



Programme of Course "Electromagnetic Design"

<ul style="list-style-type: none"> • Code: I0329 • Type of course unit: Compulsory (Laurea Magistrale in Ingegneria delle Telecomunicazioni curriculum Comune) • Level of course unit: Postgraduate Degrees • Semester: 1 		
Number of ects credits: (Laurea Magistrale in Ingegneria delle Telecomunicazioni) 9 (workload 225 hours)		
Teachers: Piero Tognolatti		
1	Course objectives	<p>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</p>
2	Course content and learning outcomes (dublin descriptors)	<p>Topics of the module include:</p> <ul style="list-style-type: none"> • Transmission-Line Multisection Matching Transformer: the Theory of Small Reflections, Signal Flow Graph, Binomial and Chebyshev design, Tapered Line transformer, Bode-Fano criterion • Narrowband Matching Circuits: lumped circuits, stubs • Microwave Resonators: lumped resonators, cavities • Three-port circuits; Power Divider and Directional Coupler: circulators, splitters, waveguide or coupled line directional couplers • Microwave Filters: Design methods, Insertion Loss Method, Filter Transformations and Implementation. Numerical Analysis of some commonly used filters • Antenna Arrays: Principle of Pattern Multiplication, Array Pattern Synthesis, Feed Networks for Arrays • Laboratory: 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 • demonstrate skill in solving engineering problems referring to electromagnetic systems; demonstrate skill in performing laboratory measurements • be able to select the appropriate procedures and design rules and goals • demonstrate capacity to read and understand text on Microwave Engineering and on related topics
3	Course prerequisites	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. A report is required for the laboratory activity</p> <p>Language: English</p> <p>Reference textbooks</p> <ul style="list-style-type: none"> • Robert S. Elliott, <i>An Introduction to Guided Waves and Microwave Circuits</i>. Prentice-Hall. 1993. • Robert E. Collin, <i>Antennas and Radiowave Propagation</i>. McGraw-Hill. 1985 . • Robert E. Collin, <i>Foundation for Microwave Engineering, second edition</i>. McGraw-Hill. 1992. • Fred Gardiol, <i>Microstrip Circuits</i>. Wiley. 1994. • E. H. Fooks, R. A. Zakarevicius, <i>Microwave Engineering using Microstrip Circuits</i>. Prentice-Hall. 1990.
5	Assessment methods	Written and oral exam

