SILVER OAK UNIVERSITY

Engineering and Technology (M.Tech.)

Electronics & Communication (Communication Systems Engg)
Subject Name:RF and Microwave Engg
Subject Code:
Semester: I

Prerequisite: Nil

Objective:
To inculcate understanding of the basics required for circuit representation of RF networks. To deal with the issues in the design of microwave amplifier. To instill knowledge on the properties of various microwave components.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Evaluation Scheme				Total Marks
L	T	P	C	Internal		External		
				Th	Pr	Th	Pr	
3	0	2	4	40	20	60	30	150

Content:

Unit No.	Course Contents	Teaching Hours	Weightage %
1	Conceptual understanding of wave propagation in the guided media such as transmission lines, rectangular and circular waveguides,Various characteristics and parameters such as wave velocity, dispersion, mismatch effects; voltage - current - field distributions.	5	20
2	**Review of Low frequency parameters**: Impedance, Admittance, Hybrid and ABCD parameters, Different types of interconnection of Two port networks, High Frequency parameters, Formulation of S parameters, Properties of S parameters, Reciprocal and lossless Network, Transmission matrix, RF behavior of Resistors, Capacitors and Inductors.	8	20
3	Impedance and Admittance Matrix, Hybrid matrix, Scattering matrix, ABCD Matrix, Discontinuities and Modal analysis, Signal flow graph representation, Various excitation and coupling methods to the waveguides.	7	20

4	Terminations, Attenuators, Phase shifters, Directional couplers, Hybrid Junctions, Power dividers, Circulator, Isolator, Impedance matching devices: Tuning screw, Stub and quarter wave transformers. Crystal and Schottkey diode detector and mixers, PIN diode switch, Gunn diode oscillator, IMPATT diode oscillator and amplifier, Varactor diode, Introduction to MIC.	8	20
5	**Measuring Instruments** : Principle of operation and application of VSWR meter, Power meter, Spectrum analyzer, Network analyzer, Measurement of Impedance, Frequency, Power, VSWR, Q-factor, Dielectric constant, Scattering coefficients, Attenuation, S-parameters.	4	10
6	Conceptual understanding the principle, working and applications of microwave circuits and active devices such as: Mixers, Detectors, Microwave Integrated Circuits, Monolithic Microwave Integrated Circuits, Microwave Amplifiers, Oscillators and Synthesizers.	7	10

Course Outcome:

Sr. No.	CO statement	Unit No
CO-1	Analyze of microwave guides in details	1
CO-2	Explain the active & passive microwave devices & components used in Microwave communication systems.	2,4
CO-3	Analyze the multi- port RF networks and RF transistor amplifiers.	2,3
CO-4	Generate Microwave signals and design microwave amplifiers.	5,6
CO-5	Measure and analyze Microwave signal and parameters.	5

Teaching & Learning Methodology: -

1. Direct Instruction
2. Flipped Classrooms
3. Kinesthetic Learning
4. Context-Based Learning
5. Adaptive Teaching

List of Experiments/Tutorials:

1 Introduction and identification of microwave component.
2 Study of the characteristics of Klystron tube and to determine its electronic tuning range. 3 Study of following characteristics of Gunn Diode
3.1 Output power and frequency as a function of voltage. 3.2 Square wave modulation through PIN diode.
4 To measure the polar pattern and the gain of a waveguide horn antenna.
5 To determine the frequency & wavelength in a rectangular waveguide working in TE10 mode.
6 Study of function of multi hole directional coupler by measuring the following parameters:
6.1 Main line and auxiliary line SWR 6.2 Coupling factor and directivity.
7 To determine the standing wave ratio and reflection coefficient.
8 To perform PC to PC Communication using Microwave test bench

Major Equipment:

Microwave test bench, klystron and gunn power supply, SWR meter, Frequency meter, Microwave spectrum analyzer

Books Recommended: -

1. Pozar D M, Microwave Engineering, Wiley
2. Mishra Ravindra, RF and Microwave Communication, Wiley
3. Gupta K C, Microwaves, New Age International Publn
4. Collin R E, Foundations for Microwave Engineering, McGrawHill International
5. M. Golio& J. Golio, RF and microwave Technologies:Vol I,II,III,CRC Press

List of Open Source Software/learning website:

HFSS, NPTEL video