King Saud University
College of Computer and Information Sciences
Department of Computer Engineering

CEN 465 – DIGITAL IMAGE PROCESSING 3 (3,0,1)
Semester I, Academic Year 2014-2015
Elective Course, Time: Mo 8:00-9:50, Wed 8:00-8:50

Course Description (catalog):

Quantitative models of imaging systems, spatial domain and frequency domain methods, digital filter design for image enhancement and restoration, edge detection, image denoising, image segmentation, image enhancement, image restoration, image compression, and image representation and description.

Prerequisites: - **Courses** CEN 352
- **Topics** None

Textbook(s) and/or Other Required Materials:
Primary: Gonzalez, R. C. and Woods, R. E., *Digital Image Processing*, 3rd Ed., 2008, Prentice Hall.
Supplementary: Bovik, A., *Handbook of Image and Video Processing*, 2000, Academic Press.

Course Learning Outcomes: This course requires the student to demonstrate the following:

1. Identify the basic components of an image processing system.
2. Recognize the basics of the human visual system as they relate to image processing.
3. Classify image types as binary images, gray-scale images, color and multi-spectral images.
4. Describe image geometry, convolution masks, image algebra and basic spatial filters.
5. Describe the 2-D Fourier including implied symmetry, phase, circular convolution, and filtering.
6. Apply lowpass, highpass, and bandpass filtering; including ideal and non-ideal filters.
7. Classify the categories of image processing applications into restoration, enhancement and compression.
8. Perform adaptive contrast enhancement to digital images.
9. Explain the concepts of image sharpening and smoothing in both spatial domain and spectral domain.
10. Design Wiener and power spectrum equalization filters for image restoration.
11. Explain the basics of image compression and decompression.

Major Topics covered and schedule in weeks:

Introduction and background.	2
Image enhancement in the spatial domain.	2
Image enhancement in the frequency domain.	2
Digital filter design.	3
Image restoration.	2
Image compression.	3
Review and evaluation	2

Grading:	**Home Work:**	10%
	Quizzes:	10%
	2-Midterms (20% each)	40%
	Final	40%

Course Policies:

- **Late** homework will NOT be accepted.
- The quizzes may be pop or announced, and may be given at anytime during class-time
- Students are encouraged to discuss homework problems but **not copy**.
- **All exams are closed book.**
- **The final exam will be comprehensive.**

Contribution of Course to Meeting Curriculum Disciplines:

Curriculum Discipline	Percentage
Mathematics and Basic Science	30
Engineering Science	30
Engineering Design	40
General Education	

Relationship of Course to Student Outcomes

Outcome	Student Outcome Description	Contribution
(a)	an ability to apply knowledge of mathematics, science, and engineering	✓
(b)	an ability to design and conduct experiments, as well as to analyze and interpret data	
(c)	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	
(d)	an ability to function on multidisciplinary teams	
(e)	an ability to identify, formulate, and solve engineering problems	✓
(f)	an understanding of professional and ethical responsibility	
(g)	an ability to communicate effectively	
(h)	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	
(i)	a recognition of the need for, and an ability to engage in life-long learning	✓
(j)	a knowledge of contemporary issues	
(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	✓

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