PHY 205 THERMAL PHYSICS

COURSE PARTICULARS

Course Code: PHY 205
Course Title: Thermal Physics
No. of Units: 3
Course Duration: Three hours of theory per week for 15 weeks.
Status: Compulsory
Course Email Address: phy205@futa.edu.ng
Course Webpage: http://www.fwt.futa.edu.ng/courseschedule.php?coursecode=PHY%205
Prerequisite: PHY 103 and MTS 104

COURSE INSTRUCTORS

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COURSE DESCRIPTION

This is a compulsory course that is designed to meet the need of students in other fields such as Physics (SOS), AGP (SEMS), AGY (SEMS) and RSG (SEMS). Topics to be covered include: The foundation of classical thermodynamics including Zeroth laws and definition of temperature; first law of thermodynamics, work, heat and internal energy. Carnot cycles and second law of thermodynamics; Entropy and irreversibility, thermodynamic potentials and Maxwell relations, Applications of thermodynamics laws (1^{st} and 2^{nd}); Qualitative discussion of phase transitions; third law of thermodynamics, ideal and real gases, Elementary kinetic theory of gases including Boltzmann constant, Maxwell-Boltzmann law of distribution of velocities. Simple applications of the distribution law and 3^{rd} law of thermodynamics.

COURSE OBJECTIVES

The objectives of this course are to:

- introduce students to the basic foundation on classical thermodynamics; and
- provide students with simple application on laws of thermodynamic and how it relates to their respective field of studies.

COURSE LEARNING OUTCOMES / COMPETENCIES

Upon successful completion of this course, the student will be able to:
(Knowledge based)

- explain, and understand the basic foundation of classical thermodynamics;
- distinguish thermodynamics laws; and
- understand the basic applications of thermodynamics laws and potentials;

(Skills)

- use the knowledge gained to:
    - apply to some real life applications; and
    - further apply the course to their respective fields of learning

GRADING SYSTEM FOR THE COURSE

This course will be graded as follows:

Class Attendance	5%
Assignments	15%
Test(s)	20%
Final Examination	60%
TOTAL	**100%**

GENERAL INSTRUCTIONS

Attendance: It is expected that every student will be in class for lectures and also participate in all class exercises. Attendance records will be kept and used to determine each person's qualification to sit for the final examination. In case of illness or other unavoidable cause of absence, the student must communicate as soon as possible with any of the instructors, indicating the reason for the absence.

Academic Integrity: Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances are prohibited. You are not allowed to make copies of another person's work and submit it as your own; that is plagiarism. All cases of academic dishonesty will be reported to the University Management for appropriate sanctions in

accordance with the guidelines for handling students' misconduct as spelt out in the Students' Handbook.

Assignments and Group Work: Students are expected to submit assignments as scheduled through their course representative. Failure to submit an assignment as at when due will earn you zero for that assignment. Only under extenuating circumstances, for which a student has the instructor in advance, will late submission of assignments be permitted.

Code of Conduct in Lecture Rooms and Laboratories: Students should turn off their cell phones during lectures. Students are prohibited from engaging in other activities (such as texting, watching videos, *etc*.) during lectures. Food and drinks are not permitted in the lecture hall.

READING LIST

[1] Reif F (1965): *Fundamentals of statistical and Thermal Physics, McGraw Hill Publishing*

[2]Frederick J. Bueche and H. Eugene, B. (2009). *Schaum's outline of theory and problems of college Physics (9th edition),*Schaums, pp 171-209.

[3] Schroeder D.V. (2000): *An Introduction to Thermal Physics, Addison-Wesley-Longman, 2000*

[4]Adeyemi, B (2009).*Thermal and Statistical Physics (A new approach). Reprinted. Titilayo Education Books Nigeria PLC. 121p*

[5]Charles Kittel and Herbert Kromer (1980): "*Thermal Physics", second edition, Freeman publisher, 496p.*

[5]Chike-Obi (1991). *"Introduction to Thermal Physics" Heinemann Educational Books, Nig PLC, Ibadan 304p.*

Legend
1- Available in the University Library
2- Available in Departmental/School Libraries
3- Available on the Internet.
4- Available as Personal Collection
5- Available in local bookshops.

COURSE OUTLINE

Week	Topic	Remarks
1	Introduction and Course Overview- foundation of classical thermodynamics including Zeroth laws and definition of temperature;	During this first class, the expectation of the students from the course will be documented. The course will also review some of the familiar concepts related to the conservation of energy (the first law) as applied to thermodynamics. Quantities such as temperature, internal energy, work and heat will be introduced
2 & 3	Thermodynamics terms: • Micro and macroscopic systems • Quasi-statics systems • Cyclic, Isochoric processes First law of thermodynamics, work, heat and internal energy	The lecture will involve explanation of some thermodynamics terms and the first law of thermodynamics
4 & 5	Second law of thermodynamics • Carnot cycle • Efficiency of a machine • Entropy • Reversible and irreversibility, • thermodynamic potentials; and • Maxwell relations,	When learning on thermodynamics systems, students will be taught on what laws of thermodynamics meant. In addition, precise relation between temperature and entropy will be given by considering interactions between two macroscopic systems
6	Applications of First and Second law of thermodynamics	Exercises will involve some simple applications on first and second law of thermodynamics. The first and second laws are then applied to the discussion of engines and refrigerators.
7 & 8	Qualitative discussion of phase transitions;	Students will be taught on the phase transitions from solid to liquid and liquid to gas and equilibrium between states of matter and the thermodynamics processes that takes place during the transitions will be the next main topic MID-SEMESTER TEST
9 & 10	Third law of thermodynamics, ideal and real gases and its applications	Students will be taught third law of thermodynamics and apply it to ideal and real gases

11 & 12	Elementary kinetic theory of gases including Boltzmann constant	Students will be taught on elementary kinetic theory and its principles
13 & 14	• Maxwell-Boltzmann law of distribution of velocities • Simple applications of the distribution law	Maxwell –Boltzmann is a very powerful relation in thermodynamic theory. Students will be taught on how to derive the relation and apply it to distribution law. Finally, introduction to classical Boltzmann statistics and quantum statistics will wrap up the course
15	REVISION	This is the week preceding the final examination. At this time, evaluation will be done to assess how far the students' expectations for the course have been met.