COURSE CATALOG

Course Code: CE 308				Course Name: Structural Dynamics			
Semester	T + P + L	Credits	ECTS	Language of Instruction	Course Type	Instruction Methods	Prequisite(s)
6-7-8	3 + 0 + 0	3	6	English	Departmental Elective(D2)	Lecture	CE201, CE202, CE204

Course Objectives	Discrete systems. One degree of freedom systems. Two degree of freedom systems. Continuous systems. Vibration of strings and cables. Longitudinal vibrations of rods. Bending vibrations of beams. Approximate methods of solutions. Torsional vibrations of shafts. Vibrations of rectangular and circular membranes. Vibrations of plates.
Topics Covered	Definition. Fundamental principles. Oscillatory motion, Free vibration: Vibration model, Equation of motion, natural frequencies, Energy method, Principles of virtual work, damping. Harmonically excited vibration: Forced harmonic motion, structural damping. Multi-degree of freedom systems: normal mode vibration, forced harmonic motion, vibration damper. Properties of vibrating systems. Flexibility matrix, stiffness matrix, stiffness of beams, Eigenvalues, eigenvectors. Lagrange equations. Continuous Systems. Vibrating String. Longitudinal vibration of rods. Torsional vibration of rods. Euler equation for beams. Approximate numerical methods. Random vibrations. Nonlinear vibrations. Vibrations of plates. Measurements and frequency analysis.
Learning Outcomes of the Course	After successfully completing this course students should be able: 1- to learn fundamental sound and vibration concepts and measurements [1,4,6] 2- to obtain an introduction to linear systems and frequency analysis [1,4,8] 3- to perform vibration analysis.[1,2] 4- to gain an ability to apply knowledge of mathematics, science and engineering [1,2,6,8,12] 5- to gain an ability to design a system, component, or process to meet desired needs [1,2] 6- to gain an ability to identify, formulate and solve dynamic engineering problems [2,13] *[Note that the numbers in between the brackets address the bullet numbers in the program outcomes list.]*
ISCED Category of the Course	52 Engineering
Textbook	W.T. Thomson, Theory of Vibration with applications, 1993, 4th Edition, Nelson Thornes
Recommended Sources	1- R. N. Chaudri, Wave and Oscillations, New Age, 2010. 2- R.E.D.Bishop, The mechanics of vibration, Cambridge University Press, 1979. 3- 3. J.H. Ginsberg, Mechanical and structural vibrations: theory and applications, Wiley, New York, 2001.

WEEKLY SCHEDULE

Week	Theoretical Topic	Applied / Laboratory Topics
1	Definition. Fundamental principles. Oscillatory motion, Free vibration: Vibration model, Equation of motion, natural frequencies,	
2	Energy method, Principles of virtual work, damping.	
3	Harmonically excited vibration: Forced harmonic motion, structural damping.	
4	Multi-degree of freedom systems: normal mode vibration, forced harmonic motion, vibration damper. Properties of vibrating systems.	
5	Flexibility matrix, stiffness matrix, stiffness of beams. Eigenvalues, eigenvectors.	
6	Lagrange equations.	
7	Continuous Systems. Vibrating String.	
8	Longitudinal vibration of rods.	
9	Torsional vibration of rods.	
10	Euler equation for beams.	
11	Approximate numerical methods.	
12	Random vibrations. Nonlinear vibrations.	
13	Vibrations of plates.	
14	Measurements and frequency analysis.	

COURSE ASSESSMENT POLICY

	Activities	Number	Contribution (%)
Studies throughout the term	Quiz	3	10
	Term Homework/ Project		
	Reports	-	-
	Graduation Thesis/ Project	-	-
	Seminar	-	-
	Homework	5	10
	Presentations	-	-
	Midterm Exams	2	40
	Project		
	Laboratory	-	-
	Other (attendance)	-	-
FINAL EXAM		1	40
Total			100

CONTRIBUTION OF THE COURSE TO CIVIL ENGINEERING PROGRAM OUTCOMES

	Program Outcomes	1	2	3
1	The ability to apply knowledge of mathematics, science, and engineering			X
2	The ability to identify, formulate, and solve engineering problems			X
3	The ability to design a system or component to meet desired needs with realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability and sustainability		X	
4	The ability to analyze and interpret data			X
5	The ability to design and conduct experiments and apply experimental results to improve processes		X	
6	The ability to convey technical material through oral presentations and written papers/reports			X
7	The ability to function within multidisciplinary teams			X
8	The understanding of professional and ethical responsibilities			X
9	The understanding of the impact of engineering on society		X	
10	The understanding of the necessity to engage in life-long learning			X
11	The understanding of management and leadership principles and techniques	X		
12	The appreciation of the role of research in civil engineering problems			X
13	A knowledge of contemporary issues in civil engineering			X
14	The ability to use modern engineering techniques, skills, and tools		X	
15	The ability to understand and explain basic concepts in management, business, and leadership	X		
16	A commitment to quality, punctuality and continuous improvement		X	

Contribution Level: 1 low, 2 medium, 3 high

ECTS-WORKLOAD TABLE

ACTIVITIES	Number	Duration (Hour)	Workload(Hour)
Lecture Time	14	3	42
Final Exam (Including Preparation Time)	1	14	14
Quiz	3	4	12
Term Homework / Project	-	-	-
Reports			
Graduation Thesis/Project	-	-	-
Seminar			
Study Time Outside the Class	14	3	42
Homework	5	4	20
Presentations	-	-	-
Midterm Exams (Including Preparation Time)	2	10	20
Project	-	-	-
Laboratory	-	-	-
Total Workload			150

ECTS Credits of the Course (Total Workload / 25)			6

Last update on 19.01.2014	Coordinator / PREPARED BY Esin Inan	APPROVED BY Esin İnan