

# Millimeter-Wave Antennas, Circuits and Systems

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## Overview

Future communication networks require significantly increased bandwidths in order to cope up with the ever increasing number of wireless devices and high data throughput. Huge bandwidth in the millimeter-wave band from 30 GHz to 300 GHz can greatly increase the present day communication capacity. At present, millimeter-wave technology is being widely used in automotive industry, security screening, telecommunications, thickness gauging, weapons systems, imaging radars and scientific researches. Millimeter wave components are usually realized by frequency scaling the microwave components. However, the fundamental characteristics of millimeter wave systems differ from other existing wireless systems. The challenges and benefits are many, making this an incredibly rich and deep area of research in the coming years.

Primary focus of this course is to introduce the design challenges of physical layer technology and their possible solutions to facilitate the deployment of millimeter wave systems. Major issues those will be addressed in the course are given below.

- Characteristics of millimeter wave communications.
- Guiding structures and interconnects at millimeter-wave frequencies.
- Antennas: Design of millimeter-wave feeds, metasurface antennas, horn antennas, and low-profile antennas
- Passive components: diplexers, ortho-mode transducers, quadrature hybrids, and other structures at millimeter wave.
- Active components: millimeter wave mixers and frequency multipliers using GaAs Schottky diodes.
- Design and fabrication of millimeter-wave components.
- Direct conversion receiver.

<b>Modules</b>	<b>Millimeter-Wave Antennas, Circuits and Systems: November 28 – December 02, 2017</b> (Number of participants for the course will be limited to fifty)
<b>You should attend if</b>	<ul style="list-style-type: none"><li>▪ you are an electronics engineer or scientist from any company or research institute or</li><li>▪ you are in managerial position in mobile industry or</li><li>▪ you are a student or faculty from an academic institution and interested to learn how to design millimeter-wave antennas, components and systems and the future direction of wireless technology.</li></ul>
<b>Fees</b>	The participation fees for taking the course is as follows: <b>Participants from abroad : US \$500</b> <b>Industry/ Research Organizations: INR 20000</b> <b>Full Time Students: Nil</b> <b>Others from Academic Institutions: INR 10000</b> The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hour internet facility. Limited shared accommodation in the guest houses is available on payment basis. Efforts will be made to book accommodation in the guest houses on receipt of request from the participants by 15th November, 2017. TA, boarding and lodging expenses should be borne by the participants.

## The Faculty



**Dr. Goutam Chattopadhyay** (S'93-M'99-SM'01-F'11) is a Senior Research Scientist at the NASA's Jet Propulsion Laboratory, California Institute of Technology, a Visiting Professor at the California Institute of Technology, Pasadena, USA, and a BEL Distinguished Chair Professor at the Indian Institute of Science, Bangalore, India. He received the Ph.D.

degree in electrical engineering from the California Institute of Technology (Caltech), Pasadena, in 1999. His research interests include high frequency heterodyne and direct detector instruments for space applications, specifically for astronomical investigations and exploring the solar system; mm-wave and terahertz (THz) amplifiers, mixers, multipliers; mm-wave and THz radars; and applications of nanotechnology at terahertz frequencies. He has more than 300 publications in international journals and conferences.

He is a Fellow of IEEE and IETE (India) and IEEE Distinguished Microwave Lecturer (2014-2016) – delivering lectures at MTT-S chapters all across the globe. He received more than 30 NASA technical achievement and new technology invention awards, 2013 IEEE Trans. THz Sc. Tech. best journal paper award, 2017 EuCAP best antenna application paper award, 1997 MTT-S Graduate Fellowship award, 2014 IETE Prof. S. N. Mitra Memorial Award, and holds 18 patents.



**Dr. Mrinal Kanti Mandal** (S'06-M'08-SM'13) is working as an Assistant Professor in the department of Electronics and Electrical Communication Engineering, Indian Institute of Technology, Kharagpur. He received the Ph.D. degree in 2008 from the same department. He received B. Tech. and M. Tech. degrees in 2001 and

2003, respectively, from Radiophysics and Electronics, University of Calcutta. After PhD he worked at various places, in the Institute for Infocom Research, Singapore (2007-2009), Université du Québec à Montréal, Canada (2009-2010), and École Polytechnique de Montréal, Canada (2010-2012) and joined IIT Kharagpur in 2012. His research interests include millimeter-wave circuits and components. He has authored or co-authored more than 75 publications in international journals and conferences. Dr. Mandal is a senior member of IEEE since 2013. He has served as chair/co-chair and organizing committee member of different international conferences. He is in the editorial board as a reviewer of several IEEE and other journals.

## Course Coordinator

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