GP 111 : Elementary Thermodynamics

Course Title	Elementary Thermodynamics
Course Code	GP 111
Course Credit	3
Course Status	Core
Prerequisite	None
Synopsis	The aim of the course is to provide the students the opportunity to formulate, model and provide solutions to real problems involving conversion of energy. Specifically: to enable students to appreciate fully the implications of the principles of thermodynamics and apply them to relatively simple situations.
Intended learning outcomes (ILO)	By the end of this course, students should be able to; 1) Use the First Law to estimate the heat and work interactions in closed and open systems 2) Apply the Second Law to, determine the reversibility in thermodynamic processes, and to estimate the performance of heat engines 3) Relate the macroscopic thermodynamic behavior of systems to the microscopic nature of matter 4) Explain the fundamental limitations of energy conversion using the laws of thermodynamics

Week	**Topics**
1	1. Introduction: What and the Why 2. Molecular hypothesis 3. Microscopic and Macroscopic View 4. System and Surroundings ; Open and Closed Systems
2	1. Kinetic energy, absolute temperature of ideal gases 2. Zeroth Law and temperature 3. Kinetic theory of gases and the ideal gas law
3	1. Ideal gas law and internal energy 2. Work, Internal energy, the first law and the meaning of heat
4	1. Kelvin-Planck version of the second law of thermodynamics 2. Quasi-static adiabatic reachability
5 - 6	1. The second law of thermodynamics and the existence of the property called Entropy 2. Properties of entropy
7 - 8	1. Clausius statement and irreversibility 2. Heat engines and limits of energy conversion 3. Thermalization and quality of energy (exergy)
9	1. Microscopic definition of Entropy 2. Entropy as a measure of uncertainty
10 - 11	1. Maximum entropy inference 2. Canonical Ensemble and thermodynamics
12 - 13	1. Boltzmann transport equation 2. Thermal conductivity
14 - 15	1. Review

Teaching - Learning Approach		**Contact hours per semester**
	Lectures (L) / Discussions	30
	Tutorial (T)	0
	Projects/PBL	24
	Total	**54**
Assessment		**Percentage**
	Quizzes, PBL Reports and Assignments	20
	Mid-Semester Examination	20
	End-Semester Examination	60
	Total	**100**

Resources	1. D. H. S. Maithripala, Classical Thermodynamics, Class Notes, Available online at FeELS, 2017. 2. J. M. Powers, Lecture Notes on Thermodynamics. Available online at: http://www3.nd.edu/_powers/ame.20231/notes.pdf 3. Christoph Schiller, From Heat to Time-Invariance, Motion Mountain: The Adventures of Physics, E-Book, Vol-1, Chapter 13. Available online at: www.motionmountain.net. 4. R. P. Feynman, R. B. Leighton, and M. Sands, “The Feynman Lecture on Physics,” Publishers: Addison Wesley, Reading, MA, USA, Vol. I, Chapter 44, pp 44.1-44.13, Feb 1977. Available online at: http://www.feynmanlectures.caltech.edu. 5. H. Gould, and J. Tobochnik. “Thermal and Statistical Physics”, Princeton University Press, 2009. Available online at: http://stp.clarku.edu/notes/