OFFERING COURSE: **Design of Fluid Machinery**
ACADEMIC YEAR: **2019/20**
TYPE OF EDUCATIONAL ACTIVITY: **Distinguishing**
INSTRUCTOR: **Vinicio Magi, Full Professor**
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Language: **Italian**

| ECTS: 9 | Course hours: 81 | Campus: **Potenza**  
Dept./School: **School of Engineering**  
Program: **Laurea Magistrale**  
Semester: **Spring** |

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES
To educate mechanical engineering students in the fundamentals of thermo-fluid dynamics design of fluid machinery and their application to important practical problems using design, analysis, and synthesis of mechanical components, systems, and tools, and through basic and applied research. The course will provide students with the necessary tools to evaluate the criteria of choice and design of the elements constituting the fluid machinery in order to influence the performance characteristics and efficiency of both the individual components of the fluid machinery and the machine as a whole.

PRE-REQUIREMENTS
It is suggested to take in advance the following exams: Applied Energy, Heat Transfer, Gas Dynamics and Propulsion, to facilitate the study of this course. The knowledge of the fundamental concepts of Thermodynamics, Fluid Mechanics, Fluid Dynamics and Numerical Analysis are essential for a simple and quick learning of the topics covered within this course.

SYLLABUS
1. Elements of thermodynamics and fluid dynamics (8 hours).  
2. Steam thermal power plants (20 hours).  
   Diagrams and power plant components. Heat regenerators. Special problems at low pressure. Design challenges and their solutions: material stress, diaphragms, discs, shafts, drums, seals, housings, thrust and load bearings, turning low-rpm engine. Impulse and reaction steam turbines, choice of the number of revolutions, stages under fluid dynamic similarities, two-dimensional axisymmetric study. Regulation and safety performance outside design conditions, control systems, safety and control.
3. Rotary compressors (14 hours).  
4. Centrifugal compressors (18 hours).  
5. Hydraulic transmissions (9 hours).  
   Volumetric rotary pumps and motors. Control of hydraulic transmissions. Fluid couplings. Torque converters polyphase and multistage.
6. Internal combustion engines (ICEs) (12 hours).  

TEACHING METHODS
The course includes 81 hours of teaching between lessons and practice. In particular, the course includes theoretical lessons (48 hours) and laboratory tutorials (33 hours). At the end of the course, technical visits to thermal power plants and engine laboratories of other universities and research centers will be organized.

**EVALUATION METHODS**

The aim of the exam is to test the level of achievement of the previously mentioned educational goals. The exam consists of 3 parts:

- **Written exam** which provides the solution of numerical exercises on all topics covered in the course. This exam is intended to evaluate the understanding of the basic issues of the course and to provide a first selection (i.e., the student who does not show sufficient knowledge of the subjects is not admitted to the subsequent tests). The student must acquire at least 18 points out of 30 to pass this test. It is not allowed to consult texts or use PCs.

- **Project exam** with the aim of assessing whether the student has acquired the ability to set up and solve design problems for fluid machinery and energy systems. The student must acquire at least 18 points out of 30 to pass this test.

- **Oral exam** which will assess the ability to compare different aspects covered during the course. The student must acquire at least 18 points out of 30 to pass this test.

The final grade is the average of the 3 scores. If one of the 3 trials are lacking or if the total score is less than 18, the student must repeat all 3 tests.

**TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL**

Notes provided by the Instructor.

Specific topics can be explored on the following textbooks:


**INTERACTION WITH STUDENTS**

At the beginning of the course, after describing the objectives, program and methods of verification, the Instructor provides educational materials (shared folders, notes, website, useful links, etc.). At the same time, the Instructor collects the mailing list of the students who want to attend the course, together with their name, serial number and email for communications.

Office hours: Tuesdays 3:00pm - 7:00pm and Wednesday 3:00pm - 7:00pm at Campus Macchia Romana, School of Engineering (Engineering Building, Fifth floor, Room n. 70).

In addition to weekly reception, the Instructor is available at all times for a contact with the students, through their e-mail, skype or telephone contact.

**EXAMINATION SESSIONS (FORECAST)**


**SEMINARS BY EXTERNAL EXPERTS**

YES X NO □

**FURTHER INFORMATION**

1 Subject to possible changes: check the web site of the Instructor or the Department/School for updates.