

## COURSE OUTLINE

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### BME 403 & ECE 435: Medical Image Processing

Term – SPRING 2021 (202101)

#### Instructor

Alexandra Branzan Albu and Amanda Dash  
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#### Office Hours

Days: on demand  
Time: on demand  
Location/Platform/link: ZOOM

#### Course Objectives

The objective of this course is to provide students with the basic skills needed to analyze, formalize, and solve diverse medical imaging problems from an image processing viewpoint.

#### Learning Outcomes

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

- design and implement algorithms for data visualization, noise reduction, contrast enhancement, image segmentation, and object recognition within the context of medical imaging.
- lead an in-depth discussion on the challenges that medical imaging modalities (X-Ray Imaging, CT, MRI, ultrasound) impose on image processing algorithms.
- read and comprehend state of the art multi-step medical image processing methods.

#### Syllabus

- Medical Image Acquisition, Representation, and Visualization. Medical Image File Formats.
- Noise in medical images. Algorithms for noise reduction.
- Image enhancement and applications to medical images.
- Image registration and applications to medical images.
- Image segmentation and applications to medical images.
- Pattern recognition in medical images – traditional paradigms.
- Pattern recognition in medical images – deep learning paradigms.

A-Section(s): ECE 435 A01 / CRN 20911 BME 403 A01 / CRN 20404

B01: on demand

Days: Mondays, Thursdays

Time: 11:30 – 12:50

Location/Platform/link: BrightSpace/Zoom

#### Required Textbook

none

#### Online Course Delivery:

As this course will be conducted online during this term, students will need to complete assignments online. The students will require access to a computer which has MATLAB software installed: <https://labs.engr.uvic.ca/>.

Optionally, students can install the MATLAB software offered by UVic: <https://matlab.engr.uvic.ca/student/>

### References:

Academic articles and book excerpts will be posted on BrightSpace as mandatory readings.

### Assessment:

Assignments (4)	40%	Due Dates: To be posted on BrightSpace.
Mid-terms (2)	40%	Dates (tentative): February 11, March 25.
Presentation (1)	20%	Due Dates (tentative): February 19-paper selection; March 28- video presentation

### **Important: All deadlines and schedules for this course will reference Pacific Standard Time until March 14, 2021 and then Pacific Daylight Time.**

**Note:** Failure to pass the cumulative mark of the two midterms will result in a failing grade for the course. Failure to pass the cumulative mark of the four assignments 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 Undergraduate Calendar.

<https://www.uvic.ca/calendar/archives/202101/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.**

[https://www.uvic.ca/calendar/archives/202101/undergrad/index.php#/policy/S12RxoZ\\_N?bc=true&bcCurrent=13%20-%20Examinations&bcGroup=Undergraduate%20Academic%20Regulations&bcltemType=policies](https://www.uvic.ca/calendar/archives/202101/undergrad/index.php#/policy/S12RxoZ_N?bc=true&bcCurrent=13%20-%20Examinations&bcGroup=Undergraduate%20Academic%20Regulations&bcltemType=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 Assistant to set up an appointment.

### Course Withdrawal Deadlines:

- January 19, 2021: Withdrawal with 100% reduction of tuition fees (under review)
- February 9, 2021: Withdrawal with 50% reduction of tuition fees (under review)
- February 28, 2021: Last day for withdrawal (no fees returned) (under review)

### Accommodation of Religious Observance:

<https://www.uvic.ca/calendar/archives/202101/undergrad/index.php#/policy/r1q0gofdN?bc=true&bcCurrent=10%20-%20Accommodation%20of%20Religious%20Observance&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/202101/undergrad/index.php#/policy/HkQ0pzdAN?bc=true&bcCurrent=%20General%20University%20Policies&bcGroup=General%20University%20Policies&bcltemType=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/202101/undergrad/index.php#/policy/Sk\\_0xsM\\_V?bc=true&bcCurrent=08%20-%20Policy%20on%20Academic%20Integrity&bcItemType=policies](https://www.uvic.ca/calendar/archives/202101/undergrad/index.php#/policy/Sk_0xsM_V?bc=true&bcCurrent=08%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 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](http://www.uvic.ca/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/>