Level Three

Thermodynamics

Course Code	Course Num.	Course Name	Credit Hours	Lec	Lab	Tut	Prerequisites
PHY	230	Thermodynamics	3	3	0	1	PHY 101, MAT101

Objectives:

After successfully completing the subject a student should be able to:

- Obtain the properties of a thermodynamic system from experimentally determined macroscopic properties of the system.
- Determine the microscopic properties of thermodynamic systems using kinetic theory and statistical mechanical methods.
- Have developed skills in partial differentiation, the solution of differential equations, integration and statistics.

Syllabus:

List of Topics	No. of Weeks	Contact Hours
Temperature: temperature and the zeroth law of thermodynamics, thermometers and temperature scales, the constant volume gas thermometer and the Kelvin scale, thermal expansion of solids and liquids, macroscopic description of an ideal gas.	2	8
Heat and the first law of thermodynamics: heat and thermal energy, heat capacity and specific heat, Latent heat, work and heat in thermodynamic processes, the first law of thermodynamics, some applications of the first law of thermodynamics, heat transfer.	3	12
Heat engines, entropy and the second law of thermodynamics: Heat engines and the second law of thermodynamics, reversible and irreversible process, the Carnot engine, the absolute temperature scale, the gasoline engine, heat pumps and refrigerators, entropy, entropy changes in irreversible processes, entropy on a microscopic scale. Third Law, Thermal Radiation.	3	12
The kinetic theory of gases: molecular model of an ideal gas, specific heat of an ideal gas, adiabatic process for an ideal gas, the equipartition of energy, the Boltzmann distribution law, distribution of molecular speeds, Mean free path, Van der Waal s equation of state.	3	12

FREE ENERGY: Review of Internal Energy and Enthalpy; Free Energy; Helmholtz Free Energy; Gibbs Free Energy; Miscellaneous Relations, the Maxwell Relations, and the Gibbs-Helmholtz Relations; The Joule and Joule-Thomson Coefficients; The Thermodynamic Functions for an Ideal Gas; The Thermodynamic Functions for Other Substances;	3	12

References:

- Physics for Scientists and Engineers (with modern physics) –by Raymond A. Serway, and John W. Jewett – Brooks Cole – 6th Edition (July 21, 2003)
- *Thermodynamics, Kinetic Theory, and Statistical Thermodynamics,* Francis W. Sears and Gerhard L. Salinger. Addison-Wesley 1986
- Randall D. Knight, physics for scientists and engineers with modern physics, (December, 2003)