

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(3-1)

Calendar Reference (choose as appropriate):

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

2. Learning Outcomes

At the end of this course, you will 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	MW	16:00	75	ICT 446
LAB B01	Not scheduled	Not scheduled	As required	Not assigned

4. Course Instructor

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

5. Examinations

The following examinations will be held in this course:

- Two tests (closed-book, closed-notes, no calculators, no electronic devices) during the term in the scheduled lecture periods; dates to be determined during the course.
- Seminars on the projects to be presented by students registered in the course, after the end of the course in April 2011.

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 and seminar	40 %
TOTAL	100 %

Note:

- It is necessary to earn a passing grade on the project report and seminar in order to pass the course as a whole.
- All of the items listed above must be completed satisfactorily in order to obtain a passing grade in the course.
- 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:

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 (one page each) and discussion of the results obtained in each experiment (one page each), must be submitted. Due date: 11 April 2011.

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 28 February 2011.

A full-fledged written project report (in the form of a single pdf file) and a seminar 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, 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 report is 15 double-space-printed pages, excluding illustrations and references. Due date for report: 13 April 2011. The date and time for the seminar presentations will be determined during the course.

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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