College of Engineering
Course Title: Thermodynamics I   **Fall 2019**

Course Prefix: CHEG	Course No.: 2043	Section No.: P01 & P81	Department of Chemical Engineering

Instructor Name: Dr. Michael Gyamerah Office Location: C.L. Wilson 200A Office Phone: 936-261-9408 Fax: 936-261-9419 Email Address: migyamerah@pvamu.edu	Prairie View A&M University P.O. Box 519 Mail Stop 2505 Prairie View, TX 77446-0519	

Office Hours: **MWF 10:00 A. M. - 11:30 A.M. & 2:00 P.M. – 3:00 P.M.; F 2:00 P.M. - 4:00 P.M.**
Virtual Office Hours: None
Course Location: Juvenile Justice Building 257
Class Meeting Days & Times: MWF 12:00-12:50 PM (Lecture); W 5:30-6:20 PM (Recitation)

Catalog Description:
(3-0) Credit 3 semester hours. Introduction to Chemical Engineering Calculations. PVT Properties of Fluids. Equations of State. First and Second Law of Thermodynamics. Applications to Heat Effects and Flow Processes.

Pre-requisites: CHEM 1034 (or CHEM 1043) and PHYS 2513. Calculus is an implied prerequisite.
Co-requistes: NA

Required Text:
1. Introduction to Chemical Engineering Thermodynamics, J. M. Smith, H. c. Van Ness and M. M . Abbott, M.T Swihart. Eighth Edition, McGraw Hill, (2017), New York, NY. ISBN: 978-1-259-69652-7.

Recommended Text/Readings:
1. Perry's Chemical Engineers' Handbook, Edition 8, by Don Green, Robert Perry, Robert H. Perry Introduction to Chemical Engineering Thermodynamics. ISBN13: 978-0-07-142294-9.
2. Fundamentals of Engineering Thermodynamics, 8th edition, M.J Moran, H. N. Shapiro, D. D. Boettner, M. B. Bailey, Wiley, 2014 ISBN : 978-1-118-41293-0 (US)

Access to Learning Resources:
PVAMU Library
phone: (936) 261-1500
web: http://www.tamu.edu/pvamu/library/

University Bookstore
phone: (936) 261-1990
web: https://www.bkstr.com/Home/10001-10734-1?demoKey=d

Goals:
The goal of the course is to introduce to the students the concept of energy and entropy. The first and second law of thermodynamics with applications to real processes and cycles are emphasized. Carnot theorem is derived and efficiency concept illustrated. Equations of state of pure substances such as van der Waals, general cubic, and Virial are discussed in detail. The applications of efficiency and laws of thermodynamics to turbines, pumps, refrigerators, automobiles and combined cycle power plants are discussed in detail.

Outcomes:
The student will have demonstrated the ability to:
1. Apply knowledge of mathematics, science and engineering
2. Identify, formulate and solve engineering problems
3. Be able to use the skills, techniques, and modern engineering tools for engineering practice

This course will utilize the following instruments to determine student grades and proficiency of the learning outcomes for the course. Continuous assessment of students' homework assignments and exams will be used to evaluate their competence in CHEG Department student outcome D1 (an ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics) with the performance criteria:
1. Identify fundamental engineering problems. Given a problem, the student is able to :
   ➢ understand the given problem and identify the subject/topic area and concepts involved,

> ➤ convert the problem into a well labeled sketch (such as free body diagram, flow chart, functional block diagram, schematic diagram, and
> ➤ identify the system of units applicable to the problem

2. Formulate/analyze fundamental engineering problems. The student is able to:
   > ➤ define the known and the unknown variables in the problem,
   > ➤ state relevant laws and equations needed for the problem, and
   > ➤ list and apply assumptions to the relevant laws and equations to obtain the specific equations appropriate to the problem

3. Solve fundamental engineering problems. The student is able to:
   > ➤ implement strategy to solve the problem,
   > ➤ solve the problem (showing consistent units throughout), and
   > ➤ evaluate and interpret the result

