COMMUNICATION ENGINEERING AND ELECTRONIC TECHNOLOGIES

(Lecce - Università degli Studi)

Teaching MICROWAVES

GenCod A003099

Owner professor Luca CATARINUCCI

Teaching in italian MICROWAVES

Teaching MICROWAVES

SSD code ING-INF/02

Reference course COMMUNICATION ENGINEERING AND ELECTRONIC

Course type Laurea Magistrale

Credits 9.0

Teaching hours Front activity hours: 81.0

For enrolled in 2024/2025

Taught in 2024/2025

Course year 1

Language ITALIAN

Curriculum PERCORSO COMUNE

Location Lecce

Semester Second Semester

Exam type Oral

Assessment Final grade

Course timetable https://easyroom.unisalento.it/Orario

BRIEF COURSE DESCRIPTION	Microwave course is aimed at providing both theoretical and practical knowledge on the main aspects of microwave engineering. It also serves as the necessary prerequisite for more advanced courses in communication engineering.
REQUIREMENTS	Electromagnetic Fields
COURSE AIMS	After the course the student should be able to * Apply microwave analysis methods to determine the main properties of high-frequency circuits. * Apply knowledge on transmission lines and waveguides particularly for their use as elements in impedance matching and filter circuits. * Design an impedance matching network with either distributed or lumped elements through the Smith Chart. * Evaluate both analytically and experimentally the scattering parameters of N-Port microwave devices * Illustrate the main aspects of N-Port networks, microwave filters and resonant cavities
TEACHING METHODOLOGY	The primary mode of instruction involves traditional 'chalk and blackboard' lectures to ensure students can closely follow each mathematical concept. Additionally, PowerPoint presentations are utilized for certain lessons where graphical support aids comprehension. Furthermore, the curriculum includes at least three hands-on experiences to familiarize students with simulating radiofrequency circuits and understanding their electromagnetic characteristics.
ASSESSMENT TYPE	An oral exame is foreseen. It is aimed at verifying the knowledge and understanding of the course topics acquired by the student (maximum overall duration: 45 minutes).

OTHER USEFUL INFORMATION	**Office Hours:** By appointment; contact the professor by email or at the end of class meetings. Official office hours will be defined once the course agenda will be definited.
FULL SYLLABUS	**activities)** Introduction: the main differences between low-frequency and hi-frequency circuits (**2 hours frontal lesson**). Transmission lines and waveguides: transmission lines theory. Smith chart. Line-Load matching through single and double stub techniques using the Smith chart. Quarter-wave matching. Properties of the most common transmission lines: coaxial cable, microstrip line, coplanar stripline. Properties of the most common waveguides: rectangular, circular, and "ridge" (**26 hours frontal lesson**). Solutions of assigned exercises and practical examples of use of the Smith Chart. (**14 hours practical exercitations**). Microwave junctions. N-port junctions. Scattering matrix. 2-port, 3-port and 4-port cases. (**9 hours frontal lesson**) Microwave devices: functional description of the main passive components used in microwave circuits. Attenuators. Circulators. Dividers and combiners (Resistive, T-junction, Wilkinson). Directional couplers theory. Two-hole couplers. Branch-Line. Rat-Race. Magic-T. (**12 hours frontal lesson**) Resonant cavities: brief overview on resonant cavities. Rectangular and circular resonant cavities. Application as filters and frequency meters. (**2 hours frontal lesson**) Microwave filters: general information on Microwave filters. Main design techniques for a microwave filter. (**7 hours frontal lesson**) Microwave circuits analysis (Laboratory Activity): Introduction to microwave CAD programs; analysis of microwave circuits. Examples of design of simple microwave circuits. (**6 hours laboratory activity**) S-Parameter evaluation (Laboratory Activity): Vector Network Analyzer description. Laboratory measurement of the scattering parameters of various microwave devices (rat race, Wilkinson divider, etc.). (**3 laboratory activity**)
REFERENCE TEXT BOOKS	[1] David M. Pozar, *Microwave Engineering*, John Wiley & Sons Inc [2] Sorrentino Roberto, Bianchi Giovanni, *Microwave and RF Engineering*, John Wiley & Sons Inc