Università degli Studi della Basilicata
Scuola di Ingegneria

OFFERING COURSE: Thermo-fluid Dynamics Design of Fluid Machinery				
INSTRUCTOR: Vinicio Magi, Full Professor				
e-mail: vinicio.magi@unibas.it		website: http://oldwww.unibas.it/utenti/magi/vmagi.html		
Language: Italian				
ECTS: 9	Course hours: 81	Academic year: 2014/15	Campus: Potenza	Spring Semester

TOPICS

- Energy conversion in fluid machinery.
- Thermal power plants. Design of steam turbine for thermal power plants.
- Rotary compressors: roots, gear, screw and vane compressors.
- Centrifugal and axial compressors.
- Hydraulic transmissions.
- Reciprocating and rotary internal combustion engines. Turbochargers. Types of fuels.
- Automotive pollution and choice of techniques to reduce pollutants.

TEACHING METHODS (please tick one or more options)
X Theoretical lessons
X Tutorials in classroom
□ Tutorials in laboratory
X Project works
X Technical visits
Other activities (please specify) _____

COURSE MATERIALS
1. D., Giacosa, "Motori Endotermici", Hoepli, Milano.
2. S., Sandrolini, G., Naldi, "Macchine", Pitagora, Bologna.
3. O., Acton, C., Caputo, "Impianti Motori", UTET, Torino.
4. J., H., Horlock, "Axial Flow Compressor", Buttherwords, London.
5. J., H., Horlock, "Axial Flow Turbines", Buttherwords, London.
6. L., Vivier, "Turbines a` Vapeur et a` Gaz", Ed. Albin, Paris.
7. Instructor's notes.

ON-LINE COURSE MATERIAL
web address: http://oldwww.unibas.it/utenti/magi/vmagi.html

EDUCATIONAL OBJECTIVES
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.

COURSE REQUIREMENTS
To facilitate the study of this course it is suggested to take in advance the following exams: Applied Energy, Heat Transfer and Principles of Fluid Mechanics for Internal Combustion Engines and Turbomachinery.

COURSE EVALUATION (please tick one or more options)
□ Intermediate verifications
X Written test
X Discussion of a project work
□ Practical test
X Oral exam
Other methods (please specify) _____

COURSE CONTENTS
Elements of thermodynamics and fluid dynamics. Energy conversion in fluid machinery with stationary flow. Entropy diagram. De Laval nozzles in series. Axial compressors.
Steam thermal power plants. 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.
Rotary compressors. Vane, Roots, gear and screw compressors. Work cycles. Losses, scavenging performance. Control of rotary compressors.
Centrifugal compressors. Design elements and challenges. Operating conditions of centrifugal compressors. Pre-wheel. Characteristic curves. Control. Notes on axial compressors.
Hydraulic transmissions. Volumetric rotary pumps and motors. Control of hydraulic transmissions. Fluid couplings. Torque converters polyphase and multistage.
Internal combustion engines (ICEs). Classification. Reciprocating and rotary engines. Notes on Wankel engine. Turbochargers. ICEs with compressor mechanical control and with turbocharger exhaust gas. Performance and efficiency of turbo engines. Types of fuels. Requirements of fuels. Automotive pollution and choice of techniques to reduce pollutants. Construction drawings of automotive engines.

SEMINARS BY QUALIFIED SCIENTISTS YES X NO □

NOTES (If any)