

MM 577 Advanced Machine Vibrations				MECHANICAL ENGINEERING DEPARTMENT					
Semester	Methods of Education							Credits	
	Lecture	Recit.	Lab.	Project/Field Study	Homework	Other	Total	Credit	ECTS credit
1,2	30	12				146	188	3	7.5
Language	Turkish								
Compulsory / Elective	Optional								
Prerequisites	-								
Course Contents	Vibrations of linear multi-degree of freedom systems with and without damping. Systems with viscous, hysteretic and Coulomb damping. Determination of equation of motion with Newton Method, Lagrange Method, Energy Method and generalized coordinates. Influence coefficients, potential and kinetic energy expressions in matrix form. Generalized coordinates and generalized forces. Eigenvalue problem and system response. Solution of equation of motion and vibration modes; analytical methods, numerical methods and computational analysis of vibrations and mode shapes Determination of natural frequencies and mode shapes; Dunkerley's Formula, Rayleigh's Method, Holzer's Method, matrix iteration method, Jacobi's Method. Orthogonality of normal modes, expansion theorem. Unrestrained systems. Introduction to rotor dynamics. Predictive maintenance and some case studies form the industry.								
Course Objectives	Determination of equations of motion and investigation of vibrations of multi-degree of freedom systems.								
Learning Outcomes and Competences	Understanding of fundamentals in the investigation of multi-degree of freedom system vibrations.								
Textbook and /or Reference	1. Meirovitch, L. (1986). Elements of Vibration Analysis. Singopure: McGraw Hill. 2. Inman, D.J. (2001). Engineering Vibration. New Jersey: Prentice Hall. 3. Meirovitch, L. (1967). Analytical Methods in Vibrations. New York: McMillan.								
Assessment Criteria					If any, mark as (X)		Percentage (%)		
	Midterm Exams				X		40		
	Quizzes								
	Homeworks								
	Projects								
	Term Paper								
	Laboratory Work								
	Other								
	Final Exam				X		60		
Instructors	Prof. Nizami AKTURK, Prof. Sefaatdin YUKSEL								
Week	Subject								
1	Introduction: Vibrations of Linear Multi-Degree of Freedom Systems with and without Damping								
2	Systems with viscous,Hysterestic and Coulomb Damping								
3	Determination of Equation of Motion with Newton Method								
4	Lagrange Method, Energy Method and Generalized Coordinates								
5	Influence Coefficients, Patantial and Kinetic Energy Exoressions in Matrix Form								
6	Generalized Coordinates and Generalized Forces								
7	Eigenvalue Problem and System Response								
8	Solution of Equation of Motion and Vibration Modes;analytical Methods								
9	Numerical Methods and Computational Analysis of Vibrations and Mode Shapes								
10	Determination of Natural Frequencies and Modes Shapes; Dunkerley's Formula, Rayleigh's Method								
11	Holzer's Method, Matrix Iteration Method, Jacobi's Method								
12	Orthogonality of Normal Modes, Expansion Theorem								
13	Unrestrained Systems. Introduction to Rotor Dynamics								
14	Predictive Maintenance and Some Case Studies form the Industry								