

Rutgers University, Department of Electrical and Computer Engineering
ABET COURSE SYLLABUS
COURSE: 14:332:378

Course Catalog Description:	14:332:378 – Virtual Reality Laboratory (1) Introduction to Unity 3D programming, stereoscopic display programming, scene graphs and hierarchical models, bi-manual game interfaces, haptic interfaces (touch feedback) and real-time interaction techniques, term project.
Pre-Requisite Courses:	none
Co-Requisite Courses:	14:332:376
Pre-Requisite by Topic:	1. Computer Architecture (14:332:331) or equivalent
Textbook & Materials:	Burdea and Coiffet, "Virtual Reality Technology," 2nd Edition (2003).
Lab Manual :	<i>Unity 3D Lab Manual (Verhurst and Burdea, 2012 on Sakai)</i>
Overall Educational Objective:	To develop skills in real-time programming of virtual worlds and use of high-end human-computer interfaces (3D sound, stereo glasses, gesture and haptic devices).
Course Learning Outcomes:	A student who successfully fulfills the course requirements will have demonstrated: <ol style="list-style-type: none">1. an ability to understand and program using Unity 3D Pro game programming language.2. an ability to understand the principles and hardware used to create stereoscopic graphics.3. an ability to program virtual sensors and update the simulation loop in real time.4. an understanding and programming of dynamic scene graphs, including control of the scene view point.5. ability to program and control a virtual hand used in combination with a bi-manual (Razer Hydra) interface.6. an ability to understand and use scene hierarchical graphics objects7. an ability to program and integrate object intelligent behavior (such as reflex behavior, collision detection)8. an ability to program multi-sensorial interactions (graphics, sound, haptics).9. an ability to work independently and as a team to create a virtual reality application.

How Course Outcomes are Assessed:

Homework assignments (60 %)

In-class participation (10 %)

Final Term Project (30 %)

N = none S = Supportive H = highly related

Outcome	Level	Proficiency assessed by
(a) an ability to apply knowledge of Mathematics, science, and engineering	H	Homework, Programming assignments, Term project
(b) an ability to design and conduct experiments and interpret data	S	Homework, Programming assignments, Term project
(c) an ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	N	
(d) an ability to function as part of a multi-disciplinary team	H	Term project
(e) an ability to identify, formulate, and solve ECE problems	H	Homework, Programming assignments, Term project
(f) an understanding of professional and ethical responsibility	N	
(g) an ability to communicate in written and oral form	S	Homework, Programming assignments, Term project
(h) the broad education necessary to understand the impact of electrical and computer engineering solutions in a global, economic, environmental, and societal context	S	Term project
(i) a recognition of the need for, and an ability to engage in life-long learning	S	Homework, Programming assignments, Term project
(j) a knowledge of contemporary issues	N	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for electrical and computer engineering practice	H	Homework, Programming assignments, Term project
Basic disciplines in Electrical Engineering	H	Homework, Programming assignments, Term project
Depth in Electrical Engineering	S	Homework, Programming assignments, Term project
Basic disciplines in Computer Engineering	S	Homework, Programming assignments, Term project Unity 3D
Depth in Computer Engineering	S	Homework, Programming assignments, Term project
Laboratory equipment and software tools	H	Homework, Programming assignments, Term project
Variety of instruction formats	S	Lecture, office hour discussions, project demonstrations

Topics Covered week by week:**Week 1, 2:** Unity 3D Core**Week 3, 4:** Giving life to Unity**Week 5, 6:** Interfacing with Unity 3D**Week 7, 8:** Terrain and Haptic Feedback**Week 9, 10:** Particle Effects**Week 11-12:** Networking in Unity 3D**Week 13-14:** Term project (individual or team) programming and report writing**Week 15:** Project demonstration**Computer Usage:****Laboratory Experiences:** It is a laboratory course associated with 14:332:376**Design Experiences:** HW problems, Term Project**Independent Learning Experiences:** Term Project, report writing, presentation**Contribution to the Professional Component:**

(a) College-level mathematics and basic sciences: 0.25 credit hours

(b) Engineering Topics (Science and/or Design): 0.75 credit hours

(c) General Education: 0 credit hours

Total credits: 1

Prepared by: G. Burdea**Date:** December 2012