

Course Number and Name												
BEC703- MICROWAVE ENGINEERING												
Credits and Contact Hours												
3 and 45												
Course Coordinator's Name												
Ms S. Beulah Hemalatha												
Text Books and References												
<p>1. Annapurna Das, Sisir K. Das, "Microwave Engineering", TMH Co., Ltd., 1999.Reprint 2001.</p> <p>2. Collin R.E., "Foundation of Microwave Engineering", 2nd Edition, TMH, 1992.</p> <p>3. Samuel Y. Liao, "Microwave devices and Circuits", PHI Pvt Ltd., 1995.</p> <p>4. http://www.microwaves101.com</p>												
Course Description												
<ul style="list-style-type: none"> • Microwave Engineering introduces the student to RF/microwave analysis methods and design techniques.. • Scattering parameters are defined and used to characterize devices and system behavior. Passive and active devices commonly utilized in microwave subsystems are analyzed • To analyze the current popular distributed systems such as peer-to-peer (P2P) systems • To understand about microwave measurements. 												
Prerequisites						Co-requisites						
Transmission lines networks and wave guides						Fiber optic communication						
required, elective, or selected elective (as per Table 5-1)												
Required												
Course Outcomes (COs)												
CO1 Demonstrate the ability to identify formulate and solve microwave network related problems												
CO2 Understand the need for the different microwave components and their specifications.												
CO3 Understand the working principles of different microwave sources												
CO4 Demonstrate the ability to identify microwave active devices along with their applications.												
CO5 Know how to model and determine the performance characteristics of a microwave circuit or system ..												
CO6 Identify the measurement techniques for different parameters like VSWR, impedance, frequency, power of microwave sources and loads.												
Student Outcomes (SOs) from Criterion 3 covered by this Course												
	COs/SOs	a	b	c	d	e	f	g	h	i	j	k
	CO1	H					M				M	
	CO2	M	M	M	M					H		M
	CO3	M		M	M	M						
	CO4	M				M		M			H	
	CO5		M	M						M		M
	CO6				M		H					

List of Topics Covered

UNIT I MICROWAVE NETWORK THEORY

7

Introduction –Microwave frequency range, applications of microwaves.– Scattering matrix representation of multi port network -properties of S-parameters – S matrix of a two port network with mismatched load – Z and ABCD parameters-Comparison between [S] - [Z] and [Y] matrices

UNIT II MICROWAVE PASSIVE DEVICES

10

Coaxial cables-connectors and adapters – Wave guides- Matched terminations –Rectangular to circular wave guide transition–Wave guide corners – Bends and twists – Windows – Attenuators – Phase shifters – Wave guide tees– E plane tee – H plane tee – Magic tee – Isolators – Circulators –Directional couplers – scattering matrix derivation for all components .

UNIT III MICROWAVE VACCUUM TUBE DEVICES

10

Introduction – Two cavity klystron amplifier – Mechanism and mode of operation –Power output and efficiency -Applications – Reflex klystron oscillator – Mechanism and mode of operation-Power output – Efficiency – Mode curve –Applications – TWT amplifier – Principle of operation-gain and applications – Magnetron oscillator – Hull cut-off voltage mechanism of operation– Power output and efficiency –Applications – Numerical problems.

UNIT IV MICROWAVE SEMICONDUCTOR DEVICES AND CIRCUITS

9

Principles of tunnel diodes - Varactor and Step recovery diodes – Transferred Electron Devices -Gunn diode- Avalanche Transit time devices- IMPATT and TRAPATT Devices- Parametric Amplifiers – Introduction to Micro strip Lines, & Monolithic Microwave Integrated circuits- Materials, MMIC Fabrication Techniques.

UNIT V MICROWAVE MEASUREMENTS

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Introduction – Slotted line carriage — Spectrum analyzer – Network analyzer – Power measurements – Schottky barrier diode sensor –Bolometer sensor – Power sensor – High power measurement – Insertion loss and attenuation measurement – VSWR measurement – Low and high VSWR – Impedance measurement – Frequency measurement – Measurement of cavity Q – Dielectric measurement of a solid by wave-guide method – Antenna measurement – Radiation pattern – Phase and gain.