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| Detailed Course Description - Course Plan Development and Updating Procedures/ Computer Science \ Multimedia Systems Department | QF01/0408-3.0E |
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| Faculty | Science & Information Technology | Department | Computer Science \ Multimedia Systems |
| Course number | 0105452 | Course title | Game Design |
| Number of credit hours | 3 | Pre-requisite/co-requisite | 0105336 |

Brief course description

Development of programming skills using software environment of a game engine and its scripting language. 3D concepts for game play, modeling, and programming. Roles needed in software development team. Contrast creation of original 3D object models for game world with incorporation of pre-created generic models.

This course is an introduction to Unity covering basic techniques for creating games in Unity. The course will cover all the basic techniques needed to create games in Unity. We'll cover:

- Importing Images, 3d-models and animations into Unity games
- Creating environments in 2d or 3d using Unity's built-in editor
- Adding GUI elements such as menus and player controls
- Using Unity's 3d rendering system to create lighting and material effects
- Creating basic game logic using the JavaScript language
- Adding animations, physics and Effects.

Unity 3d is one of the most popular tools for game developers. It offers a rich set of features for 3D rendering, animation, physics, and web features, and can publish games on PCs, consoles, websites and mobile devices.

| Course goals and learning outcomes | |
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| Goal 1 | Provide students with the knowledge and understanding needed to produce interactive computer systems and various multimedia applications |
| Learning outcomes | 1.1 The student should be able to develop, design and implement systems that allow human interaction with the computer easily and efficiently. 1.2 Students can use multimedia tools to produce and design various digital, 2D and 3D applications and audio and video effects. |
| Goal 2 | Navigating and Utilizing Unity Interface |
| Learning outcomes | 2.1 Search tools in unity environment. 2.2 Dynamically changing GameObjects, component configuration. 2.3 Debug and animation windows. 2.4 Build terrain. |
| Goal 3 | Representation of 2D and 3D objects on game scene. |
| Learning outcomes | 3.1 Flat objects representing. 3.2 Unity3D coordinate systems. 3.3 Using Vectors for manipulating of objects. 3.4 3D Game Creation. |

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| Goal 4 | Game scenes prototyping |
| Learning outcomes | 4.1 Setting camera and layouts. 4.2 Transform component (changing transform properties and resetting them). 4.3 Using several cameras on the same scene. 4.4 Using documenting and reusing prefabs. |
| Goal 5 | Game physics |
| Learning outcomes | 5.1 Mathematical principles of defining collisions for two bodies (bound object, bound sphere, mesh filter). 5.2 Components providing game physics. Rigidbody and colliders. 5.3 Setting collider properties colliders events. |
| Goal 6 | Scripting |
| Learning outcomes | 6.1 Hierarchy of classes for development games in Unity3D. 6.2 User input processing. Processing events from mouse and keyboard. 6.3 Activating and deactivating GameObjects 6.4 GameObjects interaction in scripting. 6.5 Means to organize Game Timer. |
| Textbook | 1- Unity 3D and PlayMaker Essentials: Game Development from Concept to Publishing (Focal Press Game Design Workshops) Paperback – July 27, 2016 2- Learn Unity3D Programming with UnityScript: Unity's JavaScript for Beginners by Janine Suvak (2014-08-06). |
| Supplementary references | 1- Learning C# Programming with Unity 3D 1st Edition (Jul 27, 2017) by Alex Okita. 2- Unity 3D UI Essentials by Simon Jackson (2015-01-31). 3- Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C# By Jeremy Gibson Addiso Wesley Professional, 1 edition, Jul 2014 4- Unity 5.x Game Development Essentials - Third Edition (2017) by Tommaso Lintrami |

Course timeline

| Week | Number of hours | Course topics | Pages (textbook) | Notes |
|------|-----------------|--|------------------|-------|
| 01 | 1 1 1 | 1.1 Who Plays Games 1.2 How Are Games Made? 1.2.1 AAA Studios 1.2.2 The Indie Studio 1.3 Who Can Make Games? 1.3.1 Skills and Jobs 1.3.2 Working in the Industry 1.4 What Types of Games Are There? 1.4.1 Role-Playing Games 1.4.2 Adventure Games 1.4.3 Platformer Games 1.4.4 Shooter Games | 4-18 | |