4. *Formulate and solve fundamental engineering problems by applying principles of mathematics.* The student is able to:
   > ➤ Formulate and solve fundamental engineering problems using differential and integral calculus

Grading Policy

Item (Averages)	Weight %		Grade	Percentages
Attendance	10		A	100-90
In-class Quizzes	20		B	89-80
Homework/Project	5		C	79-70
Tests/Exams	40		D	69-60
Final Exam	25		F	59 or below

Course Procedures
At the lecturer's discretion, additional (optional) assignments/tests may be given for extra credit.

Academic Calendar (Attached to end of syllabus - You should check online schedule for the accuracy of dates)

Homework Policy
- Homework problems will be solely for practice to get students ready for the class quizzes and tests.
- Practice problems have been provided for students on the tentative lecture schedule. These problems are for your independent practice and not for weekly submission.
- Specific homework assignments will be given throughout the semester as the instructor examines the specific need of the class.
- These assignments may be computer based or involve the textbook.
- Students must submit these assignments during a given time frame.
- If a student chooses to disobey the university's honor code and copy the solution manual instead of submitting the student's own independent work, the student will receive a grade of zero on the assignment and will be referred to the department head. Such meetings must take place within a week of the infraction.

Exam Policy
- Exams should be taken as scheduled. No makeup examinations will be allowed except under documented emergencies (See Student Handbook).
- Only the required and recommended supplemental texts may be used on open book exams.
- No electronic device will be allowed including iPads and eReaders.
- No graphing calculators are allowed for any test or quiz. Students must purchase a small scientific calculator to use on exams. A cell phone cannot be use as a replacement for a graphing calculator on an exam.
- No bathroom breaks are allowed during a test. If a student leaves the room during this time, their exam/quiz will be collected and considered finished by the student.
- Students should dress professionally and are NOT allowed to wear caps/hats in class.
- Students are NOT allowed to bring food to the classroom or eat in class
- Any sightings of a cellular phone during an exam or a quiz will automatically result in a grade of zero for that student, and the student will be referred to the department head. Such meetings must take place within a week of the violation.

Class Activities and Participation Grades
- Class activities will often occur each week.
- No late or replacement assignments will be accepted.
- These activities may be computer based or involve the textbook.
- Students must submit these assignments during a given time frame.

Quiz Information
- Closed-book quizzes will be given throughout the semester. Quizzes will be based on material covered in class and homework assignments.
- A quiz can be given in class or online using Taskstream or eCourses.

Final Exam Procedures
- The comprehensive final exam will have a closed book and open book section.
- All students are required to take the final exam. No exemptions are given.
- It is the student's responsibility to arrive on time for the exam with all of the needed materials.

