

Class Syllabus – Fall Semester, 115 Academic Year

Department of Mechanical Engineering, National Chung Cheng University

Course Name: : Thermodynamics I				Dept.		IBPME
				Course Code		4232504
Instructors	Yong-Song Chen	Credits	3	Compulsory	Grade	Second-Year
EMI	☒ Yes ☐ No					
Course type	☐ Humanistic Care Course ☐ Problem-oriented Course ☐ Integrate the curriculum ☐ Internship ☐ Competition Special Course ☒ Topic-based courses ☐ Practical courses ☐ Other					
Prerequisites: Fundamental Physics Class Description : This course provides basic knowledge of thermodynamics and its applications on Engineering, including properties of substances, phase change, work, heat, and energy. The zero law, the first law, and the second law will be introduced. This course is taught in English. In-class discussion is extremely important to your grade. If you don't want to participate in discussion, do not register for this class.						
Textbooks	Moran, Shapiro, Boettner, Bailery. "Moran's Principles of Engineering Thermodynamics," 9 th ed., SI Version, John Wiley & Sons, 2018. ISBN: 978-1-119-45406-9 Please respect intellectual property rights and do not illegally photocopy textbooks specified by the instructor.					
An overview of the main points of teaching						
Teaching Materials	☐ PPT ☐ Self-edited textbooks ☐ Self-made instructional videos ☒ Course handouts ☐ Teaching Procedures ☐ Other					
Teaching Methods	☒ Lectures ☐ Oral presentation ☐ Case studies ☐ Group discussion ☒ Problem-oriented learning ☐ Other					
Evaluation Tools	☒ Mid-term Exam ☒ In-class Quiz ☐ Homework ☐ Final Report ☒ Other ☒ Final Exam ☐ In-class homework ☐ Mid-term Report ☐ Special Report ☐ Scales					
Teaching Resources	☒ Course website ☐ Electronic files of textbooks are available for download ☐ Internship website					

Instructor's Information						
Course Outlines		Teaching Hours				Core Competence
Unit Title	Contents	Lectures	Demo	Practice	Other	
Introductory concepts and definitions	1. Using thermodynamics 2. Systems 3. Measuring mass, length, time and forces Specific volume, pressure, and temperature	3				B1, B2
Energy and the first law of thermodynamics	1. Work and energy 2. Energy transfer by heat 3. Energy balance for a closed system Energy analysis for cycles	5				B1, B2, B6
Evaluating properties	1. States 2. p-v-T relation 3. Thermodynamic properties 4. Generalized compressibility chart 5. Ideal gas model 6. Internal energy, enthalpy and specific heats 7. Evaluating changes of properties Polytropic process of an ideal gas	7				B1, B2
Using Energy	1. Conservation of mass and energy for a control volume system 2. Steady and Transient analysis Transient analysis	9				B1, B2, B6
The second law of thermodynamics	1. What is the 2 nd law? 2. Irreversibilities 3. The second law for cycles Carnot cycle	12				B1, B2, B6
Using entropy	1. Introducing entropy and defining entropy change 2. Entropy balance for closed systems 3. Entropy rate balance for control volumes Isentropic processes and isentropic efficiencies for devices.	10				B1, B2, B6
Achievable Core Competence		Achievable Objective				
B1	Possess the ability of basic engineering mathematics, solid mechanics, heat flow mechanics, automatic control, materials science and opto-mechanical integration engineering practical analysis	Possess the ability of basic thermodynamic practical analysis				

B2	Ability to absorb and integrate cross-domain knowledge	Ability to absorb and integrate cross-domain knowledge
B6	Ability to identify, analyse and solve professional problems	Ability to identify, analyse and solve thermodynamic problems

Core competencies of the University Division

B1 Possess the ability of basic engineering mathematics, solid mechanics, heat flow mechanics, automatic control, materials science and opto-mechanical integration engineering practical analysis

B2 Ability to absorb and integrate cross-domain knowledge

B3 Ability to perform solid force experiments, heat flow experiments, mechanical project implementation, optoelectronic engineering experiments and analyze data

B4 Ability to write programming languages and computer-aided design

B5 Mechanical and opto-electromechanical systems, component design and process planning capabilities

B6 Ability to identify, analyse and solve professional problems

B7 Ability to implement and innovate

B8 Ability to engage in scientific writing and presentations

B9 Ability to work as a team, communicate effectively and manage the program

B10 Learn general knowledge and demonstrate the ability of engineering ethics, social responsibility and sustainable development

Weekly teaching plan				
Course Time	Course Location	Grading	Office hour	Teaching quality evaluation method
Tue & Thur.: 8:45-10:00	Engineering Building II R213	Quiz: 20% Exam:20%,20%, 20% In-class discussion: 20%	Tue. and Thur.: 10:00-12:00	Questionnaire
Weeks	Teaching & Homework Progress			Note
1	Course Introduction; Introductory concepts and definitions 1.1~1.4 1.5~1.9			
2	Energy and the first law of thermodynamics 2.1~2.3			Quiz1
3	2.4~2.6 Evaluating properties 3.1~3.4			Quiz2
4	3.5~3.6 3.8~3.9			Quiz3
5	3.10~3.12 3.13~3.15			Quiz4
6	Control volume analysis using energy 4.1~4.3			Quiz5
7	4.4~4.6 4.7~4.10			Quiz6
8	Midterm Exam I 10/27 (8:30-10:00 in class) Midterm Exam I 10/29 (8:30-10:00 in class)			
9	4.11~4.12 The second law of thermodynamics 5.1~5.2			
10	5.3~5.4 5.5~5.6			Quiz7
11	5.7~5.9			Quiz8
12	5.10~5.11 Midterm Exam II 11/24 (8:30-10:00 in class)			
13	Using Entropy 6.1~6.2 6.3~6.4			
14	6.5~6.6 6.7			Quiz 9
15	6.8~6.9 6.10			Quiz10
16	6.11 6.12			Quiz11
17	6.13 Review			Quiz12
18	Final Exam 1/5 (8:30-10:00 in class)			