Course Specification

(Bachelor)

Course Title:	Digital Image Processing
Course Code:	CSC 1406
Program:	Bachelor in Computer Science
Department:	Computer Science
College:	Faculty of Computers and Information Technology
Institution:	University of Tabuk
Version:	1.0
Last Revision Date:	27 July 2022

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐ University	☐ College	☒ Department	☐Track	☐Others
B.	☐Required		☒ Elective		
3. Level/year at which this course is offered: (Level 7/8-Year 4)					
4. Course general Description:					
The aim of this course is to provide students with implementation details of common image processing algorithms and to give experience to students to work collaboratively in teams on larger projects. This course will provide mathematical foundations and practical techniques for digital manipulation of images; image acquisition; pre-processing; segmentation; Fourier domain processing; feature extraction; recognition and compression					
5. Pre-requirements for this course (if any)**:**					
Linear Algebra MATH1205					
6. Co-requisites for this course (if any)**:**					
N/A					
7. Course Main Objective(s):					
1. Understand how computers can process digital images 2. Understand the processes of two-dimensional data together with any perceived similarity with the human vision system 3. Learn the theoretical foundations of modern image processing **4.** Apply theory to practical image processing problems					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		

No	Mode of Instruction	Contact Hours	Percentage
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Understand how computers can process digital images	K3	Lectures	Exams Quizzes
1.2	Understand the processes of two-dimensional data together with any perceived similarity	K2	Lectures Class Discussion	Exams Assignments
1.3	Learn the theoretical foundations of modern image processing	K1	Lectures Case studies	
2.0	**Skills**			
2.1	Apply mathematics in the solution of computing problems	S1	Lectures Case studies	Exams Quizzes

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
2.2	Apply statistics in the solution of computing problems	S2	Lectures Class Discussion	Exams Quizzes
2.3	Use linear algebra to solve out computing problems	S1	Lectures	Exams Quizzes
3.0	**Values, autonomy, and responsibility**			
3.1	Demonstrate effective team work skills	V2	Lectures	Assignments
3.2				
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Digital Image Processing Part 1 : digital image, digital image processing, history of digital image processing	3
2.	Introduction to Digital Image Processing Part 2: state of the art examples, and key stages of digital image processing.	3
3.	Digital Image Fundamentals Part 1: the human visual system, light and the electromagnetic spectrum	3
4.	Digital Image Fundamentals Part 2: image representation, image sensing and acquis ion, sampling quantization and resolution	3
5.	Image Enhancement Part 1: different kinds of image enhancement, histogram processing.	3
6.	Image Enhancement Part 2: point processing, and neighborhood operations.	3
7.	Image Restoration Part 1: noise and images, noise models.	3
8.	Image Restoration Part 2: noise removing using spatial domain filtering, periodic noise.	3
9.	Image Restoration Part 3: nose removal using frequency domain filtering.	3
10.	Image Representation and Description Part 1: object detection and object recognition.	3
11	Image Representation and Description Part 2: object detection and object recognition.	3
12.	Color Image Processing Part 1: color fundamentals color models.	3
13.	Color Image Processing Part 2: color fundamentals color models.	3

14.	Image Segmentation Part 1: segmentation problem, finding points, lines and edges.	3
15	Image Segmentation Part 2: segmentation problem, finding points, lines and edges.	3
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm Exams	6, 10	40%
2.	Assignments	4, 12	10%
3.	Quizzes	5, 13	10%
.4	Final Exam	15	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Gonzales, R. C., and R. E. Woods. "Digital image processing 4th edition." (2018). ISBN-10 : 9780133356724, ISBN-13 : 978-0133356724
Supportive References	Sonka, Milan, Vaclav Hlavac, and Roger Boyle. *Image processing, analysis, and machine vision*. Cengage Learning, 2014.
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Classroom**
Technology equipment (projector, smart board, software)	**Projector**
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of Teaching	Faculty, Program Leaders, and Advisory Board	Both Direct and Indirect
	Students	Indirect
Effectiveness of Students Assessment	Faculty, Program Leaders, Advisory Board, and Independent Opinion	Both Direct and Indirect
Quality of Learning Resources	Faculty, Students, and Advisory Board	Indirect
The Extent to which CLOs have been Achieved	Faculty, Program Leaders, Advisory Board, and Independent Opinion	Direct (as in section B) and Indirect/Surveys
	Students	Indirect
Other	-	-

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	