UNIVERSITÀ DI PAVIA

Anno Accademico 2020/2021

CAD, COMPATIBILITA' ELETTROMAGNETICA INDUSTRIALE E LABORATORIO DI ELETTROTECNICA INDUSTRIALE

Anno immatricolazione	2020/2021
Anno offerta	2020/2021
Normativa	DM270
SSD	ING-IND/31 (ELETTROTECNICA)
Dipartimento	DIPARTIMENTO DI INGEGNERIA INDUSTRIALE E DELL'INFORMAZIONE
Corso di studio	INGEGNERIA ELETTRICA
Curriculum	Sistemi elettrici
Anno di corso	1°
Periodo didattico	Secondo Semestre (08/03/2021 - 14/06/2021)
Crediti	6
Ore	56 ore di attività frontale
Lingua insegnamento	Italiano
Tipo esame	SCRITTO E ORALE CONGIUNTI
Docente	DI BARBA PAOLO (titolare) - 3 CFU MOGNASCHI MARIA EVELINA - 3 CFU
Prerequisiti	Argomenti di: teoria dei circuiti, elettrotecnica, metodi matematici per l'ingegneria, calcolo numerico. In particolare, la conoscenza di strumenti matematici di base quali gli operatori vettoriali per l'analisi dei campi è un prerequisito specifico.
Obiettivi formativi	Advanced knowledge of electric, magnetic and electromagnetic fields. Base knowledge of commercial codes for finite element simulations. Knowledge of inverse problems and optimization methods. Knowledge of technical European norms about environmental electromagnetic compatibility.
Programma e contenuti	Computer aided design Introduction to computer aided design by means of commercial software

	e.g. Magnet by Infolytica or Comsol Multiphysics. Finite element analysis of a simple case study. Inverse problems Direct and inverse problems. Well-posed and ill-posed problems. Fredholm's integral equation of the first kind. Under- and over-determined systems of equations. Least-squares solution. Classification of inverse problems. Optimization Solutions of inverse problems by the minimization of a functional. Constrained optimization. Multiobjective optimization. Gradient-free and gradient-based methods. Deterministic vs non-deterministic search. Numerical case studies. Industrial electromagnetic compatibility Field in low and high frequency, wave propagation, reflection and refraction. Near- and far-field. Biological effects of electromagnetic field. ICNIRP, Italian and European laws. Sources in low and high frequency. Antennas: properties (gain, directivity and polarization), kind of antennas, signal modulation. Theory of measurements of electric, magnetic and electromagnetic fields. Instruments for field measurements. Measurements of electromagnetic field radiated by microwave antennas and devices, radiofrequency antennas and fields produced by electric-power transmission plants.
Metodi didattici	The lectures are held with the help of blackboard and slide based presentations. For the CAD module, Finite element codes and Matlab programming are also used. These codes are made available to students. For the Laboratory module measurements of electric and magnetic fields are done close to field sources.
Testi di riferimento	For the CAD module: P. Di Barba, A. Savini, S. Wiak. Field models in electricity and magnetism. Springer, 2008. For the Laboratory module, slides shown during the lessons.
Modalità verifica apprendimento	For the CAD module, the final examination consists in solving an inverse problem. This work is discussed with the teacher. For the Laboratory module, the final examination consists of a finite element simulation in order to asses the field measurements.
Altre informazioni	
Obiettivi Agenda 2030 per lo sviluppo sostenibile	$lbl_legenda_sviluppo_sostenibile