



Course Syllabus (Academic Year 2022)

School of Interdisciplinary Studies, Kanchanaburi Campus, Mahidol University

- Course No. and Title** : KAED 382 Renewable Energy for Sustainable Environment
Credit (study hours) : 3 (3-0-6)
- Program Name** : Bachelor of Engineering in Environmental
Engineering and Disaster Management
- Course Module** : Free elective course
Pre/co-requisite : -
- Class Semester** : 1st Semester 2nd Semester Academic Year 2022
- Class Schedule & Venue** : **Friday 9:00 – 12:00, Room L-218**
- Class Coordinator** : Dr. Pensiri Prachakittikul (PP)
Contact No.: 086-024-0919 Email: pensiri.prc@mahidol.edu

7. Course Description

Introduction and environmental impacts of currently used energy, especially from fossil fuels, explanation and discussion on background, importance, basic knowledge and current research including case studies, of renewable energy technologies in various forms, such as, energy from water, wind, solar, geothermal resources, and biomass fuels (i.e. biodiesel, ethanol, bio-oil, and biogas) focusing on roles of clean technology, waste recycling, and energy cost reduction for sustainable environment

8. Course Objectives / Course Learning Outcomes (CLOs)

No.	Objectives / CLOs	Expected Skills / Knowledge			PLOs
		Specific	Generic	Knowledge	
1.	Explain the difference between renewable and nonrenewable energy resources.	SS1	GS1 – GS4	K1 – K8	1, 4
2.	Explain the different types of renewable energy technologies that are currently available, and how they are used to provide energy.	SS2 – SS3	GS1 – GS4	K1 – K8	1, 4
3	Identify strengths and limitations associated with the different renewable energy technologies.	SS2-SS3	GS1 – GS4	K1-K8	1, 4

No.	Objectives / CLOs	Expected Skills / Knowledge			PLOs
		Specific	Generic	Knowledge	
4	Evaluate the environmental and social impacts of renewable and nonrenewable energy	SS1-SS3	GS1 – GS4	K1-K8	1, 4, 5
5	Select potential appropriate renewable energy technologies that can be used in a particular situation.	SS2-SS3	GS1 – GS4	K1-K8	1, 4, 5

9. Class Instructor List

- 9.1 Dr. Pensiri Prachakittikul (PP) Contact No.: 0860240919 Email: pensiri.prc@mahidol.edu
- 9.2 Asst. Prof. Dr. Watchara Chintakovid (WCH) Contact No.: 0863195819 Email: watcharra.chi@mahidol.ac.th
- 9.3 Dr. Patchawee Nualkhao (PN) Contact No.: 0828683270 Email: patchawee.nua@mahidol.ac.th
- 9.5 Dr. Kwuanchanok Chansawang (KC) Contact No.: 0818293921 Email: kwuanchanok.cha@mahidol.ac.th
- 9.4 Asst. Prof. Dr. Weerawut Chaiwat (WC) Contact No.: 0845223098 Email: weerawut.cha@mahidol.edu
Special Instructor from Department of Chemical Engineering, Mahidol University
- 9.5 Assoc. Prof. Dr. Surawut Chuangchote (SC) Contact No.: 0863880493 Email: surawut.chu@gmail.com
Special Instructor from King Mongkut's University of Technology Thonburi (KMUTT)
- 9.6 Dr. Chadin Chutakindaket (CC1) Contact No.: 0922266996 Email: chadin.ch@gulf.co.th
Special Instructor from Gulf Energy Development Public Company Limited
- 9.7 Assoc. Prof. Dr. Chawin Chantharasenawong (CC2) Contact No.: 0840868666 Email: chawin.cha@mail.kmutt.ac.th
Special Instructor from King Mongkut's University of Technology Thonburi (KMUTT)

10. Course Outline

Week	Date	Contents	CLOs	Teaching & Learning Method	Instructor's Names
1	13 Jan 2023 9.00-12.00	- Course introduction - Introduction to renewable and alternative energy and energy situation in Thailand and worldwide	1, 4	Lecture and case study	PP
2-3	3 Feb 2023 9.00-16.00	Wind energy	2-5	Lecture /Case study/ Quiz /Activities in class	CC2 Special Instructor

