A- Basic Information

Course Title : Image processing   Course Code : ECE441C
Teaching Hours: Lecture : 4   Tutorial : 2   Practical :   Total: 6
Program on which the course is given: B.Sc. Electrical Engineering (computer engineering)
Major or minor element of program: N. A.
Department offering the program: Electrical Engineering Department
Department offering the course: Electrical Engineering Department
Academic year / level: Fourth Year/ First Semester
Date of specifications approval: 20/6/2010

B- Professional Information

2- Course Aim

For students undertaking this course, the aims are to:

2.1- Understanding of digital image processing techniques, including imageenhancement, restoration, coding, and low level image analysis.

3- Intended Learning Outcomes of Course (ILOS)

a- Knowledge and Understanding
On completing this course, students will be able to:
a- 1 - Understand concepts and theories of mathematics and sciences, appropriate to different Image Segmentation techniques.
a- 2 - Define characteristics of engineering materials in the image acquisition, sampling and quantization.
a- 3 - Identify the principles of design including elements design, process and/or a system in noise reduction.
a- 4 - Understand the different methodologies of Image Enhancement.

b- Intellectual Skills

    At the end of this course, the students will be able to:

    b- 1 - Combine, exchange, and assess different ideas, views, and knowledge from a range of sources in the field of thresholding, Minimum Error Thresholding, Adaptive Thresholding.

    b- 2 - Assess and evaluate the characteristics and performance of components, systems and processes

    b- 3 - Solve image Spatial Filtering problems, often on the basis of limited and possibly contradicting information

    b- 4 - Select the appropriate mathematical tools, computing methods, design techniques for modeling and analyzing image restoration systems.

c- Professional Skills

    On completing this course, the students are expected to be able to:

    c- 1 - Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve image compression problems

    c- 2 - Professionally merge engineering knowledge and understanding to improve design, products and/or services.

d- General Skills

    At the end of this course, the students will be able to:

    d- 1 - Collaborate effectively within multidisciplinary team.

    d- 2 - Work in stressful environment and within constraints

    d- 3 - Demonstrate efficient IT capabilities.

    d- 4 - Lead and motivate individuals.

4- Course Contents

No.	Topics	No. of hours
1	Introduction to Digital Image Processing, examples of image processing	6
2	Digital image fundamentals: visual perception, image acquisition, sampling and quantization, relationship between pixels.	6
3	Image Enhancement: Gray-level transform, histogram processing, arithmetic/logic operation	12
4	Spatial Filtering , Low-pass Filtering – Smoothing, High-pass Filtering - Sharpening	12
5	Fourier Transform and Frequency Domain Filtering , FT/FFT, Low-pass Filtering – Smoothing, High-pass Filtering – Sharpening, Convolution, Correlation	12
6	Image Restoration : Image Degradation/restoration process, noise models, spatial filters, noised reduction in the frequency domain filtering	12

7	Image Segmentation : detection of discontinuity, boundary detection, thresholding, Minimum Error Thresholding, Adaptive Thresholding.	12
8	Image compression: fundamentals, free error compression, loosy compression	6

5- Teaching and Learning Methods

5.1- Modified Lectures
5.2- Class activity
5.3- Projects
5.4- Assignments / homework

6- Teaching and Learning Methods of Disables

None

7- Student Assessment

a- Student Assessment Methods

1	Assignments to assess knowledge and intellectual skills.
2	Quiz to assess knowledge, intellectual and professional skills.
3	Mid-term exam to assess knowledge, intellectual, professional and general skills
4	Final project to assess knowledge and intellectual skills.
5	Final exam to assess intellectual, professional and general skills.

b- Assessment Schedule

No.	Assessment	Week
1	Home assignments	5, 9, 11
2	Quizzes	4, 6, 10, 12
3	Mid-term exam	8
4	Projects	4,7,10
5	Final exam	15

c- Weighting of Assessments

Assessment	Weight
Mid_Term Examination	15 %
Final_Term Examination	66.6 %
Oral Examination	0 %
Quizzes / reports	13 %
Home assignments	5.4 %
Total	100 %

8- List of References

a- Course Notes
1- Course notes prepared by instructor.

b- Books
1- R. C. Gonzalez and R. E. Woods, Pearson Printice-Hal, Inc., Digital Image Processing, (3rd edition) 2008

c- Recommended Books
1- Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Digital Image Processing Using MATLAB, 2nd edition 2009

d- Web Sites
1- http://www.imageprocessingplace.com/
2- http://www.ee.siue.edu/CVIPtools/CVIPlab.html

