COURSE OUTLINE

Department of Thermo-Fluids, Faculty of Mechanical Engineering,
Universiti Teknologi Malaysia

Course : Thermodynamics **Code : SKMM 2413** **Section : 01 and 06**	**Academic Session : 2013/2014** **Semester : I**

Lecturer : Associate Professor Ir. Hayati Abdullah
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Synopsis :

Thermodynamics is a basic science that deals with energy. This course introduces students to the basic principles of thermodynamics. It will discuss basic concepts and introduces the various forms of energy and energy transfer as well as properties of pure substances. A general relation for the conservation of energy principle will be developed and applied to closed systems and extended to open systems. The second law of thermodynamics will be introduced and applied to cycles, cyclic devices and processes.

Course Learning Outcomes :

At the end of the course, students should be able to:

1. explain the basic concepts of thermodynamics, energy, energy transfer and laws of thermodynamics
2. determine the thermodynamics properties based on property tables, equations of states and charts
3. analyze closed and open thermodynamics systems using the first law of thermodynamics
4. analyze performance of reversible and actual heat engine, refrigerator and heat pump cycles based on the first and second laws of thermodynamics
5. analyze the entropy change during thermodynamics processes and calculate the isentropic efficiency of various steady flow devices

Teaching Methodology :

Lectures, tutorials & Active Learning

Assessment :

1. Quizzes/Assignments	10%
2. Test 1	20%
3. Test 2	30%
3. Examination	40
Total	100%

Textbook:

Yunus A. Cengel, John M. Cimbala and Robert H. Turner, *Thermal-Fluid Sciences,* Fourth Edition in SI Units, McGraw-Hill, Singapore, 2011

References :

1. M.J. Moran and H.N. Shapiro, *Fundamentals of Engineering Thermodynamics*, Fifth Edition, John Wiley & Sons, Inc., United States of America, 2004
2. R.E. Sontag, C. Borgnakke and G.J. Van Wylen, *Fundamentals of Thermodynamics*, Sixth Edition, John Wiley & Sons, Inc., United States of America, 2003

Class Schedule: Section 01 and 06

Tuesday	:	10:00 – 10:50 am	(DK 2, E07)
Friday	:	08:00 – 08:50 am	(DK 2, E07)
Friday	:	09:00 – 09:50 am	(DK 2, E07)

Tutorial

Thursday	:	10:00 – 10:50 pm	(DK 2, E07)
Thursday	:	12:00 – 12:50 am	(DK 2, E07)

Weekly schedule :

Week 1 9/9/13-13/9/13	**CHAPTER 1 : Introduction & Basic Concepts** – Definition, Units, Systems & Control Volume, Properties, State, Equilibrium, State Postulate, Process, Cycle, Temperature, Pressure
Week 2 16/9/13 – 20/9/13	**CHAPTER 2 : Properties of Pure Substance** – Phase of Pure Substances, Phase Change Processes of Pure Substances. Property Diagram for Phase-Change Processes, Property Tables
Week 3 23/9/13 –27/9/13	Ideal Gas. Ideal Gas Equation of State. Property Diagram for Ideal Gases, Compressibility Factor, Other Equations of State (Van der Waals, Beattie-Bridgeman and Benedict-Webb-Rubin)
Week 4 30/9/13 – 4/10/13	**CHAPTER 3 : Energy & Energy Transfer** – Kinetic, Potential & Internal Energy, Energy Transfer by Heat and Work, Electrical Work, Shaft Work, Spring Work, Boundary Work
Week 5 7/10/13 – 11/10/13	**CHAPTER 4 : Energy Analysis of Closed System** - Specific Heats, Enthalpy and Specific heats of ideal gases, The First Law of Thermodynamics
Week 6 14/10/12 – 18/10/13	Energy Balance for a Closed System undergoing a process, Energy Balance for a Closed System undergoing a thermodynamic cycle. **TEST I** **(Topics : Week 1 – Week 4)**
Week 7 21/10/13 –25/10/13	**CHAPTER 5 : Mass and Energy Analysis of Control Volume** - Conservation of Mass, Flow work and the Energy of Flowing Fluid
Week 8 28/10/13 – 1/11/13	Energy analysis of Steady-Flow Systems, Steady-Flow Engineering Devices : Nozzle & Diffusers, Turbine & Compressors, Throttling Valves.
Week 9 4/11/13 – 8/11/13	**Mid Semester Break**
Week 10 11/11/13 – 15/11/13	Mixing Chambers, Heat Exchangers, Energy Analysis of Unsteady-Flow Processes
Week 11 18/11/13 – 22/11/13	**CHAPTER 6: The Second Law of Thermodynamics** - Thermal Energy Reservoirs, Heat Engines, Kelvin-Planck Statement, Reversed Heat Engines : Refrigerators & heat pumps, Coefficient of Performance, Clausius Statement, Reversible & Irreversible Processes
Week 12 25/11/13 – 29/11/13	The Carnot Cycle, The Carnot Principles, Thermodynamics (Kelvin) Temperature Scale, The Carnot Heat Engine & Reversed Heat Engines
Week 13 2/12/13 – 6/12/13	**CHAPTER 7: Entropy –** Definition of Entropy, Clausius Inequality, The Increase of Entropy Principle, Entropy Change of Pure Substances, Isentropic Processes **TEST II** **(Topics : Week 5 – Week 12)**
Week 14 9/12/13 – 13/12/13	Property Diagrams involving entropy, The T ds Relations, The Entropy Change of Ideal Gas, Reversible Steady-Flow Work.
Week 15 16/12/13 – 20/12/13	Isentropic Efficiencies of Steady-Flow Devices, Entropy Balance, Entropy Generation for Closed & Open Systems
23/12/13 – 27/12/13	**Revision Week**
30/12/13 – 19/1/14	**Final Examination**