Course Type	Course Code	Name of Course	L	T	P	Credit
DC	ECC307	Microwave Engineering	3	0	0	9

Course Objective

Microwave Engineering introduces the student to RF/microwave analysis methods, microwave devices and design techniques. Passive and active devices commonly utilized in microwave subsystems are analyzed and studied. Design procedures are presented along with methods to evaluate device performance. To understand the theoretical principles underlying microwave devices and networks.

Learning Outcomes

Upon successful completion of this course, students will:

- Gain knowledge and understanding of microwave analysis methods and devices.
- Be able to apply analysis methods to determine circuit properties of passive/active microwave devices.
- Analyze microwave circuits using scattering parameters.
- Have knowledge of how transmission and waveguide structures and how they are used as elements in impedance matching and filter circuits.
- Recognize the limitations of existing vacuum tubes and solid state devices at microwave frequencies

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Smith Chart and transmission line matching:** Fundamental of transmission line, Smith chart; Single and double-stub matching, quarter-wave transformers.	8	Generalize the concepts of guided structures like transmission line, means of transporting energy or information, commonly used in power distribution and communication.
2	**Microwave Network Analysis:** Equivalent voltages and currents, scattering matrix representation of microwave networks.	06	Gain knowledge and understanding of microwave analysis methods and devices. Analyze microwave circuits using scattering parameters
3	**Microwave reciprocal networks:** T-junction power divider, Wilkinson power divider, directional couplers, hybrid junctions, Insertion loss method of filter design, frequency scaling, impedance scaling, Filter Implementation-Richard transformation Kuroda Identities, Introduction to inverters.	15	Have knowledge of how transmission and waveguide structures and how they are used as elements in impedance matching and filter circuits
4	**Microwave non-reciprocal networks:** Faraday rotation, Ferrites, Isolator, attenuators, phase shifters, and circulators.	07	Generalize the concepts of non-reciprocal devices and their analysis
5	**Active Devices:** Principle of operation of two-cavity and reflex klystron, traveling wave tube and magnetron. Microwave semiconductor devices: Operation and circuit applications of Gunn diode, and PIN Diode.	06	Recognize the limitations of existing vacuum tubes and solid state devices at microwave frequencies

Textbook:

1. David Pozar, Microwave Engineering, 3rd edition, (Wiley, 2005).

Reference Books:

1. Fred E. Gardiol, Introduction to Microwaves, (Artech House, 1984).
2. Robert E. Collin, Foundations for Microwave Engineering, 2nd edition, (McGraw Hill, 1992).