國立中正大學機械工程學系 114 學年度第一學期教學大綱表

<table>
<tr><td colspan="5">課程名稱：(中文) 熱力學(一)
(英文) Thermodynamics I</td><td>開課單位</td><td>機械工程組</td></tr>
<tr><td colspan="5"></td><td>課程代碼</td><td>4202501-01</td></tr>
<tr><td>授課教師</td><td>陳永松</td><td>學分數</td><td>3</td><td>必修</td><td>開課年級</td><td>二年級</td></tr>
<tr><td>全英文授課
EMI</td><td colspan="6">■是 □否</td></tr>
<tr><td>課程類別
course type</td><td colspan="6">□ 人文關懷課程 □ 競賽專題課程 □ 問題導向課程
■ 專題導向課程 □ 總整課程 □ 實作課程
□ 實習 □ 其他</td></tr>
<tr><td colspan="7">先修科目或先備能力：Fundamental Physics</td></tr>
<tr><td colspan="7">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.</td></tr>
<tr><td>Textbooks</td><td colspan="6">Moran, Shapiro, Boettner, Bailery. “Moran’s Principles of Engineering Thermodynamics,” 9th ed., SI Version, John Wiley & Sons, 2018. ISBN: 978-1-119-45406-9</td></tr>
<tr><td colspan="7">教學要點概述</td></tr>
<tr><td>教材編選
teaching
materials</td><td colspan="6">□ 自製簡報(ppt) ■課程講義 □自編教科書
□ 教學程式 □自製教學影片 □其他</td></tr>
<tr><td>教學方法
teaching
methods</td><td colspan="6">■講述 □小組討論 □學生口頭報告 ■問題導向學習
□個案研究 □其他</td></tr>
<tr><td>評量工具
Evaluation
tools</td><td colspan="6">■期中考 ■期末考 □隨堂測驗 □隨堂作業
□課後作業 □期中報告 □期末報告 □專題報告
□評量尺規 ■其他</td></tr>
<tr><td>教學資源
teaching
resources</td><td colspan="6">■課程網站 □教材電子檔供下載 □實習網站</td></tr>
<tr><td>教師相關訊息
instructor’s
information</td><td colspan="6"></td></tr>
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課程大綱		分配時數				可達成核心能力
單元主題	內容綱要	講授	示範	習作	其它	
Introductory concepts and definitions	1. Using thermodynamics 2. Systems 3. Measuring mass, length, time and forces 4. 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 4. 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 8. 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 3. 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 4. 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 4. Isentropic processes and isentropic efficiencies for devices.	10				B1, B2, B6

可達成核心能力		核心能力達成指標
B1	具備基本工程數學、固體力學、熱流力學、自動控制及材料科學分析的能力	具備基本熱力學分析的能力
B2	吸收與整合跨領域知識的能力	整合熱力學及物理現象等相關知識
B6	發掘、分析及解決專業問題的能力	發掘、分析及解決熱力學專業問題的能力

教學要點概述:

上課時間	上課地點	評量方式	Office hour	教學品質評量方式
Tue: 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	教學意見調查核心能力重要性及達成度分析問卷

Week	教 學 與 作 業 進 度	備 註
1	Course Introduction; Introductory concepts and definitions 1.1~1.4 1.5~1.9	Quiz 1
2	Energy and the first law of thermodynamics 2.1~2.3 2.4~2.6	Quiz 2
3	Evaluating properties 3.1~3.4 3.5~3.6	Quiz 3
4	3.8~3.9 3.10~3.12	Quiz 4
5	**No class on 10/7** **Midterm Exam I 10/9 (8:30-10:00 in class)**	
6	3.13~14 3.15	
7	Control volume analysis using energy 4.1~4.3	Quiz 5
8	4.4~4.7 4.8~4.12	Quiz 6
9	**No class on 11/4** **No class on 11/6**	
10	The second law of thermodynamics 5.1~5.2 5.3~5.4	Quiz 7
11	5.5~5.6 5.7~5.9	Quiz 8
12	5.10~5.11 **Midterm Exam II 11/27 (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 **No class on 12/25**	Quiz11
17	6.13 **No class on 1/1**	Quiz12
18	**Final Exam 1/6 (8:30-10:00 in class)**	
其他:		