Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	**Mechanical Vibrations**
Course code	47506
Scientific sector	ING-IND/13
Degree	Master in Industrial Mechanical Engineering – Major Mechanics and Automation
Semester	I
Year	// *Mechanics and Automation – mandatory* *Logistics and Production – optional*
Academic year	2017/18
Credits	5 CP
Modular	No

Total lecturing hours	28
Total lab hours	10
Total exercise hours	18
Attendance	Recommended
Prerequisites	
Course page	See Moodle https://next.unibz.it/en/faculties/sciencetechnology/master-industrial-mechanical-engineering/course-offering/

Specific educational objectives	Understanding and knowledge of the fundamentals of both theoretical as well as experimental sides of mechanical vibration. This includes the mathematical modeling of dynamical problems, solving and understanding of the results. Beyond this the students will gain practical experience of mechanical vibrations in the laboratory.

Lecturer	Dr.-Ing. Erich Wehrle
Scientific sector of the lecturer	ING-IND/13
Teaching language	English
Office hours	15
Teaching assistant (if any)	
Office hours	
List of topics covered	Introduction, review and preliminaries: • Modeling dynamic systems • Free-body diagram • Statics of rigid bars • Analytical mechanics One-degree-of-freedom system • Undamped free vibration

	• Damped free vibration • Force vibrational • Shock • Transient response Multiple-degree-of-freedom system • Undamped free vibration • Damped free vibration • Force vibrational • Shock • Transient response Continuous systems • Approximation via the finite-element method • Vibrations of beams • Modes of beams Experimental vibration measurement • Measurement of vibrational responses • Introduction to laboratory equipment and software • Sensors including accelerometers, • Sampling and filtering • Set-up and carrying out dynamical experiments
Teaching format	Frontal lectures, exercises, laboratory exercises

Learning outcomes	<u>Knowledge and understanding</u> 1. Knowledge and understanding of the fundamentals of mechanical vibrations <u>Applying knowledge and understanding</u> 2. Applying knowledge and understanding to analyze dynamical components, structures and systems. <u>Making judgments</u> 3. The structural-mechanical design under consideration of dynamical considerations including vibrations requires understanding and ability to make judgments based on theory and experiments <u>Communication skills</u> 4. Communication skills to convey and transfer understanding of mechanical vibrations. 5. Communication skills to explain results of dynamical analysis and their consequences to structural-mechanical design 6. Oral communication skills <u>Ability to learn</u> 7. Learning skills to independently study the specific fields of mechanical vibrations for applications beyond this lecture.

Assessment	Formative assessment

Form	Details	Learning outcomes assessed
In-class exercises	Continuously in exercise courses	1-6

Summative assessment

Form	%	Details	Learning outcomes assessed
Written exam	75%	2 h	1, 2, 3, 4, 5
Group project Part	25%	In teams of 2-3 students, practical project based on laboratory experiments culminating in a written report (ca. 5 pages) and a presentation (ca. 15 min)	1-7 (especially 4-7)

Assessment language	English
Evaluation criteria and criteria for awarding marks	Written examination will include numerical examples to show ability to solve vibrational problems as well as knowledge-based questions to show understanding of material.

Form	Evaluation criteria and weight
Written exams	Theoretical knowledge (30%) Correctness of methods (30%) Correctness in solution (30%) Appropriate use of units (10%)
Group project	Understanding of project goals (10%) Correctness of methods (30%) Correctness in results (30%) Communication of results (30%)

Required readings	Lecture notes
Supplementary readings	Schmitz, T. L. and Smith, K. S. (2012) Mechnical vibrations, Springer. Den Hartog, J. P. (1985) Mechanical Vibrations, Dover. Giovagnoni, M. (2009) Analisi delle vibrazioni nei sistemi meccanici, Edizioni Libreria Cortina.