PHYS1003 Energy and Related Environmental Issues

Course Outline- Fall 2024

1. Instructor(s)

L1:

Name: Dr. Man-Fung Cheung

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L2:

Name: Prof. Jaeck Berthold

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2. Instructional/Teaching Assistant(s)

IAs:	**Admin & Help Desk**	FONG Shing Hei physfong@ust.hk
TAs:	**Section L1**	MA Chen cmaaq@connect.ust.hk
	Section L2	ZHANG Ren rzhangcl@connect.ust.hk
	Demo	LAU Yat Fan yflauag@connect.ust.hk

3. Meeting Time and Venue

Lectures:

Section	**L1**	**L2**
Date/Time	Tuesday & Thursday 09:00am - 10:20am	Wednesday & Friday 1:30pm - 2:50pm
Venue	LT-F	LT-G

Q&A sessions:

Date/Time: After Lectures

Venue: Lecture Venue

Or via canvas, email

Help Desk:

Date/Time: Monday 13:00-14:00 (from 2 Sep, except public holiday)

Venue: Rm 1103, near to LT-A

4. Course Description

Credit Points: 3

Pre-requisite: A passing letter grade in LANG 1401 OR LANG 1402 OR LANG 1403 OR LANG 1404 OR LANG 1002 (prior to 2022-23)

Brief Information/synopsis:

This course will introduce the basic concepts of the physical principles behind energy. Forms of energy (including fossil energy, nuclear energy and various forms of renewable energy) and their use for electricity generation, as well as their impacts on the environment from both global and regional perspectives will be covered. Issues related to energy conservation and related environmental issues in Hong Kong and the rest of the world will be addressed.

5. Intended Learning Outcomes

Upon completion of this course, students should be able to

1. Identify fossil fuels and other energy resources, which we are using and the issues arising from the use of these energy resources.
2. Explain the thermodynamic constraints of energy conversion
3. Describe the engines used in land, sea, and air transportations, as well as in the generation of electricity.
4. Explain how the consumption of fossil fuels facilitates our modern life.
5. Discuss environmental effects of energy consumption in Hong Kong and the world.

6. Assessment Scheme

1. Midterm Examination duration: 90 minutes (on Sat 19 Oct, 10:00am-11:30am)
2. Group Project and Poster Presentation
3. Question of the day (QoD) during/after lectures
4. Suggested problem sets with solutions provided one week after the assignment
5. Percentage of coursework, examination, etc.:

Assessment	**Assessing Course ILOs**
Midterm Exam - 30%	1, 2, 3, 4
Group Project Report – 35%	2, 4, 5
Poster Presentation - 25%	2, 4, 5
Question of the day (QoD) - 10%	1, 2, 3, 4, 5

*The grading is assigned based on students' performance in assessment tasks/activities.

7. Student Learning Resources

Recommended Reading:

Reference text book of the lecture

Sustainable energy without the hot air, *David MacKay (2008)*

Free online access: www.withouthotair.com

Further Reading

Energy: A Beginner's Guide, Vaclav Smil, OneWorld Publishers, Oxford, 2006

Data Resources

1. Our World in Data, https://ourworldindata.org/
2. Gapminder World, www.gapminder.org/

Teaching and Learning Activities:

Scheduled activities: 4 hours (lectures + Q&A session + Help Desk sessions)

8. Course Schedule

Lecture Schedule

Class	Lectures	L1	L2	Remarks
1	01. Introduction to the course and Human Energy Consumption	Sept 3	Sept 4	
2	02. Fossil Fuels & Temperature	Sept 5	Sept 6	
3	03. Heat and Internal Energy	Sept 10	Sept 11	
4	04. Laws of Thermodynamics I: Work & 1st Law of Thermodynamics	Sept 12	Sept 13	
5	05. Laws of Thermodynamics II: Typical Processes with Ideal Gas & Heat Engines	Sept 17	Sept 25	
6	06. Laws of Thermodynamics III: Entropy & Carnot Cycle	Sept 19	Sept 27	
7	07. Heat Engines and Heat Pumps in our daily lives I	Sept 24	Oct 2	
8	08. Heat Engines and Heat Pumps in our daily lives II	Sept 26	Oct 4	
9	Lecture Activity: Project Introduction + Group Formation	Oct 8	Oct 9	
10	09. Electricity I: Physics of Electricity	Oct 3	Oct 16	
11	10. Electricity II: Electricity Generation and Distribution	Oct 10	Oct 18	
12	11. Hydro & Wind Power	Oct 15	Oct 25	
13	12. Hydro & Wind Power (cont.)	Oct 17	---	
	Midterm exam 10:00 am – 11:30 am on 19 Oct (Sat).	Oct 19	Oct 19	Coverage: L01 – L08
14	Lecture Activity: Project Briefing	Oct 22	Oct 23	
15	13. Solar Power (generation and storage)	Oct 24	Oct 30	
16	14. Nuclear Power I – Fission	Oct 26	Nov 1	
17	15. Nuclear Power II – Fusion	Oct 31	Nov 1	
18	16. Energy consumption in transportation	Nov 5	Nov 6	
19	17. Energy consumption in our daily lives I	Nov 7	Nov 8	
20	18. Energy consumption in our daily lives II	Nov 12	Nov 13	

21	Lecture Activity: Project Consultation	Nov 14	Nov 15	
22	19. Environmental Impacts from of non-renewable energy I	Nov 19	Nov 20	
23	20. Environmental Impacts from of non-renewable energy II	Nov 21	Nov 22	
24	21. Global warming and Climate change	Nov 26	Nov 27	
25	Lecture Activity: Project Presentation (Poster Session)	Nov 28	Nov 29	

Important Dates and Events:

Events	L1	L2	Remarks
Lecture Activity: Project Introduction + Group Formation	Oct 3	Oct 9	
Midterm exam 9:30 am – 11:00 am	Oct 19	Oct 19	Coverage: L01 – L08
Lecture Activity: Project Briefing	Oct 22	Oct 23	
Project Abstract Submission (submit as a group)	Oct 30	Oct 30	
Progress Reports Submission (submit as a group)	Nov 13	Nov 13	
Submission of Project	Nov 27	Nov 27	
Lecture Activity: Poster Presentation	Nov 28	Nov 29	