ME 205 – INTRODUCTION TO THERMODYNAMICS

Designation as a 'Required' or 'Elective' course
TYPE OF COURSE: Required for BSME Major

Course (catalog) description
COURSE DESCRIPTION: ME 205 Introduction to Thermodynamics. 3 Hours. Principle of energy transport and work; properties of substances and equation of state; first and second laws of thermodynamics; applications to mechanical cycles and systems.

Prerequisite(s)
PREREQUISITE(S): Physics 141 General Physics I (Mechanics), 4 Hours and Math 181 Calculus II, 5 Hours

Textbook(s) and/or other required material
SAMPLE SOURCES AND RESOURCES MATERIALS: M. J. Moran and H. N. Shapiro,
Fundamentals of Engineering Thermodynamics, 7th Edition, John Wiley & Sons, Inc., 2011.

Course objectives
COURSE OBJECTIVES: This course introduces introductory level materials in engineering thermodynamics to all majors of engineering students. It offers following topics –thermodynamic concepts (10%); properties of substances state and phases (30%); conservation principles and the first law of thermodynamics (30%); entropy and the second law of thermodynamics (20%); system analysis using the second law of thermodynamics (10%). Students learn fundamental concepts and how to use them for solving real-world engineering problems. A combination of visual demonstration, problem solutions and conceptual design approaches for engineering thermodynamic systems is used for enhancing fundamental understanding and engineering applications. Issues of communication skills and contemporary problems are also discussed.

Topics covered

MAJOR TOPICS:		Hrs
1	Thermodynamic concepts: systems and surroundings; equilibrium and quasi-equilibrium processes; work, heat transfer and power	4
2	Properties of substances state and phases: internal energy, enthalpy, specific heat, and equation of state.	12
3	Conservation principles and the first law of thermodynamics: conservation of mass and energy; control volume formulation; steady state and steady flow analyses; unsteady state analysis.	13
4	Entropy and the second law of thermodynamics: isolated systems; reversible and irreversible processes; entropy relations; control volume analysis; isentropic processes; component efficiencies; cyclic processes and the Carnot cycle.	10
5	System analysis using the second law of thermodynamics: reversible work; availability; irreversibility. Efficiency in energy utilization	4

6	Examinations	2
	Total	45

Class/laboratory schedule, i.e., number of sessions each week and duration of each session

CREDIT HOURS: 3 hours

TYPE OF INSTRUCTION:

Type of Instruction	Contact Hours/Week
Lecture/Discussion	3
Laboratory	0

Contribution of course to meeting the professional component

This course shows how to use undergraduate calculus as well as basic concepts of work, energy, and efficiency in energy utilization, to formulate and solve energy and industrial processing systems for design problems. Principles of zeroth, first and second laws of thermodynamics are learned to use them to calculate energy balances and to maximize energy utilization for both steady and unsteady states with and without flow. Issues of communication skills and contemporary problems are also discussed.

Relationship of course to program outcomes

As shown in the BSME Course Outcomes Matrix:

A. Ability to apply knowledge of mathematics, science and engineering
E. Ability to identify, formulate, and solve engineering problems

Person(s) who prepared this description and date of preparation

Saeed Manafzadeh, Department of Mechanical and Industrial Engineering, January 16, 2014

Comments on outcomes

A. Use of surface and volume integration, ordinary and partial differentiation, conservation of mass and energy, concept of efficiency in energy utilization.
E. Through homework's and classroom examples, students learn how to conceive engineering problems, how to relate them to thermodynamic fundamentals, and finally how to express them in mathematical terms.

These outcomes are what students are expected to gain from this course.