STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
MECH 342 - THERMODYNAMICS

Created by: Dr. Lucas Craig
Updated by:

Canino School of Engineering Technology
DEPARTMENT: MET
SEMESTER YEAR: Spring 2019

A. **TITLE**: Thermodynamics

B. **COURSE NUMBER: MECH 342**

C. **CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)**

 # Credit Hours: 3
 # Lecture Hours: 3 **per week**
 # Lab Hours: **per week**
Other: **per week**

Course Length: 15 **Weeks**

D. **WRITING INTENSIVE COURSE**: No

E. **GER CATEGORY: None**

F. **SEMESTER(S) OFFERED:** Fall

G. **COURSE DESCRIPTION:**

This course will investigate thermal power and its applications using the first and second laws of thermodynamics. The properties of liquids and gases will be considered in their current and emerging applications to energy production. The fuel sources will be discussed for their energy input and output heat values. The efficiency of all energy applications will be explored while evaluating the theory of heat transfer. Applications of the Rankin, Otto, Brayton, and refrigeration cycles will be used in evaluating the energy production of thermal systems.

H. **PRE-REQUISITES/CO-REQUISITES:**

a. Pre-requisite(s): Physics II and Calculus I
b. Co-requisite(s):
c. Pre- or co-requisite(s):

I. **STUDENT LEARNING OUTCOMES:**

Course Student Learning Outcome [SLO]	***PSLO***	***GER***	***ISLO***
a. State the definition of work, energy, and heat	6		2-Crit Think; PS
b. Differentiate between closed systems and open systems	6		2-Crit Think; PS
Determine the flow work, and apply it to a system.	6		2-Crit Think; PS
State the first law of thermodynamics, or energy conservation, for both non-flow and flow systems.	6		2-Crit Think; PS
Define enthalpy and show that its properties are independent of the system.	6		2-Crit Think; PS
Apply the first law to the analysis of a steam or gas turbine, pipe flow, boilers, nozzles, heat exchangers.	1, 6		2-Crit Think; PS

Define the second law of thermodynamics	6		2-Crit Think; PS
Differentiate a change in entropy for a process.	6		2-Crit Think; PS
Define the term "quality" and use it to determine energy in the fluid-vapor region of a power cycle	6		2-Crit Think; PS
Graphically interpret the energy state for different processes on the Mollier chart	1, 6		2-Crit Think; PS
Use a thermodynamic table to determine the properties of all fluids used in thermal application	6		2-Crit Think; PS
Apply the ideal gas equations between the components and the entire mixture.	6		2-Crit Think; PS

KEY	**Institutional Student Learning Outcomes [ISLO 1 – 5]**
ISLO #	**ISLO & Subsets**
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit,/Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

J. APPLIED LEARNING COMPONENT: **Yes__x____ No_____**

Classroom/Labs

K. TEXTS:

Cengel, Yunus A. and Michael A. Boles, 2015: Thermodynamics An Engineering Approach (8th edition). McGraw Hill Companies Inc.

L. REFERENCES:

M. % EQUIPMENT:

N. % GRADING METHOD:
A-F

O. % SUGGESTED MEASUREMENT CRITERIA/METHODS:

Homework !	30%
Exams (4) !	60% !

Final Exam 10%

P. DETAILED COURSE OUTLINE:

I. Work, Energy, Heat
   a. Work
   b. Types of energy
   c. Heat
   d. Flow work vs. non flow work

II. First Law of Thermodynamics
   A. Non-flow systems
   B. Steady-flow systems
   C. Applications of the 1st law of thermodynamics

III. Properties of liquids and gases
   A. Liquids and vapors
   B. Properties of fluids
   C. Thermodynamic Diagrams

IV. Ideal Gas and Mixtures of Ideal Gases
   A. Entropy changes of an Ideal gas
   B. Non-flow gas processes
   C. Gas flow processes
   D. Mixture composition
   E. Air-Water Vapor mixture
   F. Psychrometric Chart
   G. Air Conditioning

V. Second Law of Thermodynamics
   A. Reversibility
   B. The Carnot cycle
   C. Entropy

VI. Entropy
   A. Directionality of the processes
   B. Isentropic processes
   C. Isentropic efficiencies

VII. Power Cycles
   A. Carnot Cycle
   B. Rankine Cycle
   C. Rating of power plants
   D. Otto Cycle
   E. Diesel Cycle
   F. Brayton cycle
   G. Stirling and Ericsson Cycle
   H. Refrigeration and heat pump

Q. LABORATORY OUTLINE: