Faculty of Engineering
The University of Hong Kong

EMEE6005 RENEWABLE ENERGY TECHNOLOGY I: FUNDAMENTAL

Course Outline

Course code:	EMEE6005
Course title:	Renewable energy technology I: fundamental
Offered by (department):	Department of Electrical and Electronic Engineering
Level:	MSc
Credit units:	6 Credits
Pre-requisite course code:	Nil
Co-requisite course code:	Nil
Study load (hours):	150 hours
Contact hours:	30 hours
Student quota:	Maximum 140
Course type:	Elective
Offer in academic year:	First semester
Assessment (%):	Written examination (70 %) Continuous assessment (30 %)

This document contains information for the course EMEE6005 Renewable energy technology I: fundamental.

Its intention is for students undertaking the course to be well informed in terms of its learning expectations and also to help make their learning journey an enjoyable one.

Information presented in this document was correct at the time of printing.

Course Description and Aims

This course focuses mainly on different renewable energy technologies including hydro power, wind power, bioenergy, solar thermal, solar PV, energy storage, and energy usage.

The specific course objectives are as follows:

1. to have a deep understanding of the important role played by renewable energy in our energy supply;
2. to grasp the fundamentals of different energy resources;
3. to understand energy storage and its important role in solving intermittency and other issues; and
4. to understand how to use energy more efficiently with solid state lighting and other energy saving technologies.

Teaching Staff

Contact details for the course co-ordinator and course teachers are shown below:

Course Co-ordinator	
Name (Department: Specialty)	**Contact Details**
Dr. MWL Ko (Dept. of Mechanical Engineering: Mechanics)	E-mail: matchko@hku.hk Phone: 3917 2123 Office: Haking Wong Building, Room 5-22
Course Teachers	
Name (Department: Specialty)	**Contact Details**
Dr. MWL Ko (Dept. of Mechanical Engineering: Mechanics)	E-mail: matchko@hku.hk Phone: 3917 2123 Office: Haking Wong Building, Room 5-22

Course Learning Outcomes (Alignment with Output Standards of Engineering Council)

By the end of this course students should be able to demonstrate a threshold level of mastery of the following learning outcomes. The appropriate specific learning outcomes of Engineering Council associated with each of the course learning outcomes are also presented.

Course Learning Outcomes (CLO)	**Relevant Specific Learning Outcomes of Engineering Council for Masters Degree Graduates (Equivalent to Programme Learning Outcomes)**
1. Demonstrate an understanding of the different renewable energy technologies	I. Underpinning science and mathematics (a) A comprehensive understanding of the relevant scientific principles of the specialization (b) A critical awareness of current problems and/or new insights much of which is at, or informed by, the forefront of the specialization. (c) An understanding of concepts relevant to the discipline, some from outside engineering, and the ability to critically evaluate and apply them effectively.
2. Analyze energy conversion problems quantitatively	II. Engineering Analysis (a) The ability to use fundamental knowledge to investigate new and emerging technologies; (b) The ability to apply appropriate models for solving problems in engineering, and the ability to assess the limitations of particular cases; (c) The ability to collect and analyse research data and use appropriate engineering tools to tackle unfamiliar problems, such as those with uncertain or incomplete data or specifications, by the appropriate innovation, use or adaptation of engineering analytical methods.

3. Identify relevant engineering solutions in energy device systems	III. Design (a) The ability to apply original thought to the development of practical solutions for products, systems, components or processes. IV. Economic, social and environmental context (a) Knowledge and understanding of management and business practices, and their limitations, and how these may be applied appropriately, in the context of the particular specialization; (b) The ability to make general evaluations of risks through some understanding of the basis of such risks. V. Engineering Practice (a) A thorough understanding of current practice and its limitations, and some appreciation of likely new developments; (b) Advanced level knowledge and understanding of a wide range of engineering materials and components; (c) The ability to apply engineering techniques taking account of a range of commercial and industrial constraints.

Assessment Methodologies

CLO No.	Performance Criteria	Metric	Rubric	Standard
1	Demonstrate an understanding of the different renewable energy technologies	Assessment will be based on mid-term and final examination.	A student will demonstrate successful completion of this outcome by achieving grade C or above.	Not less than 70% of the students achieving grade C or above
2	Analyze energy conversion problems quantitatively	Assessment will be based on mid-term and final examination.	A student will demonstrate successful completion of this outcome by achieving grade C or above.	Not less than 70% of the students achieving grade C or above
3	Identify relevant engineering solutions in energy device systems	Assessment will be based on mid-term and final examination.	A student will demonstrate successful completion of this outcome by achieving grade C or above.	Not less than 70% of the students achieving grade C or above

Course Teaching and Learning Activities and Alignment with Learning Outcomes

Besides lecture notes and recommended textbooks, video clips and useful handouts are provided as appropriate to enhance the learning experiences. Also, Office Hours is fixed to help answer questions from students after class.

The course contents and its alignment with the course learning outcomes and assessment tasks are described below.

