

Course specification

(4105 Computer Vision)

Faculty: HICIT- Higher Institute for Computers & Information Technology

Programme(s) on which the course is given: Under graduate program in Computer Science

Major or minor element of programme: Compulsory

Department offering the programme: Department of Computer Science

Department offering the course: Department of Computer Science

Year / Class: 4th Year – 1st semester

Date of specification approval: 22/9/2015

A- Basic Information

Title: Computer Vision

Code: 4105

Weekly Hours:

Lecture : 3

Exercise: -

Practical: 3

Total: 6

B- Professional Information

1- Course Objectives:

This course (CS4105) introduces the student to computer Vision principles. During the study of this course, the student understands the fundamentals of Digital Images processing and earn skills in dealing with images as well as the image processing based systems. The Course begins with the overall picture of understanding what digital Image is, image processing based systems, and the applications areas of the field. Then, explaining the image acquisition, sampling, quantization, related problems, and basics of image processing (neighbouring, statistics, and labelling). The image enhancement techniques in the spatial domains: average, contrast stretching, histogram equalization, and many others. Image transformations to the frequency domain using the Fourier transformation and discrete cosine transformation. Then, The use of frequency domain in image enhancement. The image segmentation techniques using vector quantization, high pass and edges detection, and labelling of connected areas explored with practical applications. Image morphology, boundary description, features extractions, and recognition techniques.

2- Program ILOs Covered by Course

Program Intended Learning Outcomes			
Knowledge and understanding	Intellectual Skills	Professional and practical skills	General and Transferable skills
a6, a12, a21	b2	c5	d5

3 - Intended learning outcomes of course (ILOs)

a: Knowledge and Understanding

On successful completion of the course, the student should demonstrate knowledge and understanding of:

- a1- Understand Digital image and main phases of a digital image processing based computer system.
- a2- Clarify various methods and techniques to enhance an image.

- a3- Understand techniques to find out an object to segment an image.
- a4- Explain Image transformations using discrete Fourier transform and discrete cosine transform.
- a5- Explain Boundary representation and distance metrics.
- a6- Describe Morphology and features extraction techniques.
- a7- Mention classifications and recognition methodologies.

b: Intellectual skills

Cognitive skills of critical thinking, analysis, synthesis, including :

- b1– Propose a systems that includes software and hardware.
- b2 –analyze the problem and decompose it.
- b3 – solve the problem using transformers to suitable domain.

c: Professional and practical skills

- c1- Design and realize application software’s to read and enhancement images of different formats.
- c2 - Design and develop Image, compression and transformation programs.
- c3 - use Open CV to implement Image Segmentations applications and familiarization.
- c4 - Apply Object segmentation and feature extraction concept in software design and develop.

d: General and transferable skills

Specifically ability to:

- d1- Communicate with others; work in a team and involvement in group discussion and seminars.
- d2- Write technical report.

4- Contents

Topic	Hours	Lecture	Practical
Image , Digital image and image processing based systems	6	3	3
Understanding image matrix and Neighboring	6	3	3
Images enhancement:: Contrast stretching and histogram equalization.	6	3	3
Spatial domain filters	12	6	6
Frequency domain and frequency domain filters	6	3	3
Image segmentation techniques	6	3	3
Morphology	6	3	3
Boundary description, and distance metrics	12	6	6
Features extraction.	6	3	3
Recognition and classification techniques	6	3	3
Course Project	6	3	3

5 -Teaching and learning methods

- 5.1 Lectures
- 5.2 Tutorial Exercises
- 5.3 Practical Lab
- 5.4 Discussions.

6- Student assessment methods

- 6.1 Midterm Exam: To assess the knowledge and understanding achieved by the student during the previous weeks.
- 6.2 Final Exam: To evaluate what the student gain at the end of the course, and to assess: the knowledge and understanding, general skills, and intellectual skills.
- 6.3 Course Project: To allow students work in team, and to evaluate knowledge, understanding, intellectual, and transferable skills.

6.4 Course Work & Quizzes: To keep the student always in the course, and to evaluate knowledge, understanding, intellectual, and transferable skills.

Assessment Schedule

Assessment	Week #
Mid Term Exam	8
Final Exam	16
Course Project	3-14
Course Work & Quizzes	2-14

Assessment Weight

Assessment	Weight %
Mid Term Exam	5%
Final Exam	80%
Course Project	10%
Course Work & Quizzes	5%
Total	100

Course Work & Quizzes: (Short Exams, Assignments, Researches, Reports, Presentations, Class/Project discussion)

7 -List of references

6.1 Text Books

-Digital Image Processing , Rafael C. Gonzalez and Richard E. Woods, Pearson prentice Hall,2011.

-Learning OpenCV: Computer Vision in C++ with the OpenCV,Adrian Kaehler, Gary Bradski, AMAZON 2014

8- Required Facilities

-Open CV

-Visual Studio .Net

9- Course Matrices

9.1- Course Content/ILO Matrix

Course Contents	a1	a2	a3	a4	a5	a6	a7	b1	b2	b3	c1	c2	c3	c4	d1	d2
Image , Digital image and image processing based systems	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		
Image segmentation techniques																
Morphology												x				
Boundary description, and distance metrics					x											
Features extraction.						x										
Recognition and classification techniques							x									
Course Project															x	x

9.2- Learning Method /ILOs Matrix

Learning Methods	a1	a2	a3	a4	a5	a6	a7	b1	b2	b3	c1	c2	c3	c4	d1	d2
Lectures	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Tutorial Exercises								x	x	x	x	x	x	x		
Practical Lab								x	x	x	x	x	x	x		
Discussion								x	x	x	x	x	x	x	x	x

9.3 Assessment Methods /ILOs Matrix

Assessment Methods	a1	a2	a3	a4	a5	a6	a7	b1	b2	b3	c1	c2	c3	c4	d1	d2
Mid Term Exam	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Final Exam	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Course Project	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Course Work & Quizzes	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Course Coordinator: Dr. Abdellatif Hussien ()

Head of Department: Dr. Farouk Shabaan ()

Date: 22/9/2015