MICROWAVE INTEGRATED CIRCUITS

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PRE-REQUISITES : Basics of Network Theory

INTENDED AUDIENCE : Students of BE/ME/MS/BSc/MSc/PhD Both UG/ PG can be allowed

COURSE OUTLINE :

Microwave Integrated Circuits is a course designed for introducing the field of Microwave Engineering to students, engineers and academics. Since at microwave frequencies, the distributed circuit effects become very prominent, new circuit theories based on Maxwell's laws have to be introduced. Further, new circuit design techniques as well as new circuit elements are also introduced. The first part of the course deals with the basics of theory. In the later part, the designs of various microwave devices like couplers, circulators, filters and amplifiers are introduced.

ABOUT INSTRUCTOR :

Prof. Jayanta Mukherjee is an Associate Professor, at the department of Electrical Engineering at the Indian Institute of Technology, Bombay. His research interests are in the field of RF circuit design and Microwave Engineering. He has a keen interest in product design and has delivered a number of products to organizations such as BARC, and ISRO. He also actively collaborates with the private sector in India. Professor Mukherjee has won a number of research awards, has published extensively and is a Senior Member of IEEE.

COURSE PLAN :

Week 1
Lecture 1: Introduction
Lecture 2: Reflection Coefficient, VSWR, Smith Chart
Lecture 3: Reflection Coefficient, VSWR
Lecture 4: Smith Chart
Lecture 5: Applications of the Smith Chart
Lecture 6: Microwave components

Week 2
Lecture 7: Broadband Impedance matching
Lecture 8: Multi-section transformer
Lecture 9: Maximally flat (binomial) transformer, Chebyshev transformer
Lecture 10: Non-uniform transmission line(Tapers)

Week 3
Lecture 11: Scattering Parameters
Lecture 12: Properties of Scattering Parameters
Lecture 13: Properties of Scattering Parameters (contd.)
Lecture 14: Signal flow graph, ABCD parameters

Week 4
Lecture 15: 1 and 2 port passive components
Lecture 16: 3-port microwave components
Lecture 17: Couplers
Lecture 18: Coupled line couplers

Week 5
Lecture 19:Resonators and narrow band filters
Lecture 20:Narrow-band filters
Lecture 21:Filter design: Image parameter method, Insertion loss method
Lecture 22:Filter synthesis, Kuroda’s Identity

Week 6
Lecture 23: Impedance Matching Circuits for Amplifiers
Lecture 24: Micro strip matching(contd.), Mason's rule, Power gain equations
Lecture 25: Amplifier Gain Stability
Lecture 26: Amplifier Gain Stability(contd.)

Week 7
Lecture 27: Gain circles
Lecture 28: Gain circles(contd.)
Lecture 29: Noise
Lecture 30: Noise figure circles(contd.)

Week 8
Lecture 31: DC Biasing
Lecture 32: Amplifier Classes, Frequency compensation
Lecture 33: Linearity
Lecture 34: Oscillator Design