Course Syllabus

Department: Science & Technology

Date: 01-15-2013

I. Course Prefix and Number: ESC 235

Course Name: Thermodynamics

Credit Hours and Contact Hours: 3 credit hours and 3 contact hours
Catalog Description including pre- and co-requisites: *supporting data required for grade prerequisite of 'C' or higher.* First and second laws of thermodynamics. Thermodynamic processes as applied to perfect gases and pure substances. Energy analysis of heat engines including Carnot, Otto, Diesel, and Stirling. Brayton cycle, gas turbines, and jet propulsion. Rankine cycle and power plants. Heat pumps and refrigeration systems. *Prerequisite:* MAT 271

Relationship to Academic Programs and Curriculum including SUNY Gen Ed designation if applicable:
This course is primarily a technical elective course for the A.S. in Engineering Science program. It is designed for the students who wish to pursue a baccalaureate degree in Aerospace, Mechanical, Civil, Environmental, or Electrical Engineering. Other students from other programs may also take the course if they have the appropriate background.

II. Course Student Learning Outcomes: *State the student learning outcome(s) for the course (e.g. Student will be able to identify…)*
Upon completion of the course the student will be able to:

1. Calculate thermodynamic properties such as pressure, volume, temperature, enthalpy, internal energy, and entropy of systems involving air or water as a working fluid
2. Calculate efficiencies for Otto, Diesel, and Stirling cycles
3. Calculate efficiency of a jet engine based on the Brayton cycle
4. Analyze a power plant based on the Rankine cycle
5. Calculate coefficient of performance for a refrigeration system or a heat pump

College Learning Outcomes Addressed by the Course: *(check each College Learning Outcome addressed by the Student Learning Outcomes)*

☐ writing	☐ computer literacy
☐ oral communications	☐ ethics/values
☐ reading	☐ citizenship
☒ mathematics	☐ global concerns
☒ critical thinking	☐ information resources

III. Assessment Measures (Summarize how the college and student learning outcomes will be assessed): *For each identified outcome checked, please provide the specific assessment measure.*

List identified College Learning Outcomes(s)	Specific assessment measure(s)
eg: writing	*eg: student will complete a research paper*
Mathematics	Student will answer specific test questions correctly
Critical Thinking	Student will answer specific test questions correctly

IV. Instructional Materials and Methods

Types of Course Materials:

Current edition of Kurt C. Rolle, "Thermodynamics and Heat Power" is used as the textbook Instructor notes are used as the supplemental source of information for the course content.
Each student is required to have a scientific calculator.
A course website is maintained on the internet for lecture schedule, test solutions, and other supplemental learning material.

Methods of Instruction (e.g. Lecture, Lab, Seminar …):

Mainly lectures are used to convey the knowledge to the student. They are presented in the traditional way, using either whiteboard or smartboard, supplemented with models, material samples, and power point presentations.
Plenty of example problems are solved in class and the students are allowed to practice the problem solutions through various homework assignments.
Demonstrations of some key concepts are done by using lab equipment.
Field trips are taken when feasible and time permitting to see actual equipment in operation.

V. General Outline of Topics Covered:

First Law of Thermodynamics for a Closed System
Air as a Working Fluid
Equation of State
Boundary Work, Internal Energy, Specific Heat
Isobaric, Isochoric, and Isothermal Processes
Isentropic Process
Polytropic Process
Internal Combustion Engines
Otto Cycle, Diesel Cycle**,** Stirling Cycle
First Law of Thermodynamics for an Open System
Brayton Cycle: Stationary Gas Turbines
Brayton Cycle: Jet Propulsion

Intro to Power Plants, Water as a Working Fluid
Steam Quality
Steam Tables, Enthalpy, Entropy
Boiler, Pump, Turbine and Condenser Processes
Basic Rankine Cycle
Rankine Cycle with Reheat
Refrigeration Systems
Wet and Dry Compression Cycles
Heat Pumps

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