Michele Anatone

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PROGRAMME OF "MACCHINE" "MACHINES AND THERMAL POWER PLANTS"		
• CODE: I0601 • TYPE OF COURSE UNIT: COMPULSORY FOR CHEMICAL, MANAGEMENT AND ELECTRIC ENGINEERING • LEVEL OF COURSE UNIT: 1ST CYCLE, INDUSTRIAL ENGINEERING • YEAR OF STUDY: 3RD YEAR, 1ST SEMESTER		
NUMBER OF ECTS CREDITS: 6		
Teacher: Prof. Michele Anatone		
1	**Course objectives**	THE COURSE AIMS TO INITIATE STUDENTS TO THE STUDY OF FLUID MACHINERY AND OF PRIMARY ENERGY INTO MECHANICAL ENERGY CONVERSION PLANTS. AFTER AN INTRODUCTORY PHASE, WHERE THE FUNDAMENTAL CONCEPTS OF THERMODYNAMICS APPLIED TO THE ENERGY SYSTEMS ARE DEFINED, FOLLOWS THE STUDY OF THE THERMAL POWER PLANTS FED BY FOSSIL FUELS. THE COURSE CONTINUES WITH THE STUDY OF THE OPERATING PRINCIPLES AND CRITERIA OF UTILIZATION OF TURBOMACHINERY, AND VOLUMETRIC MACHINES .
2	**Course content and Learning outcomes (Dublin descriptors)**	TOPICS OF THE MODULE INCLUDE: **THERMODYNAMICS.** GAS PROPERTIES, ENERGY CONSERVATION. ADIABATIC COMPRESSION AND EXPANSION TRANSFORMATIONS. EFFICIENCY OF THE MACHINES AND OF THE POWER PLANTS. COST OF ENERGY. **TURBINES.** GENERAL DESCRIPTION AND CLASSIFICATION . NOZZLES AND DIFFUSERS. THE HUGONIOT EQUATIONS. THE WORK EXCHANGED IN TURBOMACHINERS. THE EULERIAN THEORY, SPEED DIAGRAMS, AXIAL TURBINES STAGE, DEGREE OF REACTION. STAGE EFFICIENCY. **PUMPS AND COMPRESSORS**. GENERALITIES , DEFINITIONS OF THE TOTAL HYDRAULIC HEAD, CHARACTERISTIC CURVES, WORKING POINT. POWER AND EFFICIENCY. OFF-DESIGN OPERATING CONDITIONS. PUMPS CAVITATION, NET POSITIVE SUCTION HEAD. **WATER STEAM TURBINE PLANTS.** THERMODYNAMIC CYCLES. PLANT SCHEMES AND METHODS TO IMPROVE THE EFFICIENCY. SUPERHEATING, CONDENSATION. REGENERATION. PLANT LAYOUT WITH ONE REGENERATIVE HEAT EXCHANGER. BASIC ELEMENTS ON THE OPERATION OF STEAM GENERATORS. **GAS TURBINE PLANTS**. THERMODYNAMIC CYCLES. INTERNAL AND EXTERNAL COMBUSTION PLANTS. MAXIMUM WORK AND EFFICIENCY CONDITIONS. LIMITS ON THE INLET TURBINE TEMPERATURE. **COMBINED CYCLES GAS AND STEAM TURBINES**. PLANT SCHEME. THE HEAT RECOVERY STEAM GENERATOR. HEAT TRANSFER CURVES. EFFICIENCY. ON SUCCESSFUL COMPLETION OF THIS MODULE, THE STUDENT SHOULD - HAVE KNOWLEDGE OF THE OPERATING CHARACTERISTICS OF THE TURBOMACHINES, - APPLY THE ENERGY CONSERVATION LAW TO SINGLE DEVICES AND TO COMPLEX LAYOUT. - DEMONSTRATE SKILL TO EVALUATE THE MAIN PERFORMANCES OF POWER SYSTEMS, - DEMONSTRATE SKILL TO SPECIFY THE CHARACTERISTICS OF POWER SYSTEMS STARTING FROM THE SINGLE COMPONENTS, - HAVE KNOWLEDGE AND UNDERSTANDING THE BASIC PHENOMENA TAKING PLACE IN ENERGY CONVERSION SYSTEMS.
3	**Prerequisites and learning activities**	THERMODYNAMICS, HEAT TRANSFER, CHEMISTRY.
4	**Teaching methods and language**	LECTURES AND EXERCISES. LANGUAGE: ITALIAN / ENGLISH **REF. TEXT BOOKS** MORAN, SHAPIRO. FUNDAMENTALS OF ENGINEERING TERMODYNAMICS. WILEY DELLA VOLPE. MACCHINE. LIGUORI ED. (IN ITALIAN)
5	**Assessment methods and criteria**	WRITTEN AND ORAL EXAMINATION.