

Virtual Worlds

Lecture 00. Introduction

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Virtual Worlds

- ❑ A virtual world is a **computer-simulated environment** which may be populated by many users who can create a personal avatar, and simultaneously and independently explore the virtual world, participate in its activities and communicate with others
- Wikipedia
 - ❑ In our class, we mainly focus on **how to create computer-simulated 3D virtual worlds** in which users can interact with *autonomously controlled virtual entities*
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Applications

❑ Game



❑ Social network

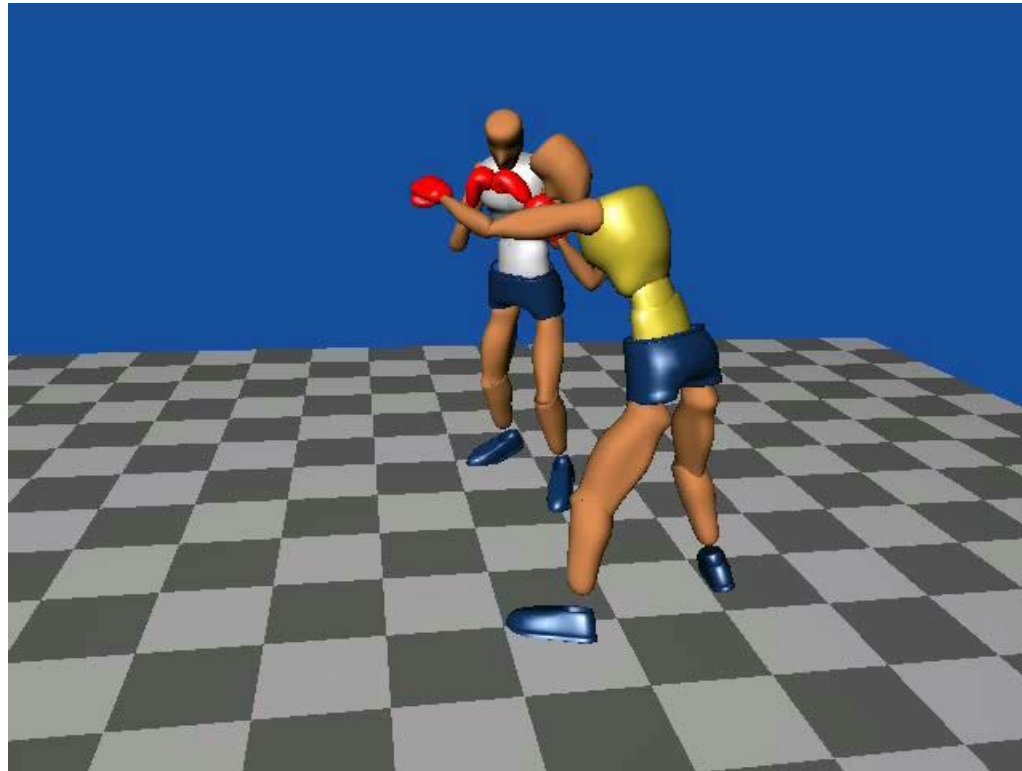
❑ Education



❑ Metaverse

My Background

- ❑ Ph.D. thesis about character animation in virtual world



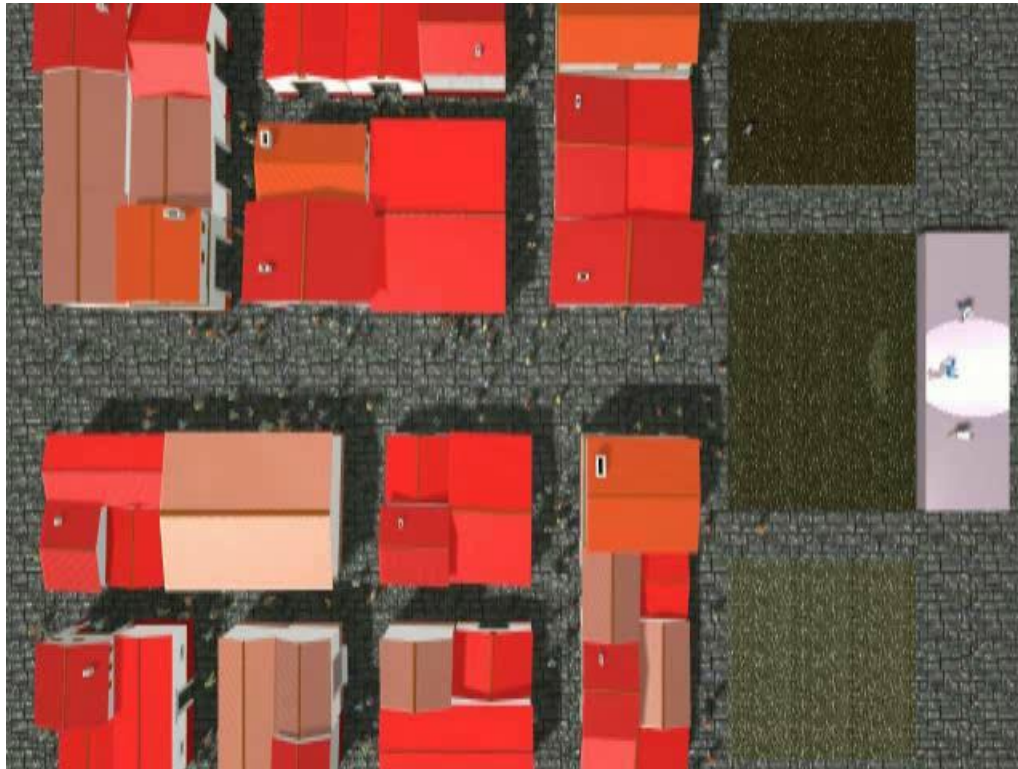