16 Week Calendar*

*subject to change at discretion of instructor

Week	Chapter	Topics
1	1: Introduction	Dimensions and Units, Measures of amount or Size, Force, Temperature, Pressure, Work, Energy, Heat
2	2: The First Law and Other Basic Concepts	Joule's Experiments, Internal Energy, The First Law of Thermodynamics, Energy Balance For Closed Systems, Thermodynamic State and State Functions, Equilibrium
3	2: The First Law and Other Basic Concepts	The Phase Rule, The Reversible Process, Constant-V and Constant-P Processes, Enthalpy, Heat Capacity, Mass and Energy Balances For Open Systems
4	3: Volumetric Properties of Pure Fluids	PVT Behavior of Pure Substances, Virial Equations of State, The Ideal Gas, Application of the Virial Equations
5	3: Volumetric Properties of Pure Fluids	Cubic Equations of State, Generalized Correlations for Gases, Generalized Correlations for Liquids
6	4: Heat Effects	Sensible Heat Effects, Latent Heats of Pure Substances, Standard Heat of Reaction, Standard Heat of Formation
7	4: Heat Effects	Standard Heat of Combustion, Temperature Dependence of $\Delta H°$, Heat Effects of Industrial Reactions
8	5: The Second Law of Thermodynamics	Statements of the Second Law, Heat Engines, Thermodynamic Temperature Scales, Entropy, Entropy Changes of an Ideal Gas, Mathematical Statement of the Second Law
SPRING MIDTERM EXAM		
9	5: The Second Law of Thermodynamics	Entropy Balance for Open Systems, Calculation of Ideal Work, Lost Work, The Third Law of Thermodynamics, Entroy from the Microscopic View Point
10	6: Thermodynamic Properties of Fluids	Property Relations for Homogeneous Phases, Residual Properties, Residual Properties by Equations of State, Two-Phase Systems
11	6: Thermodynamic Properties of Fluids	Thermodynamic Diagrams, Tables of Thermodynamic Properties, Generalized Property Correlations for Gases
12	7: Applications of Thermodynamics to Flow Processes	Duct Flow of Compressible Fluids, Turbines, Compression Processes
13	8: Production of Power From Heat	The Steam Power Plant, Internal-Combustion Engines, Jet Engines, Rocket Engines
14	9: Refrigeration and Liquefaction	The Carnot Refrigerator, The Vapor-Compression Cycle, The Heat Pump,
15	Review & Final Exam *Mark your calendar!*	**TBD**

University Rules and Procedures
Disability statement (See Student Handbook):
Students with disabilities, including learning disabilities, who wish to request accommodations in class should register with the Services for Students with Disabilities (SSD) early in the semester so that appropriate arrangements may be made. In accordance with federal laws, a student requesting special accommodations must provide documentation of their disability to the SSD coordinator.

Academic misconduct (See Student Handbook):
You are expected to practice academic honesty in every aspect of this course and all other courses. Make sure you are familiar with your Student Handbook, especially the section on academic misconduct. Students who engage in academic misconduct are subject to university disciplinary procedures.

Forms of academic dishonesty:
1. Cheating: deception in which a student misrepresents that he/she has mastered information on an academic exercise that he/she has not mastered; giving or receiving aid unauthorized by the instructor on assignments or examinations.

2. Academic misconduct: tampering with grades or taking part in obtaining or distributing any part of a scheduled test.

3. Fabrication: use of invented information or falsified research.

4. Plagiarism: unacknowledged quotation and/or paraphrase of someone else's words, ideas, or data as one's own in work submitted for credit. Failure to identify information or essays from the Internet and submitting them as one's own work also constitutes plagiarism.

Nonacademic misconduct (See Student Handbook)
The university respects the rights of instructors to teach and students to learn. Maintenance of these rights requires campus conditions that do not impede their exercise. Campus behavior that interferes with either (1) the instructor's ability to conduct the class, (2) the inability of other students to profit from the instructional program, or (3) campus behavior that interferes with the rights of others will not be tolerated. An individual engaging in such disruptive behavior may be subject to disciplinary action. Such incidents will be adjudicated by the Dean of Students under nonacademic procedures.

Sexual misconduct (See Student Handbook):
Sexual harassment of students and employers at Prairie View A&M University is unacceptable and will not be tolerated. Any member of the university community violating this policy will be subject to disciplinary action.

Attendance Policy:
Prairie View A&M University requires regular class attendance. Excessive absences will result in lowered grades. Excessive absenteeism, whether excused or unexcused, may result in a student's course grade being reduced or in assignment of a grade of "F". Absences are accumulated beginning with the first day of class.

Student Academic Appeals Process
Authority and responsibility for assigning grades to students, rests with the faculty. However, in those instances where students believe that miscommunication, errors, or unfairness of any kind may have adversely affected the instructor's assessment of their academic performance, the student has a right to appeal by the procedure listed in the Undergraduate Catalog and by doing so within thirty days of receiving the grade or experiencing any other problematic academic event that prompted the complaint.