

ROBERTO CARAPPELLUCCI

. PROGRAMME OF "GESTIONE DEI SISTEMI ENERGETICI" "MANAGEMENT OF ENERGY CONVERSION SYSTEMS"		
<ul style="list-style-type: none"> • CODE: 10235 • TYPE OF COURSE UNIT: COMPULSORY FOR THE MECHANICAL ENGINEERING SPECIALIZATION • LEVEL OF COURSE UNIT (E.G. FIRST, SECOND OR THIRD CYCLE; SUB-LEVEL IF APPLICABLE): SECOND CYCLE • YEAR OF STUDY (IF APPLICABLE); SEMESTER: FIRST YEAR, SECOND SEMESTER 		
NUMBER OF ECTS CREDITS: 9 (WORKLOAD OF 90 HOURS OF TEACHING + WORK AT HOME; 1 CREDIT = 25 HOURS OF TOTAL ACTIVITIES)		
Teacher: Prof. Roberto Carapellucci		
1	Course objectives	THE COURSE AIMS TO EXAMINE THE METHODOLOGIES FOR THE ANALYSIS, MANAGEMENT AND OPTIMIZATION OF ENERGY CONVERSION SYSTEMS. IT ALSO DEALS WITH THE STUDY OF LIBERALIZED MARKETS FOR ELECTRICITY AND NATURAL GAS, AS WELL AS TRADITIONAL POWER SYSTEMS WITH HIGH EFFICIENCY (COMBINED CYCLES AND COGENERATION PLANTS) AND INNOVATIVE TECHNOLOGIES WITH REDUCED ENVIRONMENTAL INTERACTIONS (FUEL CELLS AND CO ₂ CAPTURE TECHNOLOGIES).
2	Course content and Learning outcomes (Dublin descriptors)	<p>TOPICS OF THE MODULE INCLUDE:</p> <p>ANALYSIS AND OPTIMIZATION OF ENERGY CONVERSION SYSTEMS. EXERGY ANALYSIS OF ELEMENTARY PROCESSES AND INTEGRATED SYSTEMS. PINCH TECHNOLOGY ANALYSIS. THE MARKET FOR ELECTRICITY AND NATURAL GAS. ITALIAN ELECTRICITY SYSTEM: PRODUCTION AND DEMAND. STRUCTURE OF THE ELECTRICITY MARKET AND OPERATORS. TRADITIONAL ENERGY SYSTEMS WITH HIGH PERFORMANCE. COMBINED GAS-STEAM POWER PLANTS. T-Q PROFILES OF THE HEAT RECOVERY STEAM GENERATOR (HRSG). ENERGY BALANCES IN MULTI-PRESSURES HRSG. COMBINED HEAT AND POWER SYSTEMS. INNOVATIVE ENERGY SYSTEMS WITH REDUCED ENVIRONMENTAL INTERACTIONS. FUEL CELLS. FC INTEGRATED IN STATIONARY AND MOBILE APPLICATIONS. CARBON DIOXIDE CAPTURE IN THERMOELECTRIC POWER PLANTS. CO₂ REMOVAL UPSTREAM AND DOWNSTREAM THE COMBUSTION PROCESS. EFFECTS ON ENERGETIC AND ECONOMIC PERFORMANCE.</p> <p>ON SUCCESSFUL COMPLETION OF THIS MODULE, THE STUDENT SHOULD</p> <ul style="list-style-type: none"> - HAVE PROFOUND KNOWLEDGE OF ADVANCED TECHNIQUES TO ANALYZE ENERGY CONVERSION SYSTEMS, - HAVE KNOWLEDGE AND UNDERSTANDING OF THE CRITERIA TO OPTIMIZE ENERGY CONVERSION SYSTEMS, - UNDERSTAND AND EXPLAIN THE MEANING OF THE STRUCTURE OF THE ELECTRICITY AND NATURAL GAS STRUCTURE, - UNDERSTAND THE FUNDAMENTAL CONCEPTS FOR THE DEVELOPMENT OF INNOVATIVE ENERGY SYSTEMS WITH REDUCED ENVIRONMENTAL INTERACTIONS, - DEMONSTRATE SKILL IN ANALYZING THERMODYNAMIC EFFECTS OF MULTI-PRESSURE HRSG IN COMBINED GAS-STEAM POWER PLANTS AND ABILITY TO EVALUATE THEIR EFFECTS ON OVERALL PERFORMANCE.
3	Prerequisites and learning activities	THE STUDENT MUST KNOW THE BASIC KNOWLEDGE AND UNDERSTANDING ON ENERGY CONVERSION SYSTEMS CONTAINED IN THE EXAM "MACHINES AND THERMAL POWER PLANTS" (CODE: I0629) OF THE FIRST CYCLE OF THE INDUSTRIAL ENGINEERING SPECIALIZATION.
4	Teaching methods and language	LECTURES AND EXERCISES. LANGUAGE: ITALIAN/ ENGLISH RECOMMENDED READINGS AND TEXT BOOKS KOTAS, T.J., THE EXERGY METHOD OF THERMAL PLANT ANALYSIS, BUTTERWORTHS, LONDON. BEJAN, TSATSARONIS, MORAN, THERMAL DESIGN & OPTIMIZATION, JOHN WILEY & SONS. KEHLHOFER, COMBINED-CYCLE GAS STEAM TURBINE POWER PLANTS, PENNWell, OKLAHOMA. DOE, FUEL CELL HANDBOOK, DEPARTMENT OF ENERGY, USA, NETL, NOVEMBER 2004.
5	Assessment methods and criteria	ONE WRITTEN-ORAL EXAM