IT6011 Course Design

*IT6011 Routing and Switching*

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# Reason for New Course / Change to Course

NZQA’s reviewed ICT qualifications, in particular:

[2604 New Zealand Diploma in Software Development (Level 6)](http://www.nzqa.govt.nz/nzqf/search/viewQualification.do?selectedItemKey=2604)

# Course Requirements

## NZQA Requirements

This course is designed to meet the following Graduate Profile Outcomes:

GPO1. Analyse requirements, design and document software solutions for a range of problems in an organisational context. (LO4, 5)

GPO2. Write and maintain programs using design patterns, data structures and algorithms to meet specifications. (LO1, 2, 3)

GPO3. Apply a range of software quality assurance techniques to verify correctness of systems. (LO5)

GPO4. Apply data management and storage technologies to support the software application and the development process. (LO4)

GPO6. Choose, justify and apply architecture, technologies, and tools, to implement the software solution (LO6)

## CPP Course Descriptor

(Version of 31 August 2017, submitted to programme committee)

### Aim

To give students knowledge and skills of using another programming language and framework to enable them to build a game application, including game design, scripting, development and testing. (Suggested update)

### Learning outcomes

LO1. Write code using object oriented approach and inspect the strengths and weaknesses of object oriented and functional approaches in game development (Suggested update)

LO2. Design and write programs considering appropriate design patterns and following applicable software development standards

LO3. Analyse and apply software optimisation concepts and techniques

LO4 Design and implement application data access, management, and storage technologies appropriate to game development.

LO5. Research and implement core software development practices as they apply to game development

### Assessment schedule

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **Weight** | **Pass Criteria** | **Learning Outcomes** |
| Practical Tasks | 20% | Pass/Not achieved | LO1-3 |
| Project Design | 25% | 50% | LO 2, 5 |
| Project Execution | 40% | 50% | LO1-5 |
| Project Presentation | 15% | 50% | LO 1, 5 |

# Assessment

*High-level outline of each Assessment item. Focus on how the assessment items will enable the students to demonstrate that they have met the learning outcomes.*

## Summative Assessment: Practical Tasks (20%)

Suggested having two sets of practical tasks.

1. First set will test their C# syntax knowledge, specifically implementing OO concepts in C#. This task will be done in Visual Studio and will have students to program a solution for a specific scenario. Students will need to use C# programming language in Visual Studio, specifically variables, comparison operations, loops, lists and arrays, functions and parameters, OO concepts.
2. In the second set of practical tasks students will perform certain optimisation tasks and identify and optimise the code to use specific design patterns. This will assess their coding skills utilising design patterns and using those patterns to optimise the code.

Students will be presented with a working game and ask to optimise its code where appropriate to use the specific design patterns.

List of tasks could include:

* Appropriate use and application of Singleton Design Pattern
* Appropriate use and application of Factory Design Pattern
* Appropriate use and application of Object Pool Design Pattern
* Application of the software optimisation concepts

## Summative Assessment: Project Design (25%)

Throughout the Game Development course individual students to design and implement a game prototype to demonstrate the knowledge of the game development environment and implement core software development practices as they apply to game development. This will involve requirements analysis, concept decision making, collaboration with peers, production of design document, prototype development and testing as well as presenting their prototype and describing their experience to their peers.

This assessment forms the first part of an ongoing project that runs throughout the Game Development course.

* **Task 1**: Choose a collaboration platform for group communication
* **Task 2**: Analyse game prototype requirements and generate a general game idea
* **Task 3**: Create project design document and decide on what topics will it cover.
* **Task 4**: Fill in the design document with the information containing some or all of the following: story description, list of characters, environment/levels, gameplay, user interface and controls.
* **Task 5**: Journal all participation and responsibilities (to be done by each group member for individual assessment)

## Summative Assessment: Project Execution (40%)

This assessment forms the second part of an ongoing project that runs throughout the Game Development course.

