Augmented and Virtual Reality Applications
Syllabus

» Course Overview

Separating hype from reality is hard… especially in the fast-growing and evolving space of augmented and virtual reality (AR/VR). Recent advances in technology have allowed AR/VR systems to become extremely sophisticated and realistic. This course introduces students to the technologies that underpin AR/VR systems. Then the course walks through 7 applications of AR/VR and how they will change and impact numerous aspects of our lives and the economy. Students will also learn about and discuss the risks and side effects of these systems, including health, privacy, and ethical implications.

» Course Outline by Module

Module 1	Introduction to Augmented and Virtual Reality	**Module 6**	Augmented and Virtual Reality in Entertainment
Module 2	Augmented Reality Systems	**Module 7**	Augmented and Virtual Reality in Healthcare
Module 3	Virtual Reality Systems	**Module 8**	Augmented and Virtual Reality in Architecture, Engingeering, and Construction
Module 4	Augmented and Virtual Reality in Gaming	**Module 9**	Augmented and Virtual Reality in Shopping
Module 5	Augmented and Virtual Reality in Education	**Module 10**	Social Virtual Reality and Telepresence

» Module Overview and Learning Objectives

| Module 1. Introduction to Augmented and Virtual Reality

In this module, we are going to explore the basics of Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR). We will learn about the key components that make this technology possible and the people who invented them. We will also look at all the cool ways that these mind-bending headsets were developed, including a predecessor technology known as Heads Up Display or HUD. We'll also preview how people and businesses are using them NOW, and how they might be used in the future. Let's see what amazing things we can discover!

Learning Objectives: In this module, students will:
- Define augmented reality (AR), virtual reality (VR), and mixed reality (MR)
- Explain the difference between AR and VR
- Predict and discuss whether AR or VR will be the more widely adopted technology
- Describe the 3 primary components of a Heads Up Display (HUD)
- Evaluate the historical contributors and contributions that have led to today's AR/VR systems

| Module 2. Components and Software of Wearables

There are many different technology companies that are designing and producing sophisticated AR glasses and goggles that we may see more and more out on the streets. This module will define and explore the key components that make up AR systems and compare many of the various projects and headsets that are being developed. While some headsets are for specialized purposes, like competing in a triathlon or building an airplane, others will have general consumer uses and applications by overlaying information on physical objects around us. Students will also discover career opportunities in this new and growing field.

Learning Objectives: In this module, students will:
- Define key terms related to Augmented Reality (AR)
- Differentiate between augmented reality modes on phones, headsets, and contact lenses
- Examine technologies that allow AR to function, including motion tracking, mapping, light estimation, and software
- Compare the 4 types of AR technology categories
- Evaluate companies that make AR systems
- Identify potential career opportunities within AR systems and educational paths to enter those careers

| Module 3. Virtual Reality Systems

In early 2016, two major virtual reality systems, HTC Vive and Oculus Rift, hit the market, ushering in a new age of virtual reality gaming experiences. This module will explore these and other VR systems and the technologies and components that make them work. VR systems can be as simple as a smartphone inserted into a specialized cardboard device to a full-size immersive room known as a CAVE. Students will discuss the potential impact of these systems on society and also learn about career tracks available for those interested in VR system development.

Learning Objectives: In this module, students will:
- Define key terms related to VR
- Examine the hardware used in VR, including headsets, controllers, sensors, audio, sensory (haptics) and other components
- Describe tracking and other technologies that make VR work
- Describe categories of virtual reality based on levels of immersion, including computer-assisted virtual environments
- Compare companies that make VR systems and distinguish between tethered and un-tethered systems
- Identify potential career opportunities within VR systems and educational paths to enter those careers

| Module 4. Augmented and Virtual Reality in Gaming

The future of gaming is here! Gaming is one of the first ways that many people will experience AR or VR for the first time, whether through a smartphone game app, AR glasses, or a full-blown VR gaming system. A new immersive way of experiencing a video game has been made possible through rapidly improving technologies. No longer will players be separated by a screen but can be totally immersed in a new environment In this module, students will evaluate the variety of gaming applications across both augmented and virtual reality systems. They will also evaluate the potential impact this new gaming medium will have on both participants and society. Finally, students will explore career opportunities in this very new field.

Learning Objectives: In this module, students will:
- Define key terms related to AR/VR gaming
- Evaluate features, genres, and types of AR gaming
- Evaluate features, genres, and types of VR gaming
- Predict when they will first use AV/VR in a gaming application
- Determine the impact that AR/VR gaming will have on society
- Discuss the pros and cons of AR/VR gaming
- Identify potential career opportunities within AR/VR game development and educational paths to enter those careers

| Module 5. Augmented and Virtual Reality in Gaming

How would you like to take a field trip with your entire class to view the Great Wall of China or Machu Picchu in the mountains of Peru? With AR/VR, it is now possible. Through this module, students will be engaged in learning about the impact of AR/VR on education with applications such as Astronaut Training, Google Expeditions, and other devices in various professions. They will learn the potential drawbacks and distractions that AR/VR can cause in education along with identifying potential career paths and opportunities.

