

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	裸眼 3D 显示 Naked-eye 3D display
2.	授课院系 Originating Department	电子与电气工程系 Electronic and electrical engineering
3.	课程编号 Course Code	EES103
4.	课程学分 Credit Value	1
5.	课程类别 Course Type	通识选修课程 General Education (GE) Elective Courses (请保留相应选项 Please only keep the relevant information)
6.	授课学期 Semester	夏季 Summer
7.	授课语言 Teaching Language	中英双语 English & Chinese (请保留相应选项 Please only keep the relevant information)
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)	授课教师: 孙小卫 所属学系: 电子与电气工程系 联系方式: +(86) 186 2256 5938 Instructor : Xiao Wei SUN Affiliation: Electronic and electrical engineering Contact: +(86) 186 2256 5938
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	待公布 To be announced (请保留相应选项 Please only keep the relevant information)
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	20 人

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

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

1、知识与技能

- (1) 通过讲授与学习，学生了解 3D 显示技术分类与发展，特别是裸眼 3D 显示技术在未来的发展情况。
- (2) 通过理论课程的学习，学生了解光学成像透镜设计原理，掌握裸眼 3D 成像原理。
- (3) 通过实地体验操作，学生熟悉人眼追踪原理。
- (4) 通过动手实践，掌握一门图形学编程处理软件，掌握软硬件结合综合性问题解决方法与思路，具备科研项目研发的基础能力。

1、 Knowledge and Skills

- (1) Through the study of the course, students will understand the classification and development of 3D display technology, especially the future development of naked-eye 3D display technology.
- (2) Students will understand the principle of the naked-eye 3D display.
- (3) Students will get familiar with the principle of eye tracking.
- (4) Students will master a programming language and practice solving hardware/software problems. At the end of the course, students will have the basic scientific research ability.

2、过程与方法：

- (1) 过程：本课程将通过理论课、分享讲座与实践课相结合的教学方法，通过系统性介绍体 3D 显示、多视点 3D 显示、光场 3D 显示以及全息 3D 显示等裸眼 3D 显示的技术原理。
- (2) 方法：采用互动交流方式，让学生认识 3D 显示的发展、并且在此基础上指导学生通过实验操作详细学习实现多视点 3D 显示涉及到的技术，包括透镜设计、裸眼 3D 图像渲染与合成、人眼追踪、图像处理等。

2. Process and Method:

- (1) Process: This course will combine theory, lecture and experiment courses to introduce the technical principles of naked-eye 3D displays, including volumetric 3D display, multi-view 3D display, light field 3D display and holographic 3D display.

(2) Methods: Learning by doing. Interactive communication will be adopted to teach students the development of 3D display. Students will be instructed to implement a naked-eye 3D display, during which they will grasp the knowledges of making a 3D display, including lens design, multi-view 3D image rendering and synthesis, eye tracking, image processing, etc.

3、情感培养:

通过学习, 激发学生对显示行业的认知, 激发对光电专业学习热情。

3、Emotion:

Through this course, stimulate students interest in display industry and optoelectronics major.

16. 预达学习成果 Learning Outcomes

- 1、理论上: 学生将了解明晰各种裸眼 3D 显示技术的原理, 并了解多视点裸眼 3D 显示屏实现的流程。
- 2、知识上: 学生将了解光学设计、图像处理、3D 图像渲染与合成、人眼追踪等内容。
- 3、技能上: 学生将掌握一种编程语言技术, 制作一种 3D 显示图像。
- 4、实践上: 最终学生将能独立搭建一套裸眼 3D 显示系统。

- 1、Theory: Students will understand the principles of various naked-eye 3D display technologies and know how to realize a multi-view naked-eye 3D display.
- 2、Knowledge: Students will learn optical design, image processing, 3D image rendering and synthesis, eye tracking, etc.
- 3、Skills: Students will master a programming language to make a multi-view 3D image.
- 4、Practice: Eventually, students will be able to build a naked-eye 3D display independently.

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.)

1、裸眼 3D 显示理论（6 学时）

介绍各种裸眼 3D 显示技术原理，包括体 3D、多视点裸眼 3D、光场 3D 显示以及全息 3D 显示。

2、人眼追踪原理（4 学时）

介绍人眼追踪的技术分类以及原理。

3、Python 入门（6 学时）

介绍 python 基础语法，以及常用的开发工具，包括 anaconda、PyCharm 以及 Jupyter notebook 等。

4、图像处理入门（6 学时）

介绍图像处理的基本理论，包括图像空间滤波、彩色图像处理。

5、图形学入门（6 学时）

介绍图形学基础，以及如何使用 Blender/Unity 渲染合成多视点裸眼 3D 图像。

6、光学设计入门（4 学时）

介绍透镜设计基础，以及如何使用 ZEMAX 等光学设计软件。

1、Naked-eye 3D display theory (6 hours)

The principle of naked-eye 3D display technologies will be introduced, including volume 3D, multi-view 3D, light field 3D and holographic 3D displays.

2、Principle of eye tracking (4 hours)

The technical classification and principle of eye tracking will be introduced.

3、Introduction to Python (6 hours)

An introduction to Python and common development tools, including Anaconda, PyCharm, and Jupyter Notebook.

4、Introduction to Image processing (6 hours)

The basic theory of image processing will be introduced, including image spatial filtering and color image processing.

5、Introduction to graphics (6 hours)

The basic theory of graphics will be introduced. And we will show how to use Blender/Unity to render and compose multi-view naked eye 3D images.

6、Introduction to optical system design (4 hours)

Introduction to lens design and how to use optical design software such as ZEMAX to design a lens.

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

- 1、《3D 显示技术》，作者：马群刚、夏军著，出版社：中国工信出版集团
1、<Technology of 3D Display>, Author(s): QunGang MA, Jun XIA, Publication: China Industrial and Information Technology Publishing Group
- 2、<Design and Implementation of Autostereoscopic Displays>, Author(s): ByoungHo Lee et. al., SPIE press

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		20		
课堂表现 Class Performance		20		
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments				
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation		60		
其它（可根据需要 改写以上评估方 式） Others (The above may be modified as necessary)				

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**