Week	Date	Contents	CLOs	Teaching & Learning Method	Instructor's Names
4	10 Feb 2023 9.00-12.00	Geothermal energy	2-5	Lecture /Case study/ Quiz /Activities in class	PN
5-6	17 Feb 2023 9.00-16.00	Hydro energy & Hydropower	2-5	Lecture /Case study/ Quiz /Activities in class	CC1 Special Instructor
7-8	3 Mar 2023 9.00-16.00	Solar energy & Hydrogen energy	2-5	Lecture /Case study/ Quiz /Activities in class	SC Special Instructor
7-10 Mar 2023 Mid-term Examination					
9	17 Mar 2023 9.00-12.00	Ethanol: Fermentation	2-5	Lecture and case study	WCH
10	24 Mar 2023 9.00-12.00	Biodiesel: Extraction and transesterification	2-5	Lecture /Case study/ Quiz /Activities in class	WCH
11	31 Mar 2023 9.00-12.00	Biomass: Combustion, pyrolysis, gasification	2-5	Lecture and case study	WC Special Instructor
12	7 Apr 2023 9.00-12.00	Biomass: Combustion, pyrolysis, gasification	2-5	Lecture /Case study/ Quiz /Activities in class	WC Special Instructor
13	14 Apr 2023** 9.00-12.00	Biogas energy	2-5	Lecture /Case study/ Quiz /Activities in class	PP
14	21 Apr 2023 9.00-12.00	Biogas energy	2-5	Lecture /Case study/ Quiz /Activities in class	PP
15	28 Apr 2023 9.00-12.00	Nuclear energy	2-5	Lecture /Case study/ Quiz /Activities in class	KC
28/10/2021 Final Examination					

**** The class affected by the national holiday (Songkran Festival), a make-up class will be announced later.**

11. Course Assessment

No.	Methods / Activities	Regulations	CLOs	Week	Weight Distribution (%)
11.1	Mid-term exam	- Content (Week 1-8) - Closed book - Faculty-approved calculator	1-5		25
11.2	Final exam	- Content (Week 10-16) - Closed book - Faculty-approved calculator	1-5		25
11.4	Assignment/ Activities in class	Dependent on each instructor assignment (3.75% x 8 classes)	1-5	2-8,9-15	30
11.5	Group project and presentation	Projects–Rubric scoring	1-5	To be announcement	20
				Total	100

12. Grading System

Criterion-referenced evaluation

Grade	Score	Grade	Score	Grade	Score	Grade	Score
A	≥ 80 %	B	70 – 74.99%	C	60 – 64.99%	D	50 – 54.99%
B+	75 – 79.99%	C+	65 – 69.99%	D+	55 – 59.99%	F	< 50 %

Norm-referenced evaluation

13. References

13.1 V. Nelson, Introduction to Renewable Energy, CRC press, 2011.

13.2 D.L. Klass, Biomass for Renewable Energy, Fuels, and Chemicals, Academic press, 1998.

13.3 S.C. Capareda, Introduction to Biomass Energy Conversion, CRC press, 2014.

13.4 สื่อออนไลน์กระทรวงพลังงาน

Note:

Specific Skill (SS)	
SS1	Understand basic of renewable and non-renewable energy
SS2	To be able to identify and select suitable types of renewable energy resources for proper conversion technologies for each production area.
SS2	Understand basic principles and suitable conditions of conversion process technologies from biomass, solar, water, wind, and geothermal resources to produce renewable energy such as biofuels, heat, electricity.
Generic Skill (GS)	

GS1	Systematic thinking, problem solving and analytical skills
GS2	Professional ethics and responsibility
GS3	Teamwork skill
GS4	Creativity and Presentation skill
Knowledge (K)	
K1	Physico-chemical conversion technologies of biomass to bioenergy (Biodiesel)
K2	Bio-chemical conversion technologies of biomass to bioenergy (Ethanol and Biogas)
K3	Thermo-chemical conversion technologies of biomass to bio-energy (Biochar, Bio-oil, and Syngas)
K4	Solar cell, solar energy for electricity, and solar thermal energy technologies
K5	Hydro energy technologies for power production
K6	Wind energy technologies
K7	Geothermal energy technologies
K8	Nuclear energy technologies
Program Learning Outcomes (PLO)	
PLO1 reinforced	Apply environmental engineering principles and knowledge to systematic solutions according to Professional Standards
PLO4 reinforced	Effectively present and discuss engineering knowledge to related professional people for objective fulfillment by using proper language and media
PLO5 reinforced	Work as an environmental engineer with other people to solve complicated problems according to economic, social, and environmental issues