King Fahd University of Petroleum & Minerals
Mechanical Engineering Department

ME 204: THERMODYNAMICS II **Fall semester 2018-2019 (181)**

The Mechanical Engineering Department is committed to providing highest quality education in Mechanical Engineering, conducting world-class basic and applied research, addressing the evolving needs of industry and society, and supporting the development of more competitive and new industry in the Kingdom of Saudi Arabia.

Catalog Description: **ME 204: THERMODYNAMICS. 3 Credits.** Irreversibility and availability. Power and refrigeration cycles: steam power cycles, air-standard power cycles, and refrigeration cycles. Gas-gas and gas-water vapor mixtures. Psychrometrics. Thermodynamic relations: the Clapeyron equation, the Maxwell relations, and enthalpy and entropy departures. Chemical reactions: fuels and combustion processes.
Prerequisite: **ME 203**

Textbook: Yunus A. Cengel and Michael A. Boles, **Thermodynamics: An Engineering Approach**, 8th Edition, McGraw Hill, 2015.

References: **1)**Black and Hartley**, Thermodynamics, Harper Collins, 1991.**
2)Moran and Shapiro, **Fundamentals of Engineering Thermo-dynamics.**
3)Van Wylen, Sonntag, & Borgnakke, **Fundamentals of Classical Thermodynamics,** Wiley.

Instructor: ***Dr. B.A. Qureshi, Asst. Professor, ME Department, Location: 63-154, Phone: 2685(Office)***

Objectives:

1. **Introduce students to the concepts of availability (exergy), reversible work, irreversibility (lost work or exergy destruction) and second law efficiency.**
2. **Make students familiar with the application of thermodynamics for power generation and refrigeration through the understanding and then analysis of the pertaining cycles and engines/devices.**
3. **Introduce students to the concept of computing thermodynamic properties that cannot be measured directly in the lab through the use of relations with directly measurable properties and/or generalized charts.**
4. **Familiarize students with homogeneous non-reacting mixtures and finding their thermodynamic properties by using the properties of their individual components (constituents) with special reference to water vapor air mixtures and their applications.**
5. **Introduce students to the thermodynamic analysis of chemical reactions with special reference to combustion.**
6. Prepare students to effectively use thermodynamics in the practice of engineering.

Material Coverage and Weekly Breakdown:

Lectures	Topic.
7	Exergy: Irreversibility and Availability.
15	Power and Refrigeration Systems.
7	Gas Mixtures.

6	Thermodynamic Relations.
8	Chemical Relations.
2	Tests

Evaluation and Exams:

The course grade will be determined by the following distribution

Major Exam 1	**Mon Oct 15, 2018, 5:30 PM -7:00 PM, Bldg 63**	**20%**
Major Exam 2	**Mon Nov 26, 2018, 5:30 PM -7:00 PM, Bldg 63**	**20%**
Homework		**10%**
Quizzes and class test		**15%**
Design Project		**5 %**
Final Exam		**30%**

All exams will be conducted on a Closed Book / Closed Notes basis. Formula sheet will be distributed with each exam. Cover page must be used in all homework submissions. Copies of Thermodynamic property Tables are available for the exams.

Student Learning Outcomes:

By the end of this course students would be able to:

1. **Demonstrate an understanding of the thermodynamic terms availability (exergy), reversible work, irreversibility (lost work or exergy destruction) and second law efficiency.**
2. **Utilize the terms in 1 to evaluate the performance of thermodynamic processes and thermal Equipment.**
3. **Demonstrate an understanding of different thermodynamic cycles for power generation and Refrigeration.**
4. Evaluate the thermal performance of different heat engines and refrigeration cycles through the calculation of their thermal efficiency or coefficient of performance.
5. **Develop relations that link thermodynamic properties that cannot be measured directly in the lab to measurable properties such as temperature pressure and volume.**
6. **Differentiate between ideal gas and real gases and use generalized charts.**
7. **Demonstrate ability to obtain the properties of a mixture from the properties of its individual components.**
8. **Apply the first and second laws of Thermodynamics on systems dealing with mixtures with special reference to air conditioning equipment.**
9. **Analyze different combustion processes and apply the first law of Thermodynamics on reacting systems.**

Homework:

Homework will be assigned and solutions to be submitted according to the assigned due dates. **Late homework will not be accepted.** *The University policy regarding cheating in HW and project will be strictly applied.*

Attendance:

Attendance is strictly required by all the students and it will be monitored closely and KFUPM regulations in this regard will be executed. After the 9th absence, **DN** grade will be submitted to the Registrar. **In addition, each unexcused** absence may result **in a deduction of 0.5 point of the Final Grade.**