Effective Term
Semester A 2023/24

Part I Course Overview

Course Title
Virtual Reality

Subject Code
CS - Computer Science

Course Number
4188

Academic Unit
Computer Science (CS)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
CS2303 Data Structures for Media or
CS3334 Data Structures or
EE3206 Java Programming and Applications

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil
Part II Course Details

Abstract
Virtual reality emphasizes on the construction of interactive 3D virtual/mixed environments, and how to interact within such environments through different sensory channels, such as audio, vision and gesture. Virtual Reality has many applications. The most popular ones include 3D computer games and virtual walkthrough, which have attracted a lot of attention. This course aims at introducing virtual reality techniques and their applications.

Course Intended Learning Outcomes (CILOs)

<table>
<thead>
<tr>
<th>CILOs</th>
<th>Weighting (if app.)</th>
<th>DEC-A1</th>
<th>DEC-A2</th>
<th>DEC-A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Identify the important characteristics of different virtual reality techniques.</td>
<td></td>
<td>x</td>
<td></td>
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<tr>
<td>2 Evaluate and critique different types of virtual reality hardware systems.</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
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<tr>
<td>3 Evaluate and critique different types of virtual reality applications.</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>4 Apply virtual reality techniques to develop an application.</td>
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<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing/constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Teaching and Learning Activities (TLAs)

<table>
<thead>
<tr>
<th>TLAs</th>
<th>Brief Description</th>
<th>CILO No.</th>
<th>Hours/week (if applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lecture</td>
<td>1, 2, 3</td>
<td>3 hours/week</td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>The lecture will focus on the introduction and evaluation of virtual reality technologies and their applications.</td>
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<tr>
<td>2</td>
<td>Tutorial</td>
<td>1, 3</td>
<td>8 hours/semester</td>
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<td></td>
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<td></td>
<td>Students are required to work on different exercises and case studies that are relevant to virtual reality technologies and applications. Some of the tutorial exercises will involve evaluation and design of virtual reality technologies.</td>
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</tbody>
</table>
3 Project

Students apply suitable virtual reality techniques to develop applications.

2, 3, 4

3 hours/week for 7 weeks

Assessment Tasks / Activities (ATs)

<table>
<thead>
<tr>
<th>ATs</th>
<th>CILO No.</th>
<th>Weighting (%)</th>
<th>Remarks (e.g. Parameter for GenAI use)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz</td>
<td>1, 2</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Course Project</td>
<td>2, 3, 4</td>
<td>30</td>
<td></td>
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</tbody>
</table>

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination AND 30% of the maximum mark of the course project must be obtained.

Assessment Rubrics (AR)

Assessment Task

Quiz

Criterion

Capacity in understanding the key concerns of virtual reality techniques

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Note even reaching marginal levels

Assessment Task

Course Project

Criterion

Ability to apply virtual reality techniques to develop an application
Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Note even reaching marginal levels

Assessment Task
Examination

Criterion
Ability to evaluate virtual reality techniques and to apply them to some applications

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Note even reaching marginal levels

Part III Other Information

Keyword Syllabus

Syllabus
• Virtual Reality Technologies
  Overview of input and output devices for VR: head-mounted display, data gloves, 3D video capture, 3D displays, CAVE, haptic devices, motion tracking.
• Interaction Techniques in Virtual Reality
  3D selection and manipulation techniques, 3D user interface design and evaluation, gesture recognition and tangible interfaces.
• Virtual Environments
  Real-time rendering techniques, visibility determination, motion prediction, motion synchronization.
Software Platforms
- Scene graph, Unity3D, Unreal Engine, jMonkey Engine.

Applications of Virtual Reality
- Applications of VR in different areas such as training, simulation and information visualization.

Reading List

Compulsory Readings

<table>
<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Nil</td>
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Additional Readings

<table>
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<th>Title</th>
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