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| | | 1.4.5 Action Games 1.4.6 Strategy Games 1.4.7 Simulation Games 1.4.8 Sports Games 1.4.9 Puzzle Games 1.4.10 MMO Games | | |
| 02 | 1 1 1 | 2.1 Introduction to the Design Document 2.1.1 Do We Need a Design Document? 2.1.2 Methods of Design 2.1.3 Logical Design versus Descriptive Design 2.1.4 Mission and Vision 2.2 Sections of the Design Document 2.2.1 Game Concept 2.2.2 Game Characters 2.2.3 Game Story 2.2.4 The Game World | 24-35 | |
| 03 | 1 1 1 | 3.1 Installing Unity 3.2 Unity's Interface 3.3 Using Unity 3.4 Installing PlayMaker 3.5 PlayMaker's Interface 3.6 State Machines 3.7 Using PlayMaker | 42-70 | |
| 04 | 1 1 1 | 4.1 The Purpose of Characters 4.2 Do Games Need Characters? 4.3 Traditional Character Types 4.3.1 The Hero 4.3.2 The Shadow 4.3.3 The Mentor 4.3.4 The Ally 4.3.5 The Herald 4.3.6 The Trickster 4.3.7 The Shapeshifter 4.3.8 The Threshold Guardian 4.4 Game Character Types 4.4.1 Merchants 4.4.2 The Quest Giver 4.4.3 Information 4.5 Character Design 4.6 Character Asset Design 4.7 Importing Assets in Unity 4.7.1 Back to Projects 4.7.2 Importing 3D Assets 4.7.3 Settings for Imported 3D Assets 4.7.4 From 3D Assets to Player Controllable Assets 4.8 Character Control Systems with PlayMaker | 90-145 | |

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| | | <p>4.8.1 Designing the Character Response System</p> <p>4.8.2 Getting Input through Unity</p> <p>4.8.3 Building State Machines in PlayMaker</p> <p>4.8.3.1 Moving Sancho</p> <p>4.8.3.2 Rotating Sancho</p> <p>4.8.3.3 Jumping Sancho</p> <p>4.8.3.4 The Camera Follows Sancho</p> | | |
| 05 | <p>1</p> <p>1</p> <p>1</p> | <p>5.1 What Is Artificial Intelligence?</p> <p>5.2 Some Different Types of Artificial Intelligence</p> <p>5.2.1 Scripted Behavior</p> <p>5.2.2 Random Behavior</p> <p>5.2.3 Expert Systems</p> <p>5.2.4 Mathematical Behavior Modeling</p> <p>5.2.5 Evolutionary Systems</p> <p>5.3 Selecting an Artificial Intelligence System</p> <p>5.4 Designing a Threshold Guardian</p> <p>5.5 Implementing the Threshold Guardian</p> <p>5.5.1 The Controller</p> <p>5.5.2 Patrolling</p> <p>5.5.3 Spotting the Player</p> <p>5.5.4 Attacking the Player</p> <p>5.5.5 Hurting the Player</p> <p>5.5.6 Connecting the Attack and Health States</p> <p>5.5.7 Final Tweaks</p> <p>5.6 Prefabs</p> | 152-199 | |
| 06 | <p>1</p> <p>1</p> <p>1</p> | <p>General Review, Exercises, and First Exam 20%</p> | | |
| 07 | <p>1</p> <p>1</p> <p>1</p> | <p>6.1 What Is a Story?</p> <p>6.2 Does My Game Need a Story?</p> <p>6.3 How to Tell a Story</p> <p>6.4 The Building Blocks of a Story</p> <p>6.4.1 Characters</p> <p>6.4.2 Setting</p> <p>6.4.3 The Problem</p> <p>6.4.4 The Plot</p> <p>6.4.5 The Solution</p> <p>6.4.6 The Theme</p> <p>6.5 Aristotle and the Greeks</p> <p>6.5.1 Plot</p> <p>6.5.2 Characters</p> <p>6.5.3 Thought</p> <p>6.5.4 Diction</p> <p>6.5.5 Melody</p> <p>6.5.6 The Spectacle</p> <p>6.6 The Return of Joseph Campbell</p> | 204-225 | |

