I. Catalog Description

Introduction to the theory and practice of three-dimensional virtual environments (VEs). 3D input and output devices, applications of VEs, 3D user interfaces and human-computer interaction, 3D graphics techniques for VEs, 3D modeling and level of detail, evaluation of VEs, VE software systems and standards, collaborative and distributed VEs. Includes hands-on experience with VE hardware and software.

(3H, 3C).

II. LEARNING OBJECTIVES

Having successfully completed this course, the student will be able to:

- distinguish virtual environments from other types of computer graphics and user interfaces
- demonstrate an understanding of the principles involved in constructing effective 3D user interfaces
- identify the various types of devices used for virtual environments and explain the advantages and disadvantages of each
- evaluate user performance and usability in virtual environment applications
- use and evaluate various VE toolkits and 3D modeling programs

III. JUSTIFICATION

Course Content

Virtual environments (VEs) are a rapidly-growing, multi-disciplinary field with applications in a wide variety of domains. The inclusion of this course within the computer science program of study allows students to gain knowledge of an advanced topic related to many lower-level courses, such as computer graphics and human-computer interaction. The course provides basic background information about VEs, but also exposes students to state-of-the-art research and current hardware and software for VEs. The course will prepare students for research in this area or related areas. Virginia Tech has a large group of faculty and students working in the area who can provide practical, hands-on experience and research projects.

Course Designation/Level
This course is proposed for the 5000 level. This course will offer graduate credit. It addresses advanced topics and requires students to integrate knowledge, think critically, and perform an open-ended project. Both computer science majors and non-majors will benefit from the course because of its multi-disciplinary underpinnings.

IV. PREREQUISITES AND COREQUISITES

There are no specific prerequisites or corequisites, but the catalogue statements on prerequisites associated with course level are applicable. Prerequisites are not practical for this course because students will be from a wide variety of disciplines.

V. TEXTS AND SPECIAL TEACHING AIDS

There will be no required texts for this course (the field is very new and is changing rapidly.) Resources for the class will mainly come from required readings, available online or in a course packet. These may include:


Special teaching aids will include online lecture notes, hardware (e.g. head-mounted displays, the CAVE, tracking systems, input devices) and software (e.g. the DIVERSE toolkit, 3D studio Max) found in the virtual environments laboratory in Torgersen Hall. Web sites for VE research or industry may also be used for background material.

VI. Syllabus

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<td>VE technology</td>
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<td>Visual displays</td>
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<td>Current applications of VEs</td>
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Real-time 3D graphics
3D modeling
Level of detail (LOD)
Collision detection

5.  3D Human-computer interaction  20
   3D interaction techniques for navigation, selection,
   manipulation, and system control
   3D user interface metaphors

6.  Evaluation and metrics for VEs  10
   Usability evaluation in VEs
   Task performance
   User preference metrics
   Immersion and presence
   Quality of service

7.  VE software systems and standards  10
8.  Collaborative and distributed VEs  5
9.  Future applications of VEs  10
100

VII. OLD (CURRENT) SYLLABUS

N/A

VIII. CORE CURRICULUM GUIDELINES

N/A