VORTALS

Fundamentals of Mixed Reality

This Fundamentals of Mixed Reality course is a curriculum aligned course that has been developed in conjunction with industry and teachers. It has been designed to introduce students to the key concepts surrounding mixed reality.

In this course, students will create their own augmented and virtual reality experiences. They will also consider the technical, algorithmic, creative, and the social impact these new technologies create and in doing so, will develop problem solving skills that extend beyond mixed reality, and into any digital system they will encounter into the future.

VORTALS

THE BASICS

1. The Hook:

Technology has the ability to shape and change the world. With the advent of computers, people could design and write and build in ways never before considered. With the advent of the internet people had information on almost any topic at the tip of their fingers.

Now, mixed reality technology is about to reshape how we interact with this world. It's such a new field that it is the students who will be the ones who define its impact on the world.

2. The Learning Outcomes

By the end of the sequence, students will be able to define, and have created their own, interactive mixed reality experiences, and have reflected on the social impact such a creation can have. Through collaborative group work, students will develop vital 21st century skills.

As importantly, this course introduces students to a more subtle but key understanding: the basic construct of a 3D model. 3D models are now ubiquitous, from AR and VR applications, to 3D Games, to real-time industry application, to Hollywood movies, to webGL based websites, to scientific data, wherever you look you will find 3d data being utilised. This course provides a foundation of 3D knowledge that the student can take into any other digital area.

Finally, Vortals is based on real time technology – a game engine. Its core function is to recreate the real world, and to do so successfully the user must understand how the world works. This means this course seeds ideas across many areas such as maths, physics and English.

3. Modularity

The course is flexible, meaning you can pick and choose from modules within the course. If you have a specific area you wish to teach and others you don't – no problem! For different modules see the example timetable, lessons that share shading values are part of the same module.

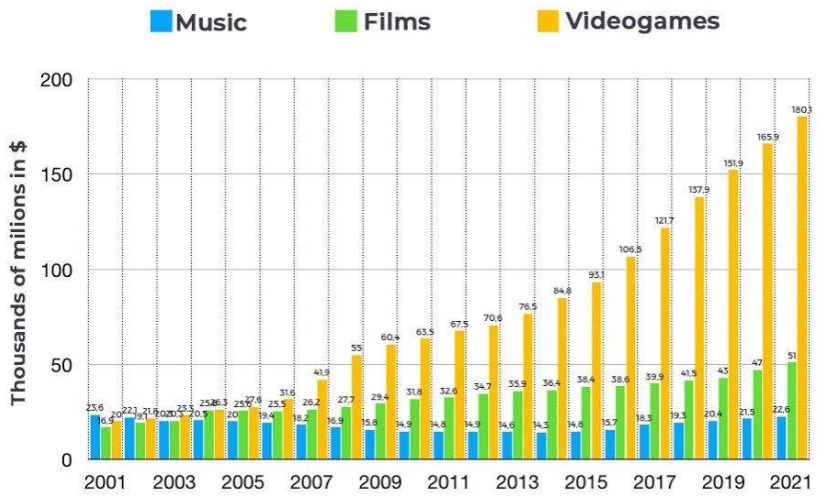
VORTALS

THE REASONS

4. Engagement

This course is hyper engaging for students. For them, VR and AR are not new technologies – they've been around for the students' entire lives! But they've never had a real opportunity to create content for mixed reality. The result is a course that is engrossing and engaging for *all* students.

5. Real Future Skills



The video game market is a rapidly growing market that dwarfs the film and TV market, and yet Unity - one of the biggest game engines in the world - makes less than half of its income from games. ***Industry is now the biggest user of real time technology*** and it is growing exponentially. Vortals is built on real time technology, and together with this course, helps build a student's understanding of the real-time technology that drives AR and VR, and the creative concepts that surround the new digital realities.

