THE INDEPENDENT
INSTITUTE OF
IIE EDUCATION

Game Development 2A
GADE6221
MODULE OUTLINE 2023
(First Edition: 2022)

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Introduction

Welcome to Game Development 2A, a module which builds on the work covered in the first year of Game Development. In the first year, we focused on the fundamentals of Programming as well as a brief introduction to Game Development using Unity and the use of version control software such as *git*.

In this module, we will look at using these fundamental principles in the context of creating fully developed 2D games within Unity. We will focus on using the Object-Oriented Principles you learnt in first year as the basis upon which these games will be built, with an emphasis on creating reusable game architectures for ease of development.

Most of the work done in the course will take the form of practical work, either as exercises in class, practical activities or practical ICE tasks. The focus in these programs will be on complete, working code that is error free. These programs will also be assessed accordingly with a focus on whether the code works and is error free.

Please remember that to get the most out of this module, it is essential that you read all prescribed texts, attend all the classes, and most importantly, complete all the given activities on VegaLearn.

We hope you will enjoy the module and take the opportunity to use the knowledge and experience gained in both future modules, and in your ultimate game development experience.

Using this Module Outline

A Module Outline is a brief summary of the module and is given to you to **support your learning.**

The content of this module is on Learn as well as in the prescribed material. You will not succeed in this module if you focus on this document alone.

To succeed in this module, you will need to:

- Attend lectures/online sessions;
- Go through the material and activities on Learn;
- Read the prescribed material.

Your lecturer will decide when activities are available/open for submission and when these submissions or contributions are due. Ensure that you take note of announcements made during lectures and/or posted in the Student Portal and within Learn in this regard.

- Your campus will provide you with details about when your assessments are due.

This Module on Learn

Learn is an online space, designed to support and maximise your learning in an active manner. Its main purpose is to **guide and pace** you through the module. In addition to the information provided in this document, you will find the following when you access Learn:

- A module overview;
- A list of prescribed material;
- A variety of additional online resources (articles, videos, audio, interactive graphics, etc.) in each learning unit that will further help to explain theoretical concepts;
- Critical questions to guide you through the module's objectives;
- Collaborative and individual activities (all of which are gradable) with time-on-task estimates to assist you in managing your time around these;
- Revision questions, or references to revision questions, after each learning unit.

Kindly note:

- Learn does **not** replace your contact time with your lecturers and/or tutors.
- GADE6221 is a Learn module, and as such, you are required to engage extensively with the content on the Learn platform. Effective use of this tool will provide you with opportunities to discuss, debate, and consolidate your understanding of the content presented in this module.
- You are expected to work through the learning units on Learn in your own time – especially before class. Any contact sessions will therefore be used to raise and address any questions or interesting points with your lecturer, and **not** to cover every aspect of this module.
- Your lecturer will communicate **submission dates** for specific activities in class and/or on Learn.

Icons Used on Learn

The following icons are used in all your modules on Learn:

Icon	Description
	A list of what you should be able to do after working through the learning unit.
	Specific references to sections in the prescribed work.
	Questions to help you recognise or think about theoretical concepts to be covered.
	Sections where you get to grapple with the content/theory. This is mainly presented in the form of questions which focus your attention and are aimed at helping you to understand the content better. You will be presented with online resources to work through (in addition to the textbook or manual references) and find some of the answers to the questions posed.
	Opportunities to make connections between different chunks of theory in the module or to real life.
	Real life or world of work information or examples of application of theory, using online resources for self-exploration.

REMEMBER:

You need to log onto Learn to:
- Access online resources such as articles, interactive graphics, explanations, video clips, etc., which will assist you in mastering the content; and
- View instructions and submit or post your contributions to individual or group activities which are managed and tracked on Learn.