This assessment will test student’s skills in coding and later building a game prototype based on the design document created in the previous assessment. Students will also be expected to test the solution created and include appropriate documentation on the work completed, collaboration occurred and testing conducted.

* **Task 1**: Create new Unity project
* **Task 2**: Create required scenes within the project
* **Task 3**: Create prefabs used in the project
* **Task 4**: Add appropriate game objects to each scene
* **Task 5**: Set up game objects behaviour by adding C# scripts to the game objects
* **Task 6**: Test the game prototype and document expected testing results and testing outcomes
* **Task 7**: Troubleshoot the bugs found through initial testing and resolve any issues
* **Task 8**: Record updated to the game design document if any concept changes occurred
* **Task 9**: Journal all participation and responsibilities

## Summative Assessment: Project Presentation (15%)

The presentation will consist of two parts.

First is a presentation of the game prototype, done in pairs. Students spend 5-10 minutes presenting the game prototype, outlining their game idea, what challenges they faced and what changes did they have to make to the game design. They should also explain their design decisions in regards to UX and changes they had to make to the game prototype based on the user testing outcome. After this part of the presentation is done, other presenters play the game and leave their feedback as user testers.

Second part is an individual task presenting one of the topics on emerging game technology. Students may select one of the topics below, or, choose the topic of their liking, if tutor approved.

* VR vs AR vs MR
* How Augmented Reality (AR) could benefit our lives
* How Virtual Reality (VR) could benefit our lives
* Game Development industry in New Zealand
* Comparison of the various game genres
* Overview and comparison of the game engines
* Why we play (Ludology)

## Formative Assessment

Three workshops:

* Game design lab – group brainstorming. Students are given a very vague idea of the game and need to come up with a draft game design document. Students will have to decide on the format of the design document, come up with game overview, environment and character description and any other additional features applicable to the game.
* FULL DAY WORKSHOP: Creating game prototype lab – collaborative game prototype creation. (???? How to share files ????) Students are given filled in game design document and asked to develop a game prototype. They will need to create new project, within the project create new scene and add game objects to the scene. Each person will work on scripting for a specific game object, which is later shared/uploaded to the common game project and tested. The outcome of the workshop should be a working prototype.
* VR lab – could vary based on the VR set we’ll get. Students will play and review some VR games. They will also have a chance to modify the existing VR game in development and test the changes made. This workshop is done after student have studied the Introduction to VR module in iQualify.

# Course Structure

## Course Outline

Welcome to the IT6034 Game Development course.

In this course you will learn the principles of game design and development with Unity game engine and will obtain the skills to use common game development tools and technologies. You will also learn about different phases of game development including testing using different game testing techniques.

When becoming a Game Programmer, you will learn best by doing. In this course you will have an opportunity to develop game converting a game idea into a working game prototype. You will come up with a game design, create game scenes, add different game objects to the scenes and add behaviour to the objects using scripting in the C# programming language. At the end of the course you will have a game prototype which you can develop into a finished product to include in your portfolio.

## Learning Activities

*Outline which learning activities will help students to develop skills, knowledge and attitudes required for the formative and summative assessments.*

* **Practical activities** throughout the course – for students to practice learned material and test their understanding of game development environment and concepts.
* **Self-assessments** at the end of each module for students to assess their understanding of the material studied, review specific topics based on the self-assessment results and ask tutor help on the areas where more explanation is required.
* **Tutor-led workshops** on difficult concepts to ensure students have proper understanding (at tutor’s discretion)
* **Tutor-led group workshops** to prepare students for the project tasks and give students an opportunity to collaborate and share ideas and skills at different stages in game development process

