

## Tamkang University Academic Year 107, 1st Semester Course Syllabus

Course Title	ADVANCED ENERGY CONVERSION	Instructor	KANG SHUNG-WEN
Course Class	TEBXD1A DOCTORAL PROGRAM, DEPARTMENT OF MECHANICAL AND ELECTRO-MECHANICAL ENGINEERING, 1A	Details	<ul style="list-style-type: none"> <li>◆ Selective</li> <li>◆ One Semester</li> <li>◆ 3 Credits</li> </ul>
<p>Departmental Aim of Education</p>			
<p>I. To prepare students who have a comprehensive understanding of the principles of applied sciences and engineering to be innovators in the field of mechanical and electromechanical engineering.</p> <p>II. To train emerging professionals who possess a high level of expertise and ethical standards who will become independent research and development leaders in the industry.</p> <p>III. To motivate students who will pursue continuing education as a means to stay on the cutting edge of global competitiveness and meet changes in their careers and the workplace with confidence and ease.</p>			
<p>Departmental core competences</p>			
<p>A. Head: Knowledge of mechanical and electromechanical engineering.</p> <p>B. Hand: Hands-on skills and practical realization.</p> <p>C. Heart: Love of learning and innovation.</p> <p>D. Eye: Vision of progress and improvements.</p>			
Course Introduction	<p>This course covers fundamentals of thermodynamics, flow and transport processes as applied to energy systems. Topics include analysis of energy conversion in thermomechanical, electrochemical, and photoelectric processes in existing and future power and transportation systems, with emphasis on efficiency, environmental impact and performance. Applications include Concentrated Solar Power Stirling Engine Generation System, Thermal Storage System, and fuel cells and batteries, etc.</p>		

**The Relevance among Teaching Objectives, Objective Levels and Departmental core competences**

I.Objective Levels (select applicable ones) :

- (i) Cognitive Domain : C1-Remembering, C2-Understanding, C3-Applying,  
C4-Analyzing, C5-Evaluating, C6-Creating
- (ii) Psychomotor Domain : P1-Imitation, P2-Mechanism, P3-Independent Operation,  
P4-Linked Operation, P5-Automation, P6-Origination
- (iii) Affective Domain : A1-Receiving, A2-Responding, A3-Valuing,  
A4-Organizing, A5-Charaterizing, A6-Implementing

II.The Relevance among Teaching Objectives, Objective Levels and Departmental core competences :

- (i) Determine the objective level(s) in any one of the three learning domains (cognitive, psychomotor, and affective) corresponding to the teaching objective. Each objective should correspond to the objective level(s) of ONLY ONE of the three domains.
- (ii) If more than one objective levels are applicable for each learning domain, select the highest one only. (For example, if the objective levels for Cognitive Domain include C3,C5,and C6, select C6 only and fill it in the boxes below. The same rule applies to Psychomotor Domain and Affective Domain.)
- (iii) Determine the Departmental core competences that correspond to each teaching objective. Each objective may correspond to one or more Departmental core competences at a time. (For example, if one objective corresponds to three Departmental core competences: A,AD, and BEF, list all of the three in the box.)

No.	Teaching Objectives	Relevance	
		Objective Levels	Departmental core competences
1	The goal of the course is to provide fundamentals of thermodynamics, flow and transport processes as applied to energy systems.	C6	ABCD

**Teaching Objectives, Teaching Methods and Assessment**

No.	Teaching Objectives	Teaching Methods	Assessment
1	The goal of the course is to provide fundamentals of thermodynamics, flow and transport processes as applied to energy systems.	Lecture, Discussion, Problem solving	Written test, Report, Participation

This course has been designed to cultivate the following essential qualities in TKU students

Essential Qualities of TKU Students	Description
◆ A global perspective	Helping students develop a broader perspective from which to understand international affairs and global development.
◆ Information literacy	Becoming adept at using information technology and learning the proper way to process information.
◆ A vision for the future	Understanding self-growth, social change, and technological development so as to gain the skills necessary to bring about one's future vision.
◆ Moral integrity	Learning how to interact with others, practicing empathy and caring for others, and constructing moral principles with which to solve ethical problems.
◆ Independent thinking	Encouraging students to keenly observe and seek out the source of their problems, and to think logically and critically.
◆ A cheerful attitude and healthy lifestyle	Raising an awareness of the fine balance between one's body and soul and the environment; helping students live a meaningful life.
◆ A spirit of teamwork and dedication	Improving one's ability to communicate and cooperate so as to integrate resources, collaborate with others, and solve problems.
◆ A sense of aesthetic appreciation	Equipping students with the ability to sense and appreciate aesthetic beauty, to express themselves clearly, and to enjoy the creative process.

#### Course Schedule

Week	Date	Subject/Topics	Note
1	107/09/10 ~ 107/09/16	Introduction of the course	
2	107/09/17 ~ 107/09/23	Energy Conversion and General Energy Analysis	
3	107/09/24 ~ 107/09/30	The first law of thermodynamics	
4	107/10/01 ~ 107/10/07	The second law of thermodynamics	
5	107/10/08 ~ 107/10/14	Entropy	
6	107/10/15 ~ 107/10/21	Irreversibility and availability	
7	107/10/22 ~ 107/10/28	Power and refrigeration cycles	
8	107/10/29 ~ 107/11/04	Exergy: A Measure of Work Potential	
9	107/11/05 ~ 107/11/11	Vapor and Combined Power Cycles	
10	107/11/12 ~ 107/11/18	Midterm test	
11	107/11/19 ~ 107/11/25	Concentrated Solar Power Stirling Engine Generation System	
12	107/11/26 ~ 107/12/02	Thermal Storage System	

13	107/12/03 ~ 107/12/09	fuel cells and batteries	
14	107/12/10 ~ 107/12/16	future power and transportation systems	
15	107/12/17 ~ 107/12/23	Gas-Vapor Mixtures and Air-Conditioning	
16	107/12/24 ~ 107/12/30	Chemical Reactions	
17	107/12/31 ~ 108/01/06	Chemical and Phase Equilibrium	
18	108/01/07 ~ 108/01/13	Final test	
Requirement			
Teaching Facility	Computer, Projector		
Textbook(s)	note and papers		
Reference(s)	Thermodynamics An Engineering Approach, 5th ed, McGraw-Hill		
Number of Assignment(s)	10 (Filled in by assignment instructor only)		
Grading Policy	◆ Attendance : 10.0 %   ◆ Mark of Usual : 20.0 %   ◆ Midterm Exam : 30.0 % ◆ Final Exam : 30.0 % ◆ Other 〈homework〉 : 10.0 %		
Note	This syllabus may be uploaded at the website of Course Syllabus Management System at <a href="http://info.ais.tku.edu.tw/csp">http://info.ais.tku.edu.tw/csp</a> or through the link of Course Syllabus Upload posted on the home page of TKU Office of Academic Affairs at <a href="http://www.acad.tku.edu.tw/CS/main.php">http://www.acad.tku.edu.tw/CS/main.php</a> . <b>※ Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.</b>		