



**OBJECT ORIENTED PROGRAMMING**  
**SEMESTER MAY 2025**  
**GROUP PROJECT DOCUMENTATION**  
**PROJECT TITLE: 2D RPG GAME**

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## Project Description

### Overview:

Our project is a 2D top-down role-playing game (RPG) developed as part of our Object-Oriented Programming course. The game allows the player to control a character who explores a game world, fights multiple types of enemies, collects coins and health items.

### Gameplay Features:

- Player can move in four directions within a 2D map.
- Multiple enemy types with different behaviors and difficulty levels.
- Collectible items such as coins, health potions, and power-ups.
- Health and damage system to manage player survival.

### Objectives:

- To design and implement a playable 2D game.
- To apply key OOP principles such as encapsulation, inheritance, polymorphism, and abstraction in the design of game components.
- To improve our understanding of game loops, object interactions, and real-time input handling.

### OOP Concepts Applied:

- **Inheritance:** All enemy types inherit from a common Enemy base class and override their behavior.
- **Polymorphism:** The game handles different objects (e.g., enemies, items) through shared interfaces or base classes.
- **Encapsulation:** Each game object (Player, Enemy, Item) maintains its own state and behavior through private fields and public methods.
- **Abstraction:** Game systems (e.g., item collection, health management) are modularized for reusability and clarity.

**Tools and Technologies Used:**

- Programming Language: C#
- Game Framework/Library: Unity with C#
- IDE: Visual Studio

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## Task Division

Member Name	Roles & Responsibilities
Mohamad Hamie Azwar Bin Hamid (Level 1)	<ul style="list-style-type: none"><li>• Took initiative and completed the first iteration of the game project, establishing a functional prototype as a foundation for further development.</li><li>• Set up the overall project structure and initial scene configuration.</li><li>• Implemented core player mechanics, including:<ul style="list-style-type: none"><li>○ Input handling system</li><li>○ Player sprite integration and animation setup</li><li>○ Rigidbody-based physics for movement and collision</li></ul></li><li>• Developed essential combat systems:<ul style="list-style-type: none"><li>○ Sword animation and visual feedback</li><li>○ Sword-enemy collision detection</li><li>○ Enemy health system with knockback and damage flash effects</li><li>○ Death visual effects (VFX) and responsive sword swinging</li></ul></li></ul>

