SCHULICH School of Engineering

COURSE OUTLINE
Fall 2015

1. Calendar Information

ENEL 697 DIGITAL IMAGE PROCESSING

Image formation and visual perceptual processing. Digital image representation. Two dimensional Fourier transform analysis. Image enhancement and restoration. Selected topics from: image reconstruction from projections; image segmentation and analysis; image coding for data compression and transmission; introduction to image understanding and computer vision. Case studies from current applications and research.

Course Hours: H(3-2)

Calendar Reference (choose as appropriate):

http://www.ucalgary.ca/pubs/calendar/current/electrical-engineering.html

2. Learning Outcomes and Graduate Attributes

At the end of this course, you should be able to:

- Understand the formation of a few types of images and their representation for processing on computers.
- Design algorithms for filtering and enhancement of images.
- Design methods for segmentation and analysis of images.

3. Timetable

Section	Days of the Week	Start Time	Duration (Minutes)	Location
LEC 01	TuTh	9:30	75	EEEL 349
LAB B01	TuTh	18:00	110	EEEL 345

4. Course Instructor

Section	Name	Phone	Office	Email
01	Dr. Raj Rangayyan	220 6745	ICT 440	ranga@ucalgary.ca

5. Examinations

Two tests (closed-book, closed-notes, no calculators, no electronic devices) during the term in the scheduled lecture periods (20 October and 19 November 2015).

6. Use of Calculators and Reference Material in Examinations

The tests are closed-book and closed-notes with no calculators and no electronic devices.

7. Final Grade Determination

The final grade in this course will be based on the following components:

Component	Weight
Lab (computer) assignments	20 %
Test-1	20 %
Test-2	20 %
Project report	40 %
TOTAL	100 %

Note:

(a) It is necessary to earn a passing grade on the project report in order to pass the course as a whole.
(b) All of the items listed above must be completed satisfactorily in order to obtain a passing grade in the course.
(c) Conversion from a score out of 100 to a letter grade will be done using a scale determined after the final examination has been marked. This allows the creation of a scale appropriate to the relative difficulty or easiness of the term work and final exam.

8. Textbook

The following textbook is required for this course:

Title	Biomedical Image Analysis
Author(s)	R.M. Rangayyan
Edition, Year	First, 2005
Publisher	CRC Press, Boca Raton, FL

9. Course Policies

All Schulich School of Engineering students and instructors have a responsibility to familiarize themselves with the policies described in the Schulich School of Engineering Advising Syllabus available at:

http://schulich.ucalgary.ca/undergraduate/advising

In addition to these policies relating to graduate and undergraduate students, SSE graduate students should be aware of the following:

Emergency Evacuation/Assembly Points

In the event of an alarm sounding, all classrooms and labs must be evacuated immediately. Please respond to alarms promptly by leaving the building by the closest

available exit. Faculty and students must remain outside the building until the 'all clear' has been given by a Fire Marshall. In case of emergency, call 220-5333.

Assembly Points have been identified across campus. These areas have been selected as they are large enough to hold a significant number of people and will provide an evacuated population access to washroom facilities and protection from the elements. More information on assembly points can be found at

http://www.ucalgary.ca/emergencyplan/assemblypoints.

9.1 Graduate Student Association.

Information on the Graduate Student Association can be found at:

http://www.ucalgary.ca/gsa/

10. Additional Course Information

You are required to complete up to ten laboratory exercises to be assigned during the course. A report in the form a single pdf file, including illustrations and discussion of the results obtained in each experiment (suggested length: two pages per exercise), must be submitted. Due date: 1 December 2015.

You are required to work on a Digital Image Processing Project of your choice. Projects must involve the development of algorithms for digital image processing, computer programming for implementation of the algorithm, and testing of the methods with real images from any application area of your choice (such as medical imaging, remote sensing, robotics, or geophysics). The algorithms need not be original, but must be technically more advanced and sophisticated than the laboratory exercises. If the project is a continuation or extension of previous work, you should state clearly your additional work and findings in the course project. The project must be completed before the end of the course.

A one-page project proposal must be submitted on or before 8 October 2015.

A full-fledged written project report (in the form of a single pdf file) must be presented at the end of the course. The project report must include a brief introductory review of the subject area and problem, complete technical details of the methods developed (equations, procedures, and algorithms), critical analysis and discussion of the results obtained with illustrations, and references. More attention should be paid to the image processing techniques developed than to the specific application of interest in the project. The recommended length of the text part of the report is six single-space double-column printed pages (IEEE transactions or conference format), excluding illustrations and references. Due date for report: 8 December 2015.

Pre-requisites: ENEL 327 Signals and Transforms or a working knowledge of linear algebra (vectors and matrices), advanced calculus (complex variables, the Fourier transform), probability and statistics, computer programming, linear system theory, and digital signal processing.

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