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### ECE 435/BME 403 Medical Image Processing

Term – Spring 2019 (201901)

#### Instructor

Dr. Alexandra Branzan Albu  
Phone: 250-721-8681  
E-mail: aalbu@uvic.ca

#### Office Hours

Days: by appointment  
Time: by appointment  
Location: EOW 307

#### 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:

- understand the image formation processes involved in X-Ray Imaging, Magnetic Resonance Imaging (MRI), Computed Tomography (CT), and Ultrasound.
- lead an in-depth discussion on the challenges that each image modality imposes on medical image processing algorithms.
- design and implement basic algorithms for noise reduction, contrast enhancement, image segmentation, and object recognition in the context of medical images.
- design, implement and evaluate a multi-step medical image processing approach.

#### Syllabus

##### IMAGE FORMATION

- Imaging systems
- Medical images obtained with ionizing radiation
- Medical images obtained with non-ionizing radiation
- Multi-modality imaging

##### IMAGE PROCESSING

- Noise reduction algorithms for medical images
- Contrast enhancement algorithms for medical images
- Edge detection
- Medical Image Segmentation
- Feature extraction, object recognition and classification
- Performance evaluation of image processing algorithms

A-Section(s): ECE 435 A01 / CRN 20887, BME 403 A01 / CRN 20400

Days: Mondays and Thursdays

Time: 11:30 – 12:50

Location: MAC D281

**Required Text**

Title: Guide To Medical Image Analysis: Methods and Algorithms  
Author: Klaus D. Toennies  
Publisher: Springer  
Year: 2012

**Note:** This textbook is available as an e-book from the UVic Library, and it is free for UVic students.

**References:** Academic articles will be posted on CourseSpaces as mandatory readings.

**Assessment:**

Assignments (4)	24%	Due Dates: TBA on CourseSpaces
Mid-terms (2)	35%	Dates (tentative): 11.02.2019; 25.03.2019
Project	35%	Dates: TBA on CourseSpaces
Class participation	6%	

**Note:**

Failure to pass the combined mark of the midterms will result in a failing grade for the course. Make-up midterms will not be available.

**There will be no supplemental examination for this 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://web.uvic.ca/calendar2019-01/undergrad/info/regulations/grading.html>

**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.

**Accommodation of Religious Observance:**

<https://web.uvic.ca/calendar2019-01/grad/registration/Registration.1.17.html#>

**Policy on Inclusivity and Diversity:**

<https://web.uvic.ca/calendar2019-01/general/policies.html>

**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>

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://web.uvic.ca/calendar2019-01/undergrad/info/regulations/academic-integrity.html>

**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 Resource Centre for Students with a Disability located in the Campus Services Building.

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)