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**	**电子材料 Electronic Materials**
2.	**授课院系 Originating Department**	电子与电气工程系
3.	**课程编号 Course Code**	EES305
4.	**课程学分 Credit Value**	2
5.	**课程类别 Course Type**	专业选修课 Major Elective Courses
6.	**授课学期 Semester**	夏季 Summer
7.	**授课语言 Teaching Language**	英语 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）**	夏光睿(Guangrui Xia), Department of Materials Engineering, the University of British Columbia, gxia@mail.ubc.ca
9.	**实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact**	待公布 To be announced
10.	**选课人数限额(可不填) Maximum Enrolment （Optional）**	

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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	21	6	5		32

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

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

This course is designed to teach the fundamentals of material science and engineering and major material analysis methods, theories and practice related to microelectronic and photonic industry.

16. 预达学习成果 Learning Outcomes

After completing this course, the students will be able to:

1. List major semiconductors, semiconductor devices, products based on semiconductor materials and applications

2. Understand the concept of primitive cells, unit cells and the 14 Bravais lattices.

3. Use Miller indices in labelling crystal directions, planes, and families. Calculate interplanar distances of lattices.

4. Identify various defect types in common semiconductors and calculate interstitial and vacancy concentrations in equilibrium. Understand the significance of crystallinity, lattice matching and thermal expansion matching

5. Compare Si and GaAs in the applications, sketch Si and GaAs unit cell, identify (with Miller indices) and sketch major crystal orientations and planes. List common dopants in Si and identify intrinsic and extrinsic semiconductors. Identify common 2D semiconductor unit cells

6. Understand the use, working principle and the limitations of major material analysis techniques such as XRD, AFM, SEM, EPD, SIMS and TEM in industry and research practice.

7. Apply Bragg's law to identify XRD peaks and their Miller indices, and calculate strains. Apply the tensor format of the Hook's law for simple stress and strain cases. Understand the difference between powder diffraction and single crystal diffraction. Use the XRD technique to measure wafer title angles and orientations.

7. Know basic lab safety rules and practice.

8. Understand common epitaxy techniques. Calculate lattice mismatch strains and thermal strains.

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.)

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1. (2 hours) Major semiconductors, semiconductor devices, products based on semiconductor materials and applications

2. (3 hours) Concept of primitive cells and unit cells and the 14 Bravais lattices.

3. (3 hours) Miller indices in labelling crystal directions, planes, and families.

4. (3 hours) Material defects, crystallinity, lattice mismatch and thermal expansion mismatch

5. (9 hours) Major material analysis techniques such as XRD, AFM, SEM, EPD, SIMS and TEM in industry and research practice (lab tours). Epitaxy.

7. Tutorials (5 hours) on

a. unit cells and Miller indices,

b. material analysis tools and examples.

c. basic lab safety rules and practice.

8. 2 in-class quizzes and quiz problem feedback (4 hours)

9. Final exam and exam problem feedback: (3 hours)

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

1. Materials Science and Engineering: An Introduction by William D. Callister, David G. Rethwisch

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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				
平时作业 Assignments		18		
期中考试 Mid-Term Test		40		
期末考试 Final Exam				
期末报告 Final Presentation		20% for the final presentation and slides, 18% for the final report		

其它（可根据需要改写以上评估方式） **Others (The above may be modified as necessary)**	Teaching survey participation	2		

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

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