ECTS COURSE INFORMATION FORM

Faculty	**Faculty of Engineering**	
Program	**B.Sc. in Electrical-Electronics Engineering**	**Elective**
	B.Sc. in Industrial Engineering	**Elective**
	B.Sc. in Computer Engineering	**Elective**
	B.Sc. in Mechanical Engineering	**Required**
	B.Sc. in Civil Engineering	**Required**

Course Code	DYN 201			
Course Title in English	Engineering Mechanics: Dynamics			
Course Title in Turkish	Mühendislik Mekaniği: Dinamik			
Language of Instruction	English			
Type of Course	Flipped Classroom/Project			
Level of Course	Undergraduate			
Course Category (by % of Content)	Basic Science	Basic Engineering	Engineering Design	General Education
	-	100	-	-
Semester Offered	Fall			
Contact Hours per Week	Lecture: 4 hours	Recitation:	Lab:	Other:
Estimated Student Workload	149 hours			
Number of Credits	6 ECTS			
Grading Mode	Standard Letter Grade			
Pre-requisites	None			
Expected Prior Knowledge	None			
Co-requisites	PHYS 103			
Registration Restrictions	Only Undergraduate Students			
Overall Educational Objective	To learn the dynamics principles of accelerated motion of particles & rigid bodies, considering the geometric aspects of the motion in two dimensions as well as the forces causing the motion by using Newton's second law, work-energy & impulse-momentum methods.			
Course Description	This course provides the fundamental aspects of dynamics, covering the following topics: Kinematics of a particle: Rectilinear and curvilinear motion in rectangular, normal-tangential and polar coordinates. Planar kinematics of rigid bodies: Absolute/relative motion, instantaneous center of velocity, motion relative to rotating axes. Planar kinetics of particles: The force-mass-acceleration method. Work-energy and impulse-momentum relations. Planar kinetics of rigid bodies and the work-Energy method. Free and forced vibrations of particles and rigid bodies.			
Course Description in Turkish	Bu ders dinamiğin temel kavramlarını içermektedir ve şu konuları kapsamaktadır: Parçacık kinematiği: Kartezyen, normal-teğetsel ve kutupsal koordinatlarda doğrusal ve eğrisel hareket. Katı cisimlerin düzlemsel kinematiği: Mutlak/bağıl hareket, anlık hız merkezi, dönen eksenlere göre hareket. Parçacıkların düzlemsel kinetiği: Kuvvet-kütle-ivme metodu. İş-enerji ve impals-momentum ilişkileri. Katı cisimlerin düzlemsel kinetiği ve iş-enerji metodu. Parçacıkların ve katı cisimlerin serbest ve zorlanmış titreşimleri.			
Course Learning Outcomes and Competences	Upon successful completion of the course, the learner is expected to: 1. solve kinematic problems of a particle and rigid bodies; 2. solve kinetic problems of a particle and rigid bodies; 3. solve free and forced vibration problems of particles and rigid bodies; 4. apply engineering design to construct a mass-spring-damper system prototype, measure free oscillations, and implement a tuned-mass damper to attenuate vibrations; 5. communicate and collaborate on a team, setting goals, accomplishing tasks, and meeting deadlines to develop a project and professionally write its final report; 6. self-learn and apply new knowledge by his/her own means as a valuable life-long learning skill.			

Relationship of the Course with the Student Outcomes	Level	Learning Outcomes	Assessed by
Student Outcomes	N=None S=Supportive H=High		Exam, Project, HW, Experiment, Presentation, etc.
(1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	H	1-3	Exams, tests, Flip. Class. Practice
(2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	S	4	Project report
(3) an ability to communicate effectively with a range of audiences			
(4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts			
(5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	S	5	Project report, project advances
(6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions			
(7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	S	6	Project report (Tracker sw.)

