



能源经济管理与 可持续发展

Management of Energy Systems
for a Sustainable Development

#1. 课程背景及简介



化石燃料是主要的能源资源,化石燃料产生的温室气体对陆地和海洋生态系统都产生了不利影响,预计还会进一步影响许多生态系统。

我们目前的能源系统是以线性经济模式运行和管理的,是不可持续的。发展循环经济和能源转型对于我们社会以及陆地和海洋生态系统的可持续发展至关重要。本课程将重点关注这些问题。

食物、水、空气、能源和住所是人类赖以生存的基本需求。我们目前拥有的线性经济系统以不可持续的方式消耗着我们有限的资源。当前线性经济系统产生的废物已导致全球变暖、洪水泛滥、生态系统变化、海洋酸化、水循环中断以及自然灾害发生率增加等。

在本课程中,您将了解线性经济与循环经济的区别、能源转型、能源资源的分布和历史消耗、未来能源需求、可再生能源系统及其在世界各地的发展。该课程还涵盖了欧盟和英国建立循环经济体系以及将当前的线性经济体系转变为循环经济的行动计划和战略。

#2. 学习目标



本课程将解决许多挑战,如:

- ★ 如何构建可持续发展的循环经济模式?
- ★ 如何实现能源转型?
- ★ 欧盟和联合国如何制定净零排放的政策和行动计划?
- ★ 我们目前的能源消费体系如何脱碳?
- ★ 如何促进可再生能源的发展?

#3. 任课教师信息



Prof. X F F

老师目前是爱丁堡大学工程学院教授,英国皇家化学会会士,国际可持续能源技术协会成员, Journal of Modern Green Energy 主编。老师研究活动主要集中在清洁能源、二氧化碳捕获和储存、能量储存、反应工程以及用于生物质转化和温室气体破坏和转化的光催化相关的工艺和催化剂的开发。我还从事材料分离和水处理、颗粒技术、孔隙尺度多相流研究,用于制药和提高石油采收率。



4.课程设置

PBL

周期	时间	课程设置内容	课时
第一周 学习指南 第二周 教授及助教辅导	1月28日 周六	什么是PBL教学方法	1
		PBL教学的常见形式	1
	1月29日 周日	教授课-1 交叉学科PBL课程设计及知识点学习 学习目标：学生将学习与能源和全球变暖相关的基础知识和全方位知识。 描述：本次会议将重点关注能源类型、全球能源分布、历史能源消耗和未来需求、全球变暖及其后果。	3
	1月30日 周一	助教课-1 知识点查漏补缺	2
	1月31日 周二	教授课-2 制定项目方向 学习目标：学生将学习循环经济模式促进可持续发展的概念和相关政策。 描述：本次会议将重点关注线性和循环经济、能源转型。	3
第二周 教授及助教辅导	2月1日 周三	助教课-2 知识点查漏补缺	2
	2月2日 周四	教授课-3 交叉学科课程知识点学习 学习目标：学生将学习联合国、欧盟和英国的能源转型和循环经济发展战略和行动计划。 描述：内容将涵盖欧盟循环经济行动计划、欧盟和中国可持续发展战略、英国循环经济行动计划、净零碳排放。	3
	2月3日 周五	助教课-3 知识点查漏补缺&跟进项目调研进度	2
	2月4日	教授课-4	1.5



	周六	互动与项目设计跟进答疑	
	2月6日 周一	助教课-3 跟进项目调研进度	2
	2月7日 周二	教授课-5 交叉学科课程知识点学习 学习目标：学生将学习不同类型可再生能源的基本原理及其最新发展。 描述：内容涵盖太阳能、风能、氢能、水电、海洋能、地热能、生物质能。	2
第三周 教授及助教辅导 未来展望	2月8日 周三	助教课-5 跟进项目调研进度	2
	2月9日 周四	教授课-6 交叉学科课程知识点学习 学习目标：本课程将让学生了解脱碳的基本方法。 描述：内容涵盖能源储存、二氧化碳捕获、储存和利用、脱碳加热和冷却。	2
	2月10日 周五	助教课-6 知识点查漏补缺& 指导项目成果展示	2
	2月11日 周六	教授课-7 教授点评项目成果	1.5
	2月12日 周日	升学与就业方向展望	1
		个人规划及发展建议	1
总课时	32		

#5. 阅读材料



★ Vera, I., & Langlois, L. (2007). Energy indicators for sustainable development. Energy, 32(6), 875-882.

