Course Outline

Instructor
• Prof. James Peters
  E1-530 EITC
  (204) 474–7419
  James.Peters3@umanitoba.ca

Office Hours
• By appointment

Teaching Assistant
• Randima Hettiarrachchi
  hettiarr@myumanitoba.ca

Contact Hours
• 4 credit hours
• Lectures
  3 hours × 13 weeks = 39 hours
• Laboratories
  3 hours × 5 weeks = 15 hours

Prerequisites:
• ECE 3780 Signal Processing 1

Course Website:
https://universityofmanitoba.desire2learn.com/

ECE 4440 – Computer Vision

Course Objectives
An introduction to theory and techniques used for processing and analysis of digital images for autonomous machine interpretation.

Course Content
The following topics will be covered:
• Digital image basics: pixels, colour spaces, logical operators, thresholding, gamma transform.
• Visualising pixel intensity distributions, contrast stretching, histogram matching.
• Linear filtering: convolution, noise, mean, median, rank order and normal distribution filtering.
• Mathematical morphology and image segmentation.
• Edge, line, corner detection: Laplacian, Gaussian, zero-cross, anisotropic filtering.
• Image shape and texture descriptors.
• Geometrical and topological properties of digital images.
• Image classification.
• Use of Matlab in image processing and analysis.

Textbook

Requirements/Regulations
• Attendance at lectures and laboratories is essential for successful completion of this course. Students must satisfy each evaluation component in the course to receive a final grade.
• It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with the University’s General Academic Regulations, as well as Section 3 of the Faculty of Engineering Academic Regulations dealing with incomplete term work, deferred examinations, attendance and withdrawal.
• No programmable devices or systems (such as calculators, PDAs, iPads, cell phones, wireless communication or data storage devices) are allowed in examinations unless approved by the course instructor.

Important Dates
• Term Tests
  February 10th, 2015 (in class)
  March 12th, 2015 (in class)
• Voluntary Withdrawal Deadline
  March 19th, 2015
• Mid-term Break
  February 16–20, 2015
  No classes or examinations
• Good Friday
  April 3rd, 2015
  No classes or examinations
Learning Outcomes

1. Learning digital image fundamentals: visual perception, digital image pixels, image features.
2. Applying knowledge of Matlab in digital image representation, colour spaces, histogram, quantization of image features.
3. Learning and applying knowledge in analyzing image filtering, DFT, enhancement, and registration methods.
4. Learning and applying knowledge in analyzing image decomposition and reconstruction with wavelets, image morphology, WFT.
5. Learning and applying knowledge in analyzing image segmentation, representation, description, and recognition techniques.

Expected Competency Levels

<table>
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Evaluation

The final course grade will be determined from a student’s performance in laboratories, periodic quizzes, 2 term tests, and a final examination. Students must complete all of the laboratories in order to be eligible to receive a passing grade.

<table>
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<tr>
<th>Component</th>
<th>Value (%)</th>
<th>Method of Feedback</th>
<th>Learning Outcomes Evaluated</th>
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<td>Laboratories</td>
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<td>Final Examination</td>
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* Method of Feedback: F - Formative (written comments and/or oral discussion), S - summative (numerical grade)

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 on Academic Integrity, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to serious academic penalty.