

KHAZAR UNIVERSITY

**SCHOOL OF ARCHITECTURE,
ENGINEERING AND APPLIED
SCIENCES**

COURSE SYLLABUS

Thermodynamics

Thermodynamics

Identification

<u>Department:</u>	Applied Physics
<u>Semester:</u>	Spring 2010
<u>Subject:</u>	Thermodynamics (ENGR 303)
<u>Credit:</u>	3 units
<u>Hours :</u>	4 hours per week (2 - lect. 2 - pract.)
<u>Instructor:</u>	D.Sc.,Associate Professor Hikmet Hassanov
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Prerequisites

Physics 2 (PHSC 112)

Textbooks

Core textbook:

1. J. P. Holman
Thermodynamics (fifth edition), McGraw-Hill, 2004

Supplementary book:

2. Kenneth JR. Wark, Donald E. Richards
Thermodynamics (sixth edition), McGraw-Hill, 1999

Objectives

General objective of the Course:

- To meet curriculum requirements of the School of Architecture, Engineering and Applied Sciences;
- To support the students academically, to improve their chance of realizing their potential;
- To build background for the students' further engineering development.

Outcomes

By the end of the Course students should be able:

- To use thermodynamic laws for solving concrete applied engineering Problems;
- To develop ideal models of any process up to real one;
- To evaluate alternating opportunities to describe the process.

Developed skills

Throughout the Course students should develop and maintain the following skills:

- Analytical thinking;
- Critical reasoning;
- Ability to finding optimal decision of the problem.

Evaluation

There will be two exams and laboratory works during the semester. Exams time and location will be announced later in class

Your grade in the Course will be determined on the base of the following scale:

Research paper	20 %
Participation	10 %
Mid-term examination	30 %
Final examination	40 %
Total	100 %

**Learning and Teaching
Methods**

This Course considers active learning process rather than passive one. Lectures, presentations, discussions, practicals.

Course weekly description

Weeks	Topics	Hours		Reading Assignment
		Lectures	Practical	
1	Introduction to Thermodynamics. Temperature. Matter of temperature. The Boltzmann distribution in general form. Macro- and microstates. Statistical weight.	2	2	[2], chapter 1, §§ 1-7
2	Heat and work. The first law of thermodynamics. Different variants of the law and their application for engineering processes. Heat engine. Matter of heat engine. The efficiency of heat engine.	2	2	[2], chapter 2, §§ 2-8
3	The second law of thermodynamics. Entropy. Axioms of the second law. Direction of the processes. Interpretation of experimental data. Classification of Clausius.	2	2	[2], chapter 6, §§ 1-6
4	Engineering application of the second law. Application of entropy to processes. Entropy like statistical term. Change of entropy in different thermodynamic processes.	2	2	[2], chapter 7, §§ 1-7
5	Classification of heat transitions. Reversible and non-reversible transitions. Thermodynamic equilibrium.	2	2	[2], chapter 6, §§ 1-5
6	The Carnot's cycle. Thermodynamic temperature scale.	2	2	[2], chapter 8, §3
7	Thermodynamic potentials. Connection between them.	2	2	[1], chapter 4, §§ 1-4
8	Mid-term Exam			
9	Thermodynamic potentials (continuation). Their practical using.	2	2	[1], chapter 4, §§ 1-4
10	The Joule – Thompson effect. Thermodynamic expansion. Thermodynamic expansion in drilling. Refrigeration of gases.	2	2	[2], chapter 12, §6; chapter 17, §6

11	Thermal effect of chemical reactions. The Kirchhoff's law. The equilibrium condition for chemical reaction. The chemical equilibrium.	2	2	[1], chapter 10, §§ 1-5
12	Chemical equilibrium from thermodynamic point of view. Change of the equilibrium condition by different thermodynamic factors. Principle of Le-Chatellier. Effect of temperature on the chemical equilibrium.	2	2	[2], chapter 14, §§ 1-9
13	Equations of state and thermodynamic properties of ideal (pure) substances.	2	2	[1], chapter 5, §§ 1-3
14	Solutions. Osmosis and osmotic pressure. Experimental methods for determining the osmotic pressure. The equation of osmotic pressure for great concentrations. The Raoult's law. Solutions classification. Application of osmosis in engineering.	2	2	[1], chapter 6, §§ 1-4
15	The bases of thermodynamics of galvanic circuits. Calculating thermodynamic potentials in chemical method of electrical energy producing (galvanic circuits).	2	2	[1], chapter 8, §§ 1-4
16	Non-reversible processes. Chemical reactions in closed and open systems.	2	2	[1], chapter 5, §§ 4-6
	Final Exam			