



جمهورية مصر العربية

وزارة التعليم العالي والبحث العلمي

Ministry of Higher Education and Scientific Research



المعهد العالى للحاسبات وتكنولوجيا المعلومات  
مدينة الشروق - القاهرة  
شعبة علوم الحاسب

## Course specification

**Course Code:** CS 433

**Course Title:** Digital Image Processing

**Academic Year:** /

**Course specification**  
**(CS 433 – Digital Image Processing)**

**Course Outline**

<b>Faculty:</b>	<i>HICIT- (Higher Institute for Computers &amp; Information Technology-El Shorouk Academy)</i>		
<b>Programme(s) on which the course is given:</b>	Undergraduate program in Computer Science		
<b>Major or minor element of programme:</b>	Compulsory		
<b>Department offering the program</b>	Department of Computer Science		
<b>Department offering the course:</b>	Department of Computer Science		
<b>Level</b>	Forth Level		
<b>Date of specification approval</b>	DD/MM/YYYY		

**Basic Information**

<b>Code:</b>	CS 433	<b>Title:</b>	Digital Image Processing	
<b>Prerequisites:</b>	CS 340 Computer Graphics			
<b>Weekly Hours:</b>				
<b>Lecture: 2</b>	<b>Exercise:</b>	<b>Practical : 2</b>	<b>Total: 3 credit hours</b>	

**Professional Information**

**Course Aims:**

This course focuses on the properties of digital images, design of display systems and algorithms, time and frequency representations, filters, image formation and enhancement, image sampling and quantization, color, point operations, segmentation, linear image filtering and correlation, image transforms (DCT, Fourier), nonlinear filtering, image enhancement in frequency domain, morphological image processing, noise reduction and restoration, simple feature extraction and recognition tasks, Students write and investigate image processing algorithms. Other recent related topics.

Program ILOs Covered by Course			
Knowledge and understanding	Intellectual Skills	Professional and practical skills	General and Transferable skills
a3, a6, a12, a13	B1, B10, B13	C1, C5, C7	D5,D10,D12

Intended learning outcomes of course (ILOs)
<p><b>a. Knowledge and Under-Standing:</b></p> <p>a1. Digital image and main phases of a digital image processing-based computer system.  a2. Methods and techniques to enhance an image.  a3. Image Segmentation techniques.  a4. Image transformations using discrete Fourier transform and discrete cosine transform.  a5. Boundary representation and distance metrics.  a6. Morphology and features extraction techniques.  a7. Classifications and recognition methodologies.</p>
<p><b>b. Intellectual Skills:</b></p> <p>b1. Design of systems that includes software and hardware.  b2. Problem analysis and problem decompositions.  b3. Thinking of problem-solving using transformations to suitable domain.</p>
<p><b>c. Professional and practical skills</b></p> <p>c1. Apply image enhancement techniques.  c2. Apply image enhancement in frequency domain.  c3. Perform Image Segmentations using thresholding.  c4. Hands on open CV.  c5. Image segmentation and feature extraction using OpenCV.</p>
<p><b>d. General and transferable skills</b></p> <p>d1. Communicate with others; work in a team and involvement in group discussion and seminars.  d2. Present data and results orally and in written form.  d3. Understanding of people and teams' formation.  d4. Differentiates between alternatives methodologies.</p>

Contents		
Topic	Contact Hours	
	lecture	Lab
Image, Digital image and image processing-based systems	2	2
Understanding image matrix and Neighboring	4	4
Images enhancement: Contrast stretching and histogram equalization.	2	2
Spatial domain filters	2	2
Frequency transformation and filters	4	4
Image segmentation techniques	2	2

Morphology	2	2
Boundary description, and distance metrics	2	2
Features extraction.	4	4
Recognition and classification techniques	2	2
Frequency transformation and filters	2	2

Teaching and learning methods	
Teaching and learning methods	Used
Lectures	√
Tutorial Exercises	√
Practical Lab	√
Discussions.	√
Self – Learning (Reading material, Websites search,)	√
Presentation	√
Problem solving/problem solving learning based	√
Video lectures	√

Student assessment methods & Schedule		
Methods	Used	Week#
Midterm Exam	√	8
Final Exam	√	16
Course Work & Quizzes	√	2-14
Practical Exam	√	15

Assessment Weight	
Assessment	Weight %
Mid Term Exam	15
Practical Exam	15
Final Exam	60%
Course Work & Quizzes	10%
Total	100

Course Work & Quizzes
Short Exams, Assignments, Research, Reports, Presentations
Class discussion

List of references	
<b>Essential books (textbooks)</b>	- Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, Pearson prentice Hall,2011. - Introductory Digital Image Processing: A Remote Sensing Perspective (Pearson Series in Geographic Information Science) 4th Edition , John Jensen,2015.

