



COURSE: Fluid flow machines and power generation systems

TEACHER: Bonfiglioli A. (6 ECTS) e Magi V. (3 ECTS)

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Language: italian

ECTS: 9

n. of hours: 90

Academic year: 2015-16

Campus: PZ

Semester: 2

TOPICS

Volumetric machines and turbo-machines: classification. Review of fundamental concepts in thermodynamics. Converging-diverging nozzles. Hydraulic turbines: Pelton, Kaplan, Francis. Centrifugal pumps. Reciprocating engines. Reciprocating volumetric compressors. Turbogas power plants. Axial steam and gas turbines.

TEACHING METHODS (please tick one or more options)

Theoretical lessons

Tutorials in classroom

Tutorials in laboratory

Project works

Technical visits

Other activities (please specify) _____

TEXTBOOKS

Catalano L.A., Napolitano M. Elementi di Macchine Operatrici a Fluido. Pitagora Editrice, Bologna. ISBN:88.371.1241.6 Capetti A. Macchine Termiche. UTET, Torino. M. Napolitano, P. De Palma, and G. Pascazio. Coursenotes available on the website of the Technical University of Bari (www.poliba.it)

ON-LINE EDUCATIONAL MATERIAL

web address: <http://oldwww.unibas.it/utenti/bonfiglioli/www.html>

LEARNING OUTCOMES

Give the student a basic understanding and calculation methodologies of volumetric fluid machinery and turbomachines, both work-adsorbing and power generating.

REQUIREMENTS

Engineering Thermodynamics and Heat Transfer (ING0023)

EVALUATION METHODS (please tick one or more options)

Intermediate verifications

Written examination

Discussion of a project work

Practical test

Oral examination

Other methods (please specify) _____

DETAILED CONTENT

Classification: volumetric and turbomachines.

Review of thermodynamics:

First and second principle of thermodynamics;

Eulerian and lagrangean viewpoint;

Stationary and inertial reference frame;

Hydraulic and thermal fluid machinery;

Positive Displacement(or Volumetric) machines and turbomachines;

Thermodynamic cycles: efficiency

Calorically and thermally perfect gases;

Pressure-volume and entropy-temperature thermodynamic planes;

Isentropic, isobaric, constant temperature, constant volume transformations;

Specific heat: definition and graphical interpretation;

Polytropic processes;

Compression and expansion efficiencies.



- Q1D flow of a compressible fluid:
 - Hypothesis and limitations
 - Isentropic flow;
 - Total and critical properties;
 - Area law;
 - Mass flow;
 - Converging and converging-diverging nozzles.
 - Velocity triangles: Euler's formula
 - Work-absorbing turbomachinery:
 - Classification
 - Centrifugal pumps:
 - Importance of the centrifugal forces;
 - Impeller;
 - Slip factor;
 - Diffuser;
 - Hydraulic and geometric similarity;
 - Characteristic curves;
 - Cavitation: Net Positive Suction head (NPSH);
 - Multistage centrifugal pumps;
 - Pump specific speed: criteria for selecting a pump.
 - Hydraulic turbines:
 - Classification
 - Turbine specific speed;
 - Pelton wheel:
 - Components;
 - Velocity triangles;
 - Torque, power and efficiency;
 - Maximum head.
 - Francis turbine:
 - Components;
 - Velocity triangles;
 - Degree of reaction;
 - Turbine specific speed;
 - Power control.
 - Kaplan turbine:
 - Components;
 - Velocity triangles: free vortex;
 - Power control;
 - Diffuser;
 - Cavitation.
 - Positive Displacement(or Volumetric) compressor:
 - Components;
 - Ideal, real and conventional cycle;
 - Power control;
 - Multi-stage compressors.
 - Turbogas power plant:
 - Baseline cycle:
 - ideal and real cycles;
 - efficiencies.
 - Axial and radial flow turbines
 - Reciprocating engines
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EXAMINATION SESSIONS (FORECAST)

15.2.2016; 25.3.2016; 20.5.2016; 29.7.2016; 23.9.2016; 25.11.2016

SEMINARS BY EXTERNAL EXPERTS YES NO X

FURTHER INFORMATION



Università degli Studi della Basilicata
Scuola di Ingegneria
