

Marco Villani

| Programme of “Costruzioni Elettromeccaniche” “Electrical Machines Design” | | |
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| Number of ECTS credits: 9 (workload is 90 hours; 1 credit = 10 hours) | | |
| CODE: I2L038 • TYPE OF COURSE UNIT: COMPULSORY • LEVEL OF COURSE UNIT (E.G. FIRST, SECOND OR THIRD CYCLE; SUB-LEVEL IF APPLICABLE): SECOND CYCLE • YEAR OF STUDY (IF APPLICABLE); SEMESTER: 2nd year , 2nd semester Teacher: Marco Villani | | |
| 1 | Course objectives and Learning outcomes | The goal of this course is to provide advanced knowledge and understanding about the construction and design of the electrical machines. The course provides to the students the basis and the methodologies to a correct design of the electrical machines (transformers, rotating AC machines and DC machines). Innovative tools and techniques will be used for the design optimization of the electrical machine for industrial, automotive and aerospace applications. The applying knowledge and understanding capabilities will allow at the graduate to approach the problem linked to the design of the electrical machines. |
| 2 | Dublin descriptors | Topics of the module include: <ul style="list-style-type: none"> - General considerations on the design of the electric machines. Specifications. Machine design criteria. Sizing equations. Construction of the electrical machines. Materials employed in the construction of the electrical machines. Magnetic analysis, losses and thermal analysis. - Design of traditional electrical machines for standard applications: design of three-phase transformers and Induction motors. - Design of electrical machines for electrical drives for industrial, automotive and aerospace applications: brushless PM motors, synchronous reluctance motors, switched-reluctance motors, PM linear synchronous motors, axial-flux PM brushless motors, fault-tolerant brushless motors. - Computer-aided-design: innovative tools and techniques for the electrical machines design. Design optimization of electrical machines. Use of software for the electromagnetic field analysis. - Laboratory of design optimization and Finite Element analysis of electrical machines. - Visit to Electromechanical Company at the end of course. |
| 3 | Prerequisites and learning activities | The student must know the basic notions of Electromagnetism, Applied Thermodynamic and Heat Transfer, Electrical Machines and Electric Drives. |
| 4 | Teaching methods and language | Lectures and exercises. Language: Italian / English Ref. Text books <ul style="list-style-type: none"> - LECTURE NOTES BY THE TEACHER (IN ENGLISH AND ITALIAN); - "COSTRUZIONI ELETTROMECCANICHE", VOL. I E II, E. DI PIERRO (IN ITALIAN); - "DESIGN OF ROTATING ELECTRICAL MACHINES", JUHA PYRHONEN, TAPANI JOKINEN; - "PM MOTOR TECHNOLOGY: DESIGN AND APPLICATIONS", J.F. GIERAS, M. WING; - "RELUCTANCE SYNCHRONOUS MACHINES AND DRIVES", I. BOLDEA; - "SWITCHED RELUCTANCE MOTOR DRIVER: MODELING, SIMULATION, ANALYSIS, DESIGN, AND APPLICATIONS", RAMU KRISHNAN; - "AXIAL-FLUX PERMANENT MAGNET BRUSHLESS MACHINES", J.F. GIERAS, M.J.KAMPER - "FINITE ELEMENTS FOR ELECTRICAL ENGINEERING", P.P.SILVESTER E R.L.FERRARI. |
| 5 | Assessment methods | Oral exam. |