My Background

- Ph.D. thesis about character animation in virtual world



My Background

- ❑ Ph.D. thesis about character animation in virtual world



My Background

- ❑ Research in the field of computer animation and VR



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광운대학교
KwangWoon University

Evolutionary Exploration of Mechanical Assemblies in VR

Department of the Computer Science
Kwangwoon University
Won Gyu Kim

School of Software
Kwangwoon University
Kang Hoon Lee

Prerequisites

☐ Programming skills

- C# programming language (for Unity)
- Computational thinking

☐ Math

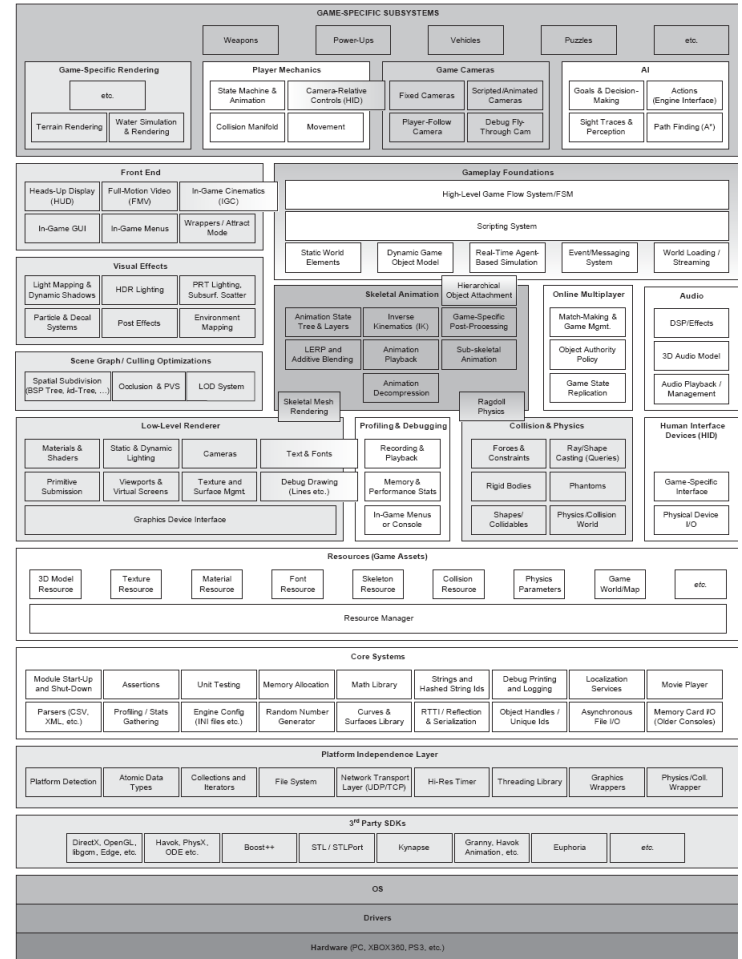
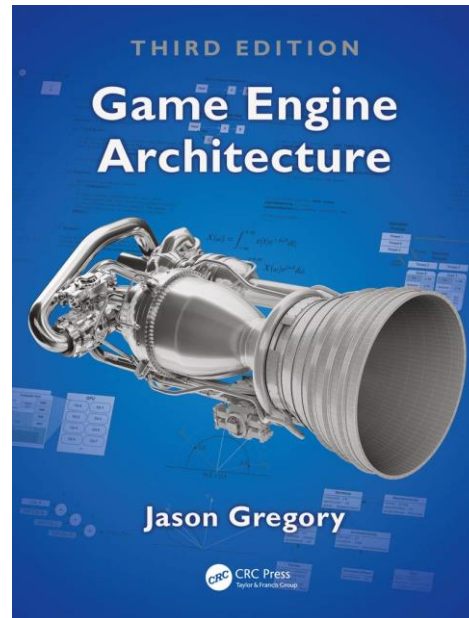
- High-school level (algebra, geometry, a bit of calculus)
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Topics

