

Programme of “METODI DI PROGETTAZIONE ELETTROMAGNETICA” (ELECTROMAGNETIC DESIGN)		
I0329, Compulsory, 2nd Cycle in Telecommunications Engineering , 2st year , 1 st semester I2E040, Optional, 2nd Cycle in Electronic Engineering , 2st year , 1 st semester		
NUMBER OF ECTS CREDITS: 9 (WORKLOAD IS 225 HOURS; 1 CREDIT = 25 HOURS)		
Teacher: Prof. Piero TOGNOLATTI		
1	Course objectives	The objective of this course is to introduce to the students the Methods to Design Passive Electromagnetic Structures used in Telecommunications Systems and in Electronics. On successful completion of this module, the student should be able to design his/her own Microwave or Antenna System. The first part of the course deals with wideband microwave circuits, hybrid junctions and microwave filters. The second part of the course is focused on the design of antenna arrays.
2	Course content and Learning outcomes (Dublin descriptors)	<ul style="list-style-type: none"> • <u>Transmission-Line Multisection Matching Transformer</u>: the Theory of Small Reflections, Signal Flow Graph, Binomial and Chebyshev design, Tapered Line transformer, Bode-Fano criterion. • <u>Narrowband Matching Circuits</u>: lumped circuits, stubs. • <u>Microwave Resonators</u>: lumped resonators, cavities. • <u>Three-port circuits; Power Divider and Directional Coupler</u>: circulators, splitters, waveguide or coupled line directional couplers. • <u>Microwave Filters</u>: Design methods, Insertion Loss Method, Filter Transformations and Implementation. Numerical Analysis of some commonly used filters. • <u>Antenna Arrays</u>: Principle of Pattern Multiplication, Array Pattern Synthesis, Feed Networks for Arrays. • <u>Laboratory</u>: implementation and characterization of Multisection Matching Transformers, Filters and Directional Couplers. <p>On successful completion of this module, the student should:</p> <ul style="list-style-type: none"> - have profound knowledge of fundamentals of Microwave Engineering and Antenna Arrays - have knowledge and understanding of the main analytical and numerical tools used to design passive microwave circuits and antenna arrays. - be able to select the appropriate procedures and design rules and goals - demonstrate skill in solving engineering problems referring to electromagnetic systems - demonstrate skill in performing laboratory measurements - demonstrate capacity to read and understand text on Microwave Engineering and on related topics.
3	Prerequisites and learning activities	The student must know the Theory of Electromagnetic Fields and the basics of Radiating Elements and Passive Microwave Circuits.
4	Teaching methods and language	<p>Lectures and exercises language: Italian / English A report is required for the laboratory activity</p> <p>Ref. Text books: David M. Pozar, Microwave Engineering, Wiley, 2011 Robert E. Collin, Foundation for Microwave Engineering, second edition, McGraw-Hill, 1992; Robert S. Elliott An Introduction to Guided Waves and Microwave Circuits, Prentice-Hall, 1993; Fred Gardiol, Microstrip Circuits, J. Wiley & Sons, 1994; E. H. Fooks, R. A. Zakarevicius, Microwave Engineering using Microstrip Circuits, Prentice-Hall, 1990; Robert E. Collin, Antennas and Radiowave Propagation, McGraw-Hill, 1985</p>
5	Assessment methods and criteria	Written and oral exam