KAMPALA
INTERNATIONAL
UNIVERSITY

EXPLORING THE HEIGHTS

School of Natural and Applied Sciences
Department of Physical Sciences

Course Outline Form

Shift: Day

Course Title: Heat and Thermodynamics

Academic Year: 2019/2020 Year: 1 Semester/Trimester: 2

Overview

Overall Description of the Course	. Introduction to thermodynamics; Properties of pure substances; Energy transfer by heat, work, and mass; Energy and mass conservation; Entropy and the second law and heat transfer.
Overall Learning Outcomes	By the end of the course, the students should be able to: 1. Explain the basic thermodynamic laws and principles 2. Discuss the concept of energy conservation through the study of the first and second laws of thermodynamics 3. Describe the concept of entropy and its importance in energy conversion 4. Examine the heat transfer mechanism by convection, conduction and radiation. 5. Illustrate basic thermodynamic analysis
General Description of Teaching/Learning Methods and Modes of Assessment	Lecture and discussion Group discussion and interpretation of observations Presentations and reports Assessment First CAT 15%, Second CAT 15%, Assignment 10% & Examination 60% = Total 100%

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Details

Topic *(also give brief description of topic)*	**Teaching/Learning Strategies**	**Learning Outcomes** **(**In terms of knowledge, skills, attitudes, and character)
Topic 1: **Thermometry and Calorimetry** Platinum resistance thermometer Thermistor - Specific heat capacity - Specific heat capacity of solids - Dulong & Petit's law- by Regnault's and Callender and Barne's methods- variation of specific heat capacity of diatomic gases	Lecture Method, Discussion Method, Demonstration and Presentations	At the end of the lesson the students should be able to: 1. Identify different thermometers and their thermometric properties 2. Explain Specific Heat Capacity and Molar heat Capacity 3. Solve problems on SHC and Molar Heat Capacity 4. Solve problems involving Dulong & Petit's law
Topic 2: **Basic Concepts of Thermodynamics** Introduction to Kinetic Theory of Gases, Thermodynamic Systems, Macroscopic and Microscopic Points of View, Pure Substance, Thermodynamic Equilibrium, Properties of Systems, State, Process, Cycle, Point Function, Path Function, Temperature, Zeroth Law of Thermodynamics, Pressure, Specific Volume, Reversible and Irreversible Processes, Energy, Work and Heat, Reversible Work.	Lecture Method, Discussion Method, Demonstration and Presentations	At the end of the lesson the students should be able to: 1. Define thermodynamics and terms associated with the concept 2. Explain process, system, cycle, state with clear examples 3. Describe Zeroth law 4. Describe concept of work, energy and heat
Topic 3: **Properties of Pure Substances** Pure Substance, Phase Change of a Pure Substance, Diagram for a Pure Substance, Surface, Phase Change, Property Diagrams in Common Use, Formation of Steam, Thermodynamic Properties of Steam and Steam Tables, External Work Done During Evaporation, Internal Latent Heat, Internal Energy of Steam, Entropy of Water, Entropy of Evaporation, Entropy of Wet Steam, Entropy of Superheated Steam, Enthalpy-Entropy	Lecture Method, Discussion Method, Demonstration and Presentations	At the end of the lesson the students should be able to: 1. Describe properties of pure substance 2. Describe External Work Done During Evaporation 3. Explain internal Latent Heat, Internal Energy of Steam 4. Define Entropy

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Topic 4: **First Law of Thermodynamics** Internal Energy, Law of Conservation of Energy, First Law of Thermodynamics, Application of First Law to a Process, Energy, Application of First Law to Steady Flow Process, Energy Relations for Flow Process, Throttling Process and Joule-Thompson Porous Plug Experiment, Heating-Cooling and Expansion of Vapours, Unsteady Flow Processes	Lecture Method, Discussion Method, Demonstration, Problem-Solving and Presentations	At the end of the lesson the students should be able to: 1. State and explain first law 2. Describe the processes involve in first law 3. Solve problems involving first law
Topic 5: **Second Law Of Thermodynamics And Entropy** Limitations of First Law of Thermodynamics and Introduction to, Second Law, Performance of Heat Engines and Reversed Heat Engines, Reversible Processes, Statements of Second Law of Thermodynamics, Clausius Inequality, Carnot Cycle, Carnot's Theorem, Entropy and Irreversibility, Change in Entropy of the Universe, The Third Law of Thermodynamics	Lecture Method, Discussion Method, Demonstration, Problem-Solving and Presentations	At the end of the lesson the students should be able to: 1. State and explain second law 2. Describe the processes involve in second law 3. Solve problems involving second law 4. Explain Carnot Cycle
Topic 6: **Availability and Irreversibility** Available and Unavailable Energy, Available Energy Referred to a Cycle, Decrease in Available Energy When Heat is Transferred Through a Finite Temperature Difference, Availability in Non-flow Systems, Availability in Steady-flow Systems, Helmholtz and Gibb's Functions, Irreversibility, Effectiveness	Lecture Method, Discussion Method, Demonstration Problem-Solving and Presentations	At the end of the lesson the students should be able to: 1. Explain Availability and irreversibility 2. Explain the concept of heat transfer through finite temperature 3. Availability in Steady-flow Systems, Helmholtz and Gibb's Functions, Irreversibility.