- ☐ **Game Engine**
 - ☐ **Modeling**
 - ☐ **Scene**
 - ☐ **Rendering**
 - ☐ **Animation**
 - ☐ **AI**
 - ☐ **Design Patterns**
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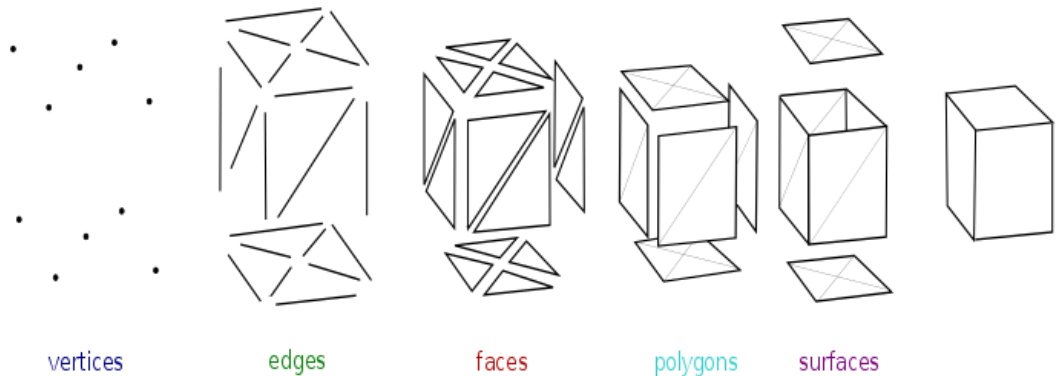
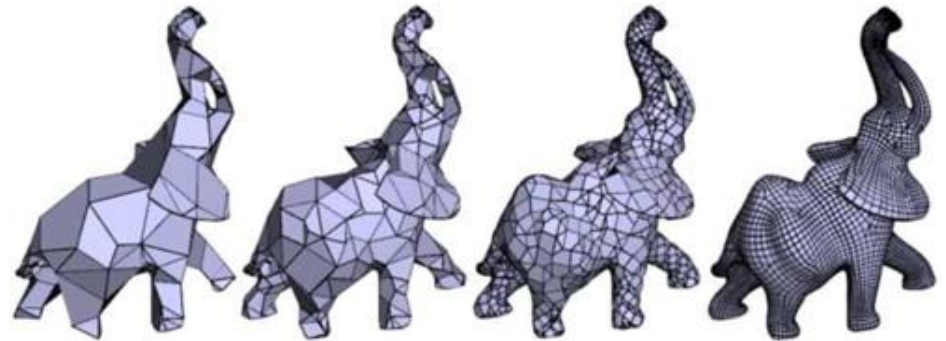
Game Engine

- ❑ Engine architecture
- ❑ Resource management
- ❑ Game loop



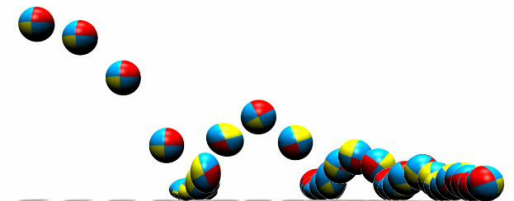
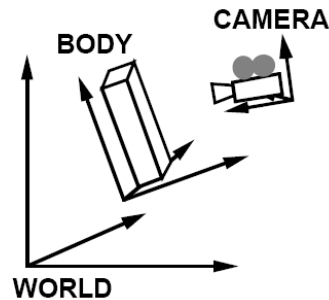
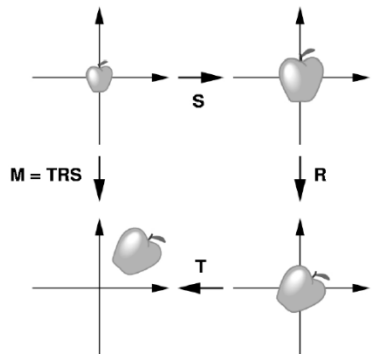
Modeling

