

Syllabus

Course description

Course title	Advanced Topics on Machine Design / Materials behavior and machine elements
Course code	47517
Scientific sector	ING-IND/14
Degree	Master in Mechanical Engineering and Industrial Management
Semester	2
Year	I – OPT
Academic year	2017/18
Credits	5
Modular	no

Total lecturing hours	32 hrs
Total lab hours	-
Total exercise hours	12 hrs
Attendance	Extremely recommended
Prerequisites	none
Course page	https://next.unibz.it/en/faculties/sciencetechnology/master-industrial-mechanical-engineering/course-offering/

Specific educational objectives	The course aims to introduce the design mindset and the main methods for the design of mechanical systems, to provide exposure to the practice of design through application and to encourage understanding of the broader implications of design.
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Lecturer	Franco Concli, franco.concli@unibz.it Ph.: 0471017748 Office: K0.05
Scientific sector of the lecturer	ING-IND/14
Teaching language	English
Office hours	By appointment
Teaching assistant (if any)	-
Office hours	-
List of topics covered	<p>The course covers the following main topics:</p> <ol style="list-style-type: none"> 1. Principle of virtual work 2. Shafts and shaft components <ol style="list-style-type: none"> a. Interference fits (hub and key) b. Deflections c. Natural frequencies d. Hyperstatic structures 3. Gears

	<ol style="list-style-type: none"> a. Failure modes (bending - pitting - micro pitting - scuffing) b. Gear types (spur - helical - bevel - worm) c. Gear configurations (parallel axis, orthogonal axis, planetary) d. Sintetic factors (sizing) e. Strenght calculation (ISO 6336) f. Gear efficiency (Power losses) g. Gear stiffness (Deformation under load) h. Examples of gearboxes (motorcycle and car transmissions) <ol style="list-style-type: none"> 4. Bearings (journal beraing) 5. Bolted connections (screwed joints) 6. Belts (flat - V - ropes) 7. Welded connections 8. Pressure vessels 9. Internal combustion engine parts (cylinder - piston - piston ring - connecting rod - crankshaft)
Teaching format	Frontal lectures, exercises (Exercises, case studies and computer lab), excursions
Learning outcomes	<p>By the end of the course, students should:</p> <ul style="list-style-type: none"> - be able to apply the analysis methods to mechanical components and to design the main mechanical systems. - be able to choose the geometry and materials so to satisfy the requirements of each component in terms of strength - be able to make reasonable assumptions when data are missing - be able to make a critical evaluation between different designs solutions - be able to develop entire projects
Assessment	Coursework will be weighted as follows: final written test dealing with a simple design of a structural problem (50%) and, if successful, an oral examination (50%).
Assessment language	English
Evaluation criteria and criteria for awarding marks	The final mark will be obtained combining the evaluations of the final written test and of the oral examination.
Required readings	Lecture notes and documents for exercise will be available on the reserve collections
Supplementary readings	R.S.KHURMI AND J.K. GUPTA, A Textbook of Machine Design, S Chand (ENG)

	<p>Shigley's Mechanical Engineering Design, McGraw-Hill (ENG)</p> <p>G. NIEMANN, H. WINTER, Maschinenelemente, Springer (GER)</p> <p>P. DAVOLI, M. FILIPPINI, C. GORLA, A. LO CONTE, Lezioni sugli organi di macchine, Politecnica (ITA)</p>
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