Form 2B

City University of Hong Kong

Information on a Course
offered by Department of Computer Science
with effect from Semester A in 2012 / 2013

Part I

Course Title: Virtual Reality and Game-Engine Technologies

Course Code: CS6175

Course Duration: One Semester

Credit Units: 3

Level: P6

Medium of Instruction: English

Prerequisites: Nil

Precursors: Nil

Equivalent Courses: Nil

Equivalent to the Old Course Code & Title:
IT6304 Selected Topics on Virtual Reality

Exclusive Courses: Nil

Part II

Course Aims

Virtual reality emphases on the construction of interactive 3D virtual environments, and how to interact with such environments through different sensory channels, such as audio, vision and gesture. Virtual Reality has many applications. The most popular one is 3D computer gaming, which is attracting a lot of attention in recent years. This course aims at introducing advanced virtual reality techniques and their applications. In particular, it investigates the 3D computer gaming application and the game engine architectures.

Course Intended Learning Outcomes (CILOs)

Upon successful completion of this course, students should be able to:

No.	CILOs	Weighting (if applicable)
1.	identify the important characteristics of different virtual reality techniques;	
2.	evaluate and critique different types of virtual reality systems;	
3.	evaluate and critique different game engine architectures;	
4.	design and apply virtual reality techniques to address real-world problems.	

Teaching and Learning Activities (TLAs)

(Indicative of likely activities and tasks designed to facilitate students' achievement of the CILOs. Final details will be provided to students in their first week of attendance in this course)

Teaching pattern:
Suggested lecture/tutorial/laboratory mix: 2 hrs. lecture; 1 hr. tutorial.

CILO No.	TLAs	Hours/week (if applicable)
CILO 1,2,3, 4	**Lecture:** The lecture will focus on the introduction and evaluation of virtual reality technologies and their applications. In particular, it explores a very popular application of virtual reality – game engines.	
CILO 2,3, 4	**Tutorial:** 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.	
CILO 4	**Project:** Students design and implement suitable virtual reality applications to solve real-world problems.	

Assessment Tasks/Activities

(Indicative of likely activities and tasks designed to assess how well the students achieve the CILOs. Final details will be provided to students in their first week of attendance in this course)

CILO No.	Type of Assessment Tasks/Activities	Weighting (if applicable)	Remarks
CILO 1	**Coursework:** Students' ability to apply suitable approaches to address the problems described in the tutorial exercises will be used to assess this CILO. **Examination:** Final examination will include questions to assess students' capability to identify the important features of different virtual reality techniques.		
CILO 2	**Coursework:** Students are required to evaluate and compare different virtual reality techniques in the tutorial exercises and case studies. **Examination:** Final examination will include questions to perform a critical comparison of different virtual reality techniques.		
CILO 3	**Coursework:** Students are required to evaluate and compare different game engine architectures and technologies in the tutorial exercises and case studies. **Examination:** Final examination will include questions to perform a critical comparison of different game engine architectures/technologies.		
CILO 4	**Coursework:** Students are required to design a virtual reality system in the tutorial exercises and to solve real-world problems. The effectiveness of the proposed solutions will be used to assess this CILO. Project: Students are required to work on a project to design or apply virtual reality techniques to build an application, according to some given requirements. **Examination:** Final examination will include questions to assess students' capability to design and apply suitable virtual reality techniques to solve real-world problems.		

Grading of Student Achievement: Refer to Grading of Courses in the Academic Regulations for Taught Postgraduate Degrees.

Examination duration: 2 hours

Percentage of coursework, examination, etc.: 40% CW; 60% Exam

Grading pattern: Standard (A+AA-…F)

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

This is a CEF approved course, students who want to apply for CEF claims must achieve at least 70% minimum attendance and obtain 50% of passing mark for the assessment of the course. ***(Subject to approval from Office of the CEF)***

Part III

Keyword Syllabus

Real-time Rendering Techniques. Animation Techniques. Obstacle Avoidance. Emotion and Expressions. Physically Based Modeling. Motion Capture. Tracking Techniques. Display Systems. Game Engine Architecture. Virtual Reality Applications. Graphics Systems. Audio Rendering.

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 and Distributed Virtual Environments
  Real-time rendering techniques, visibility determination, motion prediction, motion synchronization.
- Applications of Virtual Reality
  Applications of VR in different areas such as training, simulation and information visualization.
- Game Engine Technologies
  Game Engine Architecture, Single- and Multi-Player techniques**.**

Reference Books

G. Burdea and P. Coiffet, "Virtual Reality Technology," Second Edition, Wiley-Interscience, 2003.

Mel Slater, Anthony Steed, and Yiorgos Chrysanthou, "Computer Graphics and Virtual Environments," Addison Wesley, 2002.

Jobe Maker, "ActionScript for Multiplayer Games and Virtual Worlds," New Riders, 2010.

Jason Busby, Zak Parrish, and Jeff Wilson, "Mastering Unreal Technology, Volume I: Introduction to Level Design with Unreal Engine 3," Sams Publishing, 2010.

Jason Busby, Zak Parrish, and Jeff Wilson, "Mastering Unreal Technology, Volume II: Advanced Level Design Concepts with Unreal Engine 3," Sams Publishing, 2010.

Online Resources