# Course Outline

## ECE 484 – Audio Signal Processing

**Term – Fall 2020** (202009)

### Instructor

<table>
<thead>
<tr>
<th>Dr. Peter Driessen</th>
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<td>Phone: 8688</td>
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<tr>
<td>E-mail: <a href="mailto:peter@ece.uvic.ca">peter@ece.uvic.ca</a></td>
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### Office Hours

| Days: Monday |
| Time: 1:15-2:00 |

### 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, time-varying 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

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/S1A AgoGuV?bc=true&bcCurrent= 14%20-%20Grading&bcGroup=Undergraduate%20Academic%20Regulations&bcItemType=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/r1g0gfdN?bc=true&bcCurrent= 10%20-%20Accommodation%20of%20Religious%20Observance&bcGroup=Undergraduate%20Academic%20Regulations&bcItemType=policies

Policy on Inclusivity and Diversity:
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&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 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. 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 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, Website: https://uvicombudsperson.ca/