ADVANCED TOPICS IN MACHINE DYNAMICS

1	Course Title:	ADVANCED TOPICS IN MACHINE DYNAMICS	
2	Course Code:	MAK6218	
3	Type of Course:	Optional	
4	Level of Course:	Third Cycle	
5	Year of Study:	1	
6	Semester:	2	
7	ECTS Credits Allocated:	5.00	
8	Theoretical (hour/week):	3.00	
9	Practice (hour/week):	0.00	
10	Laboratory (hour/week):	0	
11	Prerequisites:	None	
12	Language:	Turkish	
13	Mode of Delivery:	Face to face	
14	Course Coordinator:	Prof. Dr. OSMAN KOPMAZ	
15	Course Lecturers:	Prof. Dr. OSMAN KOPMAZ	
16	Contact information of the Course Coordinator:	okopmaz@uludag.edu.tr +90 224 294 19 62 Uludağ Üniversitesi, Mühendislik Mimarlık Fakültesi, Makine Mühendisliği Bölümü, Görükle, 16059 Bursa	
17	Website:		
18	Objective of the Course:	In the design of machinery, dynamic analysis is one of the most important phases. The first stage of such an analysis is deriving equations of motion. In this course, various forms of formulations of equations of motion are given. Moreover, dynamics of some mechanisms and machines often encountered in mechanical engineering practice.	
19	Contribution of the Course to Professional Development:		
20	Learning Outcomes:		
		1	Students who attend this course can approach to machine dynamics problems with scientific methods, and use the softwares in this field more efficiently.
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21	Course Content:		

Course Content:

Week	Theoretical	Practice

1	Review of principles of dynamics and basic topics of machine dynamics. Static and dynamic equilibrium problems. Energy balancing. Mass balancing.	
2	Methods used in the derivation of equations of motion. Euler-Newton equations of motion. 1st take-home.	
3	Principle of virtual work. Principle of virtual power (Jourdain principle).	
4	Generalized coordinates. D'Alembert's principle. Lagrangian equations of motion. 2nd take-home.	
5	Hamilton principle. Generalized velocities. Kane's equations of motion. Gibbs-Appel equations.	
6	Implementations in special mechanical systems. Holonom and non-holonom systems. 3rd take-home.	
7	Deriving and solving equations of motion of systems with rigid and/or flexible bodies.	
8	Repeating courses and midterm exam	
9	Dynamics of reciprocating machines. Kinematics and dynamics of a crank-slider mechanism.	
10	First and second order crank stars. Mass and energy balancing single and multi-cylinder internal combustion engines. 4th take-home.	
13	Dynamic analysis of cam mechanisms. 5th	
14	Manipulator dynamics.	
	Materials:	Springer Verlag. R. L. Norton, Design of Machinery, McGraw Hill

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	3.00	42.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	14	5.00	70.00
Homeworks	5	15.00	75.00
Projects	0	0.00	0.00
Field Studies	0	0.00	0.00
Midterm exams	1	2.00	2.00
Others	0	0.00	0.00
Final Exams	1	2.00	2.00
Total Work Load			191.00
Total work load/ 30 hr			6.37
ECTS Credit of the Course			5.00

23	Assesment	
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Midterm Exam	1	20.00
Quiz	0	0.00
Home work project	5	30.00
Final Exam	1	50.00
Total	7	100.00
Contribution of Term (Year) Learning Activities to Success Grade		50.00
Contribution of Final Exam to Success Grade		50.00
Total		100.00
Measurement and Evaluation Techniques Used in the Course		

24	**ECTS / WORK LOAD TABLE**

25	CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS															
	PQ1	PQ2	PQ3	PQ4	PQ5	PQ6	PQ7	PQ8	PQ9	PQ10	PQ11	PQ12	PQ13	PQ14	PQ15	PQ16
ÖK1	4	4	4	0	0	0	4	0	0	0	0	0	0	0	0	0
LO: Learning Objectives PQ: Program Qualifications																
Contribution Level:	1 very low			2 low			3 Medium			4 High			5 Very High			