Module Resources

Prescribed Material (PM1) for this Module	Thorn, A. 2015. *Mastering Unity Scripting.* 1st ed. Packt Publishing ISBN: 9781784390655 (Paperback) Free copy is available on EbscoHost http://search.ebscohost.com.ezproxy.iielearn.ac.za/login.aspx?direct=true&db=nlebk&AN=945690&site=ehost-live
Prescribed Material (PM2) for this Module	The official Unity documentation will be used extensively throughout this course. https://docs.unity3d.com/ [Accessed 17 November 2022].
Recommended Readings, Digital, and Web Resources	Freeman, E. and Sierra, K. 2004. *Head First Design Patterns.* 1st ed. O'Reilly Media ISBN: 9780596007126 A free copy is available on EbscoHost: https://ezproxy.iielearn.ac.za/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=415229&site=ehost-live Please note that a few additional resources and links to resources are provided throughout this module on the Learn platform. You are encouraged to engage with these as they will assist you in mastering the various objectives of this module. They may also be useful resources for completing any assignments. You will not, however, be assessed under examination conditions on any additional or recommended reading material.
Software required	Microsoft Visual Studio C# 2022 Unity3D (latest version) Git (any GUI tools can optionally be installed)
Software Licence requirements	• Visual Studio C# 2017 provided by Microsoft through the Imagine Academy which is free for student and educational use • Unity3D – Download the latest free version from the https:\\unity3d.com website for personal use. • Git – The latest open-source version can be downloaded from https://git-scm.com/downloads
Module Overview	You will find an overview of this module on Learn under the *Module Information* link in the Course Menu.
Assessments	Find more information on this module's assessments in this document and on the Student Portal.

Module Purpose

The purpose of this module is to introduce students to new game development and develop their ability to apply object-oriented programming (OOP) techniques to develop complete digital games.

Module Outcomes

MO1	Create a gaming solution using a given Game Engine's IDE.
MO2	Apply OOP principles to develop gaming solutions.
MO3	Develop games using a given Game Engine's component model.
MO4	Integrate event-handling into gaming solutions.
MO5	Apply basic design patterns to solve gaming-related problems.
MO6	Publish a complete working game using a given Game Engine's IDE.
MO7	Introduce Basic Design Patterns to solve gaming-related problems

Assessments

Integrated Curriculum Engagement (ICE)	
Minimum number of ICE activities to complete	4
Weighting towards the final module mark	10%

	PART 1 (PERIOD 3)	PART 2 (PERIOD 5)	FINALISATION OF PORTFOLIO OF EVIDENCE
Weighting	25%	30%	35%
Duration	20 hours	20 hours	20 hours
Total marks	100	100	100
Resources required	Microsoft Visual Studio C# Unity 3D	Microsoft Visual Studio C# Unity 3D	Microsoft Visual Studio C# Unity 3D
Learning Units covered	LU1 – 3	LU1 – 4	All

Summative	Portfolio of Evidence
Weighting	90%
Duration	60 hours
Total marks	100
Resources required	Microsoft Visual Studio C# 2017 Unity3D A graphical program of your choice for developing art assets
Learning Units covered	All

Assessment Preparation Guidelines

Format of the Assessment	Preparation Hints
Portfolio of Evidence	
The PoE will consist of Part 1 and Part 2 and further activities to complete the PoE. All learning units will be assessed in the PoE, and reflection on your learning will be included.	• Ensure that you work through all the activities, exercises and revision questions on Learn and consult your textbook. • Include the Parts as submitted, together with your lecturer's feedback and your corrected Parts based on the feedback received. • Include the reflection of your learning. • Complete other activities included in the PoE.
Part 1	
This Part will assess your understanding after completing 45% to 50% of this module and will consist of the Development Planning and Basic Prototype for a 3D game.	• Ensure that you work through all the relevant activities, exercises and revision questions on Learn and in your textbook. • Brainstorm possible gaming programs based on the learning outcomes and objectives provided. • Pay attention to the instructions and to the mark allocations of each question to ensure that you are able to meet the requirements. • Make sure that you have mastered the objectives in the relevant learning units.
Part 2	
This Part will cover 65% to 75% of the work completed and will assess your ability to integrate and apply the content of this module to build on the game framework you completed in Part 1.	• Read through the prescribed chapters and content and ensure that you have engaged before you proceed with your coding. • Remember to analyse all elements required and ensure that your Part meets the requirements. • Improve the quality of your Part by using the provided rubric and addressing any areas of concern prior to submitting it for marking.

