Syllabus

Engineering Mechanics 2 (Dynamics)

MKT2112 – Department of Mechatronics Engineering, YTU

Spring 2023

Instructor and Assistant Information

Instructor	Email	Office Location & Hours
Dr. M. Selçuk ARSLAN	selcuk.mkt@gmail.com	Dekanlik / Mon. 9:00 -12:00, or by appointment.
Res. Asst. Ali İhsanTAŞ	ihsan.tas@yildiz.edu.tr	E2 / by appointment.

General Information

Prerequisite

Engineering Mechanics I.

Description

This course is an introduction to the dynamics of mechanical systems. Topics covered include kinematics, force-momentum formulation for systems of particles and rigid bodies in planar motion, and work-energy concepts.

Expectations

The lower bound of course attendance is 70% of whole semester.

~~Students, who are exempted from attendance, are also required to submit HWs and attend the quizzes.~~

Students, who is any side of cheating, will get FF.

Without instructor's permission, taking picture of the black(white)board and any digital recording of the class are not allowed.

Students must register at the web group of the course: **Google Classroom.**

~~**This course adopts Pearson's Mastering Engineering system. Every student must have an access code, which is obtained from Çağlayan Kitabevi's web site. Related links are shared through Google Classroom (to enroll, use the code provided in page 3 below). Buy e-book (or printed book) together with a code. Use this code to enroll the Pearson's Mastering Engineering system. Instructions are in the file accessible on the avesis page, where this syllabus is also available.**~~

Course Learning Outcomes

1. Column 3 indicates how the objectives and outcomes in columns 1 and 2 *map* into the EC 2000 (a) through (k) criteria (see the following page for the criteria).

2. Column 4 indicates how the objectives and outcomes in column 1 and 2 map into the Program Learning Outcomes (PLO)

Course Objectives	Course Outcomes	EC2000 (a)-(k)	PLO
1. To teach students kinematics of particles and rigid bodies.	1. Be able to calculate the velocity and acceleration of a particle in rectangular, polar, and normal and tangential coordinates.	a, e	a, e
	2. Be able to relate the velocity and acceleration of points in a rigid body using either absolute motion or relative motion approaches.	e	e
	3. Be able to demonstrate the concept of rotating axes in solving problems where motion is observed from a rotating coordinate system.	a, e	a, e
2. To teach students kinetics of particles and rigid bodies using Newton's laws.	1. Be able to solve particle and rigid body problems with the ability to visualize physical configuration.	a, c	a, c
	2. Be able to possess proficiency in the application of Newton' second law to engineering problems.	a	a
	3. Be able to construct free-body diagrams and kinetic diagrams and learn their importance in dynamics.	a	a
3. To teach students to how to understand and apply work-energy and impulse-momentum approaches to dynamics problems.	1. Be able to demonstrate the ability to describe and analyze the kinetics of particles and rigid bodies using energy and momentum principles.	a, c ,e	a, c, e
	2. Be able to develop impulse and momentum principles and to solve problems in particle impacts.	a, e	a, e
	3. Be able to choose a suitable approach to solve a specific problem.	e	e
4. To provide proficiency in the analysis of the motion of particles and rigid bodies.	1. Be able to understand problem formulation and the construction of a meaningful mathematical model.	a	a
	2. Be able to understand the importance of developing theory and its limitations for the purpose of solving problems.	c, e	c, e
	3. Be able to develop an analytical thinking necessary for practicing engineering and to realize how theory can only approximate the real world of mechanics.	a, k	a, k

ABET EC 2000 Criteria - Outcomes and Assessment: Engineering programs must demonstrate that their graduates have

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Materials

Optional Materials

Hibbeler, R.C., Engineering mechanics: dynamics, in SI Units, 14th Edition, Pearson.
Meriam, James L., L. Glenn Kraige, and Jeff N. Bolton. Engineering mechanics: dynamics. John Wiley & Sons, 2020.

Course group

Go to Google Classroom (classroom.google.com) and join the class with the code: y3ra2fm

Course Schedule

Topic	Article	Problem	Week
INTRODUCTION	1/1-7, Appendix C/7		**1**
Vector Operations			
KINEMATICS OF PARTICLES			**3**
Rectilinear Motion	2/1,2	2.31	
Plane Curvilinear Motion	2/3		
# x-y coordinates	2/4	2.62, 2.92	
# n-t coordinates	2/5	2.114	
# r-¤ coordinates	2/6	2.138, 2.233	
Relative Motion	2/8	2.190	
Constrained Motion	2/9	2.208	
KINEMATICS OF RIGID BODIES			**3**
Rotation	5/1,2	5.13, 5.21	
Relative Velocity	5/4	5.66, 5.79	
Instantaneous Centers	5/5	5.92	
Relative Acceleration	5/6	5.119,5.141	
Rotating Axes	5/7	5.151	
KINETICS OF PARTICLES			**3**
Newton's Second Law	3/1,2		
Equation of Motion	3/3		
# Rectilinear motion	3/4	3.12, 3.28	
# Curvilinear motion	3/5	3.50	
Work and Energy	3/6,7	3.117, 3.144	
Impulse and Momentum	3/8		
# Linear	3/9	3.185, 3.203	

# Angular	3/10	3.222	
Impact	3/12	3.348, 3.264	
KINETICS OF RIGID BODIES			**3**
Equations of Motion	6/1,2		
# Translation	6/3	6.15	
# Rotation	6/4	6.39, 6.42	
# General Motion	6/5	6.90, 6.77	
Work and Energy	6/6	6.122	
Impulse and Momentum	6/8	6.174	

Exam Schedule

Date	Subject
Week 9	MT-1
Week 13	MT-2

Additional Information and Resources

Make-up Exams

Students should act according to the OIDB Mevzuat. Do not be surprised if you find that make-up exams are harder.

Grading

0.3*MT-1 + 0.3*MT-2 + 0.4*Final