FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE IN COMPUTING

LEARNING MODULE OUTLINE

Academic Year	2025/2026	Semester	1
Module Code	COMP411		
Learning Module	Digital Image and Video Processing		
Pre-requisite(s)	Nil		
Medium of Instruction	English		
Credits	3	Contact Hours	45 hrs
Instructor	Dr. Yue Liu	Email	yue.liu@mpu.edu.mo
Office	Rm. A313, Chi-Un Building	Office Phone	85996433

MODULE DESCRIPTION

The module focuses on the investigation of practical digital image and video processing techniques. It aims to equip the students with the background of developing image and video processing tools and applications. The topics include: 1) the fundamental theories and mathematical models in digital image and video processing; 2) the practical algorithms in digital image and video processing; 3) the relevant mainstream standards in engineering and applications; 4) the development of image and video processing applications in practice.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

On completion of this learning module, students will be able to:

M1.	Illustrate and clarify underlying theories and mathematical models in image/video processing; (SM2p)
M2.	Apply and design quantitative and computational methods to model and solve image/video processing problems; (EA3p)
M3.	Identify and analyze practical needs and concerns in image/video processing and compressions; (D5p)
M4.	Develop and deploy suitable and creative designs for practical applications; (D4p)
M5.	Compare and contrast state-of-the-art standards in image/video compressions. (EP6p)

These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

PILOs	M1	M2	M3	M4	M5
P1. Select and apply proven methods, tools and techniques to the effective and efficient implementation of information systems;					

P2.	Evaluate computer systems in a local area network, and understand the additional requirements for connection to other networks through wide area networks;					
P3.	Be competent in system development in the Internet and the web platform;					
P4.	Work independently to design and implement a relational database, with an emphasis on how to organise, maintain and retrieve information from a DBMS;					
P5.	Acquire essential knowledge in specific fields of computing disciplines including multimedia, security and artificial intelligence;	✓	✓	✓	✓	✓
P6.	Acquire the perceptive skills needed to understand information presented in the form of UML diagram, flow chart or other industry standard formats;					
P7.	Understand the need for and use of the necessary mathematical techniques;	✓	✓			
P8.	Work independently to develop an understanding of, and the knowledge and skills associated with the general support of computer systems and networks;			✓	✓	
P9.	Work as an effective member of a team in the analysis, design and development of software systems;					
P10.	Use project planning and management techniques in systems development;					
P11.	Understand the fundamental and operational issues of computer systems in business environments;					
P12.	Equip with adequate written, oral communication and interpersonal skills;					✓
P13.	Build the capacity and desire for lifelong learning and to learn advanced and emerging technologies on one's own;					
P14.	(For Enterprise Information Systems specialisation) Gain an in-depth understanding of the information technology related to enterprise information systems, with an emphasis on development of such systems to support business processes;					
P15.	(For Gaming Technology specialisation) Acquire the general and advanced knowledge of current technologies and operating environment in the gaming industry;					
P16.	(For Computer Education specialization) Acquire the general and practical knowledge of computer education and its practicing environment in secondary education.					

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
1-2	1. Overview of Image and Video Processing	6
	1.1 Introduction to Image and Video Processing	

	1.2 Image Basics		
	1.3 Introduction to Scilab and Matlab		
3-8	2. Image Processing Techniques		18
	2.1 Image Histograms		
	2.2 Point Operations		
	2.3 Filters and Convolution		
	2.4 Edge Detection		
	2.5 Binary Image Analysis		
	2.6 Color image processing		
9-12	3. Transformation and Compressions		12
	3.1 Fourier Transform		
	3.2 Wavelet Transform		
	3.3 Frequency Filtering		
	3.4 Image Compression Basics		
13-15	4. Video Processing Techniques		9
	4.1 Video Basics		
	4.2 Video Processing and Compression Techniques		
	4.3 Video Compression Standards-MPEG family		
	4.4 MPEG-1, 2, 4 and beyond		

TEACHING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	M1	M2	M3	M4	M5
T1. Lectures	✓	✓	✓	✓	✓
T2. In-class tutorials and exercises	✓	✓	✓		

ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Bachelor's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

ASSESSMENT

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	Weighting (%)	AHEP3 LOs	ILOs to be Assessed
A1. Assignments/Classwork/Project	30%	EA3p, D5p, D4p, EP6p	M2, M3, M4, M5
A2. Test	20%	SM2p, EA3p, D5p	M1, M2, M3
A3. Examination	50%	SM2p, EA3p, D5p	M1, M2, M3

The assessment will be conducted following the University's Assessment Strategy (see www.mpu.edu.mo/teaching_learning/en/assessment_strategy.php). Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

Students with an overall score of less than 35 in the coursework must take the re-sit examination even if the overall score for the module is 50 or above.

Students with a score of less than 35 in the final examination must take the re-sit examination even if the overall score for the module is 50 or above.

Students with an overall final grade of less than 35 are NOT allowed to take the re-sit examination.

REQUIRED READINGS

1. R. Gonzalez and R. Woods (2018). Digital Image Processing (Global Edition, 4th Edition). Pearson Publishing.

REFERENCES

1. R. Gonzalez, R. Woods and S. Eddins (2020). Digital Image Processing Using Matlab (3rd edition). Gatesmark Publishing.

2. A. Bovik (2009). The Essential Guide to Video Processing (1st edition). Academic Press.

STUDENT FEEDBACK

At the end of every semester, students are invited to provide feedback on the learning module and the teaching arrangement through questionnaires. Your feedback is valuable for instructors to enhance the module and its delivery for future students. The instructor and programme coordinators will consider all feedback and respond with actions formally in the annual programme review.

ACADEMIC INTEGRITY

The Macao Polytechnic University requires students to have full commitment to academic integrity when engaging in research and academic activities. Violations of academic integrity, which include but are not limited to plagiarism, collusion, fabrication or falsification, repeated use of assignments and cheating in examinations, are considered as serious academic offenses and may lead to disciplinary actions. Students

should read the relevant regulations and guidelines in the Student Handbook which is distributed upon the admission into the University, a copy of which can also be found at www.mpu.edu.mo/student_handbook/.