Syllabus

Course Description

Course Title	Dynamics of Mechanical Systems
Course Code	47561
Course Title Additional	
Scientific-Disciplinary Sector	IIND-02/A
Language	English
Degree Course	Master in Industrial Mechanical Engineering
Other Degree Courses (Loaned)	
Lecturers	dr. Veit Gufler, Veit.Gufler@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/38756
Teaching Assistant	
Semester	Second semester
Course Year/s	1
CP	5
Teaching Hours	28
Lab Hours	18
Individual Study Hours	79
Planned Office Hours	
Contents Summary	Understanding and knowledge of the fundamentals for both the theoretical as well as the experimental sides of mechanical vibrations. This includes the mathematical modeling of dynamical problems, the solving of these derived mathematical models and understanding of the results. Furthers, the students will gain practical experience of mechanical vibrations in a laboratory environment.
Course Topics	1) Dynamics of vibrating systems with one degree of freedom: • Modeling • Free response

	• Harmonic excitation and frequency response • Forced response to impulse, step forces • Response to base excitation and isolation 2) Dynamics of vibrating systems with more degrees of freedom • Modeling • Modal analysis • Forced response 3) Continuous systems • Basic models and relations 4) Laboratory experiences • Introduction to data acquisition and sensors for dynamic measurements • Numerical and experimental applications.
Keywords	dynamic systems, mechanical vibrations, modal analysis, resonance, frequency response
Recommended Prerequisites	
Propaedeutic Courses	Fundamentals of mechanics and mathematics learned in bachelor's degree studies of mechanical engineering.
Teaching Format	Frontal lectures, hand calculation exercises, computer exercises, laboratory exercises.
Mandatory Attendance	Not mandatory but strongly recommended.
Specific Educational Objectives and Learning Outcomes	The learning outcomes need to refer to the Dublin Descriptors: 1. Knowledge and understanding: Knowledge and understanding of the fundamentals of vibration mechanics. 2. Applying Knowledge and understanding: Applying knowledge and understanding to analyze dynamical components, structures, and systems. 3. Making judgments: The structural mechanical design under consideration of dynamical considerations including vibrations requires understanding and ability to make judgments based on theory and experiments. 4. Communication skills: Communication skills to convey and transfer understanding of

	mechanical vibrations. Communication skills to explain results of dynamical analysis and their consequences to structural mechanical design. 5. Learning skills Learning skills to independently study the specific fields of mechanical vibrations for applications beyond this lecture.
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	- Formative assessment: In class exercises: during the course; ILOs assessed: 1, 2, 3, 4; - Summative assessment: 100% written exam: 2 hours; ILOs assessed: 1, 2, 3, 4.
Evaluation Criteria	The written exam includes numerical exercises, theoretical questions and questions related to the laboratory activities (no books or own notes are allowed during the exams). Exercises and questions will show ability to solve problems of mechanical vibrations as well as knowledge-based questions to show understanding of the material.
Required Readings	• Lecture slides • Notes taken during lecture
Supplementary Readings	• S. G. Kelly. Mechanical vibrations: Theory and applications. Stamford: Cengage, 2012 • T. L. Schmitz and K. S. Smith. Mechanical vibrations: Modeling and measurement. Cham: Springer, 2021. https://doi.org/10.1007/978-3-030-52344-2
Further Information	
Sustainable Development Goals (SDGs)	Quality education, Industry, innovation and infrastructure, Affordable and clean energy