AEN 1207 THERMODYNAMICS (4 CU)

Lecturer: Mr. Collins Paul Sewanyana (B.Sc. Mech. Eng., M.Sc. Agric. Eng., PhD Candidate)

Course Type: CORE (B.Sc. Agric. Eng I)

Course Credits (CU): 4 CU i.e. 60 Contact Hours per semester

Course Duration: 15 weeks (45 hours) i.e. 45 LH, 30 PH

COURSE DESCRIPTION
This course introduces students to the principles and laws of thermodynamics. It covers the basic concepts such as definitions, properties of state and laws as well as thermodynamic processes.

2. COURSE OBJECTIVES

The overall objective of this course is to be able to use the First Law of Thermodynamics to estimate the potential for thermo-mechanical energy conversion in power and propulsion systems.

The specific objectives are to:

- To provide students with the basic knowledge of relevant thermodynamic quantities.
- To introduce concepts of steady-flow energy equation or the first law of thermodynamics, cycles, energy exchange processes and the difference between various forms of energy.
- To discuss the equation of state for an ideal gas in relation to kinetic theory.
- To be able to apply ideal cycle analysis to simple heat engine cycles to estimate thermal efficiency and work as a function of pressures and temperatures at various points in the cycle.

3. RECOMMENDED REFERENCES FOR READING

1. Eastop T.D. and McConkey (1980). Applied Thermodynamics for Engineering Technologists, 4th Edition, Longman.
2. Shapiro M. (2006). Fundamentals of Engineering Thermodynamics 5th ed. Wiley & Sons
3. Haberman W. L. and John, James E.A. (2004) Engineering Thermodynamics with Heat Transfer. Prentice Hall
4. Yunus A. C. and Boles M.A.B. (2005). Thermodynamics an Engineering Approach, McGraw-Hill
5. Rogers &Mayhew (1992). Engineering Thermodynamics. 4th Edition. Longman

4. COURSE CONTENT, METHODS OF INSTRUCTION, TOOLS AND EQUIPMENT REQUIRED

TOPIC	CONTENT	METHOD OF INSTRUCTION / Time allocated	TOOLS / EQUIPMENT NEEDED
Chapter 1 . Basic definitions and Introduction	• Equation of state and ideal gases • Specific heat capacities and perfect gases • Zeroth law of thermodynamics	Interactive lectures (6 hrs) Seminar (2 hrs)	Chalk / BB or Markers / Flip charts/LCD Projector/laptop

Chapter 2. Working fluids	• Pure substances • Phase change and phase diagrams • Reading of steam tables	Interactive lectures (8 hrs) Practical (3 hrs)	Chalk / BB or Markers / Flip charts/LCD Projector/laptop / graph paper/ rulers
Chapter 3. First law of thermodynamics	• As applied to closed systems • As applied to open systems • Applications to common systems	Interactive lectures (10 hrs) Practical (3 hrs)	Chalk / BB or Markers / Flip charts/LCD Projector
Chapter 4. Second law of thermodynamics	• Second law of thermodynamics and entropy • Heat engines	Interactive lectures (6 hrs) Practical (3 hrs)	Chalk / BB or Markers / Flip charts/LCD Projector/laptop / graph paper/ rulers/ Computer lab
Chapter 5. Cycles	• Carnot cycle • Brayton cycle • Otto and diesel cycles • Rankine cycle	Interactive lectures (8 hrs) Practical (3 hrs)	Chalk / BB or Markers / Flip charts/LCD Projector
Chapter 6. Introduction Combustion	• Fuels and combustion • Theoretical and actual combustion processes • Enthalpy of formation and enthalpy of combustion • First law analysis of reacting systems • Adiabatic flame temperature	Interactive lectures (7 hrs) Practical (3 hrs)	Chalk / BB or Markers / Flip charts/LCD Projector
	• Evaluation	Tests (4 hrs)	Paper, printer, photocopier

5. SUMMARY OF TIME NEEDED

Interactive lectures covering theory	45 hrs
Class and computer-based practicals	15 hrs
Seminars	2 hrs
Evaluation	4 hrs

6. OVERALL COURSE EVALUATION

Continuous Assessment Test	20%
Class seminars and practicals	30%
Final examination	50%