UNIVERSITI TEKNOLOGI MARA

CHE433: THERMODYNAMICS

Course Name (English)	THERMODYNAMICS APPROVED
Course Code	CHE433
MQF Credit	3
Course Description	Thermodynamics is commonly encountered in many engineering system. This course covers the knowledge of science of energy especially the aspect of heat and power interaction, energy and energy transformation and relationship among the properties of matter. Student will be equipped with the conservation of energy principle, the first law and the second law of thermodynamics. Other topics include the properties of pure substance, application of the first and second law of thermodynamics in open and closed system, heat engines, entropy, Carnot and Rankine cycles and etc.
Transferable Skills	problem solving creatife thinking
Teaching Methodologies	Lectures, Tutorial
CLO	CLO1 Describe the basic principles of thermodynamics related to energy, heat, work and phase changes processes CLO2 Analyse the first and second law of thermodynamics in energy analysis for closed and open system CLO3 Evaluate the thermodynamics system performance based on first and second law of thermodynamics
Pre-Requisite Courses	THERMODYNAMICS (CHE433)

Topics
1. Introduction to thermodynamics and properties of pure substances 1.1) Definition of system, boundary and surrounding. 1.2) Non flow and flow processes (open & closed system). 1.3) Intensive and extensive properties (T & P) 1.4) Thermodynamics state 1.5) Introduction of pure substance 1.6) Discuss the phase-change process. 1.7) Illustrate the P-v, T-v, and P-T property diagrams and P-v-T surfaces of pure substances. 1.8) Demonstrate the procedures for determining thermodynamic properties of pure substances from tables of property data
2. First Law of Thermodynamics and Energy Analysis of Closed System 2.1) Introduction to principles of energy conservation, PE, KE, Internal Energy, Heat and Work 2.2) First Law of thermodynamics 2.3) Specific Heat and Enthalpy 2.4) moving boundary work 2.5) energy balance for closed system 2.6) specific heat 2.7) internal energy, enthalpy, and specific heats of ideal gases 2.8) internal energy, enthalpy, and specific heats of solids and liquids
3. Energy Analysis of Open System 3.1) conservation of mass 3.2) flow work and the energy of flowing fluid 3.3) energy analysis of steady flow system 3.4) some steady flow engineering devices

4. The Second Law of Thermodynamics 4.1) Introduce the second law of thermodynamics. 4.2) thermal energy reservoirs 4.3) heat engines, refrigerators, and heat pumps. 4.4) perpetual-motion machines 4.5) Reversible and irreversible Processes 4.6) Carnot cycle 4.7) Carnot principle 4.8) thermodynamic temperature scale. 4.9) The Carnot heat engines 4.10) The Carnot refrigerators, and heat pumps
5. Entropy 5.1) Entropy 5.2) The increase of entropy principle. 5.3) Entropy changes of pure substances 5.4) Isentropic processes 5.5) Derive the reversible steady-flow work relations. 5.6) Develop the isentropic efficiencies for various steady-flow devices. 5.7) Introduce and apply the entropy balance to various systems.
6. Vapour cycles and Combine Power Cycle 6.1) The carnot vapor cycle 6.2) Rankine cycle: the ideal cycle for vapor power cycle 6.3) deviation of actual vapor power cycle from idealized ones 6.4) how can we increase teh efficiency of the rankine cycle 6.5) The ideal reheat rankine cycle

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Assignment	Assignment 1	5%	CLO1
Assignment	Assignment 2	8%	CLO2
Assignment	Assignment 1	10%	CLO3
Assignment	Assignment 2	12%	CLO3
Assignment	Assignment 1	15%	CLO2
Test	Mid-term Assessment	4%	CLO2
Test	Mid-term Assessment	6%	CLO3

Reading List

Recommended Text

- **Cengel Y.A. and Boles M.A. 2011, *Thermodynamics: An Engineering Approach,*, 8th Ed., McGraw-Hill. New York**

Reference Book Resources

- **Borgnakke C. and Sonntag R.E 2009, *Fundamentals of Thermodynamics : SI Version (*, 3 Ed., , John Wiley & Sons, Inc. [ISBN:]**
- **Moran M.J. and Shapiro H.N 2010, *Fundamentals of Engineering Thermodynamics (6*, Ed., , John Wiley & Sons, Inc.**

Article/Paper List: This Course does not have any article/paper resources

Other References: This Course does not have any other resources