COURSE OUTLINE

Department & Faculty: Dept. of Software Engineering, Faculty of computing	Page : 1 of 5
Course Code: SCSV3123 Course Credit: 3 Course Name : Real-time Computer Graphics Total Contact Hours: 56 hours Pre-requisite Course: Fundamental of Computer Graphics (SCSV2213) Human Computer Interaction (SCSV2113) Geometric Modeling (SCSV3113)	Semester: V Academic Session: 2016/2017

Lecturer : **Ajune Wanis Binti Ismail**
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Synopsis : This course is designed to expose students in developing real-time and interactive computer graphics applications. This is an intensive programming subject and students are expected to equip themselves with adequate programming skills. Interactive development such as fast polygon rendering algorithm with level-of detail, scene management, dynamic camera manipulation, real-time shading and rendering and physical simulation will be covered and integrated in the application. Throughout the course, students will design and develop a real-time computer graphics application. At the end of this course, student should be able to acquire the theory and practice of real-time computer graphics.

LEARNING OUTCOMES

By the end of the course, students should be able to:

No.	Course Learning Outcome	Programme Learning Outcome(s) Addressed	Assessment Methods
1.	Have a thorough understanding the state-of-the-art real-time computer graphics application development.	PO1 (C1, C2, C3,C4)	LE, Q, A, F
2.	Design and develop real-time computer graphics application for virtual environment	PO2 (C4,P3)	LE, PR, F
3.	Implement an effective resource management in virtual environment	PO3 (P3,A1,A2)	LE, A
4.	Communication skills, team working, problem solving, adaptability, lifelong learning, self-esteem and ethics.	PO7 (A3,CS1,CS3,CS4, CTPS1, CTPS2)	PR, A, Pr (T – Test ; Q – Quiz; LE – Lab exercise ;

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			Sbt - Skill-Based Test; A – Assignment; Peer – Peer assessment; PR – Project ; Pr – Presentation, F – Final Exam)

STUDENT LEARNING TIME

Teaching and Learning Activities	Student Learning Time (hours)
1. Guided Learning	
- Lecture	26
- Lab Activity	26
- Student centered learning activity	4
2. Self learning	
- Independent Study	8
- revision	14
- assessment preparation	12
3. Formal assessment	
- Continuous evaluation	25
- Final examination	3
Total	**120**

TEACHING METHODOLOGY

Lecture, group discussions, hands on programming skill in laboratory activities, assignment and project presentation.

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WEEKLY SCHEDULE

Week	Topics	Activities/hours
Week 1	**1.0 Introduction to Interactive Computer Graphics and Virtual Environment** - Overview Real-time Computer Graphics Application	Lecture : 2 Lab: 2 Assessment: Literature Assignment
Week 2	**2.0 Rendering pipeline** - Architecture - Application stage - Geometry stage - Rasterisation	Lecture : 2 Lab: 2 Assessment: Quiz 1
Weeks 3-4	**3.0 Pipeline Optimization** - Locating bottleneck - Performance measurement - Optimization - Balancing the Graphics Pipeline - Multiprocessing	Lecture : 4 Lab: 4 Assessment: Lab assessment 1
Week 5	**4.0 Scene Management** - Acyclic graph - BSP - Spatial data Structure (Quadtree, Octree) - Overview of Culling, Level of Details	Lecture : 2 Lab: 2
Week 6	**5.0 Spatial Data Structure** - Quadtree - Octree	Lecture : 2 Lab: 2 Assessment: Lab assessment 2
Week 7	**6.0 Culling Techniques** - View Frustum Culling - Back Face Culling - Occlusion Culling - Portal Culling	Lecture : 2 Lab: 2

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Week 8	**SEMESTER BREAK**	
Week 9	**7.0 Level of Details** - Discrete LOD - Continuous LOD	Lecture : 2 Lab: 2 Assessment: Lab assessment 3
Week 10	**8.0 Real Time Shading Method** - Pixel and Vertex Shader - Shader Programming	Lecture : 2 Lab: 2
Week 11	**9.0 Collision Detection & Real-time Physics** Collision Detection : - Bounding box, Sphere-trees - Polygon-polygon intersection Real-time Physics : - Physics in Computer Graphics - Physically Base Modeling - Optimization	Lecture : 2 Lab: 2 Assessment: Project started
Weeks 12	**10.0 Real Time Mixed Reality Environment** - MR Taxonomy : Virtual & Augmented Reality - AR : State of the art - AR Displays - AR Tools : Libraries, Plug-in	Lecture : 2 Lab: 2
Weeks 13-14	**11.0 Special Issues in Real-time Computer Graphics** - Current Issues - Research Direction : VR and AR - Discussion	Lecture : 2 Lab: 2
Week 15	**Project Presentation**	Assessment: Project Presentation
Week 16	**Revision Week**	

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REFERENCES

1. Mooler, T Real-time Rendering
2. Eberly, D. H. *3D Game Engine Design: A Practical Approach to Real-time Computer Graphics*. Morgan Kaufmann 2002
3. *Games Programming Gems* 1-6, Charles River Media, USA.
4. Rucker, R.*Software Engineering and Computer Games*. Addison Wesley 2002..
5. Foley, Van Dam, Feiner dan Huges, *Computer Graphics Principles and Practice*, Addison-Wesley, 1994.

GRADING

No.	Assessment	Number	% each	% total
1	Literature Assignment	1	15%	15
2	Quizzes	1	5%	5
3	Lab assessment	4	5%	20
4	Programming Project	1	30%	30
5	Final Exam	1	30%	30
	Overall Total			**100**