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| | | 6.6.1 The Ordinary World 6.6.2 Call to Adventure 6.6.3 Refusal of the Call 6.6.4 Meeting the Mentor 6.6.5 Crossing the Threshold | | |
| 08 | 1 1 1 | 6.6.6 Tests, Allies, and Enemies 6.6.7 Approaching the Cave 6.6.8 The Ordeal 6.6.9 The Reward 6.6.10 The Road Back 6.6.11 Resurrection 6.6.12 Return with Elixir 6.7 Story Design 6.7.1 The Theme 6.7.2 Characters 6.7.3 Setting and Backstory 6.7.4 The Problem 6.7.5 The Plot 6.7.6 The Solution 6.7.7 Dialogue 6.8 Putting the Story into the Game 6.8.1 Voice-Over Narration 6.8.2 Written Text 6.8.3 Character Dialogue 6.8.4 Journal Systems | 224-255 | |
| 09 | 1 1 1 | 7.1 Environments for Stories 7.2 Environments for Games 7.2.1 Controlling the Player 7.2.2 Informing the Player 7.2.3 Challenging the Player 7.2.4 The Final Design 7.3 Creating the Terrain in Unity 7.3.1 Settings 7.3.2 Terrain Collider 7.3.3 Height Tools 7.4 Dressing a Terrain with Standard Content 7.4.1 Painting Textures 7.4.2 Adding Water 7.4.3 Adding Trees 7.4.4 Adding Grass 7.5 Adding Imported Assets 7.6 Lighting the Environment 7.7 Boundaries | 260-307 | |
| 10 | 1 1 | 8.1 What Are Game Mechanics? 8.1.1 The Core Mechanics | 314-33 | |

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| | 1 | 8.1.2 Victory and Loss Conditions 8.1.3 Balance Mechanics 8.1.4 Story Mechanics 8.1.5 System Mechanics 8.2 Where Do Mechanics Come From? 8.3 Designing Our Mechanics 8.3.1 The Checkpoint System 8.3.2 Respawnin Sancho 8.3.3 Sancho and Water 8.3.4 Sancho's Collection System 8.4 Implementing Our Mechanics 8.4.1 The Checkpoint System 8.4.2 Sancho and Water 8.4.3 Respawnin Sancho | | |
| 11 | 1 1 1 | 9.1 How Audio Is Used in Games 9.1.1 Music 9.1.2 Ambience 9.1.3 Sound Events 9.2 Finding Audio 9.3 Introduction to Audacity 9.3.1 Cutting Up an Audio File 9.3.2 Applying Effects to Audio 9.3.3 Adjusting Volume Levels | 350-379 | |
| 12 | 1 1 1 | Second Exam 20% | | |
| 13 | 1 1 1 | 9.4 Audio in Unity 9.4.1 2D Audio 9.4.2 3D Audio 9.4.3 Playing Ambient Audio 9.4.4 Playing Background Music 9.5 Using PlayMaker to Play Audio 9.5.1 Background Music 9.5.2 Ambient Sounds 9.5.3 Effects for Events | 380-392 | |
| 14 | 1 1 1 | 10.1 The Types of User Interfaces 10.1.1 Menu-Based Systems 10.1.2 Heads-Up Display Systems and Overlays 10.2 User Interface Design 10.2.1 HUD Design 10.2.2 Menu Design 10.2.3 Basics of Color Theory 10.3 The User Interface System of Unity 10.3.1 Building Blocks of uGUI | 392-418 | |

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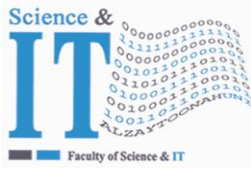
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| | | 10.3.2 Constructing the Main Menu 10.3.3 Constructing the HUD Overlay 10.3.4 Polishing the Dialogue Work | | |
| 15 | 1 1 1 | 11.1 What Is Testing? 11.1.1 Hunting Bugs 11.1.2 Play-Through Testing 11.1.3 Unit Testing 11.1.4 Break Testing 11.2 Fixing and Tweaking 11.2.1 Fixing the Following Sheep 11.3 Building the Game 11.3.1 Game Development Life Cycle 11.3.2 Build Options in Unity 11.3.3 Creating a Stand-Alone Build | 450-465 | |
| 16 | 1 1 1 | Final Exam 50% | | |

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| Theoretical course evaluation methods and weight | Participation = 10% First exam 20% Second exam 20% Final exam 50% | Practical (clinical) course evaluation methods | Semester students' work = 50% (Reports, research, quizzes, etc.) Final exam = 50% |
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| Approved by head of department | | Date of approval | |
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Extra information (to be updated every semester by corresponding faculty member)

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|--------------------------|-------------|---------------|--|
| Name of teacher | Mousa Salah | Office Number | 119 |
| Phone number (extension) | | Email | mosa.salah@zug.edu.jo |
| Office hours | | | |



جامعة الزيتونة الأردنية
Al-Zaytoonah University of Jordan
كلية العلوم وتكنولوجيا المعلومات
Faculty of Science & Information Technology



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"Tradition and Quality"

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