İzmir Institute of Technology

INSTITUTE OF ENGINEERING AND SCIENCE(M.S.)
MECHANICAL ENGINEERING

ME588	ADVANCED DYNAMİCS				
Semester	**Course Unit Code**	**Course Unit Title**	**L+P**	**Credit**	**Number of ECTS Credits**
2	ME588	ADVANCED DYNAMİCS	3	3	7

Mode of Delivery:
Face to Face
Language of Instruction:
English
Level of Course Unit:
Second Cycle
Work Placement(s):
No
Department / Program:
MECHANICAL ENGINEERING
Type of Course Unit:
Elective
Objectives of the Course:
The goal of this course is to teach the students the spatial dynamics through the spatial kinematics, review of Netwonian dynamics, rigid body dynamics and dynamic modelling via work and energy principles.
Teaching Methods and Techniques:
- Spatial Kinematics - Newtonian Dynamics - Dynamics of Rigid Bodies - Dynamics via Work and Energy Principles
Prerequisites and co-requisities:

Course Coordinator:

Name of Lecturers:
Asist Prof.Dr. Mehmet İsmet Can Dede
Assistants:

Recommended or Required Reading

Resources Baruh, Haim. Analytical dynamics. Boston: WCB/McGraw-Hill, 1999.,Ginsberg, Jerry H. Advanced engineering dynamics. Cambridge University Press, 19

Weekly Detailed Course Contents

Week	Topics	Study Materials	Materials
1	Position, velocity, and acceleration of a particle in terms of Cartesian, cylindrical, and spherical coordinate components / Mc		J. H. Ginsberg, Advanced Engineering D
2	Representation of vectors in different reference frames / Rotation of vectors / Dyadics as rotation operators		J. H. Ginsberg, Advanced Engineering D
3	Transformation and rotation matrices / Direction cosine matrices. Exponential rotation matrices. Euler angles.		J. H. Ginsberg, Advanced Engineering D
4	Differentiation of vectors with respect to different reference frames / Angular velocity and acceleration relationships		J. H. Ginsberg, Advanced Engineering D
5	Position, velocity, and acceleration of a particle with respect to differently moving reference frames.		J. H. Ginsberg, Advanced Engineering D
6	Midterm Exam 1		
7	Inertial and noninertial reference frames / Three laws of Newton / Force-acceleration relationships / Impulse-momentum re		J. H. Ginsberg, Advanced Engineering D
8	Work-energy relationships / Conservative and nonconservative forces / Potential energy		J. H. Ginsberg, Advanced Engineering D
9	Inertial properties of rigid bodies / Inertia tensor and its matrix representation in different reference frames / Newton-Euler		J. H. Ginsberg, Advanced Engineering D
10	Moment-free motions of rigid bodies / Spinning rigid bodies / Gyroscopic effects / Gyroscopes / Interacting rigid bodies		J. H. Ginsberg, Advanced Engineering D
11	Midterm Exam 2		
12	Generalized coordinates and forces / D'Alembert's and Hamilton's principles		J. H. Ginsberg, Advanced Engineering D
13	Lagrange's equations / Hamilton's equations		J. H. Ginsberg, Advanced Engineering D
14	Holonomic and nonholonomic constraints / Constraint forces		J. H. Ginsberg, Advanced Engineering D
15	Final 1st week		
16	Final 2nd week		

Course Learning Outcomes

No	Learning Outcomes
C01	Ability to apply spatial kinematics solutions for rigid bodies
C02	Ability to apply Newtonian dynamics for spatial rigid bodies
C03	Ability to implement rigid body dynamics solutions
C04	Ability to model multi degree of freedom systems by using work and energy principles

Program Learning Outcomes

No	Learning Outcome
P05	To have advanced skills in scientific and technical writing and oral communication.
P06	To have the ability to present his/her study in national or international congresses, conferences and other scientific meetings.
P07	To have an appreciation of ethical values in scientific and technical studies.
P04	To have the ability to identify, model, formulate, and solve mechanical engineering problems in the field of research.
P01	To have advanced knowledge in the master thesis subject.
P02	To have the ability to carry out independent research and study.
P03	To have the ability to use the knowledge learned in the courses.

Assessment Methods and Criteria

In-Term Studies	Quantity	Percentage
Midterm exams	2	%50
Quizzes	0	%0
Homeworks	0	%15
Other activities	0	%0
Laboratory works	0	%0
Projects	0	%0
Final examination	1	%35
Total		**%100**

ECTS Allocated Based on Student Workload

Activities	Quantity	Duration	Total Work Load
Weekly Course Time	1	36	36
Outside Activities About Course (Attendance, Presentation, Midterm exam,Final exam, Quiz etc.)	1	112	112
Application (Homework, Reading, Self Study etc.)	0	0	0
Laboratory	0	0	0
Exams and Exam Preparations	1	36	36
Total Work Load			**184**
ECTS Credit of the Course			**8**

Contribution of Learning Outcomes to Programme Outcomes

Contribution: 0: Null 1:Slight 2:Moderate 3:Significant 4:Very Significant

	P01	P02	P03	P04
C01	4	3	3	4
C02	4	3	3	4
C03	4	3	3	4
C04	4	3	3	4