

Winter 2021

## ECE 8220 – Image Processing

### COURSE DESCRIPTION:

A study of digital image structures and patterns that includes image processing fundamentals such as image formation, false-colouring, filtering, manipulation, feature extraction, description, structures visualization. Topics will include the art of image capture, computational geometry of visual scenes, detection, analysis and classification of object shapes in single camera images and in sequences video frames with applications.

### COURSE OBJECTIVE:

The focus of this course is on the use of computational methods in the study of digital images. The goal of this course is to provide an intelligent systems view of digital images in discovering hidden patterns, repeated convex image regions and geometry-based quantizers in discovering the nearest approximating pixel values in the neighbourhood of a target picture element.

### PRE-REQUISITES:

Undergraduate background in numerical methods in engineering.

### CONTACT HOURS:

3-hours per week

### COURSE CONTENT:

The following topics will be discussed:

- Digital image basics;
- Vector spaces over digital images;
- Image geometry;
- Colour spaces;
- Visible part of the electromagnetic spectrum;
- Linear filtering;
- Image segmentation;
- Image morphology;
- Applications in image processing using Matlab;

Additional advanced research topics as determined by the instructor.

### HOMEWORK:

Homework will consist of assignments that include a research notebook.

### TEXTBOOK:

J.F. Peters, Image Processing Lecture Notes, 2020-2021.

## OTHER RESOURCES

J.F. Peters, Foundations of Computer Vision. Computational Geometry, Visual Image Structures and Object Shape Detection, Springer Int. Pub. AG 2017, DOI 10.1007/978-3-319-52483-2.

*Image Processing, Analysis, and Computer Vision*, M. Sonka, V. Hlavac, R. Boyle, Cengage Learning, 2008.

*Digital Image Processing*, R.C. Gonzales, R.E. Woods, 3rd Ed., Prentice-Hall, 2008.

## GRADE ANNOUNCEMENTS:

**TBA – Due to COVID-19, this date to be announced by the Registrar’s Office**

## EVALUATION:

The final course grade is determined by student performance in the components listed below in the Evaluation Table (seminar, assignments, term tests, and a final examination. **Students must receive a minimum of 50% on the final examination and must complete and pass all components in the course in order to be eligible to receive a passing grade.**

Each component is weighted as follows:

COMPONENT	NO	VALUE %	TOTAL VALUE	DETAILS / ADDITIONAL INFO
Seminar	1	10%	10	
Assignments	3	20%	15	
Term Tests	2	20%	25	
Final Examination	1	50%	50	
<b>TOTAL</b>			100	

## GRADE SCALE:

LETTER	MARK	LETTER	MARK	LETTER	MARK	LETTER	MARK
A+	95-100	B+	80-84	C+	65-69	D	45-54
A	85-94	B	70-79	C	55-64	F	<45

## INSTRUCTOR INFO:

Name: ..... James F. Peters

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Office Hours:..... By appointment

## VOLUNTARY WITHDRAW:

**TBA – Due to COVID-19, this date to be announced by the Registrar’s Office**

## REQUIREMENTS/REGULATIONS

**Student Responsibilities:** It is the responsibility of each student to contact the instructor if he/she is uncertain about his/her standing in the course and his/her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with, among others, incomplete term work, deferred examinations, attendance and withdrawal, etc..

**Lectures:** Attendance at lectures is essential for successful completion of this course. Students must satisfy each evaluation component in the course.

## ACADEMIC INTEGRITY

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations and Requirements of the University of Manitoba, Section 7.1, students are reminded that plagiarism\* or any other form of cheating is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university) regardless of media

- examinations
- assignments
- laboratory reports
- term exams

A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty

Please refer any questions regarding Academic Integrity to your course instructor.

\***Plagiarism:** to steal and pass off (the ideas or words of another) as one's own; use (another's production) without crediting the source