

Immersive Media Programming

Course Name	Course section (credit/hours)		Elective course(4/5)			course code	M019
	course item					course component	
	Target students Division/major/grade					opening semester	2021 1ST SEMESTER
	Class time and classroom		Mon 13:30~15:00 (IUC419)Thu 13:30~15:00 (IUC419)Fri 3(IUC419) Fri 4(IUC419)			English Grade	A(100%English)
Reference to this course	Credit compositon		Theory(0) + Design(0) + Practice(0)				
	Prerequisite courses		Computer Programming, Object–Oriented Programming				
	Related basic courses						
	Recomanded concurrent courses						
Instructor	Name (title/division)		Teemu H. Laine(Associate Professor, Digital Media)				
	Office Room Number	Sanhak Hall 618	Extension Number		e-mail	tlaine@ajou.ac.kr	
	Office hour	Tue 1pm – 3pm		Homepage address			
Teaching Assistant	Name (title/division)						
	Office Room Number		Office phone Number		e-mail		

1. Course Introduction

This course introduces students to the theoretical foundations and techniques behind immersive media application development. We will focus on augmented reality (AR), virtual reality (VR) and mixed reality (MR). In addition to understanding the theoretical underpinnings and use-cases of immersive media, students will gain much hands-on experiences on techniques and tools to create immersive media applications. Students will learn to use the popular Unity game engine and its XR Foundation framework for building cross-platform interactive VR, AR and MR applications.

2. Course Objectives & course outcome

The course has the following learning objectives:

1. Learn about the history, current state, opportunities and limitations of immersive media technologies: augmented reality (AR), virtual reality (VR), mixed reality (MR).
2. Learn about the concepts behind AR, VR and MR technologies.
3. Learn how to rapidly build immersive media applications using the Unity XR Foundation.
4. Develop own immersive media concept through an iterative creative process.
5. Improve design, programming and team work skills.

3. Class types and activities

The course lectures start by introducing the students to the basic concepts of immersive media including AR, VR and MR. Students will also become familiar with history, current state, opportunities and limitations of each of these technologies. They will also learn about different immersive media experiences through selected case-studies.

In the beginning of the course we also cover the basics of the Unity game engine to ensure that students without prior experience are also able to follow the course.

The majority of the following lectures will focus on explaining and demonstrating the basic concepts and development techniques of augmented, mixed and virtual reality. The programming environment is the Unity game engine and particularly its XR Foundation framework.

There will also be weekly lab sessions where students practice immersive media programming through individual assignments and team project work. This will help students improve their programming skills and practice the theoretical content from the lectures. Professor and TAs are present in the lab environment to provide one-to-one support and guidance to students.

Students will complete two team projects during the course: one before mid-term exams and another one before final exams. In these projects, teams iteratively brainstorm, propose, design, implement and test an original immersive media application concept, such as a game or a learning tool. The project synthesizes the knowledge and skills that students learn during lectures and lab sessions. Scrum, an agile software development method, will be used for the team project. During the team project, weekly lab slots may be dedicated to students to work together, to present their weekly progress (Scrum sprints), and to get help from professor and TAs.

In addition to lectures and lab sessions, students can receive help from professor and TAs via AjouBB tools as well as a KakaoTalk chatroom which will be created in the beginning of the course.

4. Teaching Method

- | | |
|---|---|
| <input checked="" type="checkbox"/> lecture | <input checked="" type="checkbox"/> discussion and debate |
| <input checked="" type="checkbox"/> team project(presentation and case studies) | <input checked="" type="checkbox"/> experiments(role-playing,etc) |
| <input type="checkbox"/> designing and production | <input type="checkbox"/> on-site learning(on-site training) |
| <input type="checkbox"/> others | |

5. Support Systems in Use

- | | | |
|--|--|---|
| <input checked="" type="checkbox"/> AjouBb | <input type="checkbox"/> automatic recording system | <input type="checkbox"/> web-based assignment |
| <input checked="" type="checkbox"/> cyber lecture | <input checked="" type="checkbox"/> online content | |
| <input type="checkbox"/> class behavior analyzing system | <input checked="" type="checkbox"/> others (Chat room) | |

6. Teaching Tools

- | | | |
|---|---|--|
| <input checked="" type="checkbox"/> PBL(Problem Based Learning) | <input type="checkbox"/> CBL(Case Based Learning) | <input checked="" type="checkbox"/> TBL(Team Based Learning) |
| <input type="checkbox"/> UR(Undergraduate Research) | <input type="checkbox"/> FL(Flipped Learning) | <input type="checkbox"/> DSAL(Data Sciencd Active Learning) |
| <input type="checkbox"/> others | | |

7. Evaluation method of course outcome

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance		5	Attendance
midterm exam		20	Mid-term exam
final exam		25	Final exam
quiz			
presentation			
discussion			
homework		20	Individual assignments
etc		30	Team projects (15% for each)
study hours			

8. Textbook and Reference material

Main/Sub	Title	Writer	Publisher	Publication year
	To be announced. All required materials will be provided by lecture notes and website links.			

9. Class system and Class shedule

The following topics will be covered (tentative):

- Introduction to basic concepts of immersive media: augmented reality, virtual reality and mixed reality
- Basics of the Unity game engine
- Scrum Iterative and agile software development process (in team project)
- AR development with Unity XR foundation: Marker-based and markerless AR, AR user interface
- XR interaction toolkit
- Mixed reality development on HoloLens
- VR development with Unity XR Foundation: object interaction, locomotion, VR user interface, sound
- Multiplayer VR development

< Schedule >

* language : K-korean, E-English

Weeks	Title of lecture	language	time distribution(minutes)			Teaching Method	evaluation method
			theory	design	experiment practice		
1	Introduction to immersive media, Unity basics	E				Lectures, demonstrations, discussion, practice	
2	Unity basics, Introduction to AR and MR	E				Lectures, demonstrations, discussion, practice	
3	Unity XR foundation, marker-based AR	E				Lectures, demonstrations, discussion, practice, team project	
4	Markerless AR, interaction	E				Lectures, demonstrations, discussion, practice, team project	
5	Unity user interface development	E				Lectures, demonstrations, discussion, practice, team project	

< Schedule >

* language : K-korean, E-English

Weeks	Title of lecture	language	time distribution(minutes)			Teaching Method	evaluation method
			theory	design	experiment practice		
6	XR interaction toolkit	E				Lectures, demonstrations, discussion, practice, team project	
7	Mixed reality development on Hololens, team project presentations	E				Lectures, demonstrations, discussion, practice, team project	
8	Mid-term exam	E				Exam	
9	Introduction to VR development with XR Foundation	E				Lectures, demonstrations, discussion, practice	
10	Interacting with objects	E				Lectures, demonstrations, discussion, practice	
11	Locomotion	E				Lectures, demonstrations, discussion, practice, team project	
12	VR user interface	E				Lectures, demonstrations, discussion, practice, team project	
13	Sound in VR, VR multiplayer	E				Lectures, demonstrations, discussion, practice, team project	
14	VR multiplayer	E				Lectures, demonstrations, discussion, practice, team project	
15	Optimizing apps, team project presentations	E				Lectures, demonstrations, discussion, practice, team project	
16	Final exam	E				Exam	

10. Contribution index of the course for attaining ABEEK program outcomes

course outcome	contribution scale
No Data	

11. Analysis of improved matters for the previous semester

13. Reference items