COURSE OUTLINE

Course Number	Course Title	Credits
GAM 240	**Game Design II**	**3**
Hours: Lecture/Lab/Other 1/4/0	**Pre-requisite: DMA 120**	**Implementation Semester & Year SP 2022**

Catalog description:.
Develops fundamental skills and standard industry workflows required to produce three-dimensional assets used in video games. Students explore different facets of environment, character, and vehicle design. Animation, lighting, materials, textures, and unwrapping UVs are also covered. Emphasis is placed on sculpting and texturing 3D models, optimization, and prototyping specified models.

General Education Category: **Not GenEd**

Course coordinator: (Richard Giantisco, x3457, 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. Build prototypes to test game design concepts. [ILG 1-11; PLO 2, 3, 5-10]
2. Design and build game levels utilizing professional game engines and 3D modeling and animation software. [ILG 1-11; PLO 2, 3, 5-10]
3. Design concepts for digital games. [ILG 1, 4, 5-11; PLO 2, 3, 5-7, 9, 10]
4. Construct and optimize appropriate 3D models for games. [ILG 1, 4,10, 11; PLO 2, 5-7, 9, 10]
5. Create and apply textures, lighting, and simple physics to game models. [ILG 1-4, 7, 8, 10, 11 ; PLO 2, 3, 5-10]
6. Create Sales pitches for games. [ILG 1, 4, 5-11; PLO 1-7, 9]
7. Produce a complete game design document. [ILG 1, 4-11; PLO 1-7, 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 7. History. Students will understand historical events and movements in World, Western, non-Western or American societies and assess their subsequent significance.
Institutional Learning Goal 8. Diversity and Global Perspective: Students will understand the importance of a global perspective and culturally diverse peoples.
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 Development (PLO)

1. Understand the historical development of game play.
2. Apply the design process to the research and development of professional video game concepts.
3. Apply narrative structures in the design of video games and levels.
4. Describe and reference industry trends and technologies in video gaming.
5. Design meaningful video game experiences and game mechanics appropriate to context.
6. Create diagrams, storyboards, and prototypes to specify game design concepts.
7. Develop games with level editing and scripting tools within industry standard game engines.
8. Understand basic programming concepts and apply scripting languages to create interaction in game environments.
9. Create 2D and 3D game art assets from game concepts, utilizing professional 2D digital imaging and 3D modeling and animation software.
10. Work effectively on interdisciplinary teams producing functioning games and levels.

Units of study in detail – Unit Student Learning Outcomes:

Unit I **"Low-Poly Modeling" [**SLO 1, 3, 4, 6]
This unit will introduce students to the production process for creating low-poly modeling for games. Students will design and construct 3D game assets using current digital content creation software and professional game engines. Emphasis will be placed on concept development, silhouette definition, face extrusion techniques, edge creation and loop flow, and model optimization.

Learning Objectives
The student will be able to:

- Design and create unique 3D models from reference images and research.
- Sculpt 3D models using box modeling techniques.
- Cut, insert, and manipulate edge loops to create effective model topology.
- Maintain model integrity and optimize topology to meet specified poly count standards.

Unit II **" UV Mapping, Materials, & Textures" [**SLOs 1, 3-5]
This unit explores the methods and techniques used to create and apply materials to 3D game models. Students will unwrap 3D model UVs for material application, design images for standard map types, utilize Physically Based Rendering (PBR) techniques to generate maps for 3D models, and develop shaders and materials for in-game use. Emphasis will be placed on limiting UV distortion, efficient UV layout, texture design, and map allocation.

Learning Objectives
The student will be able to:

- Unwrap and layout 3D model UVs for texture creation.
- Identify and apply diffuse, specular, alpha, normal, and other map types to 3D models.
- Design and create PBR textures for use in game engines.
- Create images and textures using game industry standard software.

Unit III **" Lighting" [**SLOs 1-5]

This unit analyzes professional design strategies for lighting and rendering 3D video game models. Students will employ various lighting techniques and components to achieve specified results. Emphasis will be placed on lightmap application, appropriate shadow casting, light probe deployment, environmental effects, and scene optimization.

Learning Objectives

The student will be able to:

- Identify and explain the differences between real-time and baked lighmaps.
- Create and apply lightmaps to 3D models and environments.
- Design and create lighting systems for morning, afternoon, and night settings.
- Optimize lighting systems to efficiently produce dynamic reflections and shadows within active video game environments.

Unit IV **" High Poly Modeling & Animation" [**SLOs 1, 3-6]

This unit examines the professional workflows and techniques utilized to create high-poly 3D models for video games. Students will construct hard surface models and complex organic shapes using industry standard digital sculpting and modeling tools. This unit will also explore various animation and rigging techniques used in the gaming industry. Emphasis will be placed on developing an efficient production pipeline, creating multiple levels of detail (LOD), retopology, normal mapping, and other relevant topics.

Learning Objectives

The student will be able to:

- Configure and export 3D models for digital sculpting and/or animation.
- Sculpt high poly models using digital sculpting tools.
- Construct multiple LODs for use in game engines.
- Design and construct animation systems for use in game engines.
- Generate and apply normal maps from high poly 3D models.

Unit V **" Level Design" [**SLOs 1-7]

This unit focuses on the development process, from concept to final product, for designing a 3D game environment. Students will study a wide range of commercial examples to produce specific genres, styles, and map layouts. Emphasis will be placed on rapid grey-boxing, landmark visibility, shape language, flow maps, affordance and other related concepts.

Learning Objectives

The student will be able to:

- Identify and explain the utility of shape language within a commercial video game.
- Construct a grey-boxed video game environment.
- Plan and create a game level flow map.
- Devise and apply multiple game affordances within a game level.
- Compose a 3D game environment around a defining landmark.

Evaluation of student learning:

PROJECTS

Project 1: Fantastic Tool	-Create a handheld tool that the player can use during gameplay.
Project 2: Wraps & Maps	-Design and texture a quirky robot.
Project 3: Light Show	-Create mood lighting for a fantastic environment.
Project 4: Character Animation	-Rig and animate a video game avatar.
Project 5: Game Level	-Design and construct your own game environment.

Each project will be evaluated using various criteria. The specific goals, deliverables, and requirements of each project will be identified in the description document for each project. Please note the due dates.

Most of these projects will be subjected to in-class critiques from both the professor and your fellow students. This means that in addition to the quality of their final product, each student will also be graded on their delivery of any required prototypes or iterations, their participation during critiques, and how they collect and process feedback from their professor and peers.
Projects that are only submitted on the final deadline date without any of the required prototypes or iterations will receive a maximum grade of “C”. Iteration is important. Please prototype your projects accordingly. Work that is turned in after class on the day that it is due will be considered late. The highest grade that late projects can receive is a “C”.

GRADING

Projects	60%
Class Exercises & Quizzes	20%
Attendance	10%
Homework	10%
Total	100%