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Politecnico di Torino

Academic Year 2010/11 (first time established in A.Y.2007/08)

01MBNJA

Electromagnetic waves

1st degree and Bachelor-level of the Bologna process in Electronic And Computer Engineering - Vercelli (III FACOLTA' DI INGEGNERIA)

Teacher	Status	SSD	Les	Ex	Lab	Years Stability
Orefice Mario	PO	ING-INF/02	4	1	0	2

SSD	CFU	Activities	Area context
ING-INF/02	5	B - Caratterizzanti	Ingegneria delle telecomunicazioni

Objectives of the course

This course deals with different types of transmission lines, and gives the bases to understand and analyze the guided propagation of electromagnetic waves. The equivalent transmission lines formalism is also discussed, and the most common types of waveguides are presented.

Expected skills

After completion of the course, the student will be able to analyze simple transmission lines, also in the time domain, to carry out simple calculations on the scattering matrix of a network, to analyze single mode waveguides, also with elementary discontinuities.

Prerequisites

All courses of Mathematics, Physics, Fundamentals of Electric Circuits, and relevant prerequisites.

Syllabus

General concepts: behavior of electric circuits at high frequency: components and most significant systems. Transmission lines. Distributed parameters circuits: transmission lines equations in time and frequency domain. Single frequency and wide band matching. Examples of transmission lines: coaxial line, twin wires, microstrip. Introduction to Scattering matrix. Transmission line analysis in time domain: dispersive lines on matched load. Group velocity and phase velocity. Distortion analysis of narrow band signals and pulses, non dispersive lines closed on non dispersive mismatched loads. Maxwell equations in time domain and frequency domain. Solutions of Maxwell equations in homogeneous medium: plane waves. General concepts on waveguides: wave equations, TM, TE, TEM modes and their properties, modal lines and impedances, propagation constants, modal eigenfunctions. Examples: the rectangular metallic waveguide. Waveguide discontinuities.

Laboratories and/or exercises

Lectures and exercises on the content of the lectures; laboratory exercises (measurements on slotted lines and network analyzer). Computational electromagnetics exercises at LAIB.

Bibliography

Lecture notes (texts and slides copies) prepared by the instructor.
Moreover, as auxiliary texts: ' R. E. Collin: 'Foundations for microwave engineering', McGraw-Hill, 1992. ' D.M. Pozar, 'Microwave engineering', Addison Wesley, 1990. ' C.R.Paul, "Electromagnetics for engineers", Wiley, 2004.

Revisions / Exam

Written (with textbook but without personal notes) and oral examination.

Programma definitivo per l'A.A.2010/11

