课程大纲
COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	**MEE5409 能源催化基础 Fundamentals of energy catalysis**
2.	**课程性质** **Compulsory/Elective**	专业选修课 Major Elective Courses
3.	**课程学分/学时** **Course Credit/Hours**	3/48
4.	**授课语言** **Teaching Language**	中英双语 English & Chinese
5.	**授课教师** **Instructor(s)**	曾林，副教授，机械与能源工程系 Email：zengl3@sustech.edu.cn Lin Zeng, Associate Professor, Department of Mechanical and Energy Engineering, Email：zengl3@sustech.edu.cn
6.	**是否面向本科生开放** **Open to undergraduates or not**	是 Yes
7.	**先修要求** **Pre-requisites**	研究生课程如无特殊情况，一般不设先修课（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.） ME304 能源工程技术 ME304 Fundamentals of Energy Engineering
8.	**教学目标** **Course Objectives**	

（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

1）研究生教学目标：本课程旨在介绍能源利用过程中的催化的原理以及各种类型催化技术的最新进展。通过课程学习，掌握能源转化过程中催化的重要性、催化的原理以及各类催化优劣的评价手段，基本熟悉各种催化转化的基本过程和关键技术。进一步，结合现阶段对新能源的开发与利用，介绍现阶段电解制备燃料、纳米催化等最新的研究进展。通过该课程的学习，让学生意识到能源转化过程中催化的重要性，学习到基本的能源催化转化原理，提升运用基础知识和基本原理解决实际问题的能力。

This course aims to introduce the principle of catalysis in the process of energy utilization and the latest development of various types of catalytic technologies. Through the course study, students master the importance of catalysis in the process of energy conversion, the principle of catalysis and the evaluation means of various catalysis, and be basically familiar with the basic processes and key technologies of various catalytic conversion. In addition, combined with the development and utilization of renewable energies at this stage, the latest research progress in electrolytic fuel preparation and nanocatalysis are introduced. Through the course study, students will be aware of the importance of catalysis in the process of energy conversion, learn the basic principles of energy catalytic conversion, and improve their ability to use basic knowledge and basic principles to solve practical problems.

2）本科生教学目标：通过该课程的教学使学生了解能源催化的基本原理以及催化技术的最新发展状况，对能源催化，特别是电参与的催化的科学原理和应用有更广泛的理解和认识。提高学生在能源催化方向理论知识积累，培养学生的工程分析及设计能力。通过该课程的教学使研究生掌握能源催化的关键技术，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 energy catalysis and the latest development of catalytic technologies, and to have a broader understanding of the scientific principles and applications of catalysis for energy conversion and utilization. Through the teaching of this course, undergraduate students can master the basic principles and the key technologies for catalytic technologies, lay a certain foundation for the promotion and development of professional ability in the follow-up scientific research work.

9. 教学方法
Teaching Methods

（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

教室讲授（多媒体授课+案例解析），以及课程项目设计（课程展示+报告）
Classroom lecture (multimedia teaching + case analysis), and course project (oral presentation + report)

对本科生和研究生使用相同方法，不同评估标准（课后作业和课程项目难度不同）
Use the same teaching method for both undergraduate and graduate students, but with different assessment criteria (different difficulty levels in homework and course projects).

10. 教学内容
Course Contents
（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

Section 1	能源现状以及催化基本原理 Energy status and basic principles of catalysis
Section 2	催化的作用以及动力学 Function of catalysis and kinetics
Section 3	酸碱催化与化石能源转化利用 Acid-base catalysis and fossil energy conversion and utilization
Section 4	金属催化与化石能源转化利用 Metal catalysis and fossil energy conversion and utilization
Section 5	电化学催化与可再生能源转化利用 Electrochemical catalysis and renewable energy conversion and utilization
Section 6	配位催化 Coordination Catalysis
Section 7	酶催化 Enzyme catalysis
Section 8	光电催化与光制燃料 Photocatalysis and photo-to-fuel production
Section 9	能源催化的发展前景与发展方向 Development prospect and direction of energy
Section 10	课程项目汇报 Course project report
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11. 课程考核
Course Assessment

	（①考核形式 Form of examination；②.分数构成 grading policy；③如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.） ①考核形式 Form of examination：Assessment ②分数构成 grading policy：a.出勤 Attendance 10%; b. Class performance 10%; c.期末考试 Final exam 40%; d. 期末报告 Final Presentation 40% ③如面向本科生开放，请注明区分内容。If the course is open to undergraduates, please indicate the difference.） 本科生考核分数构成如下 Grading policy for ： a.出勤 Attendance 10%; b. Class performance 10%; c.期末考试 Final exam 30%; d. 期末报告 Final Presentation 50%
12.	**教材及其它参考资料** **Textbook and Supplementary Readings**
	教材： Textbook 1: Laszlo Guczi, Andras Erdohelyi, Catalysis for Alternative Energy Generation, Springer, 2012, ISBN: 978-1-4614-0343-2 Textbook 2: Alessandro Lavacchi, Hamish Miller, Francesco Vizza, Nanotechnology in Electrocatalysis for Energy, Springer, 2015, ISBN: 978-1-4939-4537-5 参考书： Reference 1: Advanced Nanomaterials for Catalysis and Energy: Synthesis, Characterization and Applications, Vladislav A. Sadykov, Elsevier, 2019, ISBN: 978-0-12-814807-5 Reference 2: Catalysis for Green Energy and Technology, Samira Bagheri, Springer, 2017, ISBN: 978-3-319-43104-8 Reference 3: 能源转化催化原理，吴志杰编，中国石油大学出版社，ISBN：9787563660162