《可持续发展与可持续能源系统》课程教学大纲

Course outline of Sustainability and Sustainable Energy Systems

<table>
<tr><td colspan="6">课程基本信息（Course Information）</td></tr>
<tr><td>课程代码
（Course Code）</td><td>RE343</td><td>*学时
（Credit Hours）</td><td>32</td><td>*学分
（Credits）</td><td>2</td></tr>
<tr><td rowspan="2">*课程名称
（Course Name）</td><td colspan="5">（中文）可持续发展与可持续能源系统</td></tr>
<tr><td colspan="5">（English）Sustainability and Sustainable Energy Systems</td></tr>
<tr><td>课程性质
(Course Type)</td><td colspan="5">Elective Course</td></tr>
<tr><td>授课对象
（Target Audience）</td><td colspan="5">The course is intended for advanced undergraduates and graduate students</td></tr>
<tr><td>授课语言
(Language of Instruction)</td><td colspan="5">English</td></tr>
<tr><td>*开课院系
（School）</td><td colspan="5">School of Agriculture and Biology</td></tr>
<tr><td>先修课程
（Prerequisite）</td><td colspan="5">Physics, basic mathematics</td></tr>
<tr><td>授课教师
（Instructor）</td><td colspan="2">Norman Scott 教授
美国康奈尔大学荣誉退休教授，美国工程院院士，上海交通大学名誉教授;
Sunghwan Jung 副教授
美国康奈尔大学农业与生命科学学院副教授</td><td>课程网址
(Course Webpage)</td><td colspan="2"></td></tr>
<tr><td>*课程简介
（Description）</td><td colspan="5">（中文 300-500 字，含课程性质、主要教学内容、课程教学目标等）
本门课程主要包含两部分，由两位教授分别讲解：
1）“能源、食品与城市化的可持续系统”由 Norman Scott 教授主讲。人类社会面临的主要问题是创造一个政策支持并鼓励融合能源、环境与自然资源的可持续的社区。最关键的在于联通住房、交通、环境影响、经济发展与社会福利，使得其满足社区的目前要求且能够同时保护环境以供未来的需求。可供融合城市建设分析的系统解决方法是，“绿色”建筑、可再生能源、交通、经济发展、农业与食品系统、水资源管理、垃圾管理以及沟通/治理。学生将学会评估和接触到：i)发展可持续社区的不同方法；ii）节约能源和充分利用能源的好处；iii)替代能源：生物能源、太阳能、风能、地热设计等可再生能源。
2）“可持续工程设计”由 Jung 教授主讲。课程由讨论大自然中的可持续自然设计</td></tr>
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	开始，主要以动物系统中的设计为例。然后讲解如何测算自然设计中的质、势、与能量平衡，根据能量与势的平衡测算目前的可持续能源系统，如太阳能板、风力涡轮等等。学生将会从技术层面学习到能量与质量的转换，并批判地学习作为可持续发展解决方法的生物启发设计。
*课程简介 （Description）	（300-500 words） This course consists of 2 parts: 1)Sustainable Systems for Energy, Food and Urbanization (Prof. Scott's part) The major challenge, facing our society, is to create sustainable communities that are supported and encouraged via policies that integrate energy, environment and natural resources. The focus is interconnectivity of housing, transportation, environmental impacts, economic development and social wellbeing "that meets a community's current needs while preserving the environment so that these needs can continue to be met in the future." A systems approach will be utilized to integrate analysis of urban design, "green" buildings, renewable energy, transportation, economic development, agriculture and food systems, water management, waste management and communication/governance. Students will be able to evaluate and assess: i) various practices needed to develop sustainable communities, ii) benefits of energy conservation and efficiency options, and iii) renewable energy options of bioenergy, solar, wind and geothermal designs. 2) Sustainable engineering designs (Prof. Jung's part) This course starts with discussing sustainable natural designs in nature; mostly in animal systems. Mass, momentum, and energy balance will be introduced to learn how to quantitively evaluate the performance of natural designs. Also, we will practice to evaluate our current sustainable energy systems based on energy and momentum balances; e.g. solar panel, wind turbines, and more. Students will learn technical aspects of energy and mass transfer and will critically think about bio-inspired design as possible sustainable solutions.
课程教学大纲（Course Syllabus）	
*学习目标(Learning Outcomes)	For Prof. Scott's part: 1. The student will be able to evaluate and assess the value of various practices leading to development of sustainable and resilient communities. (A5, B2) 2. The student will be able to identify and determine benefits of energy conservation and efficiency options. (B2, B4) 3. The student will be able to evaluate the various options of bio-based energy systems (B5, C3) 4. The student will be able to evaluate renewable energy options of solar, wind and geothermal designs. (B4, C4) For Prof. Jung's part:

