

# CSE 190: Virtual Reality Technologies

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LECTURE #1: COURSE OVERVIEW

# Instructor

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Office: Atkinson Hall, Room 2125

Office hours: Tuesdays 3:30-4:30pm

# Course Staff

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## Tutors:

- Timothy Wang
- Russell Xie
- Robin Xu

See Piazza for office hours. They will be held in VR lab, room B210.

# Class Goals

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Provide in-depth knowledge of virtual reality technologies.

Gain experience with the software pipeline for rendering in VR systems, with a focus on HMDs.

Give up to date overview of current VR technology developments.

# Course Topics

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Introduction to course and VR

Human perception

VR display systems

Head mounted display components

Sensor processing

Spatial audio

Content creation:

- VR authoring tools
- Panoramic video

VR programming in C++ and OpenGL

# Prerequisites

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CSE167 (Introduction to Computer Graphics) or equivalent

- Programming in C++ with modern OpenGL
- Microsoft Visual Studio for C++
- Linear algebra, coordinate system transformations
- GLSL shader programming

You need to know how to debug C++ code

You need to feel comfortable writing C++ programs from scratch

# Online Course Resources

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Course web site:

- <http://ivl.calit2.net/wiki/index.php/CSE190S2018>

Ted:

- Scores for assignments
- Submission of code for homework projects
- Scheduling of content presentations

Piazza:

- Course related notifications and discussions
- Tutors' office hours
- Job and internship postings
- URL: <https://piazza.com/ucsd/spring2018/cse190/home>

# Lectures/Discussion

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## Lectures:

- Tue/Thu 2-3:20pm at EBU3B, room B210 (VR Lab)

## Homework Discussion:

- Mondays 4-4:50pm, starting April 9<sup>th</sup>
- Location: same as lectures

## Homework presentations:

- Fridays on due dates at 2pm in B210



# Assignment Submission on Ted

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Submissions are required for each homework project:

- All source code (.h and .cpp files)
- Shader code
- 3D model, textures, etc.
- Don't upload code binaries or project files

# Books

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No required books.

Recommended books: see course web site

# Class Structure

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- Two lectures per week
- Three structured homework assignments
- Final Project
- Written exam
- VR content presentation

# Grading

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Project 1	15%
Project 2	15%
Project 3	15%
Final Project	25%
Midterm Exam	25%
Presentation	5%

# Cloud Storage

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Unless otherwise explicitly authorized, each student is completely responsible to keep their code, homeworks, design files and other course work off of publicly accessible internet sites.

Example: it is **not allowed** to put code in a **public** Github repository.

However, you are **encouraged** to put your code in a **private** Github repository.

These rules expire after finals week.

# Programming Assignments

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- You write applications to run on the Oculus Rift
- Use lab computers or your own VR ready laptop
- Teamwork (teams of two) allowed for projects 1 and 4
- 2 weeks per project, more for final
- Operating system: Windows 7 or 10
- Programming language: C++
- APIs: OpenGL, Oculus SDK, and others
- Grading in CSE lab B210
  - Demonstrate to course staff on due dates after 2pm
- Late submissions not accepted - all assignments must be turned in on time

# VR App Presentation

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- Each student needs to present a **VR or AR app** in class
- App must run on your smart phone with a VR viewer (eg, Merge VR, Gear VR, Daydream) in 3D stereo with head (orientation) tracking
- The app must be from an app store (eg, Google Play, Apple Itunes, Oculus store, Samsung Gear VR store)
- Enter app URL on scheduling wiki on TritonEd
  - Deadline: Monday, April 9<sup>th</sup>
  - You must at least pick a date by then
- In-class presentation should take max. 5 minutes
- After presentation: short Q&A

# Example for VR App

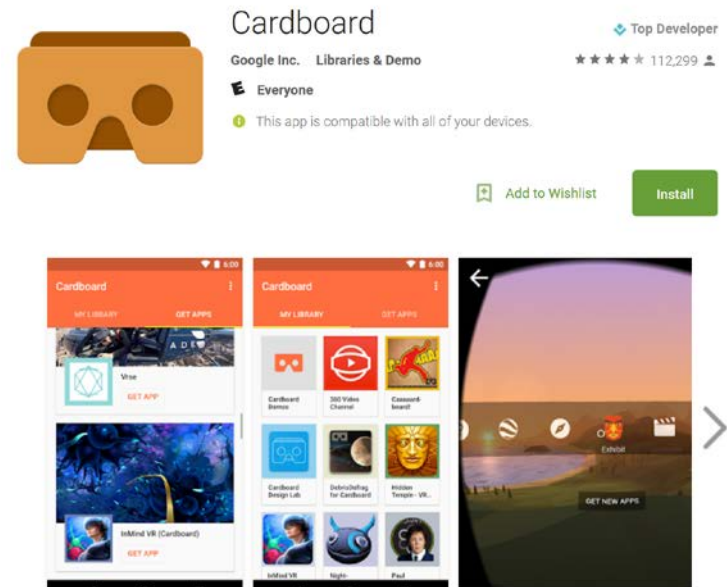
App: Google Cardboard

URL:

<https://play.google.com/store/apps/details?id=com.google.samples.apps.cardboarddemo&hl=en>

Comments:

- This app is a portal to a large number of Google vetted VR apps
- Pros: Very polished, great tutorial mode, large variety of apps to choose from within VR mode
- Cons: requires Cardboard compatible viewer



Cardboard puts virtual reality on your smartphone. The Cardboard app helps you launch your favorite VR experiences, discover new apps, and set up a viewer.

Try out a set of included demos as well



# Midterm Exam

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In-Class written examination.

Closed book.

Date: May 24<sup>th</sup>

Counts 25% of your grade.

Exam content covered in class.

Format similar to midterm exams in CSE 167 and CSE 165.

# Final Project

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For teams of two.

Less formalized project, similar to final projects in CSE 167 and CSE 165.

Based on C++ and OpenGL.

25% of grade.

# Note on Slides

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Most of the slides were created from scratch for this course.

Some of the material was inspired by the three recommended books.

Some of the slides were inspired by Professor Gordon Wetzstein (Stanford), from his course EE 267 – Virtual Reality.

- <https://stanford.edu/class/ee267/>