- ❑ Coordinate systems
- ❑ Points and vectors
- ❑ Vector algebra
- ❑ Data structures
- ❑ File formats



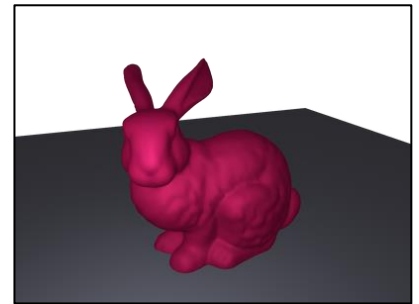
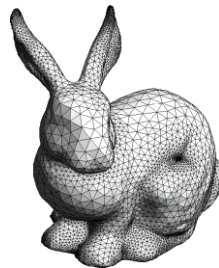
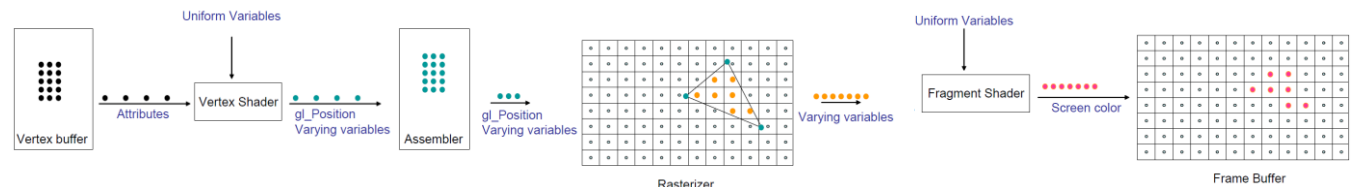
Scene

- ❑ Matrix algebra
- ❑ Linear transformation
- ❑ Homogeneous coordinates
- ❑ Compound transformation



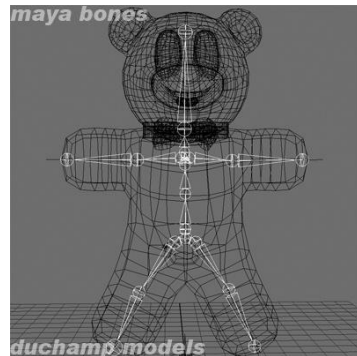
Rendering

- ❑ Geometry processing
- ❑ Lighting and shading
- ❑ Rasterization
- ❑ Texture mapping



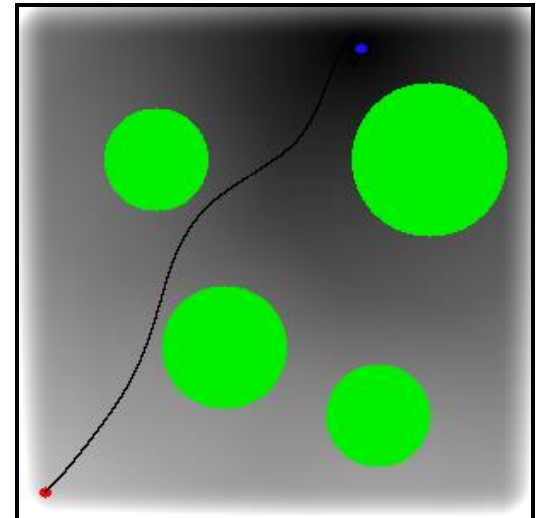
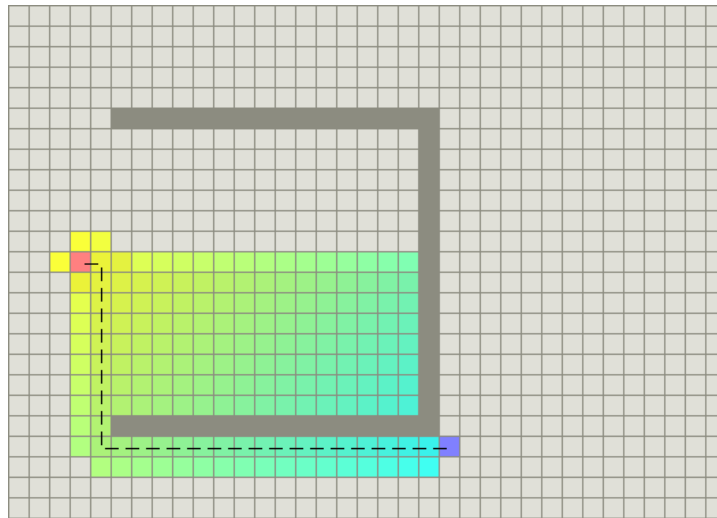
Animation