	<ul style="list-style-type: none"><li>• Programmed player dash functionality for enhanced mobility.</li><li>• Configured camera behaviour using CineMachine for smooth following and framing.</li><li>• Created the game environment using Tilemap and Rule Tile for efficient level design.</li><li>• Contributed to enemy AI design, particularly enemy state behaviour.</li><li>• Participated in designing the UML class diagram, ensuring accurate class structure and relationships.</li></ul>
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<p>Nurul Amira Alisha Binti Mohd Azli (Level 2)</p>	<p><b>Destructible Objects</b></p> <ul style="list-style-type: none"> <li>• Implemented destructible elements in the environment, including bushes, barrels, and chests.</li> <li>• Tested collision and destruction animations to ensure smooth gameplay interaction.</li> </ul> <p><b>Sprite Transparency</b></p> <ul style="list-style-type: none"> <li>• Developed a transparency system where the player becomes partially transparent when moving behind bushes.</li> <li>• Verified visual clarity to ensure the player remains visible during gameplay.</li> </ul> <p><b>Scene &amp; Portal System</b></p> <ul style="list-style-type: none"> <li>• Added a new game scene to expand the world.</li> <li>• Created a portal effect and implemented smooth scene transitions between areas.</li> </ul> <p><b>2D Lighting</b></p> <ul style="list-style-type: none"> <li>• Integrated 2D lighting to enhance the game's atmosphere and depth.</li> <li>• Adjusted light intensity and colour to achieve the desired visual style.</li> </ul> <p><b>Weapon UI Setup</b></p> <ul style="list-style-type: none"> <li>• Designed and implemented a weapon selection UI to display available weapons (sword, staff, bow).</li> <li>• Configured the system so that only the sword is functional at this stage, with staff and bow as placeholders.</li> </ul> <p><b>Weapon Selection System</b></p>
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	<p>Added input controls allowing players to switch weapons via hotkeys (1 for sword, 2 for staff, 3 for bow).</p> <ul style="list-style-type: none"><li>• Set up the groundwork for future staff and bow mechanics; they are currently non-functional in this version.</li></ul>
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<p>Vyshnavee A/P Ramakrishnan (Level 3)</p>	<p><b>Implemented Weapon Cooldown System</b></p> <ul style="list-style-type: none"> <li>• Integrated a weapon cooldown system in the ActiveWeapon script to prevent rapid weapon usage, ensuring fair and balanced gameplay.</li> <li>• Ensured that the cooldown dynamically adjusts based on the currently equipped weapon's settings.</li> </ul> <p><b>Bow and Arrow Mechanics</b></p> <ul style="list-style-type: none"> <li>• Created a bow weapon that fires arrows as projectiles using Rigidbody2D physics.</li> <li>• Scripted arrow behaviour to detect collision and deal damage to enemies and destructible objects.</li> <li>• Added logic for arrow direction, speed, and hit detection with environmental elements.</li> </ul> <p><b>Magic Laser Weapon System</b></p> <ul style="list-style-type: none"> <li>• Designed a continuous laser attack using ray casting stuff to damage enemies.</li> <li>• Applied visual effects to simulate magical energy beams.</li> <li>• Ensured laser obeys cooldown rules and ends after a defined duration or upon releasing the attack key.</li> </ul>
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	<p><b>Enabled Destruction of Environmental Objects</b></p> <ul style="list-style-type: none"> <li>• Added logic for weapons like arrow, laser to interact with destructible objects also and not only enemies like barrels and bushes.</li> <li>• Created a generic destructible object script with health and destruction triggers.</li> </ul> <p><b>Integrated Weapons into Main Combat System</b></p> <ul style="list-style-type: none"> <li>• Ensured all weapons could damage both enemies and interactable objects consistently.</li> <li>• Worked with enemy scripts and destructible scripts to handle collision detection, damage, and knockback effects.</li> <li>• Integrated animations for weapon usage such as shooting and casting magic.</li> <li>• Ensured animation synced with attack timing and cooldown for smooth visual feedback.</li> <li>• Handled idle and transition states between different weapon types.</li> </ul>
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<p>Muhammad Fahim Amzar Bin Faris Fahmi (Level 4)</p>	<p><b>Player Health and Knockback Implementation</b></p> <ul style="list-style-type: none"> <li>• Player is knocked back to indicate getting hit by enemies' weapons or contact.</li> <li>• Player also turns white for a split second and the back to original colour to show receiving damage from enemies.</li> </ul> <p><b>Ghost Enemies</b></p> <ul style="list-style-type: none"> <li>• Created a new enemy type in the shape of ghosts in the second level of the game.</li> <li>• Inherited the movements and behaviour from the original enemy.</li> </ul> <p><b>Bullets</b></p> <ul style="list-style-type: none"> <li>• Added a bullet feature to the ghost enemies that can be shot directly towards the position of the player.</li> </ul> <p><b>Enemy Interface and State Control</b></p> <ul style="list-style-type: none"> <li>• Ensuring all enemies share the same basic methods or properties.</li> <li>• Added a roaming and attack states for the enemies when in range with the player</li> <li>• The enemies also have an attack cooldown.</li> </ul> <p><b>Bullet Bursts</b></p> <ul style="list-style-type: none"> <li>• Created an ultimate weapon for the ghosts where bullets are fired in short rapid sequences in all directions.</li> </ul>
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<p>Safiyy Aiman Danish Bin Abdul Rahaman (Level 5)</p>	<p><b>Oscillate + Stagger</b></p> <ul style="list-style-type: none"> <li>Added oscillating movement and staggered timing for objects and enemies. When a player gets hit by an opponent, an effect occurs alongside knockback. The oscillation allows enemies to have dynamic movement before being attacked by the player.</li> </ul> <p><b>Pickup Coins</b></p> <ul style="list-style-type: none"> <li>Added a collectable coin system that adds to a coin counter UI whenever the player interacts with a coin object in the game. These coins can later be used for weapon upgrades and buying consumables at a shop later in the game.</li> </ul> <p><b>Health UI</b></p> <ul style="list-style-type: none"> <li>Implemented a Health UI that displays the amount of damage the player can take before respawning with no coins in their inventory.</li> </ul>
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<p>Ahmad Mujahid Bin Mohamad Rizza (Level 6)</p>	<p><b>Implemented Health and Stamina UI:</b></p> <ul style="list-style-type: none"> <li>• The Player now can see the health bar and stamina point in game.</li> <li>• Stamina bars have 3 points, when you dash once you will lose one stamina bar.</li> </ul> <p><b>Drop pickup</b></p> <ul style="list-style-type: none"> <li>• When the player destroys a bush, barrel, cart, or stack of carts, it will drop a randomize item which consist of 3 things; Gold coin, Stamina globe and heart</li> <li>• Every item drop pickup, it has it owns effect;</li> <li>• Heart: your health bar will increase once when you pick up one heart and display it through the UI</li> <li>• Gold Coin: your money collection will increase</li> <li>• Stamina globe: as the player collect one stamina globe, it will increase also 1 stamina bar in the UI</li> </ul> <p><b>Make a Health Slider and Enemy drop pickup</b></p> <ul style="list-style-type: none"> <li>• When the player gets hit by an enemy or monster, the health bar will uniformly decrease.</li> <li>• As the player kill the enemy or monster, it will also drop a</li> </ul>
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	<p>random ite; which consists of 3 things: Coin, Stamina globe, and heart.</p> <p><b>Economy manager</b></p> <ul style="list-style-type: none"> <li>• The player now can see the money count in the game; when the character collects the gold coin, the number of gold coins will increase and show it in the gold Coin Collection UI.</li> </ul> <p><b>Custom Cursor</b></p> <ul style="list-style-type: none"> <li>• The player will see a new cursor for the player to use in the game. This will make the game more user-friendly.</li> </ul> <p><b>Grape Enemy</b></p> <ul style="list-style-type: none"> <li>• Created a new enemy type in the shape of ghosts in the second level of the game.</li> <li>• Inherited the movements and behaviour from the original enemy (the blue slime monster).</li> <li>• The enemy movement attack is curved.</li> <li>• The attack will spalt when hit the ground</li> </ul> <p><b>Player Death</b></p> <ul style="list-style-type: none"> <li>• When the health bar is zero, the character will go to dead state, which will respawn back at the first level (at the start of the map)</li> </ul>
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