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<tr><td></td><td>1． Students will be able to identify, evaluate, and discuss mass, momentum, and energy balances of natural or sustainable engineering systems. (B2, C3)
2. Students will understand how biological systems achieve sustainable solutions.(B3, B4)
3. Students will evaluate the performance/efficiency of sustainable energy systems. (B4, C5)
4. Students critically think about addressing a problem or need related to sustainability. (C3, D1)</td></tr>
<tr><td>*教学内容
进度安排及要求
(Class Schedule & Requirements)</td><td>
<table>
<tr><th>教学内容</th><th>学时</th><th>教学方式</th><th>作业及要求</th><th>基本要求</th><th>考查方式</th></tr>
<tr><td>Sustainability thinking in developing sustainable communities</td><td>2</td><td>Lectures & Discussions</td><td>Reading of assigned materials and participation in discussion</td><td>Homework assignments</td><td>Covered by final exam at end of 2 weeks</td></tr>
<tr><td>Energy conservation and efficiency</td><td>2</td><td>Lectures & Discussions</td><td>Reading of assigned materials and participation in discussion</td><td>Homework assignments</td><td>Covered by final exam at end of 2 weeks</td></tr>
<tr><td>Bioenergy Systems (basics and design)</td><td>3</td><td>Lectures & Discussions</td><td>Reading of assigned materials and participation in discussion</td><td>Homework assignments</td><td>Covered by final exam at end of 2 weeks</td></tr>
<tr><td>Solar Systems (basics and design)</td><td>3</td><td>Lectures & Discussions</td><td>Reading of assigned materials and participation in discussion</td><td>Homework assignments</td><td>Covered by final exam at end of 2 weeks</td></tr>
<tr><td>Wind Systems (basics and design(</td><td>3</td><td>Lectures & Discussions</td><td>Reading of assigned materials and participation in discussion</td><td>Homework assignments</td><td>Covered by final exam at end of 2 weeks</td></tr>
<tr><td>Geothermal Systems</td><td>2</td><td>Lectures & Discussions</td><td>Reading of assigned</td><td>Homework assignments</td><td>Covered by final</td></tr>
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	(basics and design)			materials and participation in discussion		exam at end of 2 weeks
	Final Exam	1	In-class exam	Written exam	Exam	
	Basic concept: Matter, Momentum, Energy	3	Lectures & Discussions	Participation in group discussion	Homework	Covered by a final exam
	Life on earth: Metabolism, Allometry	3	Lectures & Discussions	Reading of assigned materials	Homework	Covered by a final exam
	Mass, momentum, energy Balances	2	Lectures & Discussions	Participation in group discussion	Homework	Covered by a final exam
	Case studies; efficiency of solar panel and wind turbine	3	Lectures & Discussions	Reading of assigned materials	Homework	Covered by a final exam
	Optimization in natural designs	2	Lectures & Discussions	Reading of assigned materials	Homework	Covered by a final exam
	Bio-inspired engineering designs	2	Lectures & Discussions	Reading of assigned materials	Homework	Covered by a final exam
	Final exam	1	In-class exam	Solving problems	Exam	
*考核方式 (Grading)	（成绩构成） Homework (60%) Final exam (40%)					
*教材或参考资料 (Textbooks & Other Materials)	（必含信息：教材名称，作者，出版社，出版年份，版次，书号） **For Prof. Scott's part,** the text, *'Energy Systems Engineering',* Francis Vanek, Louis Albright and Largus Angenent, McGraw Hill, NY, 2016, ISBN 978-0-07-1787789-9 will be a major reference. However, students **will not be required** to purchase the book because specific course handouts will be provided to students from current and relevant sources and from refereed publications **For Prof. Jung's part**, no textbook required.					

其它（More）	
备注（Notes）	

备注说明：

1．带*内容为必填项。

2．课程简介字数为 300-500 字；课程大纲以表述清楚教学安排为宜，字数不限。