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**	新能源技术：生物能源工程 New Energy Technologies: Bioenergy Engineering
2.	**授课院系 Originating Department**	机械与能源工程系 Department of Mechanical and Energy Engineering
3.	**课程编号 Course Code**	ME484
4.	**课程学分 Credit Value**	3
5.	**课程类别 Course Type**	专业选修课 Major Elective Course
6.	**授课学期 Semester**	秋季学期 Fall
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）**	袁文桥 Wenqiao Yuan, Professor, North Carolina State University; Visiting Professor, SUSTech. wayne.yuan2@yahoo.com
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）**	

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	40			8 (field trips and guest lectures)	48

12.	先修课程、其它学习要求 **Pre-requisites or Other Academic Requirements**	MAE303 流体力学或 MAE207 工程流体力学 MAE303 Mechanics of Materials or MAE207 Engineering Fluid Mechanics MAE305 热力学或 MAE308 传热学 MAE305 Engineering Thermodynamics or MAE308 Heat Transfer
13.	后续课程、其它学习规划 **Courses for which this course is a pre-requisite**	None
14.	其它要求修读本课程的学系 **Cross-listing Dept.**	None

教学大纲及教学日历 SYLLABUS

15. **教学目标 Course Objectives**

The goal of this course is to provide students with background, principles and technical breadth relevant to bioenergy development. It will also allow students to identify critical issues and opportunities in bioseparation sciences and technologies. We will first introduce the basic methods of bioseparations that are essential in bioenergy development: analytical methods, cell lysis and flocculation, filtration, sedimentation, and extraction. Then we will focus on latest bioenergy conversion technologies: biomass resources, ethanol fermentation, biodiesel production, anaerobic digestion, thermochemical conversion techniques, and other new technologies.

16. **预达学习成果 Learning Outcomes**

1. Students will be able use differential equations in solving transport phenomenon problems.
2. Students will gain knowledge about contemporary bioenergy conversion processes and technologies.
3. Students will gain scientific writing skills.

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.)

Lectures (40 hours)

Section 1: Overview of bioseparation technologies (1 hour, basic information of bioseparations)

Section 2: Analytical methods (3 hours, overview of major analytical methods in bioseparations)

Section 3: Cell lysis and flocculation (4 hours, major cell harvesting and lysis methods)

Section 4: Filtration (4 hours, dead-end and counter-flow filtration principles)

Section 5: Sedimentation (4 hours, centrifugation and gravity sedimentation principles)

Section 6: Extraction (4 hours, multi-stage solvent extraction principles)

Section 7: Biomass resources (1 hour, photosynthesis and biomass resource overview)

Section 8: Ethanol fermentation I (2 hours, fermentation processes)

Section 9: Ethanol fermentation II (2 hours, lignocellulosic bioethanol fermentation)

Section 10: Biodiesel production I (2 hours, basic biodiesel production technologies)

Section 11: Biodiesel production II (2 hours, biodiesel handling issues)

Section 12: Anaerobic digestion (2 hours, waste management and biogas production)

Section 13: Thermochemical conversion (4 hours, biomass gasification and pyrolysis)

Section 14: New technologies (3 hours, artificial photosynthesis and microbial/bio-fuel cells)

Section 15: Presentations + Report (2 hours, student project presentations)

Guest lectures and field trips (8 hours)

Section 16: microalgae for biofuels (1 hour, latest algae cultivation and processing techniques)

Section 17: biomass thermochemical conversion advances (1 hour, gasification advances)

Section 18: Ocean bioenergy (1 hour, oceanic algae and microbial energy development)

Section 19: Alcohol fermentation (1 hour, butanol fermentation advances)

Section 20: local bioenergy field trip (2 hours, location TBD)

Section 21: local bioenergy field trip (2 hours, location TBD)

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

Bioseparations Science and Engineering, 2nd Edition, by Roger G. Harrison et al., 2015.

Biomass to Renewable Energy Processes, 2nd Edition, by Jay Cheng, 2017

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		5%		
课堂表现 Class Performance		15%		
小测验 Quiz		5%		
课程项目 Projects		None		
平时作业 Assignments		25%		
期中考试 Mid-Term Test		25%		

期末考试 Final Exam		None		
期末报告 Final Presentation		None		
其它（可根据需要改写以上评估方式） Others (The above may be modified as necessary)		25%		阅读报告 Critical report

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
