COURSE INFORMATION

Course Code	AAM 556	Course Name	Vibration of Continuous Systems					
Type of Course	**Level of Course**	**Semester**	**Language**	**Theory**	**Application (Practice)**	**Laboratory**	**Local Credits**	**ECTS**
Elective	Graduate	-	English	3	0	0	3	6

Department	: Aerospace Engineering
Prerequisites/Requirements for Admission	: -
Mode of Delivery	: Face to Face
Course Coordinator	: Assist. Prof. Dr. Reza AGHAZADEH
Course Lecturer(s)	: Assist. Prof. Dr. Reza AGHAZADEH
Course Assistant(s)	:
Course Description/Aim	: This course covers analytical and computational methods of vibration analysis of continuous structural systems, including strings, bars, shafts, beams and circular plates. Moreover, exact and approximate analytical methods of analysis with illustrative examples are presented.
Course Contents	: Generalized coordinates and Hamilton's principle, boundary value problem, eigenvalue problem and generalized orthogonality, vibration of strings, bars, membranes and plates. Exact and approximate methods, modal analysis, and response of undamped continuous systems.
Recommended Optional Program Components	:
Compulsory Attendance	: 70%

Course Learning Outcomes

#	Learning outcome	Teaching Methods/Techniques	Assessment method(s)
At the end of this course; students will be able to:			
1	Derive equations of motion for vibration of continuous systems using Hamilton's principle.	Theoretical Lecture, Solving Exercises	Exams/Homeworks/Project
2	Determine natural modes of vibration in continuous systems using exact methods.	Theoretical Lecture, Solving Exercises	Exams/Homeworks/Project
3	Determine natural modes of vibration in continuous systems using approximate methods.	Theoretical Lecture, Solving Exercises	Exams/Homeworks/Project
4	Apply modal analysis for undamped vibrations.	Theoretical Lecture, Solving Exercises	Exams/Homeworks/Project
5	Apply approximate methods for undamped vibrations.	Theoretical Lecture, Solving Exercises	Exams/Homeworks/Project

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Weekly Detailed Course Content

Week	Content	Recommended Resource(s)	Time (Hours)
1	Principles of Analytical Dynamics – Generalized Coordinates	Textbook/ Lecture Notes	3
2	Principles of Analytical Dynamics – Hamilton's Principle	Textbook/ Lecture Notes	3
3	Boundary Value Problem	Textbook/ Lecture Notes	3
4	Eigenvalue Problem	Textbook/ Lecture Notes	3
5	Natural Modes of Vibration – Strings and Rods	Textbook/ Lecture Notes	3
6	Natural Modes of Vibration – Beams and Membranes	Textbook/ Lecture Notes	3
7	Expansion and Enclosure Theorems	Textbook/ Lecture Notes	3
8	Approximate Method for Natural Modes of Vibration – Rayleigh's Energy Method / Midterm Exam	Textbook/ Lecture Notes	3
9	Approximate Method for Natural Modes of Vibration – Rayleigh-Ritz Method	Textbook/ Lecture Notes	3
10	Approximate Method for Natural Modes of Vibration – Assumed Modes Method and Weighted Residuals	Textbook/ Lecture Notes	3
11	Modal Analysis for Undamped Systems	Textbook/ Lecture Notes	3
12	Approximate Methods for Analysis of Undamped Systems - Assumed Modes Method	Textbook/ Lecture Notes	3
13	Approximate Methods for Analysis of Undamped Systems – Galerkin's Method	Textbook/ Lecture Notes	3
14	Approximate Methods for Analysis of Undamped Systems – Collocation Method	Textbook/ Lecture Notes	3
15	Final Exam		
16	Final Exam		

Sources

Course Notes / Textbooks	Meirovitch, L., 2000, *Fundamentals of Vibration*, McGraw Hill.
Supplemental Readings	Meirovitch, L., 1997, *Principles and Techniques of Vibrations*, Prentice Hall. Rao, S. S., 1995, *Mechanical Vibrations*, Addison Wesley. Kelly, S. G., 2000, *Fundamentals of Vibrations*, McGraw Hill. Meirovitch, L., 1967, *Analytical Methods in Vibrations*, MacMillan.

Evaluation System

Work Placement	Number	Percentage of Grade (%)
Attendance		
Quizzes		
Homework	3	15
Presentation		
Laboratory/Practice		
Report(s)		
Graduate Thesis/Project		
Seminar		
Projects	1	15
Midterm exam(s)	1	30
Others		

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Final exam	1	40
	Total	100
	Percentage of semester work	60
	Percentage of final exam	40
	Total	100

Workload Calculation

Activity	Number	Time (hours)	Total Work Load (hours)
Course Hours	14	3	42
On-line Activity Hours			
Individual study	16	6	96
Midterm exam(s)	1	2	2
Final exam	1	2	2
Homework	3	6	18
Presentation			
Project	1	20	20
		Total	180
		ECTS Credit *(Total/30)*	6

Contribution of Learning Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
LO1	5	5	2	5	4	2	3	4	2
LO2	5	5	2	5	4	2	3	4	2
LO3	5	5	2	5	4	2	3	4	2
LO4	5	5	2	5	4	2	3	4	2
LO5	5	5	2	5	4	2	3	4	2

Contribution Level : 1: “Very low”, 2: “Low”, 3: “Medium”, 4: “High”, 5: “Very High”
LO: Learning Outcome of the Course
PO: Program Outcome