Syllabus

Kursbeschreibung

Titel der Lehrveranstaltung	Dynamics of Mechanical Systems
Code der Lehrveranstaltung	47561
Zusätzlicher Titel der Lehrveranstaltung	
Wissenschaftlich-disziplinärer Bereich	IIND-02/A
Sprache	Englisch
Studiengang	Master in Industrie- und Maschineningenieurwesen
Andere Studiengänge (gem. Lehrveranstaltung)	
Dozenten/Dozentinnen	dr. Veit Gufler, Veit.Gufler@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/38756
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
Studienjahr/e	1
KP	5
Vorlesungsstunden	28
Laboratoriumsstunden	18
Stunden für individuelles Studium	79
Vorgesehene Sprechzeiten	15
Inhaltsangabe	- Introduction and fundamentals of mechanical vibrations - Free and forced vibration of single degree-of-freedom systems - Free and forced vibration of multiple degree-of-freedom systems - Numerical and experimental methods in vibration analysis
Themen der Lehrveranstaltung	The course provides a comprehensive introduction to the theory and analysis of mechanical vibrations. It begins with the

	fundamental concepts of kinematics, dynamics and the modeling of vibrating mechanical systems. The free and forced vibration response of single degree-of-freedom systems is studied in detail, including undamped and damped vibration, resonance, harmonic excitation, vibration isolation and the formulation of equations of motion using energy-based methods. The course then extends these concepts to multiple degree-of-freedom systems, covering free and forced vibration, modal analysis and an introduction to the dynamic behavior of continuous systems. In addition, numerical methods for vibration analysis are introduced and applied to practical engineering problems. The course concludes with an overview of experimental vibration analysis, including measurement techniques and experimental modal analysis for the identification and characterization of dynamic system properties.
Stichwörter	Dynamic systems, mechanical vibrations, frequency response, resonance, modal analysis
Empfohlene Voraussetzungen	
Propädeutische Lehrveranstaltungen	Fundamentals of mechanics and mathematics learned in bachelor's degree studies of mechanical engineering.
Unterrichtsform	Frontal lectures, hand calculation exercises, computer exercises, laboratory exercises.
Anwesenheitspflicht	Not mandatory but strongly recommended.
Spezifische Bildungsziele und erwartete Lernergebnisse	Knowledge and Understanding: - Fundamentals of mechanical vibrations and dynamic system behavior - Free and forced vibration of single and multiple degree-of-freedom systems - Fundamentals of numerical and experimental vibration analysis Applying Knowledge and Understanding: - Analysis and evaluation of the dynamic behavior of mechanical systems - Application of analytical, numerical and experimental methods for vibration analysis Making Judgements: - Selection of appropriate analytical, numerical and experimental

	methods - Interpretation and assessment of numerical and experimental results Communication Skills: - Analysis and discussion of technical documentation - Discussion of technical problems and solution concepts Learning Skills: - Independent deepening of course content through the use of scientific and technical literature - Familiarization with advanced methods in vibration analysis
Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)	
Art der Prüfung	The assessment is based on a written examination consisting of numerical exercises accounting for 60 % of the final grade and theoretical questions accounting for 40 %.
Bewertungskriterien	The assessment criteria for the numerical exercises are the correctness of the solution procedure and the results. The assessment criteria for the theoretical questions are based on knowledge of the course topics, the clarity and relevance of the answers, command of the language of instruction, and the ability to exercise independent judgment. The weighting of each numerical exercise and theoretical question is specified in the written examination.
Pflichtliteratur	• Notes taken during lecture • Lecture slides
Weiterführende Literatur	• S. G. Kelly. Mechanical vibrations: Theory and applications. San Diego: Cognella, 2022 • 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
Weitere Informationen	
Ziele für nachhaltige Entwicklung (SDGs)	Hochwertige Bildung, Industrie, Innovation und Infrastruktur, Bezahlbare und saubere Energie