## Content

This course includes the following modules:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Module** | **Weight**  **(credits)** | **Content hours\*** | **LO** | **Content, Notes** | **Who** | **Status** |
| The basics of Game Design |  | 2 | LO5 |  |  |  |
| Unity Environment |  | 4 | LO4, 5 |  |  |  |
| Scripting with C# |  | 2 | LO1, 2 |  |  |  |
| Optimisation techniques |  | 2.5 | LO1, 2, 3 |  |  |  |
| Game Testing |  | 1.5 | LO1, 5 |  |  |  |
| Introduction to VR |  | 2 | LO1,5 |  |  |  |
| Game Deployment |  | 1 | LO5 |  |  |  |

## Learning Objectives of Modules

**Module:** **The Basics of Game Design**

* Identifying roles in the game development team
* Describing phases of game development
* Designing for the best User Experience
* Identifying Game Design Document components and Selecting Design Layout
* Creating Game Design Document appropriate for the game

**Module:** **Unity Environment**

* ENVIRONMENT OVERVIEW
  + Installing Unity
  + Creating new Unity 3D project
  + Customise the Unity interface
  + Identify Different components of the Unity Editor
  + Explain the benefits of the Asset Store
* SETTING UP GAME OBJECTS
  + Differentiate GameObjects by their appearance
  + Identify GameObjects within a scene
  + Create a Prefab and add Game Objects to the scene based on the prefab created
  + Creating materials and applying them to the Game Objects

**Module: Scripting in C#**

* C# BASICS
  + Identify different components of Visual Studio IDE
  + Create and modify a projects in Visual Studio IDE
  + Understand basic C# language syntax and employ good coding practices
  + Create and use C# data types
  + Understand and use control structures for branching and looping
  + Break solution into classes and methods
* SCRIPTING IN UNITY
  + Source Control options
  + Using C# Syntax to create new scripts
  + Attaching scripts to the game objects
* DESIGN PATTERS
  + Singleton Design Pattern
  + Factory Design Pattern
  + Object Pool Design Pattern
  + Design patterns in game development

**Module: Optimisation Techniques**

* Evaluate the effectiveness of the code fragment
* Apply troubleshooting methodologies to resolve problems including interface and cable issues
* Optimise code to use appropriate design patterns

**Module: Game Testing**

* Identify Game testing types and methods
* Test driven design (TDD)
* Using try/catch for error handling
* Apply Game Testing techniques to test a game prototype

**Module: Introduction to VR**

* Comparing different VR hardware
* Recognising the differences in designing for VR
* Designing a simple VR game

**Module: Game Deployment**

* Preparing a game for deployment
* Developing for different platforms (e.g. Rift vs Gear VR)
* Investigating deployment options in Unity
* Deploying game to different platforms

# Design Decisions

* **Unity** was chosen as it is one of the most popular platforms for game development (based on the feedback from the NZGDC 2017)
* **C#** programming language was chosen as it is predominantly used to work with Unity platform and to expose students to the different programming language.
* **Introducing VR** in the course was chosen as it is one of the emerging trends that is getting more and more popular in game development.
* **Gear VR** is chosen to introduce programming to VR. It is one of the most popular VR sets which works with specific mobile phones, that later can be used for the mobile phone development course.
* **Group workshops** chosen to develop students’ soft skills and technical skills
* **Project** is chosen as main form of assessment to test students skills as shift towards project-based learning has been implemented throughout the new courses developed. Practical assessments favoured over theory examinations. The project is chosen as individual task due to constraints of the game engine and inability to work simultaneously on the same scene. Collaborative game development is done through the chain of tutor-led group workshops.

# IT Resources

## IT resources

* **General study:**
  + OS: Windows 7 SP1+, 8, 10
  + GPU: Graphics card with DX9 (shader model 3.0) or DX11 with feature level 9.3 capabilities.
  + Gear VR SM-R324 or 325 - <https://www.noelleeming.co.nz/shop/wearables/vr-headsets/samsung-sm-r324-gear-vr-with-controller/prod152232.html> - 2 or 3 per campus
  + Mobile phones compatible with the Gear VR - Galaxy Note8, S8, S8+, S7, S7 edge, Note5, S6 edge+, S6, S6 edge – 2 or 3 per campus
* **Group workshops:**

The workshops are practical and require a separate room with working computers that have access to Unity, MS Office and VR equipment (see General Study setup above).

