

CSE 5194.03 (Proposed): Virtual Reality

Course Description

Principles and methods for the design, development, and evaluation of three-dimensional interfaces in virtual environments and their applications in data science, medicine, and engineering.

Transcript Abbreviation: Virtual Reality

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Undergrad, Graduate

Student Ranks: Senior, Masters, Doctoral

Course Offerings: Spring

Flex Scheduled Course: Never

Course Frequency: Every Year

Course Length: 14 Week

Credits: 3.0

Repeatable: No

Time Distribution: 3.0 hr Lec

Expected out-of-class hours per week: 6.0

Graded Component: Lecture

Credit by Examination: No

Admission Condition: No

Off Campus: Never

Campus Locations: Columbus

Prerequisites and Co-requisites: Graduate standing or permission of instructor

Exclusions:

Cross-Listings:

Course Rationale: Piloting a new course on the design and development of 3D user interfaces for virtual environments.

The course is required for this unit's degrees, majors, and/or minors: No

The course is a GEC: No

The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.0901

Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
BS CSE	BS Computer Science and Engineering
MS CSE	MS Computer Science and Engineering

Course Goals

Master fundamental 3D interfaces theory including software and hardware technologies (CAVE, head-mounted display, google cardboard), 3d interaction techniques (navigation, manipulation, system control, and symbolic input) and evaluation methods.
Be competent with applying the key principles and techniques learned in the class to solve real-world problems.
Be competent with design principles of creating interaction techniques.
Be competent with creation of interactive visualization in immersive settings.

Be familiar with utilizing hardware characteristics (stereo, head-tracking) in design.
Be familiar with interdisciplinary research methods.
Be familiar with software packages.
Be exposed to original research and applications in virtual reality.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Background in virtual reality and virtual environments	3.0							
Input devices: Wands, 3D mouse	3.0							
Output devices: HMD, CAVE, fishtank, CAVE2, ImmersaDesk	3.0							
Immersion and presence: Stereo, head-tracking	3.0							
Real-time graphics: Rendering and visualization	3.0							
Augmented and mixed reality	3.0							
Navigation: Travel and way finding in 3D	3.0							
Selection and manipulation of objects in 3D	3.0							
System control: Change of system state in 3D	3.0							
Analytical tasks	3.0							
Evaluation and validation techniques	3.0							
Software development	3.0							
The future of VE	3.0							

Representative Assignments

Programming exercise: Scene Construction
Programming exercise: Navigation
Programming exercise: Selection and manipulation
Paper presentation and critiques
Virtual reality design and development project

Grades

Aspect	Percent
Programming exercises	18%
Paper presentation and critiques	20%
Term project	50%
Final exam	12%

Representative Textbooks and Other Course Materials

Title	Author
<i>3D User Interfaces: Theory and Practice (2nd Edition)</i>	Joseph J. LaViola Jr., Ernst Kruijff, Ryan P. McMahan, Doug Bowman, Ivan P. Poupyrev

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	a	An ability to apply knowledge of mathematics, science, and engineering.
	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
***	c	An ability to design a system, component, or process to meet desired needs.
**	d	An ability to function on multi-disciplinary teams.
***	e	An ability to identify, formulate, and solve engineering problems.
	f	An understanding of professional and ethical responsibility.
*	g	An ability to communicate effectively.
	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
*	i	A recognition of the need for, and an ability to engage in life-long learning.
*	j	A knowledge of contemporary issues.
**	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

BS CSE Program Outcomes

Course Contribution		Program Outcome
***	a	an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering;
	b	an ability to design and conduct experiments, as well as to analyze and interpret data;
***	c	an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations;
**	d	an ability to function on multi-disciplinary teams;
***	e	an ability to identify, formulate, and solve engineering problems;
	f	an understanding of professional, ethical, legal, security and social issues and responsibilities;
*	g	an ability to communicate effectively with a range of audiences;
	h	an ability to analyze the local and global impact of computing on individuals, organizations, and society;
*	i	a recognition of the need for, and an ability to engage in life-long learning and continuing professional development;
*	j	a knowledge of contemporary issues;
**	k	an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional;
**	l	an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution;
**	m	an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;
**	n	an ability to apply design and development principles in the construction of software systems of varying complexity.

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