FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE IN COMPUTING

LEARNING MODULE OUTLINE

Academic Year	2025/2026	Semester	2
Module Code	Computer Game Design and Development		
Learning Module	COMP424		
Pre-requisite(s)	COMP311		
Medium of Instruction	English		
Credits	3	Contact Hours	45 hrs
Instructor	Andrew Siu	Email	kmsiu@mpu.edu.mo
Office	A319, Chi-Un Building, Main Campus	Office Phone	8599-6451

MODULE DESCRIPTION

This module introduces the fundamental principles and concepts of video game design and development. The module covers several major areas: the theories and concepts of game design, game specification, game-related mathematical concepts and architecture and other features of game engine. In practice, fundamental game development techniques and C# programming are covered using Unity game engine.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

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

M1.	Examine the principles and concepts in game design and development. (EA1p)
M2.	Assess the architecture of a game engine. (EP4p)
M3.	Survey basic mathematical models for game development and implementation. (SM2p)
M4.	Obtain techniques to design and develop a computer game with a game engine. (D4p)
M5.	Gain the experience of the team work in a term project involving design and development of a video game. (EP9p)

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 specialization) 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 specialization) 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. Introduction to Games and Game Development	6
1	1.1 What is a video game?	
1,2	1.2 Evolution of video games	
2	1.3 Categorizations of video games	
2	1.4 Development of video games	

	2. Game design essentials	4
3	2.1 Aesthetics of interaction	
4	2.2 Gameplay balancing	
	3. Game development process and design specification	4
5	3.1 Game development process	
5	3.2 Game design specification	
	4. 2D and 3D math for games	4
6	4.1 Geometric transformations for 2D and 3D graphics	
6	4.2 Vector operations	
	5. Game development (Unity)	27
7	5.1 Unity 2D basics and IDE	
8,9	5.2 C# Scripting	
10	5.2.1 Data type, structures, and GameObject	
11,12	5.2.2 MonoBehaviour mechanism and Event handling	
12	5.2.3 Input control	
13,14	5.2.4 Animation and Object spawning	
15	5.2.5 Coroutine and IEnumerator	

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 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. Term projects (2) (20% and 25%)	45%	EA1p, SM2p, D4p, EP9p	M3, M4, M5
A2. Test	15%	EA1p, EP4p, SM2p	M1, M2, M3
A3. Examination	40%	EA1p, EP4p, SM2p	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

There is no official text for this module. Module notes are distributed in the class

REFERENCES

1.   Teaching and learning Aesthetics of Interaction, Lundgren

2.   Man Play and Games, Roger Caillois

3.   Participation-centered Game Design Guidelines

4.   The Participation-Centered Game Design Canvas

5.   Case Study of Petri Nets in Game Design, Araújo, Roque

6.   MDA: A Formal Approach to Game Design and Game Research, Hunicke, LeBlanc, Zubek

7.   Flow in Games, Jenova Chen

8.   Beyond the Library: Applying film post-production techniques to game sound design, Peck

9.   Pattern Language for Sound Design in Games (Links to an external site.)

10.   Gameplay Experience Evaluation Centered on Participation: the Fátima Game Design Case, Pereira, Roque

11.   The Goal Question Metrics Approach, Basili, Caldiera, Rombach

12.   Good Games are Created Through Playtesting, Schell

13.   Game Mechanics must be in Balance, Schell

14.   Blackman, S. (2013). Beginning 3D Game Development with Unity 4: All-in-one, multi-platform game development,

15.   Millington, I. (2010). Game Physics Engine Development: How to Build a Robust Commercial-Grade Physics Engine for your Game, Morgan Kaufmann.

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/.