CASE
SCHOOL OF ENGINEERING

To: Whom It May Concern
From: Frank Merat, Associate Chair for ECE, EECS Department
Re: EECS 490
Date: October 22, 2004

We wish to update the bulletin description of EECS 490. The class has not been taught since approximately 1997 and since that time both the subject and the research directions of the department have changed. The attached syllabus shows how the new course will emphasize two-dimensional image processing, color images, filtering, image restoration and enhancement, and image compression.

Detailed course information is attached.

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NEW COURSE DESCRIPTION

EECS 490. DIGITAL IMAGE PROCESSING

Summary Description:
Digital images are introduced as two-dimensional sampled arrays of data. The course begins with one-to-one operations such as image addition and subtraction and image descriptors such as the histogram. Basic filters such as the gradient and Laplacian in the spatial domain are used to enhance images. The 2-D Fourier transform is introduced and frequency domain operations such as high and low-pass filtering are developed. It is shown how filtering techniques can be used to remove noise and other image degradation. The different methods of representing color images are described and fundamental concepts of color image transformations and color image processing are developed. The concepts of image redundancy and information theory are shown to lead to image compression. Lossless and lossy image processing algorithms such as LZW will be covered and related to image compression standards such as JPEG. Programming assignments will use MATLAB and the MATLAB Image Processing Toolbox.

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EECS 490 Digital Image Processing (Fall 2004)

Required Textbook: Digital Image Processing, 2nd Ed., Rafael C. Gonzalez and Richard E. Woods, Prentice Hall, 2001, ISBN 0-20-118075-8.
Lecture Schedule: TR from 4:30 - 5:45 pm in Bingham 103.
Instructor: Prof. Frank Merat, Glennan 518, x4572 (flm)
Instructor Office Hours: see course Web site
Course Web Site: http://vorlon.cwru.edu/~flm/eecs490f04/
Textbook Web Site: http://www.imageprocessingbook.com/index_dip2e.htm
Images: http://www.cvgpr.uni-mannheim.de/mberg/bv0304/images/images.html

Basis of Grades

*Homework (**25 %**)*: Students may work together on homework assignments, but each student is required to turn in his/her own work.

*Mid-Term (**25 %**)*:

*Presentations (**25 %**)*: Students will be expected to give short presentations on assigned topics as well as to demonstrate computer solutions in class.

*Final Exam (**25 %**)*: The final exam will be given on December 9th, from 12:30-3:30 pm.

Late Policy and Missed Assignments

Assignments are due in lecture on the specified date.

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Fall 2004 Agenda and Assignment Dates

Notes:
1. Reading is from Digital Image Processing, 2th Ed., Gonzalez and Woods, Prentice-Hall, 2001.

Date	Class	Agenda	Reading
8/24	1	Course Outline and Information; intro. to image processing	Ch.1
8/26	2	Image formation & sensing; image parameters; sampling & aliasing	2.1-2.4
8/31	3	Pixel connectivity; 1-1 image processing; gray level transformations	2.5, 3.1, 3.2
9/2	4	Histogram processing	3.3
9/7	5	Arithmetic/logic operations; spatial filtering; smoothing	3.4-3.6
9/9	6	Sharpening; Laplacian; unsharp masking	3.7
9/14	7	Gradient and other derivative filters	3.7.3
9/16	8	2-D Fourier transform; properties of the 2-D Fourier transform	4.1-4.2
9/21	9	Filtering in the frequency domain	4.2.3
9/23	10	Relationships between the spatial and frequency domain	4.2.4
9/28	11	Lowpass filters	4.3
9/30	12	Highpass and other filters	4.4
10/5	13	Implementing the 2-D Fourier Transform; padding; correlation	4.6.3-4.6.4
10/7	14	The Fast Fourier Transform	4.6.5
10/12	15	Image restoration; noise	5.1-5.2
10/14	16	Noise reduction using spatial filters; adaptive filtering	5.3
10/19		FALL BREAK	
10/21	17	MID-TERM EXAM	
10/26	18	Noise reduction using frequency domain techniques	5.4
10/28	19	Image degradation; inverse filters; Wiener filters	5.6-5.8
11/2	20	Geometric transforms; image registration and warping	5.11-5.12
11/4	21	Color images; color spaces; color space transformations	6.1-6.2
11/9	22	Pseudocolor transformations	6.3
11/11	23	Color image transformations and color image processing	6.5
11/16	24	Image redundancy; image fidelity criteria	8.1
11/18	25	Information theory; fundamentals of image compression	8.2
11/23	26	Coding theorems	8.3
11/25		THANKSGIVING HOLIDAY	
11/30	27	Lossless compression	8.4
12/2	28	Lossy compression; image compression standards	8.5-8.6
12/9		FINAL EXAM, 11:30-3:30 pm	