Syllabus

Kursbeschreibung

Titel der Lehrveranstaltung	Angewandte Mechanik
Code der Lehrveranstaltung	42137
Zusätzlicher Titel der Lehrveranstaltung	
Wissenschaftlich-disziplinärer Bereich	IIND-02/A
Sprache	Italienisch
Studiengang	Bachelor in Industrie- und Maschineningenieurwesen
Andere Studiengänge (gem. Lehrveranstaltung)	
Dozenten/Dozentinnen	Prof. Andrea Giusti, Andrea.Giusti@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/47728
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Erstes Semester
Studienjahr/e	3
KP	10
Vorlesungsstunden	60
Laboratoriumsstunden	40
Stunden für individuelles Studium	150
Vorgesehene Sprechzeiten	30
Inhaltsangabe	- Mechanisms, degrees of freedom, kinematic pairs, kinematic scheme of a mechanism. - Kinematic analysis of (planar) mechanisms: position, velocity, acceleration - Static and dynamic analysis of (planar) mechanisms. Lagrange's equations. - Periodic motion, flywheel design, and balancing;

	- Mechanical transmissions and components (kinematics and transmitted forces/torques) - Flexible power transmission elements (belts, ropes and chains) - Fundamentals of mechanical vibrations
Themen der Lehrveranstaltung	Introduction and fundamentals. Basic concepts and definitions for the study of mechanisms. Degrees of freedom, kinematic pairs and structure equation. Kinematic analysis of planar mechanisms. Kinematic analysis of position, velocity and acceleration (by base and dyads mechanisms). Singular configurations. Introduction to 3D kinematics. Examples. Static and dynamic analysis of planar mechanisms. Recalls on Newtonian and Lagrangian approach. Newtonian and Lagrangian methods for the static analysis of planar mechanisms. Application examples. D'Alembert's principle. Equation of dynamic equilibrium for mechanisms. Lagrange's equation. Inertia reduced to the free coordinate. One degree of freedom mechanisms in periodic regime. Flywheel design, balancing of a slider-crank mechanism. Application examples. Transmission gears and other mechanical components. Description of the most common elements of machines (kinematics and exchanged and transmitted forces). Wheels. Gears. Toothed gears. Ordinary and epicyclic gearings. Screws and their applications. Flexible elements: Belts and chains. Overview of: joints, clutches, brakes. Comparison of different drives. Fundamentals of mechanical vibrations. Introduction to mechanical vibrations. Vibrations of one degree of freedom systems. Undamped and damped harmonic oscillators. Free and forced vibrations.
Stichwörter	Mechanisms, Mechanical Systems, Kinematics, Statics, Dynamics
Empfohlene Voraussetzungen	Mechanics of Structures.
Propädeutische Lehrveranstaltungen	
Unterrichtsform	The topics are presented by the professor by means of Power Point presentations or the blackboard. The course also includes exercise sessions and, where possible,

	practical classes (computer-based, e.g. using MATLAB, WorkingModel, Simscape Multibody or MSC Adams), as well as educational field trips with laboratory activities. A selection of the material presented in class and useful material will be available in the course reserve collection database.
Anwesenheitspflicht	Attendance is not compulsory.
Spezifische Bildungsziele und erwartete Lernergebnisse	The course belongs to the type "caratterizzanti" – areas: mechanics and automation. It aims at teaching both scientific foundations and practical methods. The course aims at introducing the basis for understanding the principles of the applied mechanics. Students will learn, in the first part of the course, fundamental concepts and methodologies for the kinematic and dynamic study of mechanisms; in the second part of the course, they will acquire knowledge and competences on properties and characteristics of the main machine components, and on mechanical vibrations. Knowledge and understanding 1. Knowledge and understanding of applied mechanics fundamentals 2. Knowledge and understanding of the main mechanical components and their applications Applying knowledge and understanding 3. Ability to formulate the equilibrium conditions for a mechanical system 4. Ability to apply the learned principles in the study of planar mechanisms 5. Ability to apply the learned principles to design mechanical components and transmissions from a kinematic point of view Making judgements 6. Making judgments for choosing the suitable mechanical component or kinematic solution Communication skills 7. Ability to present the acquired knowledge and competences with a proper language Learning skills 8. Ability to autonomously extend the knowledge acquired during the study course.
Spezifisches Bildungsziel	

und erwartete Lernergebnisse (zusätzliche Informationen)	
Art der Prüfung	- Summative assessment. Written exam with exercises and questions: 60% written exam, exercises: 2 exercises (100 minuti); ILOs assessed 1 - 8; 40% written exam, theory: 4 open questions (80 minuti); ILOs assessed: 1,2,4,6,7. - Optional midterm test on the first part of the course, consisting of questions and an exercise: 60% optional midterm written test:1 exercise (50 minutes); ILOs assessed: 1 - 5, 8; 40% optional midterm written test, theory: 2 questions. (40 minutes); ILOs assessed: 1-3, 8. The result of the optional midterm test, if sufficient (>=18/30), may be considered, for the entire academic year, as the grade for the first part of the course content. In this case, the final written exam result will be computed as the arithmetic mean of the optional midterm test result and the written exam result for the second part of the course.
Bewertungskriterien	The mark will be awarded according to the following criteria: Theoretical knowledge (35%) Correctness of methods (35%) Correctness in solution (30%)
Pflichtliteratur	Notes from the lectures Handouts provided by the lecturer. Subject Librarian: David Gebhardi, David.Gebhardi@unibz.it and Ilaria Miceli, Ilaria.Miceli@unibz.it
Weiterführende Literatur	M. Callegari, P. Fanghella, F. Pellicano, Meccanica applicata alle macchine, terza edizione, Città Studi, 2022. M. Giovagnoni, A. Rossi, Una introduzione allo studio dei meccanismi, Ed. Cortina, Padova. G. Jacazio, S. Pastorelli, “Meccanica applicata alle macchine”, Ed.

	Levrotto e Bella, Torino.
Weitere Informationen	Software used (possible): Matlab, WorkingModel, Simscape Multibody or MSC Adams.
Ziele für nachhaltige Entwicklung (SDGs)	Industrie, Innovation und Infrastruktur, Menschenwürdige Arbeit und Wirtschaftswachstum