课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	课程名称 Course Title	计算机图形学　Computer Graphics
2.	授课院系 Originating Department	计算机科学与工程系 Department of Computer Science and Technology
3.	课程编号 Course Code	CS312
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业选修课 Major Elective Courses
6.	授课学期 Semester	春季 Spring
7.	授课语言 Teaching Language	英文 English
8.	授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师） Instructor(s)，Affiliation& Contact （For team teaching, please list all instructors）	Elvis Sze-Yeung Liu，助理教授，计算机科学与工程系，esyliu@sustech.edu.cn Elvis Sze-Yeung Liu, Assistant Professor, Department of Computer Science and Engineering, esyliu@sustech.edu.cn
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	罗子云，在读博士，计算机科学与工程系，luozy@mail.sustech.edu.cn Ziyun Luo, Ph.D candidate, Department of Computer Science and Technology, luozy@mail. sustech.edu.cn
10.	选课人数限额(可不填) Maximum　　　　Enrolment （Optional）	

11.	授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other（Please specify）	总学时 Total
	学时数 Credit Hours	32		32		64

12.	先修课程、其它学习要求 **Pre-requisites or Other Academic Requirements**	
13.	后续课程、其它学习规划 **Courses for which this course is a pre-requisite**	
14.	其它要求修读本课程的学系 **Cross-listing Dept.**	

教学大纲及教学日历 SYLLABUS

15. 教学目标 **Course Objectives**

The objectives of this course are

1. To provide an introduction to the theory and practice of computer graphics.

2. To help students to understand standards based graphics library in several programming projects illustrating the theory and practice of programming computer graphics applications.

16. 预达学习成果 **Learning Outcomes**

On completion of this course, students will be able to

1. Understand the basic structure of modern computer graphics systems

2. Understand the basic principles of implementing computer graphics primitives

3. Understand key algorithms for modelling and rendering graphical data

4. Develop design and problem solving skills with application to computer graphics

5. Gain experience in constructing interactive computer graphics programs using Unity3D.
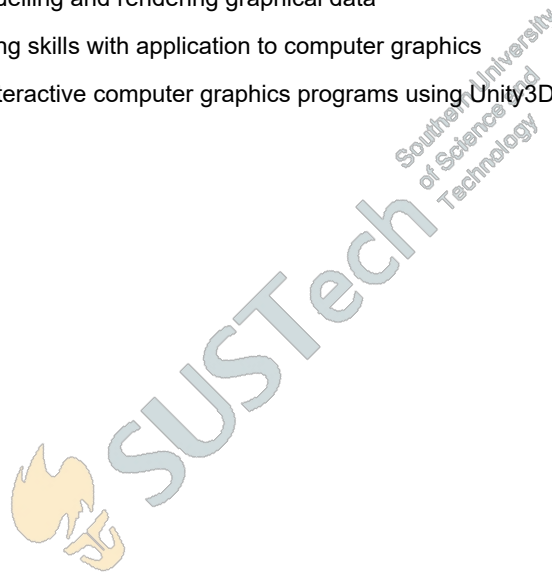
17. 课程内容及教学日历 （如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人）

Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

Lecture 2 hours, Lab 2 hours, 4 hours per week. Prerequisites: Computer Programming, Data Structure and Algorithms. This course provides introduction to computer graphics mathematics, algorithms, software, and hardware. Topics include: mathematics for computer graphics, transformations, lighting, colour, shadows, texture mapping, ray tracing, collision detection, computer game programming, and industry experiences.

Course outline

Week 1: Introduction

History of computer graphics

Overview of graphics architectures and software

Overview of modeling and rendering

Graphics pipeline

Week 2: Introduction to 2D and 3D Graphics

Curves

Conversion

Surface Representation

Meshes

Week 3: Mathematics of Computer Graphics

Vectors

Matrices

Coordinate systems

Interception of Lines

Triangles

Polygons

Week 4: Transformation in 2D and 3D

Translation

Rotation

Sheer

Week 5: Camera and Viewing

Perspective specifications

Week 6: Colour and Lighting

Colour models

Lighting models

Week 7: Shading and Ray Tracing

Shading models

Material models

Ray tracing

Week 8: Texture Mapping

Mapping methods

Texture coordinates

Week 9: Real-time Shadows

Projective shadows

Depth maps

Shadow test

Week 10: Introduction to Computer Games

Single player games

Multiplayer games

Virtual reality

Week 11: Collision Detection

Primitive Collision Detection

Bounding boxes

Continues Collision Detection

Week 12: Spatial Data Structures

Grid

Octree

BSP Tree

K-D Tree

Week 13: Presentation of Projects

Week 14: Special Topics in Computer Graphics I – Industrial Talk

Week 15: Special Topics in Computer Graphics II – Industrial Talk

Week 16: Revision

Lab Schedule

Week 1.   Linear Algebra warmup

Week 2.   OpenGL introduction and setup

Week 3.   Curves and Surfaces

Week 4.   Geometric (hierarchical) modeling

Week 5.   Shading and lighting

Week 6.   Texture

Week 7.   Sampling

Week 8.   Ray Casting

Week 9.   Ray Tracing

Week 10. Collision detection

Week 11. Unity3D introduction and setup

Week 12. Acceleration structures

Week 13. Final Project tutorial

Week 14. Final Project presentation

Week 15. Photon mapping

Week 16. Revision

18. 教材及其它参考资料 Textbook and Supplementary Readings

Textbook

-None

Reference Book

-John F. Hughes, Andries Van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner, Kurt Akeley, Computer Graphics: Principles and Practice, 3rd Edition, Addison Wesley

课程评估 ASSESSMENT

19.

评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance				
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects	10 weeks	30%		
平时作业 Assignments	16 weeks	20%		
期中考试 Mid-Term Test				
期末考试 Final Exam		50%		
期末报告 Final Presentation				

其它（可根据需要改写以上评估方式） **Others (The above may be modified as necessary)**		6	

20. **记分方式 GRADING SYSTEM**

☑ A. 十三级等级制 **Letter Grading**
☐ B. 二级记分制（通过/不通过） **Pass/Fail Grading**

课程审批 REVIEW AND APPROVAL

21. **本课程设置已经过以下责任人/委员会审议通过**
This Course has been approved by the following person or committee of authority