* **Collaboration:** If cross campus group collaboration required for the workshops:
  + Zoom room facilities

## Software resources

* + MS Office – for creating design documents
  + Unity 5 version (<https://unity3d.com/files/store/files/Unity-License-Grant-Program-Qualification.pdf?_ga=2.140591794.1025767272.1507263240-525684954.1506744320>, needs sorting out licencing, need to investigate Unity for Education and whether we can apply)
  + The latest Microsoft Visual Studio (2017 at the moment) – Community version might be OK
  + Access to internet

# References & Teaching Resources

## Video Tutorials

From Lynda.com:

*Unity 5: 3D Essential Training*

*Cert Prep: Unity Fundamentals*

*Cert Prep: Unity Materials, Lighting, and Effects*

*Scripting in Unity*

*C# for Unity Game Development*

*Careers in the Game Industry*

*Unity: Scripting in C#*

*Unity Debugging scripts*

From Ebook Central – Possibilities only, will be refined to no more than 5 items:

[Unity Virtual Reality Projects](https://ebookcentral.proquest.com/lib/weltec/detail.action?docID=4191240)

[Game Development with Unity by Michelle Menard and Bryan Wagstaff](https://ebookcentral.proquest.com/lib/weltec/detail.action?docID=3136735)

[Unity Game Development Scripting by Kyle D’Aoust](https://ebookcentral.proquest.com/lib/weltec/detail.action?docID=3136735)

[Mastering Unity 5.x by Alan Thorn](https://ebookcentral.proquest.com/lib/weltec/detail.action?docID=4794159)

[Unity 5.x Cookbook by Chico Queiroz, Matt Smith](https://ebookcentral.proquest.com/lib/weltec/detail.action?docID=4191128)

[Unity 5 Game Optimization by Chris Dickinson](https://ebookcentral.proquest.com/lib/weltec/detail.action?docID=4191216)

[Unity 5.x By Example by Alan Thorn](https://ebookcentral.proquest.com/lib/weltec/detail.action?docID=4520685)

[Getting Started with Unity by Patric Felicia](https://ebookcentral.proquest.com/lib/weltec/detail.action?docID=1389415)

[Unity for Absolute Beginners by Sue Blackman and Jenny Wang](https://ebookcentral.proquest.com/lib/weltec/detail.action?docID=1781945)

[Getting Started with Unity 5 by Edward Laveieri](https://ebookcentral.proquest.com/lib/weltec/detail.action?docID=2059368)

## Textbooks

N/A

## Web Articles & Other References

The official website of the NZ Game Development Assossiation:

<https://nzgda.com/>

Creating Game Design Document:

<https://www.gamasutra.com/view/feature/131791/the_anatomy_of_a_design_document_.php?page=2>

<https://www.gamasutra.com/view/feature/131632/creating_a_great_design_document.php>

<https://en.wikipedia.org/wiki/Game_design_document>

C# basics through game:

<https://www.codehunt.com/>

Coursera: multiple game development courses

<https://www.coursera.org>

# Working Group

|  |  |  |
| --- | --- | --- |
| **Role** | **Name** | **Contact** |
| Developers  (lead and co-developers) | Inna Medyannikova, Benedicte Florin, Jeff Williams |  |
| Industry Advisors |  |  |
| Tutor | Anchal Gupta (Auckland), John Wang (Chch) |  |
| Tech Reviewer |  |  |
| Proofreader |  |  |
| Pre Assessment Moderator |  |  |
| Post Assessment Moderator |  |  |

## Industry consultation

*Note any form of consultation with industry or attendance of professional events that inform your course development. This will need to be incorporated into the overall consultation log.*

| **Date** | **Type** | **Who / Contact details** | **Outcome** |
| --- | --- | --- | --- |
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