

Lezione 1 - Intro & Energy Scenarios

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There are cultural and mathematical objectives which we will be looking at.

looking at why some designs have some applications and not others, we look at the criteria and other aspects which will help us decide.

54 h lezione

36 h exercises. → take other exercises.

8h/week.

24/11/2021 → lezione cancellata.

"Macchine a Fluidi" Dossena, Ferrari, Gaetani, et. al.

"Fluid Mechanics and Thermodynamics of Turbo machinery"

- Elsevier Science

Exam:

↳ Written: 3 exercises and 2 theoretical questions

- ↳ 1 on hydraulic machines → operate on incomp. fluids
- ↳ 1 thermal machines → operate with compressible fluids
- ↳ 1 energy systems
- ↳ problem for energy balancer.

Mid-terms → 2 exerciser and 1 theoretical question.
↳ 16 each

Complete 11/66 and 2/7
↳ 32 points

Review of Topics

Fluid Machines are machines that exchanged work, between fluid and solid.

Classification of Fluid Machines:

↳ Direction of work transfer (+ or -, the sign)

↳ Thermodynamics/volumetric behavior of the fluid

↳ incompressible flow machines

↳ compressible flow machines

↳ Nothing is severe enough to change the compression.

↳ wind turbine, even though they work with air, don't compress the air, so they are incompressible.

↳ working principle ↳ low-power ↳ < 1 MW

↳ volumetric machines → car engines → plays with volume between piston and cylinder

↳ turbomachines → air-craft engines ↳ doesn't trap anything, uses

10x MW

bz high power

forces generated to extract energy.

Power \propto flow rate & work exchanged

Volumetric engines are compactable but low power,
but turbomachines are good for airplanes and high
power.

Basic Principles → First Part

↳ Theoretical Bases

Theory & Principles of Fluid Mechanics.

We are using still acceptable formulas but more practical ones.

In reversibility is useful since it tells us our efficiency

Then:

Incompressible Fluid Machines

↳ Pelton is excited locally, others can leave now
though

Wind turbines

→ Thermal Machines

↳ Jet enjamer

→ Compressors and turbine (centrifugal vs.)

→ Blade aspect ratio.

(contingual vs.
convergent paths)

- ↳ Steam generator turbines
- ↳ Gas Turbines & ICE
(internal energy systems)

Energy Resources

Non-renewable

- ↳ energy sources accumulated over time, non-renewable but are not regenerated at the rate at which we use them.
- Nuclear is non-renewable.

Renewable

- ↳ are renewed at the rate we use them. They are derived from wind and the sun.
Currently we are not able to completely exploit them, but we might be able to in the future.
- hydro, tidal and currents.

The problem with renewable is that they are low density, so they require a lot of money and high surface area usage for the use.