



# MICROWAVE INTEGRATED CIRCUITS

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IIT Bombay

**TYPE OF COURSE** : Rerun | Elective | UG/PG

**COURSE DURATION** : 8 weeks (24 Jan' 22 - 18 Mar' 22)

**EXAM DATE** : 27 Mar 2022

**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** : Introduction, Reflection Coefficient, VSWR, Smith Chart, Reflection Coefficient, VSWR, Smith Chart, Applications of the Smith Chart, Microwave components

**Week 2** : Broadband Impedance matching, Multi-section transformer, Maximally flat (binomial) transformer, Chebyshev transformer, Non-uniform transmission line(Tapers)

**Week 3** : Scattering Parameters, Properties of Scattering Parameters, Properties of Scattering Parameters (contd.), Signal flow graph, ABCD parameters.

**Week 4** : 1 and 2 port passive components, 3-port microwave components, Couplers, Coupled line couplers

**Week 5** : Resonators and narrow band filters, Narrow-band filters, Filter design: Image parameter method, Insertion loss method, Filter synthesis, Kuroda's Identity.

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

**Week 7** : Gain circles, Gain circles(contd.), Noise, Noise figure circles(contd.).

**Week 8** : DC Biasing, Amplifier Classes, Frequency compensation, Linearity, Oscillator Design