OLD DOMINION UNIVERSITY

DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

Fall 2016

EECE 783/883 – Digital Image Processing♣

Course Catalog
Theory and applications of digital image processing, sampling, quantization, enhancement and restoration of images; use of segmentation, descriptors, and pattern recognition; architectures for image processing.

Objective
Image visualization and appropriate processing of images are necessary to understanding different topics such as computer vision, pattern recognition, object detection, information processing and display. Some of the advanced systems-related concepts such as convolution, edge extraction, filtering and two-dimensional transforms are better understood when these algorithms are applied to images. The course ECE 783/883 will provide an introduction to image processing. An emphasis will be placed on the implementation of computer algorithms using high level programming languages such as C/C++, MATLAB etc. to process images.

Prerequisites & Co-Requisites

Regular graduate standing is required to enroll in this course. Access to a personal computer running Windows, a World Wide Web browser and Knowledge of C/C++ or MATLAB (or any other high level programming language) is mandatory. You may use the departmental/college/university clusters.

Instructor	Dr. Khan M. Iftekharuddin Professor and Chair Department of Electrical and Computer Engineering Office: Department of Electrical and Computer Engineering 231 Kaufman Hall (757) 683-5481/4967 Office (757) 683-3220 Fax WWW: http://www.odu.edu/~kiftekha/ECE783_883/ECE783.html
Lectures **Location**	Time: MW 3:00 pm – 4:15 pm KH225
Office Hours	By appointment only.
Textbooks	R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd Ed. Prentice Hall, 2008 (Required)
References	K. M. Iftekharuddin and A. A. Awwal, Field Guide to Image Processing, SPIE Press, 2012. K. R. Castleman, Digital Image Processing, Prentice Hall, 1996. A. K. Jain, Fundamental of Digital Image Processing Prentice Hall, 1989.

Computer Usage

Computer simulations will be assigned which require use of any high level programming language to process digital

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♣ *Note: This document may be changed/modified at the instructor's discretion. The changes/modification, if any, will be communicated to you promptly.*

images. The C/C++ compilers, the MATLAB are available in ECE departmental clusters and College of Engineering clusters. In addition, some other types of image processing toolboxes such as Intel's OpenCV (opencv.org) may be downloaded from the WWW for practice. To perform all programming, processing, and viewing of the resulting images locally, the image processing algorithms may be implemented on a personal computer running C/C++ compiler, MATLAB or any other high level language.

Laboratory Assignments

Approximately five laboratory assignments will be given over the duration of the semester, corresponding to the image processing topics itemized in the tentative schedule section. Approximately 2-3 weeks will be given for completion of a particular laboratory assignment. Each assignment will consist of computer simulations, which require knowledge of the C/C++, MATLAB or any other high level programming language. Students are encouraged to discuss the basic concepts on the assignments; however, the implementation of algorithms/code must be their own. In addition, analytical (written homework) problems may be assigned at regular intervals.

Each laboratory assignment and homework must be turned in by the beginning of class on the scheduled due date. In the event of extenuating circumstances such as illness or a family emergency, an extension may be granted for with prior permission from the instructor.

You will be given additional instructions on the format of the report.

Email for class announcements

Occasionally, we plan to send email to the students updating on immediate class announcements. If you normally use another e-mail account, you need to go to OCCS web to make sure that mail sent to your ODU account is automatically forwarded to the account you do use.

Exams

One midterm exam and a final will be given during the semester. The final exam may either be a take home or in-class. The tentative schedule is shown below. Exams will only be given at the scheduled times unless prior arrangements have been made.

Final Project

An open-ended project will be assigned during the second half of the course. The objective of the final project is to have each student (or a group of 2 students for 783) work on a research-related project on image processing. The students may be given option to propose and discuss project ideas with the instructor. Those who do not have a suitable project idea, they will be assigned a project. These projects may involve significant computer simulations and/or analytical development. Substantial instructor supervision may be expected.
Schedule for Final Project (a more detail instruction will be provided later):
In-class project selection/assignment presentation: No later than October 5 – **5 points**
In-class progress presentation: No later than November 2 (this is a short 5-10 minute power point presentation showing project progress, results, discussions to the class) – **10 points**
Final project presentation - A formal 10-20 minute oral presentation of the results for each student will take place on the last day of class period – **25 points**
Project Report – **60 points**

Course Grading Policy
The relative weighting of the different types of work used to evaluate individual performance in the course is listed below:

Laboratory Assignments (projects):	25%
HW, Pop quizzes:	10%
Mid Term:	20%
Final Project:	20%
Final Exam:	25%

Final grades will be computed statistically by examining the averages of all students enrolled in the course. The

highest possible grading curve is shown below (% may be lowered depending on overall class performance):

A:	90% -- 100%
B:	80% -- 89%
C:	70% -- 79%
D:	60% -- 69%
F:	< 59.5%

Tentative Syllabus

Tentative topics that will be covered are listed below, but not necessarily in the order that they will be presented:

Chapter	Sections	Week	Computer Projects and Exams
1	Chapter 1 – Math Preliminaries	1	
2	Chapter 2 – Pixel Basics	2	Project#1
3	Chapter 3 – Spatial Domain Processing	2	Project#2
4	Chapter 4- Frequency Domain Processing	2	Mid term I
6	Chapter 7 - Wavelet transform (Castleman/Gonzalez/Iftekharuddin)	2	Project#3
5	Chapter 5 – Image Restoration	1	Project#4
8	Chapter 6 – Color Image Processing*	0	*Individual reading
9	Chapter 8 – Image Compression	2	Mid term II
10	Chapter 9 – Image Segmentation	1	Project #5
11	Chapter 10 - Morphology	1	Final (Consult the University Schedule)
12	Chapter 11 – Image Recognition etc.*	1	*Time permitting

Academic Honesty Statement

All work in this course must be completed in a manner consistent with student code of conduct as described in the ODU students' handbook. Violation will result in appropriate disciplinary action.

Disabilities Statement

Any students with disabilities who need accommodations are encouraged to speak with the instructor as soon as possible to make appropriate arrangements for those accommodations. Any student with permit from the students' disability office will be provided reasonable accommodation.

Class Attendance Policy

Prompt class attendance is the policy and practice of the ECE department. The class instructor reserves the right to refuse entrance to latecomers.

Prepared by: Khan M. Iftekharuddin, Ph.D. *Updated: August 2016*