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

1. Annapurna Das, Sisir K. Das, "Microwave Engineering", TMH Co., Ltd., 1999.Reprint 2001.
2. Collin R.E., "Foundation of Microwave Engineering", 2nd Edition, TMH, 1992.
3. Samuel Y. Liao, "Microwave devices and Circuits", PHI Pvt Ltd., 1995.
4. http://www.microwaves101.com

Course Description

- 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
Electromagnetic Fields and waves.	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 VACCUM 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 9

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.