#6. 项目主题



本课程使用 PBL 教学法，PBL 即项目式学习，是一种以学生为中心的教学



方法，教师提供关键素材构建学习环境，学生通过在此环境里解决一个开放式项目的经历来学习。以下为本课程可选的项目主题：

- 发展循环经济的机遇
- 能源转型的机遇
- 可持续能源与可持续发展的关系

英文版教学大纲



Course Title	Management of Energy Systems for a Sustainable Development
Credit Hours	32 (one credit hour is 45 minutes)
Course Objectives	<p>This class will address the major challenges in development of sustainable energy and circular economy such as:</p> <p>How to build a circular economic mode for sustainable development?</p> <p>How to fulfill energy transition?</p> <p>How to set the policy and action plan in EU and UN to net zero emission?</p> <p>How to decarbonize our current energy consumption system?</p> <p>How to enhance the development of renewable energy?</p>
Course Description	<p>This course covers the major fundamental knowledge and concerns related to energy resources and consumption, circular economy, energy transition, sustainable energy and its development, and energy storage. The course will give students the detailed concepts of energy type, historic data for resource distribution, energy distribution, consumption, why greenhouse gases cause global warming, various type of renewable energy, primary energy, embodied energy and operational energy, net zero carbon emission and energy storage. EU and UK action plan and strategy for the development of circular</p>



	economy and energy transition will also be discussed in detail.
--	---

Brief introduction of the course

Food, water, air, energy and shelter are the essential needs for human to survive. The linear economic system that we currently have consumes our finite resources in an unsustainable way. The wastes produced from current linear economic system have caused global warming, flooding, change of ecosystems, ocean acidification, disruption of the water cycle, and increased occurrence of natural disasters etc.

In this course, you will learn the difference in linear economy and circular economy, energy transition, the distribution and historic consumption of energy resources, future energy demands, renewable energy systems and their development around the world. The course also covers the action plans and strategy in EU and UK for building a circular economic system and for transiting current linear economic system to a circular economy.

	Topics
Module 1	Objective: Student will learn the fundamental knowledge and a full spectrum related to energy and global warming Description: This session will focus on energy type, the distributions of energy source around the world, historic energy consumption and future demands, global warming and its consequence.
Module 2	Objective: Students will learn the concepts and relevant policy of circular economic mode for sustainable development. Description: This session will focus on linear and circular economy, energy transition
Module 3	Objective: Students will learn the strategy and action plans for energy transition and circular economy development from UN, EU and UK Description: The contents will cover the EU circular economy action plan, EU and China strategy for sustainable development, the UK circular economy action plan, Net Zero Carbon Emission.



Module 4	<p>Objective: Students will learn the fundamental and principle of different type of renewable energy and their recent development.</p> <p>Description: Contents cover solar energy, wind energy, hydrogen energy, hydroelectric energy, ocean energy, geothermal energy, and biomass.</p>
Module 5	<p>Objective: This session will give students the ideas of the fundamental approaches for decarburization.</p> <p>Description: The contents cover energy storage, CO2 capture, Storage and Utilization, decarbonising heating and cooling</p>

Required Readings

1.Vera, I., & Langlois, L. (2007). Energy indicators for sustainable development. Energy, 32(6), 875-882.

Suggested list of the topics for the final project (choose one topic)

- 1.Opportunities from the development of circular economy
- 2.Opportunities from energy transition
- 3.The relationship between sustainable energy and sustainable development

Criteria

- 1. Opportunities from the development of circular economy (1000words)
In this essay, you need review the circular economy first, the impact of circular economy on our society and our sustainable development, then use one or two examples to discuss the opportunities in detail. For example, you can discuss the implement of circular economy in design stage of a product and its opportunities in the future, in terms of either research or business.
- 2.Opportunities from energy transition (1000words)
In this essay, you need to review energy transition, the impact of energy transition on our current energy system and our sustainable development, then use one or two examples to discuss the opportunities in detail, in terms of either research or business. For example, you can use solar energy as an example.
- 3.The relationship between sustainable energy and sustainable development

(1000words)

In this essay, you need review sustainable energy, the importance of sustainable development and the requirement from sustainable development, and then discuss their relationship. Then use one or two examples to discuss the opportunities in detail.

Class Expectation

From this course, you will not only learn the fundamental knowledge related to sustainable development, but also will see the broad picture in energy transition and circular economy. After this course, you will be able to stand at a high level to oversee the crisis, challenges and demands of the global concerns in the sustainable development of a circular economic system and energy transition for our society. You may be able to justify what kind of job or career is sustainable and has a good future in terms of whether the job can merge the circular economic system or can contribute to the sustainable development in energy, materials etc.