RF AND MICROWAVE NETWORKS

PROF. BRATIN GHOSH

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INTENDED AUDIENCE : Undergraduate/Post-Graduate students

INDUSTRY SUPPORT : ISRO, DRDO, BEL, SAMEER, Astra Microwave, Qualcomm, Intel, Ansys, Wipro, Keysight Technology, Agilent, Anritsu, WiPL-D, Altair Engineering, Mistral Solutions Pvt. Ltd, Verdant Telemetry and Antenna Systems, Data Patterns, Syratron Technologies Pvt Ltd.

COURSE OUTLINE :

The course begins with an introduction to microwave networks. Thereafter, it investigates the basic and general relationships of modal orthogonality in cylindrical guides of arbitrary cross-section. Field expressions and propagation behavior inside such guides are also investigated. Next, the obstacle problem in the waveguide is treated. This is followed by the analysis and network modeling of two waveguide discontinuities : the post and the diaphragm. Thereafter, the waveguide junction problem is investigated with reference to the capacitive and inductive waveguide junctions. The numerical modeling of the waveguide feed is next investigated, with reference to a probe feed in a waveguide. The circuit modeling of apertures excited through waveguides is addressed. Modeling of cavities is undertaken, alongwith determination of the input impedance of a probe-excited cavity and the problem of a waveguide aperture-coupled to a cavity. Treatment of apertures in ground-planes is addressed. Modeling of radiation from a plane current sheet is investigated. Finally, cylindrical waves and their treatment are examined.

ABOUT INSTRUCTOR :

Prof. Bratin Ghosh received his Bachelors in Electronics and Telecommunication Engineering in 1990 from Jadavpur University, Kolkata, Master of Technology in Electronics and Electrical Communication Engineering with specialization in Microwave Engineering in 1994 from the Indian Institute of Technology, Kharagpur and Ph.D. in Applied Electromagnetics in 2002 from the University of Manitoba, Canada. Thereafter, he completed his postdoctoral from the Royal Military College of Canada. He is currently Professor in the Department of Electronics and Electrical Communication Engineering, Indian Institute of Technology, Kharagpur. He is a TPC member and an invited / keynote speaker and chaired sessions in many national and international conferences and seminars. He is also in the review and editorial boards of many international journals. He has been the recipient of many federal project grants in addition to research grants from the industry on the design of efficient antennas and guided systems. He has also organized many short term lectures and workshops in the field of applied electromagnetics that have been well attended by participants from both the academia and industry. He had been the recipient of the National Talent Search Scholarship, the University of Manitoba Graduate Fellowship and is Senior Member, IEEE. He has also been the recipient of many national awards, travel grants and best student paper awards. His areas of research interest are full-wave Green's function technique for the analysis of cylindrical and spherical multilayer structures, singularity removal techniques, anisotropic media, efficient evaluation of Sommerfeld integral tails and leaky and creeping waves in cylindrical structures. He is also actively involved in the design and analysis of efficient horn antenna feeds, metamaterials, dielectric resonator antennas, antenna miniaturization and numerical techniques.

COURSE PLAN :

Week 1: The Network Concept : One-Port Network, Two-Port Network, Signal Flow Graph.
Week 2: Cylindrical Waveguides.
Week 3: Modal Expansion in Waveguides.
Week 4: Modal Analysis of Waveguide junctions. Capacitive and Inductive Waveguide junctions.
Week 5: Analysis of Obstacles in Waveguide. Small Obstacles in Waveguide.
Week 6: Posts in Waveguides. Diaphragms in Waveguides.
Week 7: Waveguide Feeds. Currents in Waveguides.
Week 8: Apertures in Ground Planes. Plane Current Sheets.
Week 9: Excitation of Apertures.
Week 10: Modal Expansion in Cavities. Probes in Cavities.
Week 11: Aperture Coupling to Cavities.
Week 12: Wave Interaction with Cylindrical Structures.