Rutgers University, Department of Electrical and Computer Engineering
ABET COURSE SYLLABUS
COURSE: 14:332:376

Course Catalog Description:	14:332:376 – Virtual Reality Introduction to VR, input/output devices, haptic interfaces, dedicated hardware, world modeling, human factors in VR simulations, applications, the future of VR.
Pre-Requisite Courses:	None
Co-Requisite Courses:	14:332:378
Pre-Requisite by Topic:	1. Computer Architecture (14:332:331). Or equivalent for students from other departments
Textbook & Materials:	G. Burdea and P. Coiffet, *Virtual Reality Technology*, 2nd Ed., John Wiley & Sons, 2003.
References:	None
Overall Educational Objective:	To develop skills in determining DC and AC steady state solutions to electrical networks, and power computations.
Course Learning Outcomes:	A student who successfully fulfills the course requirements will have demonstrated:

1. an ability to define and explain the meaning/function of virtual reality input devices (trackers, sensing gloves, 3-D probes)

2. an ability to define and explain the meaning/function of virtual reality output devices (stereo displays, 3D sound, haptic gloves)

3. an ability to understand and describe special computer architecture use in VR systems (graphics pipeline, graphics cards, physics processing unit, game consoles, tiled displays, distributed VR systems)

4. an ability to understand and describe the stages of modeling in VR (from geometric modeling to physical modeling to intelligent behavior).

5. an in-depth understanding of real-time programming and available toolkits for VR authoring (both text-based and graphics-based programming).

6. an ability to understand and describe the role of human factors in the design and evaluation of VR systems, particularly how to design and conduct human-factor studies and how to address cyber-sickness effects.

7. an ability to understand and describe applications of VR in the fields of Medicine, Entertainment and Defense,

including the efficacy of VR-based training.

8. an understanding of the emerging areas of VR applications in manufacturing, robotics and scientific visualization.

How Course Outcomes are Assessed:
Quizzes (10 %)
Mid-Term Exam (45 %)
Final Exam (45 %)

N = none S = Supportive H = highly related

Outcome	Level	Proficiency assessed by
(a) an ability to apply knowledge of Mathematics, science, and engineering	H	Quizzes, and Exams
(b) an ability to design and conduct experiments and interpret data	S	Quizzes and Exams
(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	S	Quizzes and Exams
(d) an ability to function as part of a multi-disciplinary team	N	
(e) an ability to identify, formulate, and solve ECE problems	H	Quizzes and Exams
(f) an understanding of professional and ethical responsibility	N	
(g) an ability to communicate in written and oral form	S	Quizzes and Exams
(h) the broad education necessary to understand the impact of electrical and computer engineering solutions in a global, economic, environmental, and societal context	S	Quizzes and Exams, discussions during lectures
(i) a recognition of the need for, and an ability to engage in life-long learning	S	discussions during lectures
(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	Quizzes and Exams
Basic disciplines in Electrical Engineering	S	Quizzes and Exams
Depth in Electrical Engineering	S	Quizzes and Exams
Basic disciplines in Computer Engineering	S	Quizzes and Exams
Depth in Computer Engineering	N	
Laboratory equipment and software tools	S	Quizzes and Exams
Variety of instruction formats	S	Lectures, independent research presentations

Topics Covered week by week:

Week 1: Introduction
Week 2: Virtual Reality Input Devices
Week 3: Virtual Reality Output Devices
Week 4: Virtual Reality Output Devices
Week 5: Computing Architectures for VR
Week 6: Computing Architectures for VR
Week 7: Modeling
Week 8: Modeling
Week 9: Programming in VR
Week 10: Programming in VR
Week 11: Human factors
Week 12: Traditional Applications of VR
Week 13: Traditional Applications of VR
Week 14: Emerging Applications of VR
Week 15: Review

Computer Usage: view online class notes, independent topic research, view quiz solutions and sample examinations.

Laboratory Experiences: In a separate course 14:332:378 co-requisite with this course.

Design Experiences: Quiz answers involve system design.

Independent Learning Experiences: 1. independent topic research and class presentation.

Contribution to the Professional Component:
(a) College-level mathematics and basic sciences: 0.25 credit hours
(b) Engineering Topics (Science and/or Design): 2.75 credit hours
(c) General Education: 0 credit hours
Total credits: 3
Prepared by: G. Burdea
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