	- Pillow: Image Processing with Python Kindle Edition, Michael Driscoll.
<b>Course notes</b>	E-Learning Portal <a href="https://learn.sha.edu.eg/course/view.php?id=1372">https://learn.sha.edu.eg/course/view.php?id=1372</a> <a href="https://www.academia.edu/23394861/DIGITAL_IMAGE_PROCESSING_APPLICATIONS_LECTURE_NOTES">https://www.academia.edu/23394861/DIGITAL_IMAGE_PROCESSING_APPLICATIONS_LECTURE_NOTES</a> <a href="https://www.studocu.com/de/document/technische-universitat-munchen/computer-aided-medical-procedures-1-camp/edge-detect-other-slides/15321104">https://www.studocu.com/de/document/technische-universitat-munchen/computer-aided-medical-procedures-1-camp/edge-detect-other-slides/15321104</a>
<b>Recommended books</b>	Feature Extraction and Image Processing Second edition Mark S. Nixon Alberto S. Aguado <a href="https://learn.sha.edu.eg/pluginfile.php/185040/mod_resource/content/1/Feature.Extraction._Image.Processing.pdf">[https://learn.sha.edu.eg/pluginfile.php/185040/mod_resource/content/1/Feature.Extraction._Image.Processing.pdf]</a>
<b>Periodicals, website</b>	PowerPoint presentations of all course materials All labs material
<b>Videos link</b>	Video of lectures and sections

Required Facilities		
Tools & SW (Technology facilities):	<ul style="list-style-type: none"> <li>- Anaconda</li> <li>- Python/OpenCV</li> <li>- Microsoft TEAMS to create virtual classrooms for lectures, discussions for project.</li> <li>- Academy Portal (MOODLE) to make electronic quizzes and electronic midterm exam.</li> <li>- Academy Portal (MOODLE) to upload project deliverable and assignment.</li> <li>- Academy portal (MOODLE) to upload electronic material.</li> </ul>	
Teaching facilities:	Whiteboard	√
	Computer Lab	√
	Data show	√
	E-Learning	√
	Videos	√
	Website	√

### Course Content/ILO Matrix

Course Contents	Knowledge & understanding							Intellectual skills			Professional and practical skills					General			
	a1	a2	a3	a4	a5	a6	a7	b1	b2	b3	c1	c2	c3	C4	C5	d1	d2	d3	d4
Image , Digital image and image processing based systems	x															x			
Understanding image matrix and Neighbouring			x											x					
Images enhancement: Contrast stretching and histogram equalization.	x																		
Spatial domain filters		x		x				x	x	x									
Frequency domain and frequency domain filters		x	x	x							x	x		x				x	
Image segmentation techniques													x						
Morphology												x							
Boundary description, and distance metrics					x												x		
Features extraction.						x									x				
Recognition and classification techniques							x												x

### Learning Method /ILOs Matrix

Learning Methods	Knowledge and understanding							Intellectual skills			Professional and practical skills					General			
	a1	a2	a3	a4	a5	a6	a7	b1	b2	b3	c1	c2	c3	C4	C5	d1	d2	d3	d4
Lectures	x	x	x	x	x	x	x		x							x		x	
Tutorials and Lab	x							x	x	x	x	x	x				x		x
Exercise & Assignment		x	x	x	x	x	x	x	x		x	x		x			x	x	x

### Assessment Methods /ILOs Matrix

Assessment Methods	Knowledge & understanding							Intellectual skills			Professional and practical skills					General			
	a1	a2	a3	a4	a5	a6	a7	b1	b2	b3	c1	c2	c3	C4	C5	d1	d2	d3	d4
Midterm Exam	x		x	x	x		x	x	x		x							x	
Final term Exam	x	x		x		x		x		x	x						x		x
Quizzes and Project			x						x			x	x	x	x	x		x	x
Semester work	x		x					x		x		x		x		x	x		x

