ABDULLAH GÜL UNIVERSITY
GRADUATE SCHOOL OF ENGINEERING & SCIENCE
ELECTRICAL AND COMPUTER ENGINEERING PROGRAM
COURSE DESCRIPTION AND SYLLABUS

Course Title	Code	Semester	T+L Hours	Credit	ECTS
DIGITAL IMAGE PROCESSING	ECE-530	FALL-SPRING	3 + 0	3	10

Prerequisite Courses	-

Type	Selective
Language	English
Coordinator	Asst. Prof. Kasım Taşdemir
Instructor	Asst. Prof. Kasım Taşdemir
Adjunt	none
Aim	The principle objectives of this course are to provide an introduction to basic concepts and methodologies for digital image processing, and to develop a foundation that can be used as the basis for further study and research in this field.
Learning Outcomes	• An ability to understand, analyze and modify the structure of digital images acquired from various types of sensors • An ability to enhance the quality of the digital images by using various filters in both spatial and frequency domains • An ability to analyze different kinds of noises and to eliminate the noise using image restoration and reconstruction tools • An ability to perform image analysis and enhancements in wavelet domain • An ability to compress and decompress digital images • An ability to carry out morphological operations on digital images • An ability to segment regions with particular properties using various image segmentation tools
Course Content	• Overview of digital image processing applications, • Transition of images from analog to digital domain and fundamentals of digital images, • Histogram processing, • Spatial filtering, • Discrete Fourier Transform of one and two variables, and image filtering in frequency domain, • Various types of noises and their statistical properties, • Various filters for noise reduction, image enhancement, i.e., sharpening, softening etc. • Image reconstruction from projections, • Wavelets and multiresolution processing, • Image compression fundamentals, • Morphological image processing, • Image segmentation and thresholding

WEEKLY TOPICS AND PRELIMINARY STUDY

Week	Topic	Preliminary Study
1	Overview of Digital Image Processing applications,	The relevant articles from the literature
2	Image sampling and quantization, Relation of the pixels,	The relevant articles from the literature
3	Intensity transformations, histogram processing, spatial filters	The relevant articles from the literature
4	Fourier transform of sampled functions, Discrete Fourier Transform (DFT) and properties of 2D DFT,	The relevant articles from the literature
5	Filtering in frequency domain	The relevant articles from the literature
6	Filtering in frequency domain (Continued)	The relevant articles from the literature
7	Image restoration and reconstruction	The relevant articles from the literature
8	Midterm Exam	The relevant articles from the literature
9	Image reconstruction from projections	The relevant articles from the literature
10	Wavelets and multiresolution processing,	The relevant articles from

		the literature
11	Wavelets and multiresolution processing (Continued)	The relevant articles from the literature
12	Morphological operations	The relevant articles from the literature
13	Image segmentation and thresholding	The relevant articles from the literature
14	Introduction to pattern recognition	The relevant articles from the literature
15	Course Review	The relevant articles from the literature
16	Final Exam	

SOURCES	
Lecture Notes	Lecture slides
Other Sources	**Course Textbook:** Rafael C. Gonzalez, "Digital Image Processing", Prentice Hall, 3rd edition, 2008 **Additional Materials:** 1. Gonzalez, et al., "Digital Image Processing Using MATLAB", Gatesmark Publishing, 2nd edition, 2009 2. William K. Pratt, "Digital Image Processing: PIKS Scientific Inside", Wiley, 4th edition, 2006, 3. Edward R. Dougherty, "Random Processes for Image Signal Processing", Wiley, 1998

COURSE MATERIALS SHARING	
Documents	Lecture notes, slides and images
Homeworks	8 homeworks will be assigned
Exams	1 Midterm and 1 Final Exam

EVALUATION SYSTEM		
SEMESTER STUDY	**NUMBER**	**CONTRIBUTION**
Midterm	1	30
Homework	8	30
-	-	-
SUB-TOTAL		60
Contribution of Semester Study		60
Contribution of Final Exam	1	40
TOTAL		100

Course Category	
Sciences and Mathematics	0%
Engineering	100%
Social Sciences	0%

RELATIONSHIPS BETWEEN LEARNING OUTCOMES AND PROGRAM QUALIFICATIONS							
No	Program Qualifications	Contribution Level				
		1	2	3	4	5
1	Accessing knowledge, evaluating and interpreting information by doing scientific research in the field of Materials Science and Mechanical Engineering					**X**
2	Ability to use science and engineering knowledge for development of new methods in Materials Science and Mechanical Engineering					**X**
3	To be able to understand and analyze materials by using basic knowledge on Materials Science and Mechanical Engineering					**X**
4	Design and implement analytical, modeling and experimental research					**X**
5	Solve and interpret the problems encountered in experimental research					**X**

6	Considering scientific and ethical values during the collection and interpretation of data				x	
7	Integrating knowledge of different disciplines with the help of scientific methods, and completion and implementation of scientific knowledge using data			x		
8	To gain leadership ability and responsibility in disciplinary and interdisciplinary team works					x
9	To be able to contribute to the solution of social, scientific and ethical problems encountered in the field of Materials Science and Mechanical Engineering					x
10	To be able to define, interpret and create new information about the interactions between various discipline of Materials Science and Mechanical Engineering					x

*Increasing from 1 to 5.

ECTS / WORK LOAD TABLE			
Activities	Number	Duration (Hours)	Total Work Load
Course Length	14	3	42
Midterm Exam Preparation	1	57	57
Final Exam Preparation	1	67	67
Repetition of the Topics	14	1	14
Semestr Homework Studies	8	15	120
Total Work Load			300
Total Work Load / 30			300/30
Course ECTS Credit			10