ACADEMIC YEAR: 2019-2020

COURSE: Machine Design I

TYPE OF EDUCATIONAL ACTIVITY: Characterizing

TEACHER: Katia Genovese
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phone: +39-0971-205019 (office)/5013 (lab)
mobile (optional);

Language: Italian

ECTS: 6 n. of hours: 60
30 theoretical lessons
30 tutorials

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

Semester: II

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The course of Machine Design I provides the fundamentals on the mechanical behavior of materials with regards to the application of current methodologies for the mechanical design of components and machines on the basis of applied loads and constraints under general working conditions.

The student will learn about:
- Mechanical behavior of materials (with and without defects) under static and dynamic loading.
- Brittle/ductile failure modalities.
- Standard tests for the assessment of the fatigue strength and fracture toughness of materials.
- Notch effect.
- Residual stresses.
- Basics of bolted and soldered joints design.

The course aims to provide the student with the following skills:
- Analyze and design structural members subjected to combined loads. Solving a structural problem.
- Evaluate the safety factor of a mechanical structure.
- Mechanical design of shafts, bolted and soldered joints.
- Fatigue analysis of mechanical components and soldered joints.

The student should enlarge his/her knowledge on the course topics by obtaining further insights through autonomous documentation and he/she should demonstrate correctness of technical speech.

PRE-REQUIREMENTS

Some topics covered by the courses of Mathematical Physics, Strength of Materials and Manufacturing Technologies are considered as course prerequisites as following:
- Beam theory.
- Solution of structural problem for isostatic structures.
- Standard tests for the mechanical characterization of materials (tensile, hardness and resilience tests).

SYLLABUS

**Fundamentals of Machine Design.**
Stress and strain. Beam linear elastic theory.

Mechanical characterization of materials.

Fatigue.

Fracture mechanics.

Design and selection of machine elements.
Nomenclature for bolted and soldered joints. Design of bolted and soldered joint under static loading. Design of soldered joints under cyclic loading (at constant and variable cycle amplitude).

TEACHING METHODS
Lectures and tutorials.

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 of one/two problems. 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.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL
Lecture notes and supplemental material is made available in a shared folder.
Reference books:

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 - 5th floor or laboratory - 1st floor).

EXAMINATION SESSIONS (FORECAST)\(^1\)

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.

SEMINARS BY EXTERNAL EXPERTS  YES □  NO □

FURTHER INFORMATION

\(^1\) Subject to possible changes: check the web site of the Teacher or the Department/School for updates.