

# MECHANICAL VIBRATIONS AND ACOUSTIC

<b>1</b>	Course Title:	MECHANICAL VIBRATIONS AND ACOUSTIC	
<b>2</b>	Course Code:	MAK3044	
<b>3</b>	Type of Course:	Optional	
<b>4</b>	Level of Course:	First Cycle	
<b>5</b>	Year of Study:	3	
<b>6</b>	Semester:	6	
<b>7</b>	ECTS Credits Allocated:	3.00	
<b>8</b>	Theoretical (hour/week):	2.00	
<b>9</b>	Practice (hour/week):	0.00	
<b>10</b>	Laboratory (hour/week):	0	
<b>11</b>	Prerequisites:	None	
<b>12</b>	Language:	Turkish	
<b>13</b>	Mode of Delivery:	Face to face	
<b>14</b>	Course Coordinator:	Prof. Dr. OSMAN KOPMAZ	
<b>15</b>	Course Lecturers:	Prof. Dr. OSMAN KOPMAZ	
<b>16</b>	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	
<b>17</b>	Website:		
<b>18</b>	Objective of the Course:	Vibration is a significant phenomenon in engineering systems. Teaching the theory about mechanical vibrations which are getting increasingly important in modern systems, and its applications, and giving basic principles of acoustics are among the goals of this course.	
<b>19</b>	Contribution of the Course to Professional Development:		
<b>20</b>	Learning Outcomes:		
		<b>1</b>	Students who take this course can classify, model and analytically or numerically solve general vibration problems in engineering practice.
		<b>2</b>	They are informed about sound, noise, noise measurement, and noise reduction.
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<b>21</b>	Course Content:		
		<b>Course Content:</b>	
Week	Theoretical	Practice	

1	Basic concepts of elementary vibration theory System parameters. Mass, stiffness and damping. Equations of motion. Frequency, period. Initial conditions. Models with single degree of freedom.	
2	Derivation of equation of motion in a conservative one-degree-of-freedom system.	
3	Undamped and damped vibrations of a system with one degree of freedom. Natural frequency and period. Viscous damping. Logarithmic decrement. 1st take-home.	
4	System with dry friction. Definition of effective mass. Forced vibrations of undamped system with one degree of freedom. Frequency response spectrum.	
5	Forced vibration in a damped system. Isolation and transmissibility. Vibration isolation.	
6	Response periodic and non-periodic excitation. Convolution and Duhamel integrals. 2nd take-home.	
7	Systems with two degree of freedom. Undamped case. Natural vibration modes.	
8	Repeating courses and midterm exam	
9	Coordinate transformations. Natural coordinates. System response to initial conditions excitation. Beat phenomena. Undamped and damped vibration absorbers. 3rd take-home.	
10	Multi-degree-of-freedom systems. Lagrangian equations of motion. Linear transformation. Modal matrix. Coupling. Orthogonality in modal vectors.	
11	Stiffness and inertia matrices. Positive definit and semi-definit systems. Constrained and unconstrained systems. 4th take-home.	
12	Sound. Hearing. Audible sound interval. Decibel. Sound pressure. Sound power. Sound intensity.	
13	Reverberation. Insertion loss. Transmission loss. Noise reduction. 5th take-home.	
14	Air-borne and structure-born sounds. Relation between mechanical vibrations and noise.	

22	Textbooks, References and/or Other Materials:	L. Meirovitch, Fundamentals of Vibration, Prentice Hall. W. Seto, Mechanical Vibrations, McGraw-Hill Schaum. L. L. Baranek, Noise and Vibration Control, Inst. Of Noise Control Engineer.
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23	Assesment	
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TERM LEARNING ACTIVITIES	NUMBE R	WEIGHT
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			
<b>24</b>	<b>ECTS / WORK LOAD TABLE</b>		
<b>Activites</b>	<b>Number</b>	<b>Duration (hour)</b>	<b>Total Work Load (hour)</b>
Theoretical	14	2.00	28.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	14	2.00	28.00
Homeworks	5	6.00	30.00
Projects	0	0.00	0.00
Field Studies	0	0.00	0.00
Midterm exams	1	1.50	1.50
Others	0	0.00	0.00
Final Exams	1	1.50	1.50
Total Work Load			89.00
Total work load/ 30 hr			2.97
ECTS Credit of the Course			3.00

<b>25</b>	<b>CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS</b>															
	<b>PQ1</b>	<b>PQ2</b>	<b>PQ3</b>	<b>PQ4</b>	<b>PQ5</b>	<b>PQ6</b>	<b>PQ7</b>	<b>PQ8</b>	<b>PQ9</b>	<b>PQ10</b>	<b>PQ11</b>	<b>PQ12</b>	<b>PQ13</b>	<b>PQ14</b>	<b>PQ15</b>	<b>PQ16</b>
<b>ÖK1</b>	4	4	4	0	0	0	4	0	0	0	0	0	0	0	0	0
<b>ÖK2</b>	4	4	4	0	0	0	4	0	0	0	0	0	0	0	0	0
<b>LO: Learning Objectives    PQ: Program Qualifications</b>																
<b>Contribution Level:</b>	<b>1 very low</b>			<b>2 low</b>			<b>3 Medium</b>			<b>4 High</b>			<b>5 Very High</b>			