COURSE CODE: ENGR 213
COURSE NAME: Thermodynamics
Summer Session Sample Syllabus

TOTAL NO. OF CONTACT HOURS: 45
CREDITS: 3
PREREQUISITES: Principles of Chemistry; Introduction to Physics

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COURSE AIMS:

This course provides an introduction to Thermodynamics, a branch of physics concerned with heat and temperature and their relation to energy and work. It defines macroscopic variables, such as internal energy, entropy, and pressure that partly describe a body of matter or radiation. It states that the behavior of those variables is subject to general constraints that are common to all materials, not the peculiar properties of particular materials. These general constraints are expressed in the four laws of thermodynamics, which can be explained by statistical mechanics, in terms of the microscopic constituents.

SUMMARY OF COURSE CONTENT:

Basic elements of classical thermodynamics, including first and second laws, properties of pure materials, ideal gas law, reversibility and irreversibility, and Carnot cycle; control volume analysis of closed simple systems and open systems at steady state; engineering applications, including cycles; psychrometrics.

LEARNING OUTCOMES:

Upon successful completion of this course, the student will:

(1) Demonstrate logical and rigorous engineering problem solving ability.

(2) Compute thermodynamic properties (v, u , h, s) of pure fluids (tables) and ideal gases (equations of state) as functions of temperature and pressure.

(3) Sketch and label simple phase diagrams and draw process paths.

(4) Apply First and Second Law thermodynamic analysis to simple machines such as pistons, cylinders, heat exchangers, turbines, and compressors. These include both open and closed systems which may operate under transient or steady state conditions.

(5) Calculate heat and work terms and efficiencies for heat engines, refrigerators, and heat pumps.

(6) Solve coupled First and Second Law problems to assess process feasibility, second law efficiency, and lost work.

(7) Evaluate energy balances for reacting systems (e.g., combustion).

(8) Demonstrate a comprehension of the vocabulary used in engineering thermodynamic calculations and analysis.

TEXTBOOK:

Fundamentals of Engineering Thermodynamics, 8th Edition	Moran, Shapiro, Boettner, Bailey	John Wiley & Sons	978-1-118-41293-0	Previous or International Editions of the textbook are acceptable.

TENTATIVE SCHEDULE (Modifications will be announced in class)			
Session	**Session Focus**	**Reading Assignment / Other Assignment**	**Meeting Place/Exam Dates**
Week 1	Energy/Process Definitions; Temperature, Pressure, Significant Figures; Properties of Pure Substances (ideal gas, equations of state, phase diagrams, steam tables).	TBA	
Week 2	First Law of Thermodynamics (ideal gas thermodynamic properties, steam systems, closed systems, nozzle, diffuser, and throttle valves).	TBA	First quiz: Thursday, (Week 2)
Week 3	First Law, cont'd. (pumps, compressors, turbines, heat exchangers, tank filling operations, multi-unit systems).	TBA	Second quiz: Thursday, (Week 3)
Week 4	Second Law of Thermodynamics (introduction, entropy balance, ideal gas entropy and isentropic processes, open and closed systems)	TBA	Third quiz: Thursday, (Week 4)
Week 5	Second Law, cont'd. (device efficiencies, two heat exchanger systems, Rankine cycles, stoichiometry and reacting systems).	TBA	Fourth quiz: Thursday, (Week 5) Final Exam COMPREHENSIVE on Friday, (End of Week 5)