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Syllabus Course description

Course title	Machine Construction and Design
Course code	42153
Scientific sector	ING-IND/14
Degree	Bachelor in Industrial and Mechanical Engineering
Semester	II
Year	3
Academic Year	2021-22
Credits	6
Modular	

Total lecturing hours	36
Total lab hours	
Total exercise hours	24
Attendance	required
Prerequisites	
Course page	https://www.unibz.it/de/faculties/sciencetechnology/bachelor-industrial-mechanical-engineering/course-offering/?academicYear=2021

Specific educational objectives	<p>In a first part the course provides a basic introduction to the method of finite elements (FEM) and its application to the structural analysis in the field of machine design, with beam and plane elements.</p> <p>The second part of the course deals with machine elements and their application in mechanical systems.</p>
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Lecturer	Prof. Gorla Carlo
Scientific sector of the lecturer	
Teaching language	English
Office hours	18
Teaching assistant (if any)	
Office hours	
List of topics covered	<p>Part 1: FEM</p> <ul style="list-style-type: none"> • Introduction to Finite Element Method • 2D Bar and Beam Element • Shape Functions, Stiffness matrix. Loads and boundary conditions • Structural Plane Problems Plane Elements <p>Part 2: Machine Elements</p> <ul style="list-style-type: none"> • Mechanical Springs. Types, classification, Properties, Stiffness, Leaf Springs, Helical Springs, Stresses, Assessment • Transmission Shafts

	<ul style="list-style-type: none"> • Shaft-Hub Connection • Basics on Gears • Rolling Bearings: Types, Properties, Application, Calculation of Life, Mounting conditions • Design Application: Gearbox • Pressure vessel design. Cylindrical shell and spherical end, Bolts, Flange, Gasket
Teaching format	Frontal lectures, exercises, Design Application with a Written report.

Learning outcomes (ILOs)	<p>The learning outcomes are referred to the Dublin Descriptors:</p> <p><u>Knowledge and understanding</u></p> <ol style="list-style-type: none"> 1. Knowledge of the basics of the Finite Elements Method 2. Fundamental machine elements and parts. <p><u>Applying knowledge and understanding</u></p> <ol style="list-style-type: none"> 3. Application of FEM to simple cases 4. Design and assessment of a practical application consisting in a mechanical gearbox <p><u>Making judgements</u></p> <ol style="list-style-type: none"> 5. Conditions of applicability of the tools for structural analysis, analysis of a complex mechanical systems and identification of the required assessments and their criticality <p><u>Communication skills</u></p> <ol style="list-style-type: none"> 6. Writing of a report of a design application <p><u>Ability to learn</u></p> <ol style="list-style-type: none"> 7. Ability to identify the requirements of deeper investigations in a practical application
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Assessment	Formative assessment		
	Form	Length /duration	ILOs assessed
	Exercise on FEM	2 x 2 hours	3
	Exercise on machine elements with design application	10 x 2 hours	4,6

	and written report														
	<p>Summative assessment</p> <table border="1"> <thead> <tr> <th>Form</th> <th>%</th> <th>Length /duration</th> <th>ILOs assessed</th> </tr> </thead> <tbody> <tr> <td>Written Questions</td> <td>50%</td> <td>90 min</td> <td>1,2</td> </tr> <tr> <td>Oral Exam: discussion of the report</td> <td>50%</td> <td></td> <td>5,7</td> </tr> </tbody> </table>			Form	%	Length /duration	ILOs assessed	Written Questions	50%	90 min	1,2	Oral Exam: discussion of the report	50%		5,7
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Evaluation criteria and criteria for awarding marks	<table border="1"> <thead> <tr> <th>Form</th> <th>Weight</th> </tr> </thead> <tbody> <tr> <td>Written Questions</td> <td>Correct Answers (100%)</td> </tr> <tr> <td>Oral Exam: discussion of the report</td> <td>Report (40 %) Correctness of the Results (30%) Critical Discussion (30%)</td> </tr> </tbody> </table>			Form	Weight	Written Questions	Correct Answers (100%)	Oral Exam: discussion of the report	Report (40 %) Correctness of the Results (30%) Critical Discussion (30%)						
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Required readings	Lecture notes and documents for exercise, that will be available on the course site														
Supplementary readings	<ul style="list-style-type: none"> • COOK, R.D., Finite Element modeling for stress analysis, L Wiley & Sons, 1995 (ENG) • P. DAVOLI, M. FILIPPINI, C. GORLA, A. LO CONTE, Lezioni sugli organi di macchine, Politecnica (ITA) • Shigley's Mechanical Engineering Design, McGraw-Hill (ENG) • G. NIEMANN, H. WINTER, Maschinenelemente, Springer (GER) 														