

KHAZAR UNIVERSITY

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

COURSE SYLLABUS

Engineering Mechanics

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Identification

<i>Semester:</i>	Spring, 2010
<i>Department:</i>	Applied Physics
<i>Subject:</i>	Engineering Mechanics
<i>Credit-units:</i>	4
<i>Instructor:</i>	Prof. Valeh Bakhshaliev
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Textbooks and Materials:

Core Textbook:

1. Ferdinand P.Beer , E.Russel Johnston, Jr. Vector Mechanics for Engineers: Statics and Dynamics, McGraw-Hill Companies,6th ed. Boston, 2007.
2. Targ S. Theoretical mechanics, Moscow, 2005 (in English)
3. Karl-Heinrich Grote, Erik K. Antonsson (Editors). Handbook of Mechanical Engineering, Springer Science+Business Media,LLC NewYork,1999.

Supplementary Textbook:

4. Bakhshaliev V.I. Solution of problems of theoretical mechanics, (textbook), Baku, 2009.

For class presentation and discussions, the student should utilize the Journal and Internet Materials. Moreover, the course does not limit the use of learning materials at the Khazar University library.

Objectives

General Objectives of the Course:

To meet curriculum requirements of the School of Architecture, Engineering and Applied Sciences

Specific Objectives of the Course:

This course deals with basic principles of Statics and Kinetics (Kinematics, Dynamics). The course consists information for general laws of mechanical motion of material bodies.

The progress of technology confronts the engineer with a wide variety of problems connected with structural design (buildings, bridges, etc.), the design, manufacture and operation of various machines, motors and means of locomotion, such as automobiles, ships aircraft, and spaceships. Despite the diversity of problems that arise, their solution, at least in part, is based on

certain general principles common to all of them, namely, the laws of governing the motion and equilibrium of material bodies.

Outline

Engineering Mechanics is the science which treats of the general laws of motion and equilibrium of material bodies and of the resulting mutual interactions. Engineering Mechanics constitutes one of the scientific bedrocks of modern engineering. Other branches of mechanics are based on the laws and methods of theoretical mechanics.

Outcomes

By the end of the course the students should be able:
Familiarize with fundamental concepts of Engineering Mechanics and their engineering applications. Introduce useful frameworks and various techniques for solving a wide variety of problems.

Developed Skills

Analytical thinking
Presentation
Calculation skills
Other

Evaluation

Participation & activity	10
Practice	10
Quizzes	10
Mid-term Examination	30
<u>Final Examination</u>	<u>40</u>
Total	100

Learning and Teaching Methods

This course considers active learning process: lectures, discussions, practices and presentations.

Course Schedule

Weeks	Topics	Lectures, hours	Pract. hours	Reading
1	Introduction, subjects and studying area of Engineering Mechanics. Basic concepts and principles of Statics.	2	2	Chapt.1 [2]
	Constraints and their reactions. Axiom of constraints.	2		Chapt.2 [2]
2	Geometrical method of composition of concurrent force systems and their equilibrium.	2	2	Chapt.2 [2]
	Projection of a force on an axis and a plane. Analytical method of composition of concurrent forces. Analytical method of equilibrium of a system of concurrent forces.	2		Chapt.3 [2]

3	Composition and resolution of parallel forces. A force couple. Moment of couple. Conditions for the equilibrium of couples.	2	2	Chapt.3 [2]
	Moment of force about a point and an axis. Quiz.	2		Chapt.3 [2]
4	Reduction of a coplanar force system to a given centre. Conditions for the equilibrium of a coplanar force system	2	2	Chapt.4 [2]
	Introduction to Kinetics. Kinematics of a particle and rigid body.	2		Chapt.11[1], Chapt.10[2]
5	Method of describing motion of a particle.	2	2	Chapt.11[1], Chapt.10[2]
	Velocity and acceleration vector of a particle.	2		Chapt.11[1], Chapt.10[2]
6	Determination of the velocity and acceleration of a particle when its motion is described by the coordinate and the natural methods.	2	2	Chapt.11[1], Chapt.10[2]
	Uniform and uniform variable motion of a particle.	2		Chapt.11[1], Chapt.10[2]
7	Translational and rotational motion of a rigid body. Angular velocity and angular acceleration.	2	2	Chapt.15[1], Chapt.11[2]
	Uniform and uniform variable rotations of a rigid body.	2		Chapt.15[1], Chapt.11[2]
8	Midterm Exam			
9	Velocities and accelerations of the points of a rotating body.	2	2	Chapt.15[1], Chapt.11[2]
	Plane motion of a rigid body.	2		Chapt.16 [1], Chapt.12[2]
10	Determination of the velocity and acceleration of a point of plane body. Instantaneous centre of zero velocity.	2	2	Chapt.16 [1], Chapt.12[2]
	Introduction to Dynamics. Basic concepts and definitions. Laws of Dynamics.	2		Chapt.12 [1], Chapt.16[2]
11	Differential equations of motion for a particle.	2	2	Chapt.12 [1], Chapt.17[2]
	General theorems of particle dynamics. Theorem of change in the momentum of a particle.	2		Chapt.12 [1], Chapt.18[2]

12	Theorem of change in the angular momentum of a particle. Dalamberts principle for a particle.	2	2	Chapt.12 [1], Chapt.18[2]
	Work done by a force. Power. Theorem of change in the kinetic energy of a particle.	2		Chapt.13 [1], Chapt.18[2]
13	Oscillation of mechanical system with one degree of freedom. Free vibration of system.	2	2	Chapt.19 [1], Chapt.21[2]
	Forced and damped vibrations of mechanical systems.	2		Chapt.19 [1], Chapt.21[2]
14	Dynamics of a mechanical system and a rigid body. External and internal forces. The differential equations of motion of a system.	2	2	Chapt.14,15 [1], Chapt.23[2]
	Moment of inertia of a body about an axis. Moment of inertia of a body about parallel axes (Huygens theorem).	2		Chapt.14,15 [1], Chapt.23[2]
15	Theorem of the motion of the centre of mass of a system. Theorem of the change in the linear and angular momentum of a system.	2	2	Chapt.14,15 [1], Chapt.24[2]
	Differential equation of the rotational motion of a rigid body.	2		Chapt.15 [1], Chapt.26[2]
16	Theorem of the change in the kinetic energy of a mechanical system.	2	2	Chapt.14,15 [1], Chapt.27[2]
	Dalamberts principle for a mechanical system.	2		Chapt.18[2]
	Final Examination			