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# BE 421: BIO IMAGE PROCESSING AND COMPUTER VISION

BAE 421/521 (FALL 2015)

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Instructor:	Dev Shrestha	Office:	JML 81B
		Phone:	208 885 7545
		E-mail:	devs@uidaho.edu
Meeting:		Lecture:	(MW) JML 44, 8:30-9:20 AM
		Lab:	(W) JML 82, 1:30 – 4:20 PM
Office hours:		MW;	9:30-11:30 AM (Walk-ins welcome)
Classes and Credits:		2 one-hour lectures;	1 three-hour lab; 3 credits

## COURSE OUTLINE

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This course will provide students with a sound background in image processing and computer vision. Digital image processing can be used for image understanding, noise removal, feature extraction and measurements through computer implementation. This course is designed to be the first course in image processing and hence no prior digital signal processing is needed.

## EXPECTED COURSE OUTCOMES

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At the end of the course the students should be able to

1. Understand the fundamentals of digital image, image representation and transformations.
2. Be able to identify different types of image noise and denoise the image.
3. Understand camera model, image distortion and correction
4. Be able to do morphological image operation and feature extraction
5. Understand frequency domain image analysis, image compression.
6. Be able to work on image description and video processing.

## BOOKS

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Text: “Digital Image Processing,” by Rafael C. Gonzales and Richard E. Woods, 3<sup>rd</sup> Ed

Reference: “Image processing toolbox user’s guide” available at:  
[http://www.mathworks.com/help/pdf\\_doc/images/images\\_tb.pdf](http://www.mathworks.com/help/pdf_doc/images/images_tb.pdf)

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## TENTATIVE CLASS SCHEDULE

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Date	Discussion	Reference
22-Aug	Application examples of digital image processing	Chapter 1.3
24-Aug	Similarities and Difference between human and computer vision	Chapter 2.1
29-Aug	Image acquisition and camera model	Chapter 2.3
31-Aug	Understanding digital image representation and operations	Chapter 2.4 - 2.6
5-Sep	Labor Day — UI CLOSED	
7-Sep	Aspects of image quality, histogram, intensity and contrast	Chapter 3.1,3.3
12-Sep	Histogram operations	Chapter 3.3
14-Sep	Spatial filtering for image enhancements I	Chapter 3.4,3.5
19-Sep	Spatial filtering for image enhancements II	Chapter 3.6,3.7
21-Sep	Binary image and morphological operations I	Chapter 9.1-9.3
26-Sep	Binary image and morphological operations II	Chapter 9.5
28-Sep	Hour Exam 1	
3-Oct	Frequency domain analysis	Chapter 4.1
5-Oct	Fourier transform review	Chapter 4.2-4.3
10-Oct	Fourier transform for image processing	Chapter 4.4-4.5
12-Oct	Interpreting Fourier transform of an image	Chapter 4.6
17-Oct	Image filtering	Chapter 4.7
19-Oct	Image enhancement and restoration	Chapter 4.8
24-Oct	Color models and representation	Chapter 6.1-6.2
26-Oct	Pseudo color image processing	Chapter 6.3
31-Oct	Hour Exam 2	
2-Nov	Image segmentation	Chapter 6.7
7-Nov	Point, line and edge detection	Chapter 10.2
9-Nov	Image representation	Chapter 11.1
14-Nov	Chain code	Chapter 11.1
16-Nov	Boundary description	Chapter 11.2
21-Nov	UI CLOSED November 21-25	
23-Nov	UI CLOSED November 21-25	
28-Nov	Object recognition and pattern matching	Chapter 12.2.1
30-Nov	Bayesian classification	Chapter 12.2.2
5-Dec	Object recognition through Neural Network I	Chapter 12.2.3
7-Dec	Object recognition through Neural Network II	Chapter 12.2.3

## LAB SCHEDULE

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Date	Lab work
24-Aug	Introduction to Matlab environment
31-Aug	Image reading, viewing, manipulating and saving back
7-Sep	Histogram operations
14-Sep	Spatial filtering 1
21-Sep	Spatial filtering 2

28-Sep	Binary Image operation
5-Oct	Fourier transform
12-Oct	Interpreting Fourier Transform of an Image
19-Oct	Image Filtering
26-Oct	Color image processing
2-Nov	Image segmentation
9-Nov	point, line and edge detection
16-Nov	Chain Code
23-Nov	UI CLOSED November 21-25
30-Nov	Bayesian Classifier
7-Dec	Neural Networks

The laboratory reports are due the following week the lab is completed. Only one lab report per group is adequate.

## GRADING:

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Class Attendance	10%
Laboratory Reports	10%
Homework	20%
Hour Exams (2 × 15%)	30%
Final Exam	30%

Student attendance is expected at all classes. Making up quizzes or tests should be pre-approved.

## 521 REQUIREMENTS

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1. A separate homework will be provided for students taking this course at graduate level
2. The student will work on a project addressing a problem related to image processing.

Final Examination: 7:30am – 9: 20am, Friday, December 16, 2011

***Disability Support Services Reasonable Accommodations Statement:***

*Reasonable accommodations are available for students who have documented temporary or permanent disabilities. Please notify your instructor(s) during the first week of class regarding accommodation(s) needed for the course. All accommodations must be approved through Disability Support Services located in the Idaho Commons Building, Room 306.*