Module Pacer			
Code	Programme	Contact Sessions	Credits
GADE6221	BCGD2	60 sessions	15
Learning Unit 1	The Unity Integrated Development Environment		

Overview:

This introductory learning unit looks comprehensively at using the Unity IDE in the development of a digital game, including the various tools, menus and editor features that exists in Unity. This also includes learning how to import assets into Unity from other programs.

In Theme 1 we will identify all the different sections of the Unity IDE. After this, the purpose and function of all the different parts of the Unity IDE and how they integrate, will be addressed. You will learn how to create placeholder assets, import user created assets and import assets from the Unity Store in the second theme.

Please work through Themes 1 and 2 on Learn, together with the relevant sections of your prescribed source/s. To ensure that you are working towards mastering the objectives for this learning unit, please also ensure that you complete the activities on Learn.

The challenge you may experience in this learning unit relates to complexity of the Unity interface, especially if you are unfamiliar with it.

Learning Unit 1: Theme Breakdown		
Sessions: 1 – 8	Theme 1: The Unity IDE	Prescribed Material (PM)
Related Outcome: MO001	LO1: Identify the different sections of the Unity IDE; LO2: Explain the purpose and function of all the different parts of the Unity IDE and how they integrate.	PM2: https://docs.unity3d.com/Manual/UnityBasics.html https://docs.unity3d.com/Manual/UsingTheEditor.html https://docs.unity3d.com/Manual/EditorFeatures.html https://docs.unity3d.com/Manual/AssetWorkflow.html
	Theme 2: Importing and Using Assets	
	LO3: Create Placeholder assets; LO4: Import user created Assets; LO5: Import Assets from the Unity Store.	

Learning Unit 2	C# and Unity Scripting

Overview:

This learning unit is twofold on purpose. Firstly, to provide a very brief revision of C# coding and secondly to integrate the C# principles you should already be familiar with, with game development in Unity.

We will apply the fundamental work covered in first year in the first theme. In Theme 2 you will learn to instantiate scripts in Unity and incorporate Enumerations in Unity with C#. Next, we will create C# Arrays within the Unity editor and apply the Update() and Start() methods in Unity.

Please work through Themes 1 and 2 on Learn, together with the relevant sections of your prescribed source/s. To ensure that you are working towards mastering the objectives for this learning unit, please complete the activities on Learn.

The challenge you may experience in this learning unit relates to any concepts you might not have fully understood from first year. Refer to your first year Prescribed Material and notes as it is critical that you do not start programming this year with any gaps in your fundamental C# knowledge.

Learning Unit 2: Theme Breakdown		
Sessions: 9 – 19	Theme 1: C# Revision	Prescribed Material (PM)
Related Outcomes: MO001 MO002 M0004	LO1: Revise the fundamental work covered in first year.	PM1: Chapter 1
	Theme 2: Unity and C# Integration	PM1: Chapter 1
	LO2: Instantiate scripts in Unity; LO3: Incorporate Enumerations in Unity with C#; LO4: Create C# Arrays within the Unity editor; LO5: Apply the Update() and Start() methods in Unity.	

Learning Unit 3	Using Unity's Component Model

Overview:

Unity has its own component model through which a developer can access and manipulate the various GameObjects and Assets within a game. This learning unit introduces Unity's component Model as well as describes how a developer can access the various objects in the hierarchy.