Prepared by and Date	Prof. Dr. Dante Dorantes / January 13, 2020	
Semester	Fall 2020-2021	
Name of Instructors	Prof. Dr. Dante Dorantes	
Course Contents	Week	Topic
	1.	Kinematics of a particle: Components of velocity & acceleration in rectilinear motion.
	2.	Components of velocity & acceleration in curvilinear motion.
	3.	Natural, polar & cylindrical coordinates of curvilinear motion.
	4.	Relative motion, constrained motion, and degrees of freedom.
	5.	Kinematics of planar rigid bodies: Motion about a fixed axis/rotating axes, general motion, relative velocity/acceleration.
	6.	Instantaneous center of rotation, Coriolis acceleration.
	7.	Kinetics of a particle: Newton's second law, equation of motion; linear & angular momentum, conservation of angular momentum.
	8.	Work of a force, principle of work & energy, power & efficiency.
	9.	Potential energy, conservation of energy, central forces.
	10.	Principle of impulse of force, linear momentum, angular impulse & angular momentum.
	11.	Kinetics of planar rigid bodies: Mass moment of inertia, parallel-axis theorem; general plane motion, angular momentum and moment equation; translation, fixed-axis rotation
	12.	General planar motion; constrained/unconstrained motion, and system of interconnected rigid bodies.
	13.	Introduction to vibrations & time response: Particle/rigid free vibrations.
	14.	Introduction to vibrations & time response: Rigid forced vibrations.
	15.	Final Exam/Project/Presentation Period
	16.	Final Exam/Project/Presentation Period
Required/Recommended Readings	Engineering Mechanics: Dynamics. SI Version. J.L. Meriam, L.G. Kraige. John Wiley & Sons, Inc. 7th edition 2013	
Teaching Methods	Flipped classroom and project-based learning	
Homework and Projects	Project: Design and construction of a physical mass-spring-damper system prototype from the real-life, implement a tuned-mass damper for free vibrations and compete for best attenuations.	

Laboratory Work	
Computer Use	Tracker freeware to acquire vibrations and plots from objects recorded as videos.
Other Activities	
Assessment Methods	Types of assessment — Number — Ratio (%) Midterm Exam — 2 — 45 Flipped Classroom Practice — 14 — 10 (participation levels: 0, 1, 2) After-video tests — 6 — 5 Project — 1 — 40 Total — 100
Course Administration	**Instructor's office and phone number**: 5th Floor, 0212 395 36 40 **office hours:** Monday 13:00-15:00 **email address:** dante.dorantes@mef.edu.tr **Rules for attendance:** attendance is taken during Flipped Classroom Practice. A minimum of 70% of attendance is mandatory. **Rules for Flipped Classroom Practice:** Missed Flipped Classroom Practice will be given a zero grade. Participation quizzes with flaws or lack of individual collaboration attitude during team work will be given a grade of one. Successful flipped classroom participation will be given a grade of two. **Rules for late submission of the project:** It will be discounted 20/100 by each delayed day. **Rules for missing a midterm**: Provided that a valid justification is approved by the university and presented, a make-up exam will be granted one week after the regular midterm date. **Minimum grade to be allowed to pass the course:** Satisfactory Project, Laboratory reports, and at least 70% attendance are mandatory to be allowed to pass the course. **A reminder of proper classroom behavior, code of student conduct**: YÖK Regulations **Statement on plagiarism**: YÖK Regulations http://www.mef.edu.tr/Yonetmelikler

ECTS Student Workload Estimation

Activity	No/Weeks	Hours			Calculation	Explanation
	No/Weeks per Semester (A)	Preparing for the Activity (B)	Spent in the Activity Itself (C)	Completing the Activity Requirements (D)		
Lecture/Flipped Classro	22		2	1	66	A*(B+C+D)
After-video online tests	4		0.5	0.5	4	A*(B+C+D)
Midterm(s)	2	10	4		28	A*(B+C+D)
Project & advances	3	3	14		51	A*(B+C+D)
Final Examination					0	A*(B+C+D)
Total Workload					149	
Total Workload/25					5.96	
ECTS					**6**	