COURSE OUTLINE

Course Number	Course Title	Credits
GAM 245	**Game Programming II**	**3.0**
Hours: Lecture/Lab/Other 1/4/0	**Pre-requisite: GAM 145**	**Implementation Semester & Year: SP 2022**

Catalog description:

Builds upon the existing skills developed in GAM 145. Students expand upon their knowledge of the C# programming language and its application within a game engine. Higher-level programming techniques serve topics such as quaternion application, AI behaviors, pathfinding, advanced collision detection, and task management for video games.

General Education Category: **Not GenEd**

Course coordinator: (Ric Giantisco, x3458, giantisr@mccc.edu)

Required texts & Other materials: (None)

Course Student Learning Outcomes (SLO):

Upon successful completion of this course the student will be able to:

1. Design enemy AI behaviors for video games such as basic herding and flocking. [ILG 1-5, 9-11; PLO 1-4, 6, 8, 9]
2. Develop two-dimensional and three-dimensional navigation and pathfinding to enable AI pursuit and evasion. [ILG 1-5, 10, 11; PLO 1-4, 6, 8, 9]
3. Engineer and apply rule-based systems, task scheduling, event managers, and other related tools. [ILG 1-5, 9-11; PLO 1-4, 6-9]
4. Construct and implement layered trigger mechanics and systems. [ILG 1-4, 10, 11; PLO 1-4, 6, 8, 9]
5. Apply class inheritance and static fields and methods to create unique game avatars and types. [ILG 1-4, 10, 11; PLO 1-4, 6, 8, 9]
6. Create and execute coroutine functions to control repeating or large tasks. [ILG 1-4, 10, 11; PLO 1-4, 6, 8, 9]
7. Prototype various game types such as SHMUPs, card games, word games, and action- adventure games. [ILG 1-6, 10, 11; PLO 1-9]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 1. Written and Oral Communication in English. Students will communicate effectively in both speech and writing.
Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
Institutional Learning Goal 3. Science. Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.
Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.
Institutional Learning Goal 5. Social Science. Students will use social science theories and concepts to analyze human behavior and social and political institutions and to act as responsible citizens.

Institutional Learning Goal. 6. Humanities. Students will analyze works in the fields of art, music, or theater; literature; philosophy and/or religious studies; and/or will gain competence in the use of a foreign language.
Institutional Learning Goal 9. Ethical Reasoning and Action. Students will understand ethical frameworks, issues, and situations.
Institutional Learning Goal 10. Information Literacy: Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.
Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes for Game Programming (PLO)

1. Understand the historical development of games;
2. Describe and reference industry trends and technologies in video gaming;
3. Apply the design process to research and develop professional video game concepts;
4. Create diagrams and prototypes to specify game design concepts;
5. Create a professional sales pitch for a game concept;
6. Program game engine components such as resource management, entity-based systems, physics simulation, and user interfaces;
7. Create a custom 2-D game engine;
8. Develop skills to be a self-learner and problem solver;
9. Work effectively on interdisciplinary teams producing functioning games and levels.

Units of study in detail – Unit Student Learning Outcomes:

Unit I Game Managers & Menu Systems [SLOs 3, 4-7]

This unit focuses on developing effective and efficient systems to manage data generated during gameplay. Students will utilize components such as class inheritance, coroutines, and standard UI layouts to produce specified results. Emphasis will be placed on designing code with proper syntax, naming conventions, and optimized conditional structures.

Learning Objectives

The student will be able to:

- Define and distinguish between several different game prototypes.
- Demonstrate proficient knowledge of basic algorithms and data structures.
- Design and manage game prototypes using programming techniques such as class inheritance, static fields and methods, coroutines, etc.
- Identify standard UI designs and hierarchies utilized in video games.
- Construct and prototype basic HUD and game menu functionality.

Unit II Basic AI Movement & Behavior [SLOs 1-2, 4-7]

This unit explores various techniques for diversifying avatar behavior during gameplay. Students will define basic AI behaviors such as patrol, alert, and pursue using line-of-sight, collision detection, and other proximity measures. Emphasis will be placed on designing logical progressions and constructing efficient and modular code.

Learning Objectives

The student will be able to:

- Design and employ basic player movement.
- Identify AI behavior mechanisms and complexity.
- Create "seek", "flee", "wander", "pursue", and "evade" type behaviors.
- Develop obstacle and collision avoidance.

Unit III **Pathfinding [**SLOs 1-2, 4-7]

This unit examines different pathfinding systems applicable for two-dimensional and three-dimensional video games. Students will develop waypoint systems and apply game engine navigation systems to game levels to achieve specified results. Emphasis will be placed on situational assessment, problem solving, and efficient application.

Learning Objectives

The student will be able to:

- Conceptualize and layout level paths and obstacles.
- Design pathfinding graphs and data structures.
- Construct hierarchical pathfinding.
- Create dynamic pathfinding.

Unit IV **Advanced AI Behavior [**SLOs 1-7]

This unit investigates common patterns and structures for non-playable character (NPC) behavior in video games. Students will employ Object Oriented Programming (OOP) to simulate independent and collective behaviors. Emphasis will be placed on effective implementation of component-oriented OOP and strategic use of modularity.

Learning Objectives

The student will be able to:

- Create decision, state, and behavior trees.
- Create layered trigger mechanics and systems.
- Develop rule-based systems.
- Create formation and tactical movement.

Evaluation of student learning:

PROJECTS

Project 1: Inventory System	-Design a system for players to select and utilize different tools.
Project 2: Birds of a Feather	-Create unique behaviors for different game avatars.
Project 3: Guard Patrol	-Develop a player movement system and enemy navigation system.
Project 4: Game Prototype	-Create a simple video game prototype.

Each project will be evaluated on several factors. The specific goals, deliverables, and requirements of each project will be identified in the description sheet for each project.

GRADING

Projects:	60%
Quizzes:	20%
Homework:	10%
Attendance:	10%
Total	**100%**