

## 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.	<b>课程名称 Course Title</b>	光电与光化学转化原理 Principle of Solar to Electricity and Solar Photochemistry Conversion
2.	<b>授课院系 Originating Department</b>	机械与能源工程系 Department of Mechanical and Energy Engineering
3.	<b>课程编号 Course Code</b>	ME371
4.	<b>课程学分 Credit Value</b>	3
5.	<b>课程类别 Course Type</b>	专业核心课 Major Core Courses
6.	<b>授课学期 Semester</b>	秋季 Fall
7.	<b>授课语言 Teaching Language</b>	中英双语 English & Chinese
8.	<b>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 &amp; Contact (For team teaching, please list all instructors)</b>	陈熹翰, 副教授, 机械与能源工程系 Email: chenxh@sustech.edu.cn Xihan Chen, Associate Professor, Department of Mechanical and Energy Engineering, Email: chenxh@sustech.edu.cn
9.	<b>实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact</b>	待公布 To be announced
10.	<b>选课人数限额(可不填) Maximum Enrolment (Optional)</b>	30

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	48				48
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	能源半导体器件物理 (ME272)				
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

本课程旨在介绍目前应用最广泛的三种太阳能转化系统，光电转化系统，光电化学转化系统及光化学转化系统的工作原理，系统设计及表征方法。通过课程学习，掌握上述能源转换过程中的基本原理和表征手段，了解上述太阳能转化系统的最新的研究进展以及规模化应用情况。

The course examines the principles of three widely used solar energy conversion system to build a foundation for explaining the basic concepts and implementation of conversion processes. It reviews the properties and availability of solar radiation and geometric relationship of sun/collector, principles of photovoltaic conversion, principles of solar to fuel generation, principles of solar driven photocatalytic process and properties of materials used in various solar energy conversion systems. From the course, the students are expected to learn the latest development in solar energy conversion process, management and applications.

#### 16. 预达学习成果 Learning Outcomes

通过该课程的教学使学生了解太阳能转化的基本原理以及其最新发展状况，对能源转换的科学原理和应用有更广泛的理解和认识。提高学生在能源转化系统方向理论知识积累，培养学生的工程分析及设计能力。通过该课程的教学使本科生掌握太阳能转化的关键技术，为后续科研工作中专业能力的提升及发展奠定一定的基础。

Course objectives for undergraduates: To enable students to understand the basic principles of solar energy conversion and the latest development of solar energy conversion technology, and to have a broader understanding of the scientific principles and applications of energy conversion. Through the teaching of this course, undergraduate students can master the basic principles and the key technologies for solar energy conversion systems, lay a certain foundation for the promotion and development of professional ability in the follow-up scientific research work.

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.)**

Week 1 太阳能介绍 Introduction to solar energy (3 hrs)

Week 2-5 太阳能转化材料 Materials for solar energy conversion (11 hrs)

1. 光基础 Property of Light (3 hrs)
2. 半导体材料基础 Semiconductor Physics (3 hrs)
3. 分子材料基础 Molecular Physics (3 hrs)
4. 第一代第二代第三代太阳能电池 First-Second-Third Generation Solar cell (2 hrs)

Week 6-8 光电转化 Principles of Photovoltaics (12 hrs)

1. 半导体节及暗电流 Semiconductor Junctions and dark current (3 hrs)
2. 光激发 Light Excitations (3 hrs)
3. 光电流及光电压 Light induced current and voltage (3 hrs)
4. 光致载流子动力学 Photocarrier Dynamics (3 hrs)

Week 9 期中考试 Midterm-Exam (2 hrs)

Week 10-12 光电化学转化 Principles of photoelectrochemical conversion (9 hrs)

1. 电化学基础 Electrochemical Principle (3hrs)
2. 界面接触 Semiconductor-Liquid Junctions (3 hrs)
3. 界面动力学 Junction Dynamics (3 hrs)

Week 13-14 光化学转化 Principle of photochemical conversion (6 hrs)

1. 光化学反应 Photochemistry Reactions (3 hrs)
2. 光化学动力学过程 Photophysics in Photochemical Conversion (3 hrs)

Week 15 其他太阳能转化，系统集成、管理和应用 Other solar energy conversion process, System integration, management and application (3 hrs)

Week 16 课程项目汇报 Course project report (2 hrs)

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

**The Physics of Solar Energy Conversion**  
Bisquert, Juan Milton: Taylor & Francis Group

**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	Every Lecture	10		
课堂表现 Class Performance				
小测验 Quiz	Every 2 weeks	20		
课程项目 Projects				
平时作业 Assignments				
期中考试 Mid-Term Test	9 <sup>th</sup> Week	40		
期末考试 Final Exam				
期末报告 Final Report	Final Week	30		
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