Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NECC542	Microwave Transmission Lines and Networks	3	1	0	4

Course Objective

The course aims to introduce the students to different kinds of available high frequency / microwave transmission lines, matching networks and passive networks. The student will basically learn how to select, analyze, and design a transmission lines and transmission line based networks.

Learning Outcomes

Upon successful completion of this course, students will be familiar with different kind of

- single conductor and multi conductor transmission lines, like, two-wire transmission lines, waveguides, planar transmission lines, etc, and their analysis.
- Matching networks, like, lumped element matching network, distributed element matching network, and tapered line matching networks.
- Passive networks like power dividers, couplers and filters.

Module No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Transmission Lines and Waveguides:** Lumped-Element Circuit Model of Transmission Line, Field Analysis, Terminated Lossless Transmission Line, General analysis of TEM, TE and TM Waves, Parallel plate, Rectangular and Circular waveguides, Coaxial line Surface wave propagation in grounded dielectric slab, Microstrip lines, Strip lines, Coupled microstrip lines.	12L+4T	Students will be introduced to different transmission lines and waveguides and their analysis, and surface wave propagation in planar transmission lines.
2	**Smith chart and Matching Networks**: Smith chart, Lumped element matching, Single-stub and double-stub tuning, Quarter-Wave transformer, Theory of small reflections, Multisection transformers, Tapered lines, Bode-Fano criteria.	10L+4T	Students will familiarize with different kinds of transmission line matching networks, their analysis, and design procedure.
3	**Microwave Network Analysis:** Equivalent voltages and currents; Z, Y, S, and ABCD parameters; Scattering parameters.	4L+1T	Students will familiarize with different multi-port network parameters
4	**Power Dividers and Couplers:** Scattering matrix of 3- and 4-port junctions; Design of T-junction and Wilkinson power dividers; Design of 90° and 180° hybrids; Coupled line directional coupler.	10L+3T	Students will familiarize with basic microwave power dividers and couplers through transmission line concepts.
5	**Filters:** Analysis of periodic structures, filter design by insertion loss method, maximally flat and Chebyshev designs, Filter transformation - frequency scaling, impedance scaling, Filter Implementation - Richard transformation, Kuroda Identities, Coupled line filters	6L+2T	Students will familiarize with microwave filter design
	Total	**42**	

Text Book:

1.Microwave Engineering, S. Das. First edition, 2014.

Reference Books:

1.Microwave Engineering, D. M. Pozar, 4th edition, 2012.
2. Transmission Line Design Handbook (Artech House Antennas and Propagation Library) by Brian C. Wadell, 1991.
3. Transmission Lines and Lumped Circuits: Fundamentals and Applications (Electromagnetism) by G. Miano and A. Maffucci, 1st edition, 2001.
4. Foundation of Microwave Engineering, R. E. Collin, 2nd edition, 2007.