Course Description Form

1. Course Name:
Image Processing
2. Course Code:
WBM-51-05
3. Semester / Year:
Semester 1 / 2025-2026
4. Description Preparation Date:
20250- 9-20
5. Available Attendance Forms:
presence in the classroom
6. Number of Credit Hours (Total) / Number of Units (Total)
60 Hours / 3 Units
7. Course administrator's name (mention all, if more than one name)
Name: Faris Kareem SHAMMARI Email: faris.kar@uowa.edu.iq

8. Course Objectives	
Course Objectives	-Introduce the fundamental concepts of digital image formation and representation. -Study basic image processing techniques such as image denoising, enhancement, and restoration. -Learn image segmentation methods, feature extraction techniques, and structural analysis of images. -Cover classical computer vision techniques including motion tracking, detection, and recognition. -Introduce modern deep learning–based approaches for image and video analysis. -Apply practical techniques to common tasks such as: Image classification • Object detection and tracking • Semantic segmentation • Face recognition -Perform programming exercises and case studies to bridge theoretical concepts with practical implementation. -Equip students with the knowledge and skills required to design and develop advanced image processing and computer vision systems.
9. Teaching and Learning Strategies	
Strategy	1. **Theoretical lectures** to explain the fundamental concepts and mathematical models of image processing and computer vision. 2. **Demonstrations** to illustrate image processing workflows using real-world examples. 3. **Project-Based Learning**, where students develop a practical project in image processing or build a computer vision model.

	4. **Laboratory sessions** using MATLAB and various image datasets for hands-on practical implementation. 5. **Collaborative learning** through group discussions and analysis of real-world image and video problems. 6. **Case studies** to explore real applications such as face recognition, object detection, and medical image enhancement.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Learning Outcomes 2 and 6	Introduction	Theoretical lectures. Discussion lectures/tutorials. Practical laboratory experiments.	Written exams. Quizzes. Scientific report writing. Homework.
2+3	4	Learning Outcomes 2 and 6	Human visual system. Sources of Digital Images, Simultaneous contrast. Optical illusions. Image acquisition.	Theoretical lectures. Discussion lectures/tutorials. Practical laboratory experiments.	Written exams. Quizzes. Scientific report writing. Homework.
4	4	Learning Outcomes 2 and 6	Image formation model. Image sampling and quantization.	Theoretical lectures. Discussion lectures/tutorials. Practical laboratory experiments.	Written exams. Quizzes. Scientific report writing. Homework.
5	4	Learning Outcomes 2 and 6	Representing digital images. Spatial and intensity resolution.	Theoretical lectures. Discussion lectures/tutorials. Practical laboratory experiments.	Written exams. Quizzes. Scientific report writing. Homework.
6	4	Learning Outcomes 2 and 6	Image file format. Basic relationships between pixels. Distance measures.	Theoretical lectures. Discussion lectures/tutorials. Practical laboratory experiments.	Written exams. Quizzes. Scientific report writing. Homework.
7	4	Learning Outcomes 2 and 6	Distance measures. Point operations. Arithmetic operations Set and logical operations.	Theoretical lectures. Discussion lectures/tutorials. Practical laboratory experiments.	Written exams. Quizzes. Scientific report writing. Homework.
8	4	Learning Outcomes 2 and 6	**First mid teams**	Theoretical lectures. Discussion lectures/tutorials. Practical laboratory experiments.	Written exams.
9+10	4	Learning Outcomes 2 and 6	Set and logical operations. Spatial domain. Processes on spatial domain.	Theoretical lectures. Discussion lectures/tutorials.	Written exams. Quizzes. Scientific report writing. Homework.

				Practical laboratory experiments.	
11	4	Learning Outcomes 2 and 6	Basic intensity transformation functions.	Theoretical lectures. Discussion lectures/tutorials. Practical laboratory experiments.	Written exams. Quizzes. Scientific report writing. Homework.
12	4	Learning Outcomes 2 and 6	Piecewise-linear transformation functions. Histograms. Histogram processing. Histogram equalization.	Theoretical lectures. Discussion lectures/tutorials. Practical laboratory experiments.	Written exams. Quizzes. Scientific report writing. Homework.
13	4	Learning Outcomes 2 and 6	What is a spatial filter? The mechanics of linear spatial filtering. Correlation and convolution. Smoothing spatial filters (linear and nonlinear). Sharpening spatial filters characteristics Foundation of sharpening filters. Laplacian filter	Theoretical lectures. Discussion lectures/tutorials. Practical laboratory experiments.	Written exams. Quizzes. Scientific report writing. Homework.
14	4	Learning Outcomes 2 and 6	**Second mid teams**	Theoretical lectures. Discussion lectures/tutorials. Practical laboratory experiments.	Written exams. .
15	4	Learning Outcomes 2 and 6	Image Segmentation, Application of image segmentation, Point Detection, Line Detection, Edge detection, Sobel Edge detection, Prewitt Edge detection	Theoretical lectures. Discussion lectures/tutorials. Practical laboratory experiments.	Written exams. Quizzes. Scientific report writing. Homework.

11. Course Evaluation

Monthly Exams: 2 × 15 = 30 marks
Homework Assignments: 5 marks
Quizzes: 5 marks
Laboratory Work: 10 marks

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Digital Image Processing -Gonzales R.C., Woods R.E. 4th ed., 2018.
Main references (sources)	- Digital Image Processing using SCILAB, Rohit M. Thanki • Ashish Kothari, 2019.

	- Digital Image Processing Using MATLAB, Gonzalez R.C., Woods R and Eddins S., 3rd ed., 2020.
Recommended books and references (scientific journals, reports...)	All reputable scientific journals that are related to the broad concept mathematical theories and their results