Microwave Engineering(404183)

Teaching Scheme:
Lectures: 4 Hrs/ Week

Examination Scheme:
In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

- To lay the foundation for microwave engineering
- To understand the applications of microwave engineering
- Carryout the microwave network analysis.

Course Outcomes:

After successfully completing the course students will be able to

- Formulate the wave equation in wave guide for analysis.
  Identify the use of microwave components and devices in microwave applications.
  Will be able to identified suitable microwave measurement system

Introduction to Microwaves engineering: History of Microwaves, Microwave Frequency bands. Applications of Microwave.

General solution for TEM, TE and TM waves, Parallel plate waveguide, rectangular waveguide, coaxial line, Rectangular waveguide cavity resonators, introduction to Circular waveguide cavity resonators

Stripline, Microstrip line, Parallel Strip line, Coplaner Strip line, Shielded Strip Line,

Unit II : Microwave Network Analysis 8L

Impedance and Equivalent voltages and currents, Impedance and Admittance matrices, The scattering matrix, The Transmission (ABCD) matrix, Signal flow graphs, Excitation of Waveguides – Electric and Magnetic currents, Aperture coupling

Unit III : Impedance Matching and Tuning 6L

Matching with lumped Elements (L networks), Single stub tuning, Double stud tuning, the quarter wave transformer, the theory of small reflection, Binomial matching transformers,

chebyshev multisection matching transformers, Tapered lines

Unit IV : Microwave Sources and Solid State Devices 6L

Limitation of conventional tubes, microwave tubes, velocity modulation, method of producing the velocity modulation, principle of operation of two cavity klystron, reflex klystron principle of operation, velocity modulation in reflex klystron, applegate diagram with gap voltage for a reflex klystron. Principle of operation of Magnetron, hull cutoff condition, advantages of slow wave devices, principle of operation of TWT.

Microwave bipolar transistor, FET, Principle of Operation and application of tunnel diode, Principle of operation of Gunn diode, application of gunn diode advantages of gunn diode, principle of operation of PIN diode, applications of PIN diode.

Unit V : Microwave passive and active components

Directional Coupler, Power Divider, Magic Tee, attenuator, resonator, Isolator, Oscillators, Mixers, with wave guides and striplines, tunable detector

Unit VI : Microwave measurements 6L

Measurement devices: Slotted line, Tunable detector, VSWR meter, Power Meter, S-parameter measurement, frequency measurements, Power measurement, Attenuation measurement, Phase shift measurement, VSWR measurement, Impedance measurement, Q of cavity resonator measurement

David M. Pozar, “Microwave Engineering", Fourth edition, Wiley.

Samuel Y. Liao, “Microwave Devices and Circuits”, 3rd edition, Pearson

M. Kulkarni, “Microwave and Radar engineering”, 3rd edition, Umesh Publications