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ACADEMIC YEAR: 2016-2017

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COURSE: Machine Design II

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TYPE OF EDUCATIONAL ACTIVITY: Characterizing

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TEACHER: Katia Genovese

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e-mail: [katia.genovese@unibas.it](mailto:katia.genovese@unibas.it)

website:

phone: +39 0971 205019

mobile (optional);

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Language: Italian

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ECTS: 6

n. of hours: 60  
30 theoretical lessons  
30 tutorials

Campus:  
Dept./School: School of  
Engineering  
Master Program:  
Mechanical Engineering

Semester: II

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#### EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The course of Machine Design II provides the fundamentals for the mechanical design of components and machines with an introduction to the finite element method and its applications to engineering problems.

The student will learn about:

- Engineering criteria and design methods for material and component selection.
- Fundamental approaches to stress and fatigue analysis and failure prevention for machine components.
- The Finite Element Method.

The course aims to provide the student with the following skills:

- Ability to identify, formulate and solve a mechanical structural problem.
  - Ability to design a component as a part of a complex mechanical system
  - Perform a basic stress analysis with a FE commercial software.
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#### PRE-REQUIREMENTS

Some topics covered by the courses of Machine Design I and Strength of Materials are considered as course prerequisites as following:

- Strength of materials: main concepts and test standards.
  - Methodologies for static and fatigue strength evaluation.
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#### SYLLABUS

##### **Design and selection of machine elements.**

Nomenclature of the main mechanical components. Kinematic schemes. Design of shafts. Selection of rolling-element bearings. Design of gears. Threaded fasteners and design of bolted joints. Design of a flange coupling. Design of soldered joints. Keyed joints. Spline joints. Springs. Clutches.

##### **Fundamentals of Finite Element Analysis.**

The Finite Element Method. Main steps in a FE analysis of a structural problem: creating geometry, defining material, creating mesh, applying loads and constraints, solving and data postprocessing.

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#### TEACHING METHODS

Lectures and tutorials. Some lab hours will be devoted to the use of software for FE-based analyses.

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#### EVALUATION METHODS

Student learning assessment is done through a written and an oral examination. The exam is representative of the course content and objectives. The written test consists in the design of a mechanical system. It is possible to use a single formulary. The use of PC and smart-phones is not allowed during the test. Written test duration is three hours. The student can postpone the oral examination to the next exam session.

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#### TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

Lecture notes and supplemental material is made available in a shared folder.

Reference books:

R. Giovannozzi. *Costruzione di Macchine*, Voll.1-2, Patron editore, Bologna.

R.G. Budynas, J.K. Nisbett. *Shigley, Progetto e Costruzione di Macchine*, McGraw Hill Education, Milano.

R.C. Juvinall, K. M. Marshek. *Fondamenti della progettazione dei componenti delle macchine*, Edizioni ETS, Pisa, 2001.

SKF, *I cuscinetti volventi*, Catalogo tecnico.

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#### INTERACTION WITH STUDENTS

During the first lecture, the main aims and the program of the course will be illustrated. The student will be informed about teacher's email address and telephone number as well as about the office hours. Lecture notes and supplemental material will be made available in a shared folder. The teacher will be available for questions and discussion at the end of each lesson. Office hours is Tuesday 12:30-13:30 (office - 5<sup>th</sup> floor or laboratory - 1<sup>st</sup> floor).

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#### EXAMINATION SESSIONS (FORECAST)<sup>1</sup>

A final examination comprehending a written and an oral session will be scheduled bimonthly starting from January. The dates will be published on the ESSE3 system as soon as available.

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SEMINARS BY EXTERNAL EXPERTS    YES     NO

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#### FURTHER INFORMATION

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<sup>1</sup> Subject to possible changes: check the web site of the Teacher or the Department/School for updates.