We will commence this learning unit by creating new GameObjects in Unity. In Theme 2, you will be expected to apply the GetComponent() method, find and compare GameObjects and access and manipulate Object Hierarchies. The application of the Update(), FixedUpdate() and LateUpdate() methods as well as basic design patterns and Singleton classes in Unity, will be addressed in the last theme of the learning unit.

Please work through Themes 1, 2, 3 and 4 on Learn, together with the relevant sections of your prescribed source/s. To ensure that you are working towards mastering the objectives for this learning unit, please complete the activities on Learn.

One aspect that you may find challenging in this learning unit is the difference between a traditional Object-Oriented model and Unity's component model. Ensure that you refer to the Prescribed Material's sections on Unity's component model.

Learning Unit 3	Using Unity's Component Model

Learning Unit 3: Theme Breakdown		
Sessions: 20 – 35	Theme 1: The GameObject	Prescribed Material (PM)
Related Outcomes: MO003 MO005 MO007	LO1: Create new GameObjects in Unity.	PM1: Chapter 3
	Theme 2: Component Interaction	PM1: Chapter 3
	LO2: Apply the GetComponent() method; LO3: Find and Compare GameObjects; LO4: Access and Manipulate Object Hierarchies.	
	Theme 3: Design Patterns	RM: Chapters 1, 3, 4 and 8
	LO5: Explain the purpose and benefits of using design patterns; LO6: Create and implement the factory design pattern, the decorator design pattern and the template design pattern.	
	Theme 4: The World, Time and Updates	PM1: Chapter 3
	LO7: Apply the Update(), FixedUpdate() and LateUpdate() methods; LO8: Apply Singleton classes in Unity.	

Learning Unit 4	Event handling

Overview:

Unity uses an event handling model to control the flow of information between components as well as handling events that occur within a game. Due to the fact that modern games often have multiple events occurring at the same time, it is critical to understand and be able to use Unity's event handling system.

We will commence this learning unit by explaining and using Unity's pre-created events. We will then look at creating events using Interfaces and using Delegates.

Please work through Themes 1, 2 and 3 on Learn, together with the relevant sections of your prescribed source/s. To ensure that you are working towards mastering the objectives for this learning unit, please complete the activities on Learn.

The challenge you may experience in this learning unit relates to understanding and using Interfaces. Fortunately, an alternative method via the use of delegates is also provided.

Learning Unit 4	Event handling

Learning Unit 4: Theme Breakdown		
Sessions: 36 – 48	Theme 1: The purpose of events	Prescribed Material (PM)
Related Outcome: MO004	LO1: Explain the purpose behind using events.	PM1: Chapter 4
	Theme 2: Creating events with Interfaces	PM1: Chapter 4
	LO2: Create events using Interfaces.	
	Theme 3: Creating events with Delegates	PM1: Chapter 4
	LO3: Create events using Delegates.	

Learning Unit 5	Publish a complete working game using the Unity Engine

Overview:

Learning Unit 5 will cover connecting to a database from within Unity as well as using C# to manipulate a database. Customising the user settings and optimising a game is also addressed. You will then have the opportunity to combine all the skills you have learnt and finally publish a complete and playable game.

Please work through Themes 1 and 2 on Learn, together with the relevant sections of your prescribed source/s. To ensure that you are working towards mastering the objectives for this learning unit, please complete the activities on Learn.

The challenge you may experience in this learning unit relates to bringing all the techniques you have learned together in one cohesive whole. Focusing on your development approach, including planning, version and control and debugging will help to ease this process.

Learning Unit 5: Theme Breakdown		
Sessions: 49 – 60	Theme 1: Using Databases with a Unity Game	Prescribed Material (PM)
Related Outcome: MO006	LO1: Connect to a Database within Unity; LO2: Manipulate a Database using C#.	Class Notes
	Theme 2: Publishing a game	Class Notes
	LO3: Customise user settings; LO4: Optimise your game.	