- ☐ Kinematics
- ☐ Rotation
- ☐ Splines
- ☐ Motion data
- ☐ Physics



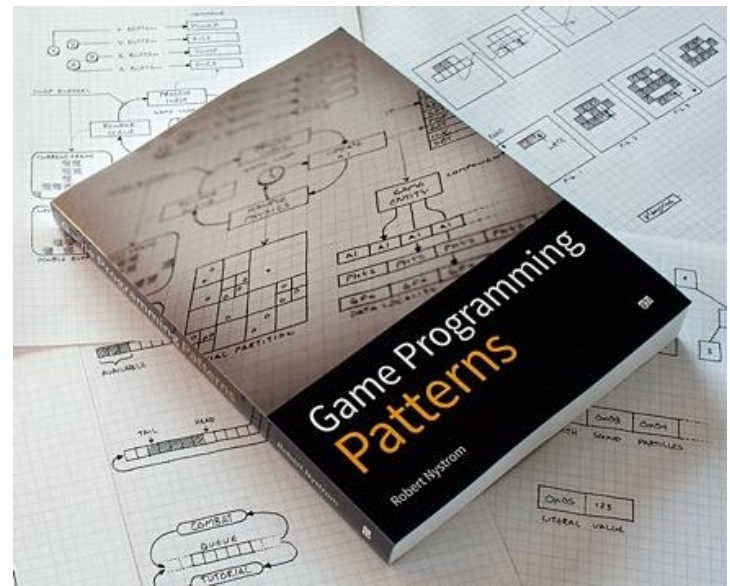
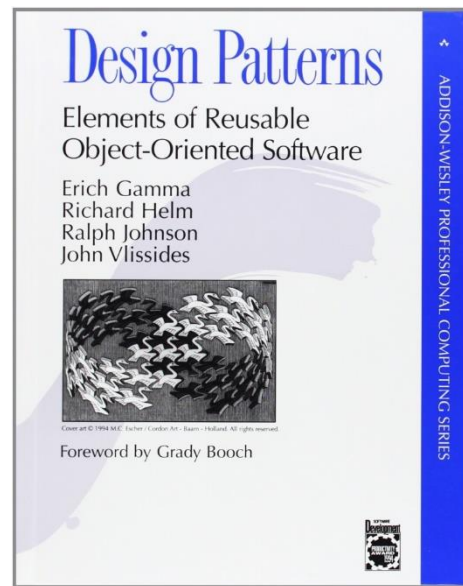
AI

- ☐ Basic pathfinding
- ☐ Modified pathfinding
- ☐ Reactive steering
- ☐ Reinforcement learning



