EC 412: RF AND Microwave Engineering (4-0-2:5)

Introduction
RF Behavior of Passive Components, Chip Components.

Transmission line analysis
Need For Transmission Line Theory, Examples Of Transmission Lines, Equivalent Circuit Representation, Theoretical Foundation, Circuit Parameters For A Parallel Plate Transmission Line, General Transmission Line Equation, Microstrip Transmission Lines, Terminated Lossless Transmission Line, Special Termination Conditions, Sourced And Loaded Transmission Line.

Smith Chart
From Reflection Coefficients to Load Impedance, Impedance Transformation, Admittance Transformation, Parallel and Series Connection.

Single- and multiport networks
Basic Definitions, Interconnecting Networks, Network Properties And Application, Scattering Parameters- Definition And Meaning Of S- Parameters.

RF filters design
Basic Resonator and Filter Configurations, Special Filter Realizations.

MMIC
Introduction, Materials, Fabrication Techniques, Thin Film Formation.

Microwave waveguides and components
Introduction, Rectangular Waveguides, Rectangular Cavity Resonators, Microwave Hybrid Circuits: Waveguides Tees, Magic Tees, Directional Couplers.

Microwave devices and sources
Microwave Bipolar Transistors, Microwave Tunnel Diodes, Gunn Diodes, Klystrons and Magnetrons.

Microwave communications
Simplified Microwave System, Microwave Repeaters, Diversity, Microwave Radio Stations, System Gain.

RADAR
Basic Radar, Simple Form Of Radar Equation, Radar Block Diagram, Detection Of Signal Noise, Receiver Noise & SNR, Transmitted Power, PRF, Antenna Parameters, Introduction To Doppler And MTI Radar, Delay Line Canceller, Staggered PRFs, Tracking With Radar, Conical Scan And Sequential Lobbing.

Electronic navigation
Instrument Landing System, Precision Approach Radar, Microwave Landing System, Satellite Navigation Systems (GPS).

Suggested Practical:
1. Introduction on Microwave Bench.
2. To Plot Standing Wave Pattern Of Different Loads.
3. To Measure VSWR Of Different Loads.

4. To Find Unknown Impedance Using Smith Chart.
5. To Study Properties Of Directional Coupler.
6. To Study Microstrip Band Pass And Band Stop Filters.
7. To Study Microstrip Power Divider.
8. To Plot Mode Characteristics Of Reflex Klystron.
9. To Measure Dielectric Constant Of Substrate Used for Microstrip Line.

Text Books:

1. L. Samuel Y., “Microwave Devices and Circuits”, PHI
2. F. Gustrao, “RF & Microwave Engineering”, Wiley

References:

1. D. Annapurna and D. Sisir K., “Microwave Engineering”, Tata McGraw-Hill
2. S. Merril I., “Introduction to Radar Systems”, Tata McGraw-Hill
3. Rao, “Microwave Engineering”, PHI
4. L. O. Sadiku, “Electromagnetic Theory”, Oxford