Course Specifications

Course Title:	Digital Image Processing
Course Code:	**ICS 334**
Program:	
Department:	**Computer Science**
College:	
Institution:	

Table of Contents

A. Course Identification

1. Credit hours:	**3**
2. Course type	
a.	University ☐ College ☐ Department ■ Others ☐
b.	Required ☐ Elective ■
3. Level/year at which this course is offered:	**Selective subject**
4. Pre-requisites for this course (if any)**:**	MATH 210 and ICS 211
5. Co-requisites for this course (if any)**:**	Nil

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**		٨٠%
2	**Blended**		10%
3	**E-learning**		5%
4	**Correspondence**		5%
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	
4	**Others** (specify)	
	Total	60
Other Learning Hours*		
1	**Study**	
2	**Assignments**	
3	**Library**	
4	**Projects/Research Essays/Theses**	
5	**Others** (specify)	
	Total	

***** The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course covers topics relevant to the understanding, Mathematical Characterization, feature extraction, and modification of images. Included in this course will be the necessary theoretical background as well as practical exercises in image processing. Topics include 2D mathematical system theory, image transforms such as Discrete Cosine Transform, Fourier transform and Wavelet transform, image understanding, image analysis, image enhancement techniques, restoration and Morphological Image Processing. Finally edge Detection methods, Image segmentation and Shape Analysis. Students will perform various image processing and transformation techniques using Matlab Toolboxes.

2. Course Main Objectives

1. Be familiar with the fundamental principles of Visualization - Observe the objects that are not visible
2. Be able to use Image sharpening and restoration - To create a better image.
3. Have the ability to implement Image retrieval - Seek for the image of interest
4. Be able to perform pattern measurement – Measures various objects in an image.
5. Be able to describe, discuss and apply the main theories, models and methodologies of image processing
6. Have the ability to design and implement Image Recognition – Distinguish the objects in an image

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Have a clear understanding of the principals the Digital Image Processing terminology used to describe features of images.	
1.2	Have a good understanding of the mathematical foundations for digital manipulation of images; image acquisition; preprocessing; segmentation; Fourier domain processing, compression and analysis.	
1.3	Learn and understand the Image Enhancement in the Spatial Domain and Frequency Domain.	
2	**Skills :**	
2.1	Be able to design code and test digital image processing applications using MATLAB language.	
2.2	Be able to use the documentation for, and make use of, MATLAB library and MATLAB Digital Image Processing Toolbox (IPT).	
2.3	Be able to use different digital image processing algorithms.	
2...		
3	**Competence:**	

CLOs		Aligned PLOs
3.1	Be able to write programs using Matlab language for digital manipulation of images; image acquisition; preprocessing; segmentation; Fourier domain processing; and compression.	
3.2		

C. Course Content

No	List of Topics	Contact Hours
1	*Introduction And Digital Image Fundamentals:* - Image Sampling and Quantization. - Some basic relationships like Neighbors, Connectivity, and Distance Measures between pixels. - Translation, Scaling, Rotation and Perspective Projection of Image	12
2	*Digital image Representation:* - Image Reading - Image Displaying - Writing Images using MATLAB , Data Classes, and - Image Types using MATLAB	8
3	*Image Enhancement in the Spatial Domain:* - Some basic Gray Level Transformations - Histogram Processing - Smoothening and Sharpening Spatial Filters, and - Intensity Transformation Function	8
4	*Image Enhancement in the Frequency Domain:* - Introduction to Fourier Transform and the frequency Domain - Computing and Visualizing the 2D DFT (MATLAB - Smoothing Frequency Domain Filters - Sharpening Frequency Domain Filters - Homomorphic Filtering	12
5	*Image Restoration* - A model of Image Degradation / Restoration Process - Noise Models - Restoration in the presence of Noise Only Spatial Filtering -Periodic Noise Reduction by Frequency Domain Filtering	12

6	*Image Compression* - Coding - Inter pixel and Psych visual Redundancy - Image Compression models - Compression standards	8
7	Graduate Project In Digital Image Processing by MATLB	4
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Have a clear understanding of the principals the Digital Image Processing terminology used to describe features of images.	**-Lectures -Lab demonstrations -Case studies -Individual presentations**	**-Written Exam -Homework - Assignments -Lab assignments -Class Activities -Quizzes**
1.2	Have a good understanding of the mathematical foundations for digital manipulation of images, image acquisition, preprocessing, segmentation, Fourier domain processing, compression and analysis.		
1.3	Learn and understand the Image Enhancement in the Spatial Domain and Frequency Domain.		
2.0	**Skills**		
2.1	Be able to use different digital image processing algorithms.	**-Lab demonstrations -Case studies -Individual presentations -Brainstorming Presentation**	**-Homework assignments -Lab assignments -Class Activities -Quizzes**
2.2	Be able to design code and test digital image processing applications using MATLAB language.		
2.3	Be able to use the documentation for, and make use of, MATLAB library and MATLAB Digital Image Processing Toolbox (IPT).		
2.4	Be able to write programs using Matlab language for digital manipulation of images, image acquisition,preprocessing,segmentation, Fourier domain processing; and compression.		
3.0	**Competence**		
3.1	Analyze a wide range of problems and provide solutions related to the design of image processing systems through suitable algorithms, structures, diagrams, and other appropriate methods.	**-Small group discussion -Whole group discussion -Brainstorming Presentation**	**-Written Exam -Homework assignments -Lab assignments -Class Activities -Quizzes**
3.2	Be able to solve image problems using MATLAB Toolbox.		
3.3	Be able to use the documentation for, and make use of, MATLAB library and MATLAB Digital Image Processing Toolbox (IPT).		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	First written mid-term exam	6	15%
2	Second written mid-term exam	12	15%
3	Presentation, class activities, and group discussion	Every Week	10%
4	Homework assignments	After every chapter	10%
5	Implementation of presented concepts	Every two weeks	10%
6	Final written exam	16	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

1. Office hours: Sun: 10-12
   Office call: Tuesday:10-12

A total of 6 office hours per week in the lecturer schedule in order to facilitate the student.

2. Contacting students using the following Email address: fatma_harby@yahoo.com

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	-Maria Petrou, Fundamental : Digital Image Processing, John Wiley and Sons, 2010.
Essential References Materials	-"Digital Image Processing", Rafael C. Gonzalez & Richard E. Woods, Addison-Wesley, 2002. -"Machine Vision: Automated Visual Inspection and Robot Vision", David Vernon, Prentice Hall, 1991.
Electronic Materials	• http://www.tutorialspoint.com/dip/image_processing_introduction.htm • https://www.engineersgarage.com/article_page/introduction-to-image-processing/
Other Learning Materials	-Video and presentation are available with me.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom and Lab, as those that are available at college of science at Al Zulfi.

Item	Resources
Technology Resources (AV, data show, Smart Board, software, etc.)	Smart Board, projector, internet, and whiteboard.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	N/A

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Strategies for Obtaining Student Feedback on Effectiveness of Teaching.	- Questionnaires (Course evaluation) filled by the students and electronically organized by the university. - Student-faculty management meetings.	
Evaluation of Teaching by the Program/Department Instructor.	- Discussion within the staff members teaching the course. - Departmental internal review of the course.	
Processes for Improvement of Teaching.	- Periodical departmental revision of methods of teaching. - Monitoring of teaching activities by senior faculty members. - Training courses.	
Processes for Verifying Standards of Student Achievement.	- Evaluation matrix	
Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.	- Course evaluation - Exam evaluation - Improvement plan	

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	