Design Patterns

- ❑ Design patterns revisited
- ❑ Sequencing patterns
- ❑ Behavioral patterns



Unity

□ Unity Learn: Create with Code

■ <https://learn.unity.com/course/create-with-code>

The screenshot shows the Unity Learn website interface for the 'Create with Code' course. The top navigation bar includes the Unity Learn logo, links for '내 학습' (My Learning), '학습 길잡이' (Learning Guide), '찾아보기' (Browse), 'Live', and '교육 담당자' (Instructor). A search bar on the right contains the text '학습하려는 주제 검색'. On the left sidebar, a list of course units is visible: '교육 과정 Create with Code', '프로젝트 Getting Started', '프로젝트 Unit 1 - Player Control', '프로젝트 Unit 2 - Basic Gameplay', '프로젝트 Unit 3 - Sound and Effects', '프로젝트 Unit 4 - Gameplay Mechanics', '프로젝트 Unit 5 - User Interface', and '프로젝트 Next Steps'. The main content area features a large header image with the course title 'Create with Code' in white text. Below the title, it lists '교육 과정' (Course), '초급' (Beginner), '+900 XP', '41시간 30분' (41h 30m), and '12605' (enrollments). A star rating of 4.5 (738 reviews) and the 'Unity Technologies' logo are also present. A tabbed interface at the bottom of the main area shows '개요' (Overview), '기술' (Tech), 'Live', and '교육 담당자' (Instructor). The '개요' tab is active, displaying a '요약' (Summary) section with text about learning to create with code in C#. To the right of the summary is a 'Unity 버전 선택' (Select Unity Version) dropdown menu set to '2021.3', with a note '최근 업데이트: 2021년 12월 07일'. Below this is a '언어' (Language) dropdown menu set to '영어' (English). A small shield icon is visible in the bottom right corner.

Unity Learn 내 학습 학습 길잡이 찾아보기 Live 교육 담당자

Q 학습하려는 주제 검색

교육 과정 Create with Code

프로젝트 Getting Started

프로젝트 Unit 1 - Player Control

프로젝트 Unit 2 - Basic Gameplay

프로젝트 Unit 3 - Sound and Effects

프로젝트 Unit 4 - Gameplay Mechanics

프로젝트 Unit 5 - User Interface

프로젝트 Next Steps

Create with Code

교육 과정 • 초급 • +900 XP • 41시간 30분 • 12605

★★★★★ (738)

Unity Technologies

개요 기술 Live 교육 담당자

요약

In this official course from Unity, you will learn to Create with Code as you program your own exciting projects from scratch in C#. As you iterate with prototypes, tackle programming challenges, complete quizzes, and develop your own personal project, you will transform from an absolute beginner to a capable Unity developer. By the end of the course - if you are completing it through a school program - you will also be ready to put your skills to the test on the Unity Certified User Programmer Exam. Most importantly, though, when you complete this course, you will have the confidence that you can Create with

Unity 버전 선택

최근 업데이트: 2021년 12월 07일

2021.3

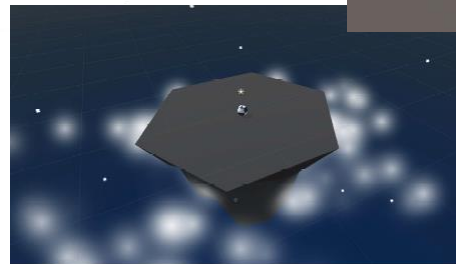
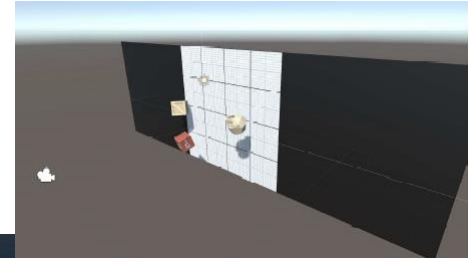
언어

영어

Unity

□ Unity Learn: Create with Code

- CC #1: Player Control
- CC #2: Basic Gameplay
- CC #3: Sound and Effects
- CC #4: Gameplay Mechanics
- CC #5: User Interface



Grading

☐ Programming Assignments

- HW #1: Modeling and Scene
- HW #2: Rendering and Animation
- HW #3: AI and Design Pattern

☐ Exams

- Midterm: 8th Week
 - Final: 15th Week
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Schedule

Week	Date	Subject	Homework
1	3/4, 3/6	Introduction	
2	3/11, 3/13	Engine Architecture	
3	3/18, 3/20	Unity: Create with Code 1	
4	3/25, 3/27	3D Modeling	HW #1 out
5	4/1, 4/3	Unity: Create with Code 2	
6	4/8, 4/10	Scene	
7	4/15, 4/17	Unity: Create with Code 3	HW #1 in
8	4/22	Midterm Exam	
9	4/29, 5/1	Rendering	HW #2 out
10	5/6, 5/8	Unity: Create with Code 4	
11	5/13, 5/15	Animation	
12	5/20, 5/22	Unity: Create with Code 5	HW #2 in
13	5/27, 5/29	AI	HW #3 out
14	6/3, 6/5	Design Patterns	
15	6/10	Final Exam	
16	6/19	-	HW #3 in

★ All Unity lectures are taught via pre-recorded videos. (Week 3, 5, 7, 10, 12)