Syllabus

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.

Lecturer: Franco Concli, franco.concli@unibz.it
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Scientific sector of the lecturer: ING-IND/14
Teaching language: English
Office hours: By appointment
Teaching assistant (if any): -

List of topics covered: The course covers the following main topics:

1. Principle of virtual work
2. Shafts and shaft components
   a. Interference fits (hub and key)
   b. Deflections
   c. Natural frequencies
   d. Hyperstatic structures
3. Gears
a. Failure modes (bending - pitting - micro pitting - scuffing)
b. Gear types (spur - helical - bevel - worm)
c. Gear configurations (parallel axis, orthogonal axis, planetary)
d. Synthetic factors (sizing)
e. Strength calculation (ISO 6336)
f. Gear efficiency (Power losses)
g. Gear stiffness (Deformation under load)
h. Examples of gearboxes (motorcycle and car transmissions)

4. Bearings (journal bearing)
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
By the end of the course, students should:

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