Course Code: CoE4TN3
Course Title: Image Processing
Course Outline: academic year 2004-2005, term 2

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Schedule: Lectures: Monday and Thursday 12:30-13:20, GS/218, tutorial: Wednesdays 11:30-12:20, JHE/329

Course Objectives:

- To provide an introduction to basic concepts and methodologies for the formation, representation, compression, enhancement and analysis of digital images.
- To provide a foundation for developing applications and for further study in the field.
- To gain practical experience in the design and implementation of image processing algorithms.

Outline of Topics:

- Introduction
  - Applications of digital image processing
  - Elements of digital image processing system
- Digital Image Fundamentals
  - Image perception
  - Sampling and quantization
  - Basic relationships between pixels
- Image Enhancement
  - Point processing
  - Spatial filtering
- Enhancement in the frequency domain
- Image Restoration
  - Degradation models
  - Inverse filtering
  - Minimum mean square error (Wiener) filtering
  - Constrained least squares filtering
- Wavelets and multiresolution processing
  - Multiresolution expansion
  - Wavelet transforms in one dimension
  - Wavelet transforms in two dimensions

- Image Compression
    - Elements of information theory
    - Lossless compression
    - Lossy compression
    - Image compression standards
- Image Segmentation
    - Detection of discontinuities
    - Segmentation by thresholding
    - Region based segmentation
- Image representation and description
    - Chain codes
    - Fourier descriptors
    - Moments
- Color image processing
    - Color models
    - Pseudocolor image processing
    - Color transformation
- Morphological image processing
    - Dilation and erosion
    - Opening and closing
    - Hit or miss transformation

Chapters 1-5, 7-9, a combination of 10 and 11 and time permitting a summary of chapters 6 and 9 of the textbook are covered.
Format: The course consists of class lecture sessions, tutorial session and a laboratory component. The lab component of the course consists of programming assignments and a small project that the students can do on their own time schedule.

Assessment:
Homework & Quiz: 20%
Midterm: 20%
Final: 40%
Project: 20%
Statistical adjustments (such as bell curving) will not normally be used.

Calculator requirement for tests and examinations: any calculator is allowed.

Textbook:
"Digital Image Processing, Second edition", by R. Gonzalez and R. Woods, Prentice Hall, 2002.
Reference books:
"Digital Image Processing", by K. R. Castleman, Prentice-Hall, 1996.
"Digital Image Processing, Third Edition", by W. K. Pratt, John Wiley, 2001.
"Image Processing in C", by D. Phillips, R&D Books, 1994.

Academic dishonesty

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at
http://www.mcmaster.ca/senate/academic/ac_integrity.htm

The following illustrates only three forms of academic dishonesty:
1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained (e.g., using others' project materials without proper referencing).
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

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"Students are reminded that they should read and comply with the Statement on Academic Ethics and the Senate Resolutions on Academic Dishonesty as found in the Senate Policy Statements distributed at registration and available in the Senate Office."