Calendar Entry

This course focuses mainly on different renewable energy technologies including hydro power, wind power, bioenergy, solar thermal, solar PV, energy storage, and energy usage. The specific course objectives are: (1) to have a deep understanding of the important role played by renewable energy in our energy supply; and (2) to grasp the fundamentals of different energy resources; (3) to understand energy storage and its important role in solving intermittency and other issues; and (4) to understand how to use energy more efficiently with solid state lighting and other energy saving technologies.

Topics include: renewable energy in a big picture; hydro power; winder power; solar thermal; solar PV; bioenergy; energy storage: intermittency and other issues; energy usage: solid state lighting.

Course Content	Responsible Lecturer(s)	Contact Hours	Total Study Load (hours)	Course Learning Outcomes
Week 1 Introduction				
Introduction: Renewable energy in a big picture	Dr. M. W. L. Ko	2.5	12.5	1, 2, 3
Weeks 2-8 Different renewable energy technologies				
Hydro power; winder power	Dr. M. W. L. Ko	7.5	37.5	1, 2, 3
Thermoelectricity	Dr. M. W. L. Ko	5	25	1, 2, 3
Solar energy conversion (Solar Thermal, Solar PV)	Dr. M. W. L. Ko	5	25	1, 2, 3
Weeks 9-12 Energy storage and usage				
Bioenergy	Dr. M. W. L. Ko	10	50	1, 2, 3

[#] Note that the dates of the assessment tasks align with the topic(s) and not necessarily the Teaching Week. The exact dates of the assessment tasks (and their due dates) will be provided by the teacher of the respective task.

Guidelines on Grading and Standards of Assessment

HKU has adopted standards-based assessment. The general course grade descriptors aim to provide descriptions on the normal expectations of student achieving particular grades.

Course Grade	Description
A	Exceptionally good performance demonstrating a superior understanding of the subject matter, a foundation of extensive knowledge, a skilful use of concepts, and ability to analyze and evaluate problems.
B	Good performance demonstrating capacity to use the appropriate concepts, a good understanding of the subject matter, and an ability to handle the problems encountered in the course.
C	Adequate performance demonstrating an adequate understanding of the subject matter, an ability to handle relatively simple problems, and adequate preparation for moving on to more advanced work in the field.
D	Minimally acceptable performance demonstrating at least partial familiarity with the subject matter and some capacity to deal with relatively simple problems, but also demonstrating deficiencies serious enough to make it inadvisable to proceed further in the field without additional work.
F	Unacceptable performance demonstrating unfamiliarity with the subject matter, and lack of capacity to deal with relatively simple problems, and also demonstrating deficiencies serious enough to make it advisable to retake the course.

Course Assessment Tasks and Alignment with Learning Outcomes

Assessment tasks in this course are described below, which includes weighting, assessment type, and alignment with course learning outcomes.

Weighting of continuous assessment and written examination

Assessment Type	Percentage of Total Assessment (%)	Description	Course Learning Outcomes
Continuous Assessment	30 %	Midterm (30%) (1 hr)	1, 2, 3
Written Examination	70 %	Final examination (70%) (2 hr)	1, 2, 3

Course and Assessment Policy

Late submission / Missed quiz

There will be no 'make-up' for a missed quiz under normal circumstances. For students who are absent from continuous assessment such as mid-term tests with genuine reasons, the percentage marks obtained in the final examination of that subject will be used as the continuous assessment marks in per cent. Genuine reasons include medical conditions with doctor's certificate and urgent family matters with proof.

Academic conduct

The University Regulations on academic misconduct will be strictly enforced. Students are strongly recommended to refer to http://www.hku.hk/student/plagiarism/ for further details. In addition, students should familiarise themselves with http://lib.hku.hk/turnitin/.

Means / Processes for Student Feedback on Course

SETL

Students are asked to complete this evaluation (Student Evaluation of Teaching and Learning) of their learning experiences at the conclusion of the course. Questionnaire items relate to the overall evaluation of the course as well as an evaluation of teaching.

Other means of student feedback

1. Post questions or concerns on Moodle
2. Email or call instructors directly
3. Come over to the instructors' office during office hours

Learning Resources

Required text / References

1.	Godfrey Boyle	Renewable energy: power for a sustainable future, 2nd edition, Oxford University Press, 2004.
	Other references	
2.	Frances S. Sterrett	Alternative fuels and the environment, Lewis Publishers, 1995.
3.	Laurie Bernham	Renewable energy sources for fuels and electricity, Island Press, 1993.
4.	Wrixon, G. T.	Renewable energy-2000, Springer-Verlag, 1994.
5.	A.W. Culp	Principles of Energy Conversion, McGraw-Hill Co., 1991.
6.	N.K. Bansal	Renewable energy sources and conversion technology, Tata McGraw-Hill, 1990.
7.	Twidell. J & Wier	Renewable Energy Sources, E.&F.N.Spon, 1990.

Course website

Selected course material will be posted on Moodle platform in addition to announcements and important dates/deadlines: students are advised to regularly consult the Moodle site for this course.

Date: 04 Sep, 2024 Completed by: Dr. MWL Ko