Course Coordinator :   Ass. Prof/ Mazen Mohamed Selim

- Head of Department :   Prof/ Sayed Abo-Elsood Sayed Ward

Course Specifications: Image processing
(2012 - 2013)

- Matrix of Knowledge and Skills of the course

No.	Topics	week	Basic Knowledge	Intellectual Skills	Professional Skills	General Skills
1	Introduction to Digital Image Processing, examples of image processing	1	a1, a2	B3	c1	d1, d4
2	Digital image fundamentals: visual perception, image acquisition, sampling and quantization, relationship between pixels.	2		B3	c2	d1, d2
3	Image Enhancement: Gray-level transform, histogram processing, arithmetic/logic operation	3	a1,a4	B1, b2	c1,c2	d2, d3
4	Image Enhancement: Gray-level transform, histogram processing, arithmetic/logic operation	4	a1, a4	B1, b2	c1,c2	d2, d3
5	Spatial Filtering , Low-	5	A2, a4	B3	c2	

	pass Filtering – Smoothing, High-pass Filtering - Sharpening					
6	Spatial Filtering , Low-pass Filtering – Smoothing, High-pass Filtering - Sharpening	6	A2, a4	B3	c2	
7	Fourier Transform and Frequency Domain Filtering , FT/FFT, Low-pass Filtering – Smoothing, High-pass Filtering – Sharpening, Convolution, Correlation	7	a1, a3	B1, b4	c1	D3, d4
8	midterm exam	8				
9	Fourier Transform and Frequency Domain Filtering , FT/FFT, Low-pass Filtering – Smoothing, High-pass Filtering – Sharpening, Convolution, Correlation	9	a1, a3	B1, b4	c1	D3, d4
10	Image Restoration : Image Degradation/restoration process, noise models, spatial filters, noised reduction in the frequency domain filtering	10	A3	B3,b1,b2	c1, c2	d1, d3
11	Image Restoration : Image Degradation/restoration process, noise models,	11	A3	B3,b1,b2	c1, c2	d1, d3

	spatial filters, noised reduction in the frequency domain filtering					
12	Image Segmentation : detection of discontinuity, boundary detection, thresholding, Minimum Error Thresholding, Adaptive Thresholding.	12	a1, a4	B4		D4
13	Image Segmentation : detection of discontinuity, boundary detection, thresholding, Minimum Error Thresholding, Adaptive Thresholding.	13	a1, a4	B4		D4
14	Image compression: fundamentals, free error compression, loosy compression	14	a1,a3	B3	c2	d1,d2
15	final exam	15				

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Matrix of course content and ILO's

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Course content	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	D1	D2	D3	D4
Introduction to Digital Image Processing, examples of image processing	✓	✓					✓		✓		✓			✓
Digital image fundamentals: visual perception, image acquisition, sampling andquantization, relationship between pixels.							✓			✓	✓	✓		
Image Enhancement: Gray-level transform, histogram processing, arithmetic/logicoperation	✓			✓	✓	✓			✓	✓		✓	✓	
Spatial Filtering , Low-pass Filtering – Smoothing, High-pass		✓		✓			✓			✓				

Topic	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
Filtering–Sharpening															
Fourier Transform and Frequency Domain Filtering , FT/FFT, Low-pass Filtering – Smoothing, High-pass Filtering – Sharpening, Convolution, Correlation	✓		✓		✓				✓	✓	✓			✓	✓
Image Restoration : Image Degradation/restoration process, noise models, spatialfilters, noised reduction in the frequency domain filtering			✓		✓	✓	✓		✓	✓	✓			✓	
Image Segmentation : detection of discontinuity, boundary detection ‹thresholding, Minimum Error Thresholding, Adaptive Thresholding	✓			✓					✓						✓
Image compression: fundamentals, free error compression, loosy compression	✓		✓				✓				✓	✓	✓		

Matrix of course aims and ILO's

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Course aims	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	D1	D2	D3	D4
Understanding of digital image processing techniques, including imageenhancement, restoration, coding, and low level image analysis	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

course ILOS VS Program ILOS:

	A1	A3	A4	A5	B4	B5	B7	B13	C1	C2	D1	D2	D4	D5
A1	√													
A2		√												
A3			√											
A4				√										
B1					√									
B2						√								
B3							√							
B4								√						
C1									√					
C2										√				
D1											√			
D2												√		
D3													√	
D4														√

Course coordinator: Ass. Prof/ Mazen Mohamed Selim
Course instructor: Ass. Prof/ AbdulwahabKamel Mohamed Al_Samak
Head of department: Prof. Dr.Sayed Abo-elseoud Ward