EXAMPLE TIMETABLE

55 Minute lessons

TERM ONE

Week	LESSON 1	LESSON 2
1	**Course Outline/Assess** Class Procedures/Logon Computer Policy File Management	**Introduction to AR and VR**
2	**Algorithmic AR and VR**	**The Language of AR and VR**
3	**Create a Mixed Reality Scene**	**Mixed Reality Ethics**
4	**Hardware Design: CPU, GPU & RAM** Hardware construction and considerations for AR	**Hardware Design: CPU, GPU & RAM** Practical exercise.
5	**Build Vortals Tutorial 2**	**Technical Design: Fundamentals of a 3D Model** Practical Problem solving exercises
6	**Technical Design: Fundamentals of a 3D Model *continued*** Practical Problem solving exercises	**Technical Design: Rendering for Games and Production**
7	**Technical Design: Lighting for Games and Production** Light a prebuilt scene	**Technical Design: Lighting for Games and Production** Light a prebuilt scene
8	**Build "Museums and Dinosaurs" VR Project**	**Build "Museums and Dinosaurs" VR Project**
9	**Project Planning** AR walking Tour or Interactive Museum Experience	**Project Planning** AR walking Tour or Interactive Museum Experience
10	**Project Planning** AR walking Tour or Interactive Museum Experience	**Project Planning** AR walking Tour or Interactive Museum Experience **Project Brief DUE**

55 Minute lessons **TERM TWO**	
LESSON 1	**LESSON 2**
Group Project – Interactive Museum Experience	**Group Project – Interactive Museum Experience**
Group Project – Interactive Museum Experience	**Group Project – Interactive Museum Experience**
Group Project – Interactive Museum Experience	**Group Project – Interactive Museum Experience**
Group Project – VR playtest	**Group Project – VR playtest** **Project Progress Reflection DUE**
Group Project – Interactive Museum Experience	**Group Project – Interactive Museum Experience**
Group Project – Interactive Museum Experience	**Group Project – Interactive Museum Experience**
Group Project – Interactive Museum Experience	**Group Project – Interactive Museum Experience**
Group Project	**Group Project** **Completed Project and Reflection DUE**
Stand and Deliver	**Stand and Deliver**
Stand and Deliver	**Stand and Deliver**

AUSTRALIAN CURRICULUM LINKS

Investigate the role of hardware and software in managing, controlling and securing the movement of and access to data in networked digital systems (ACTDIK034)

- *Explain the role of hardware and software components in allowing people to interact with digital systems, for example using a mouse or touch pad or screen, speech, accelerometer*

Different methods of manipulation, storage and transmission of data (ACTDIK035)

- *Explaining (and applying) the difference between lossy and lossless compression, for example the difference between JPEG and PNG image*
- *Explaining the component structure and contents of a 3D model and the associated issues when transferring such data between software.*

Analyse and visualise data to create information and address complex problems, and model processes, entities and their relationships using structured data (ACTDIP037)

- *using visualisation to identify patterns and relationships between sets of data and information, and support abstract reasoning,*

Define and decompose real-world problems precisely, taking into account functional and non-functional requirements and including interviewing stakeholders to identify needs (ACTDIP038)

- *developing a preliminary specification for an opportunity or a need that typically contains a problem statement, a set of solution needs expressed as functional and non-functional requirements, any assumptions or constraints to be considered and the scope or boundaries of the solution*
- *investigating different types of non-functional requirements for solutions, for example considering how the requirements of reliability, user-friendliness, portability and robustness could affect the way people use solutions*

Design the user experience of a digital system by evaluating alternative designs against criteria including functionality, accessibility, usability, and aesthetics (ACTDIP039)

- *Evaluating aspects of the total user experience, that is, all aspects of the system as perceived by the users, for example, a user's initial experience of setting up and*

using a system, or a user's emotional or cultural response to using a digital system

- *Designing the user interface of a solution using story boards and mock-ups*

Design algorithms represented diagrammatically and in structured English and validate algorithms and programs through tracing and test cases (ACTDIP040)

- *Recognising that different algorithms can solve a problem with different trade-offs*
- *tracing algorithms to predict results and program state for a given input*

Create interactive solutions for sharing ideas and information online, taking into account safety, social contexts and legal responsibilities (ACTDIP043)

- *Applying techniques to make ethical decisions when faced with dilemmas about security and ownership of data.*

Critically analyse factors, including social, ethical and sustainability considerations, that impact on designed solutions for global preferred futures and the complex design and production processes involved (ACTDEK040)

- *evaluating design and technology professions and their contributions to society locally, nationally, regionally and globally,*
- *considering the factors that influence design and professional designers and technologists, including time, access to skills, knowledge, finance, expertise*

Explain how products, services and environments evolve with consideration of preferred futures and the impact of emerging technologies on design decisions (ACTDEK041)

- *Predicting the impact of emerging technologies for preferred futures*
- *Constructing scenarios of how the future may unfold (forecasting) and what impacts there may be for society and particular groups, and back casting from preferred futures*

Develop project plans using digital technologies to plan and manage projects individually and collaboratively taking into consideration time, cost, risk and production processes (ACTDEP052)