November 1, 2020, and then Pacific Standard Time.**

**Note:**

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 Undergraduate Calendar.

<https://www.uvic.ca/calendar/archives/202009/undergrad/index.php#/policy/S1AAgoGuV?bc=true&bcCurrent=14%20-%20Grading&bcGroup=Undergraduate%20Academic%20Regulations&bcltemType=policies>

**There will be no supplemental examination for this course.**

**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 Assistant to set up an appointment.

**Course Withdrawal Deadlines:**

- September 22, 2020: Withdrawal with 100% reduction of tuition fees
- October 13, 2020: Withdrawal with 50% reduction of tuition fees
- October 31, 2020: Last day for withdrawal (no fees returned)

**Accommodation of Religious Observance:**

<https://www.uvic.ca/calendar/archives/202009/undergrad/index.php#/policy/r1q0gofdN?bc=true&bcCurrent=10%20-%20Accommodation%20of%20Religious%20Observance&bcGroup=Undergraduate%20Academic%20Regulations&bcltemType=policies>

**Policy on Inclusivity and Diversity:**

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

Academic Calendar:

<https://www.uvic.ca/calendar/archives/202009/undergrad/index.php#/policy/HkQ0pzdAN?bc=true&bcCurrent=%20General%20University%20Policies&bcGroup=General%20University%20Policies&bclItemType=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/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 Undergraduate Calendar for the UVic policy on academic integrity.

[https://www.uvic.ca/calendar/archives/202009/undergrad/index.php#/policy/Sk\\_0xsM\\_V?bc=true&bcCurrent=08%20-%20Policy%20on%20Academic%20Integrity&bcGroup=Undergraduate%20Academic%20Regulations&bclItemType=policies](https://www.uvic.ca/calendar/archives/202009/undergrad/index.php#/policy/Sk_0xsM_V?bc=true&bcCurrent=08%20-%20Policy%20on%20Academic%20Integrity&bcGroup=Undergraduate%20Academic%20Regulations&bclItemType=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 an 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, 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/>