Jordan University of Science and Technology

Faculty of Engineering

Aeronautical Engineering Department

AE461 Mechanical Vibrations - JNQF Level: 7

First Semester 2023-2024

Course Catalog
3 Credit Hours. Elements of vibratory systems, Properties of Oscillatory Motion, Derivation of Governing Differential Equations, Free and Damped Vibrations, Harmonically Excited Motion, Rotating and Reciprocating Unbalance, Support Motion, Vibration Measurements, Vibration Isolation, Transient Vibrations, Free and Forced Vibrations of Multi-Degrees-of-Freedom Systems, Vibration Absorbers.

Text Book	
Title	Engineering Vibrations
Author(s)	D. Inman
Edition	5th Edition
Short Name	Ref. 1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
Ref. 2	Mechanical Vibrations	Singiresu S. Rao	6th Edition	
Ref. 3	Machinery Vibration: Measurement and Analysis	Victor Wowk	2nd Edition	

Instructor	
Name	**Dr. Ahmad Al Shyyab**
Office Location	M5 L2
Office Hours	Sun : 09:30 - 10:30 Mon : 09:30 - 11:30 Tue : 09:30 - 10:30 Wed : 09:30 - 11:30
Email	asalshyyab@just.edu.jo

Class Schedule & Room
Section 1: Lecture Time: Sun, Tue, Thu : 08:30 - 09:30 Room: M5126

Prerequisites		
Line Number	**Course Name**	**Prerequisite Type**
712120	AE212 Dynamics	Prerequisite / Pass
713030	AE303 Applied Math For Engineers	Prerequisite / Study

Tentative List of Topics Covered		
Weeks	**Topic**	**References**
Weeks 1, 2, 3, 4	Introduction to Vibration and the Free Response.	**Chapter 1** From **Ref. 1**
Weeks 5, 6, 7, 8	Response to Harmonic Excitation	**Chapter 2** From **Ref. 1**
Weeks 8, 9, 10	General Forced Response	**Chapter 3** From **Ref. 1**
Weeks 11, 12, 13, 14	Multi-Degree-of-Freedom System	**Chapter 4** From **Ref. 1**
Weeks 15, 16	Design for Vibration Absorber	**Chapter 5** From **Ref. 1**

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
Formulate expressions for mechanical vibration energy storing and dissipation elements to model single and multi-degree freedom vibratory systems. [1SO1] [1L7K1]	6%	
Formulate mathematical models of single- and multi-degree-of-freedom vibrating systems. [1SO1] [1L7K1]	20%	
Solve the equation of motion of free single-degree-of-freedom systems to understand the effects of system parameters on the natural frequency, stability, and exponential decay of the motion response. [1SO1] [1L7K1]	13%	
Solve the equation of motion of forced single-degree-of-freedom systems to investigate the role of damping and the frequency ratio terms on the phase and magnitude of the forced response. [1SO1] [1L7K1]	20%	
Solve the equation of motion of free and forced multi-degree-of-freedom systems to analyze the motion response and introduce concepts of natural frequencies and mode shapes. [1SO1] [1L7K1]	15%	
Apply modal analysis techniques to solve equations of motion of free multi-degree-of-freedom systems. [1SO1] [1L7K1]	15%	

Design vibration absorber to reduce or eliminate motion response of single-degree-of-freedom systems [1SO2] [1L7S2]	6%	
Design accelerometer to measure the motion response of vibrating body [1SO2] [1L7S3]	5%	

Relationship to Program Student Outcomes (Out of 100%)						
SO1	SO2	SO3	SO4	SO5	SO6	SO7
89	11					

Relationship to NQF Outcomes (Out of 100%)		
L7K1	L7S2	L7S3
89	6	5

Evaluation	
Assessment Tool	**Weight**
First Exam	30%
2ed exam	30%
Final	40%

Policy	
Attendance	According to university rules, you are allowed to be absent up to 20% of the total number of in-class lectures without showing any excuse. Have you missed more than 20% of the total number of in-class lectures you will be dismissed even if you show an excuse.

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