Learning Objectives: In this module, students will:
- Define key terms related to AR/VR in education
- Evaluate applications of AR/VR in education in the classroom and in corporate training
- Predict when they will first use AV/VR in school
- Determine the impact that learning using AR/VR could have on educational outcomes
- Discuss potential drawbacks and distractions that AR/VR could cause in education
- Identify potential career opportunities within AR/VR in education and educational paths to enter those careers

| Module 6. Augmented and Virtual Reality in Entertainment

The fascinating and exciting applications of augmented and virtual reality just keep coming! Imagine if you could watch your favorite sports team not from your couch or nosebleed seats, but through virtual reality you could be at center court, on the 50-yard line, or behind home plate. Or if concerts are your thing, virtual reality could transport you to front row seats, with stunning visual and audio to make you feel as if you are right there. This module explores the vast entertainment applications of AR and VR, from sports and concerts, to cinematic experiences and location-based entertainment. Students will also discuss the impact of AR and VR systems on social isolation.

Learning Objectives: In this module, students will:
- Define key terms related to AR/VR in entertainment
- Predict when they will first use AV/VR to watch a live event
- Examine applications of AR/VR in entertainment, including sports applications, location-based entertainment, and cinematic virtual reality
- Compare cinematic VR with traditional movies and TV and describe the changes in writing and production that cinematic VR will require
- Discuss whether AR and VR devices isolate or connect people

| Module 7. Augmented and Virtual Reality in Healthcare

Virtual reality in healthcare has already provided huge benefits to doctors and patients, yet there is still much to discover in this industry through AR/VR. Imagine being able to see the complete view of a surgeon during an operation and the experience it will provide to future surgeons. It has already taken the teaching and learning experience to a new level. Through this module, students will learn of the impact AR/VR will have on healthcare of the future.

Learning Objectives: In this module, students will:
- Define key terms related to AR/VR in healthcare
- Evaluate uses of AR/VR in healthcare by patients
- Describe how AR/VR are used to in therapy to overcome psychological issues
- Examine the use of AR/VR systems by medical professionals
- Determine the impact that AR/VR healthcare applications will have on society and jobs
- Identify potential career opportunities within AR/VR in healthcare and educational paths to enter those careers.

| Module 8. Augmented and Virtual Reality in Architecture, Engineering, and Construction

In Architecture and Engineering, design and development are very critical. But the problem encountered with the design and development is that the plans are 3D dimensions, but typically created on 2D planes. This makes it difficult to capture the full scale of the design. But thanks to AR/VR, engineers and architects are now able to view plans in a way that they never had before. During this module, students will understand and review the key terms related to architecture and engineering AR/VR. They will be able to evaluate various applications for real estate and construction tours

.

Learning Objectives: In this module, students will:
- Define key terms related to AR/VR in architecture, engineering, and construction
- Evaluate applications of AR/VR in architecture, real estate, engineering, and construction
- Describe ways that AR/VR technology can improve safety and save money on construction projects
- Evaluate companies that make virtual reality systems or solutions for the engineering and construction industries
- Discuss potential risks from product liability of VR and AR devices
- Identify potential career opportunities within AR/VR in engineering and educational paths to enter those careers

| Module 9. Augmented and Virtual Reality in Shopping

Have you ever wanted to know what a piece of furniture would look like in your home before purchasing? Through AR, we now have the ability to see how rooms in our home would look before spending all that money, and later find out that it doesn't look right. This course outlines the various ways in which AR/VR are being used to create shopping experiences. During this module, students will learn about the trends along with the pros and cons of AR/VR of virtual shopping.

Learning Objectives: In this module, students will:
- Define key terms related to AR/VR in shopping and retail
- Predict when they will first use AV/VR while shopping
- Evaluate applications of both AR and VR in shopping
- Discuss the potential impact of AR/VR in shopping on jobs and the economy
- Describe the pros and cons of marketing within AR/VR
- Identify entrepreneurs within AR/VR in shopping and explain their ideas and contributions to this field
- Research a startup company in the AR/VR shopping field and describe their product or service

| Module 10. Social Virtual Reality and Telepresence

Holograms have been a staple of science fiction books and movies. Three-dimensional images of a person are projected into space, making it seem as if they are actually there. Not surprisingly, the technology being augmented reality is bringing this closer to happening. The fields of telepresence and telerobotics could have huge implications for how we work, collaborate, and interact with other people. This module explores the applications and potential impact of these exciting and innovative areas.

***Learning Objectives*:** In this module, students will:
- Define key terms related to AR/VR in telepresence and telerobotics
- Evaluate telepresence, telerobotics, and social applications of AR/VR
- Examine potential courtroom applications of AR/VR technology
- Discuss and predict the long-term impact of AR/VR on brain functioning
- Identify potential career opportunities within telerobotics/telepresence and educational paths to enter those careers