Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Dynamics of Mechanical Systems
Course code	47561
Scientific sector	ING-IND/13
Degree	Master in Industrial Mechanical Engineering
Semester	2
Year	1
Academic year	2025/2026
Credits	5
Modular	no

Total lecturing hours	28
Total lab and exercise hours	18
Attendance	Not mandatory but strongly recommended
Recommended preliminary knowledge	Fundamentals of mechanics and mathematics learned in bachelor's degree studies of mechanical engineering
Connections with other courses	Connection with the courses of mechanics of machines and of structures. Connection with the theory of automatic control
Course page	https://www.unibz.it/en/faculties/engineering/master-industrial-mechanical-engineering/course-offering/?academicYear=2025

Specific educational objectives	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.

Lecturers	Dr. Veit Gufler
Scientific sector of the lecturers	ING-IND/13
Teaching language	English
Office hours	15
Teaching assistant *(if any)*	-
Office hours	-

List of topics covered	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 degree 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
Professional applications of the covered topics	Engineering professions involving the design, the optimization and the monitoring of machines and structures.
Teaching format	Frontal lectures, hand calculation exercises, computer exercises, laboratory exercises.

Learning outcomes (ILO)	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.

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<tr><td></td><td>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.</td></tr>
<tr><td>Assessment</td><td>Formative assessment
<table><tr><th>Form</th><th>Length /duration</th><th>ILOs assessed</th></tr><tr><td>In-class exercises</td><td>During the course</td><td>1, 2, 3, 4</td></tr></table>
Summative assessment
<table><tr><th>Form</th><th>%</th><th>Length /duration</th><th>ILOs assessed</th></tr><tr><td>Written exam</td><td>100 %</td><td>2 hours</td><td>1, 2, 3, 4</td></tr></table></td></tr>
<tr><td>Assessment language</td><td>English</td></tr>
<tr><td>Evaluation criteria and criteria for awarding marks</td><td>The written exam incudes numerical exercises, theoretical questions, 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.</td></tr>
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<tr><td>Required readings</td><td>• Notes taken during lecture.
• Notes written by the teacher during the lessons, that will be available in the online repository</td></tr>
<tr><td>Supplementary readings</td><td>• "Mechanical Vibrations Theory and applications" S. GRAHAM KELLY</td></tr>
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