

Polytechnic University of Puerto Rico
Department of Electrical Engineering
Master's Degree in Electrical Engineering

Course Syllabus

Course Title : Image Processing

Course Code : [EE 7712](#)

Credits : Three (3) credits

Duration : One academic quarter.

Schedule : Forty-five credit hours per course.

Prerequisites : [EE 6010](#): Mathematical Methods for Signal Processing
[EE 6020](#): Stochastic Processes.

Course Description

The course is designed to give graduate students the fundamentals and tools to tackle digital image processing. Techniques such as image filtering design and applications, image restoration, image segmentation, color image processing and others are covered. Students enrolled in this course are expected to have knowledge in linear signals and systems, 1-D Fourier Transform, basic linear algebra, basic probability theory and basic programming techniques (MATLAB familiarity is preferred).

Justification

Today many key applications such as satellite remote sensing of the earth, security and identification systems generate massive amounts of image data. Effective exploitation of these resources requires the mastering of fundamental image processing techniques and a continuous development of new image processing algorithms and systems that will ease the task of extracting information from massive amounts of raw data.

Objectives

1. Learn the requisite mathematical techniques that make the foundation for Image Processing
2. Study 2D and 3D image representation techniques.
3. Study techniques for image enhancement and noise reduction
4. Learn the principal image feature extraction techniques.
5. Study Computer Vision and its exploitation of image processing techniques

Textbook

Digital Image Processing (2002)

2nd. Edition

By Gonzalez, R and R.E. Woods

Addison-Wesley Publishing Corp, New York, NY

ISBN 0-201-18075-8

Topics Covered:

- Image processing fundamentals, human vision system
- Digital image enhancement techniques: point processing, spatial filtering
- Digital image enhancement in the Frequency Domain
- Digital image restoration, inverse filtering, Wiener filtering
- Color image processing
- Image Segmentation: edge detection, thresholding, region segmentation
- Introduction to Digital image compression techniques and standards: source coding, entropy coding, transform and predictive coding, JPEG, MPEG
- Introduction to Wavelets and multi-resolution processing
- Brief Description of Advanced topics: Morphology, recognition.

Evaluation Criteria:

- 40 % Assignments
- 30 % Two Exams
- 30 % Project: This is a Design or Research Project or Paper Review (Includes Presentation and Generation of a Report/Paper)

Final grade will be determined based on the following scale:

100-90	A
89-80	B
79-70	C
69-60	D
59- 0	F

Course History

March 2002; Prepared by: Roman Lopez Ph. D.

May 2002; Revised by: Marvi Teixeira Ph.D., P.E.

August 2007; Revised by: Yahia Masalma, Ph.D.,

November 2008; Revised by: Marvi Teixeira Ph.D., P.E.

Bibliography:

Computer Vision and Fuzzy-Neural Networks with CDROM. (2001)

Kulkarni, Arun D

Prentice Hall

ISBN: 0135705991

Image Processing In Java (1999)

Douglas A. Lyon

Prentice Hall PTR

ISBN 0-13-974577-7

Computer Vision and Image Processing: A Practical Approach Using CVIPTools (1998)

(BK/CD-ROM)

Scott E. Umbaugh

ISBN 0-13-264599-8

Digital Video Processing (1996)

A. Murat Tekalp

Prentice Hall

ISBN 0-13-190075-7

Digital Image Processing (1996)

Kenneth R. Castleman,

Perceptive Scientific Instruments, Inc. Copyright

ISBN 0-13-2114674

Fundamentals of Digital Image Processing (1989)

Jain

Prentice Hall Professional Technical Reference

ISBN 0-13-336165-9

Image Processing - Analysis and Machine Vision (1999)

Milan Sonka, Vaclav Hlavac, Roger Boyle

2nd Edition

Brooks/Cole

ISBN: 053495393X