The University of Jordan
School of Engineering
Department of Computer Engineering
Fall Semester – A.Y. 2024-2025

Course:
Digital Image Processing and Analysis – 0907544
(3 Cr. – Elective Course)

Catalog Data:
This course introduces the basics of digital image analysis and processing with emphasis on both theory and implementation. Image representation, image types, intensity transformations and spatial filtering, image enhancement, frequency domain processing, image restoration, geometric transformations and image registration, color image processing, image compression and vector quantization, morphological image processing, image segmentation, edge detection, line detection using the Hough transform, representation and description, object recognition. Hands-on computer work using MATLAB will be a major part of the learning experience.

Prerequisites by Course:
1901231 Data Structures.

Prerequisites by Topic:
Students are assumed to have had sufficient knowledge pertaining to signals and systems, probability and linear algebra, in addition to basic knowledge in using Matlab.

Textbook:
Digital Image Processing, R. Gonzales and R. Woods, 3rd edition, 2008. Prentice Hall, 2008.

References:
1. Gonzalez, Woods, and Eddins, Digital Image Processing Using MATLAB, 1st edition, Prentice Hall, 2004.
2. Anil K. Jain, Fundamentals of Digital Image Processing, Prentice Hall Information and System Sciences Series, 1st edition, 1988.

Course Website:
https://sites.google.com/view/iyadjafar

Schedule & Duration:
16 Weeks, 48 lectures, 50 minutes each (including exams).

Minimum Student Material:
Text book, class handouts, some instructor keynotes, calculator and access to a personal computer and internet.

Minimum College Facilities:
Classroom with whiteboard and projection display facilities, library, and computational facilities.

Course Objectives:
This course introduces the students to the basic concepts of digital image analysis and processing at a number of different levels:

1. Human visual system and image perception
2. Overview of digital image processing applications and fields
3. Understanding digital image acquisition, sampling, quantization, and representation
4. Image enhancement and filtering in the spatial and frequency domain
5. Image restoration and noise models
6. Digital color image models and processing
7. Concepts of image segmentation

8. Morphological image processing

Course Outcomes and Relation to ABET Program Outcomes:

Upon successful completion of this course, a student should be able to:

1. Enhance digital images in spatial and frequency domains mathematically and using Matlab [1,2].
2. Perform segmentation of objects found in digital images [1,2]
3. Improve the quality of image segmentation using image morphology [1,2].

Course Topics:

1. Introduction (Chapter 1)
2. Digital Image Fundamentals (Chapter 2)
3. Intensity Transformation and Spatial Filtering (Chapter 3).
4. Filtering in the Frequency domain (Chapter 4)
5. Image Restoration and Reconstruction (Chapter 5)
6. Color Image Processing (Chapter 6)
7. Image Segmentation (Chapter 10)
8. Morphological Image Processing (Chapter 9)

Computer Usage:

Students are expected to solve several homework assignments using Matlab.

Attendance:

Class attendance will be taken every class and the university's polices will be enforced in this regard.

Assessments:

Quizzes and Exams.

Grading policy:

Homework	20%	
Midterm Exam	30%	
Final Exam	50%	TBA

Instructors:

Class Time and Location:

Program Outcomes (PO)

1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3	An ability to communicate effectively with a range of audiences
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Last Updated: JULY 13TH, 2024