

Mini-Project Course in Hyderabad on MU-MIMO, Massive MIMO and OFDM Technologies for 5G Networks

March 27th to 30th, 2019

Organized by Prof. Aditya K. Jagannatham, EE Department, IIT Kanpur in
association with ECE Department, Osmania University, Hyderabad

IMPORTANT INFORMATION FOR THE SHORT COURSE AT OSMANIA UNIVERSITY, HYDERABAD

Note:

1. Campus map of Osmania University, are given at the end of the document.
2. Please bring a scientific calculator along with you to participate in problem solving during lectures and tutorial sessions. If possible, please also bring laptop with MATLAB installed and fully charged during all regular course days also. In addition, MATLAB project participants are required to bring Laptop with MATLAB preferably R13 or later to participate in the MATLAB projects to be conducted on 30th March, 2019.

Contact Info

Note: Please contact only in case of **emergency**

Narendra Singh	narend@iitk.ac.in	9935290881
Parul Srivastava	psrivast@iitk.ac.in	7054568434

How to reach Osmania University, Hyderabad

Hyderabad is well connected by rail and road with the major cities in India. OU campus is located in Amberpet area. OU is located at a distance of about 2 Kms from the (STPD) Sitafal Mandi, 3.55 Kms from (SC) Secunderabad JN railway station. **Taxis are also available from the Railway Station.** There are pre-paid auto and taxi booth. Sometimes you may be able to negotiate a few rupees less with the driver, if you don't go to the pre-paid booth. For taxi services you can also book online(Ola, Uber etc.)

Please note that transportation has to be arranged by the participant and the associated charges have to be borne by the participant. These are not covered in the registration fees.

Air connectivity

Visitors coming over to Hyderabad can fly into Rajiv Gandhi International Airport that serves Hyderabad, the capital of the Indian state of Telangana. One can avail taxis at the MERU/ SKY cabs stand outside. Alternatively, one can also book a cab using OLA/ UBER app and board at the designated pickup points.

Accommodation Information

Participants are requested to make their own accommodation arrangements in Hyderabad.

Note: Accommodation charges are NOT included in the course registration fees.

Breakfast/ Meals Information

Participants have to bear food expenses. There are food outlets in and around OU. A basic canteen facility is available on campus premises.

The venue for the lecture part of the short course is in Seminar Hall, Osmania University

Course folder, stationary and printed course material will be provided on 27th March morning during the registration session starting at 8:30 AM. Course certificate and receipt for the short course registration will be given only to those who attend all modules of the course and after all the payment dues are cleared.

Please bring a scientific calculator along with you to participate in problem solving during lectures and tutorial sessions.

Tentative Schedule

The tentative schedule for the duration of the short course from 27th to 30th March. It is also available online at:

<https://www.iitk.ac.in/mwn/hyderabad/programme.html>

DAY 1: March 27th, 2019 (WEDNESDAY)	
8:30 AM	Registration
09:00 AM - 10:15 AM	Introduction to 5G technology – Opportunities and Challenges
10:15 AM - 10:45 AM	Tea Break
10:45 AM- 12:15 PM	MIMO Techniques - Receiver Processing, Diversity, Zero-Forcing (ZF), MMSE Receivers and Properties
12:15 PM - 02:00 PM	Lunch Break
02:00 PM- 03:15 PM	Practical Problem Solving Session - MIMO Techniques, Receivers and Performance over Fading Channels
03:15 PM - 03:45 PM	Tea Break
03.45 PM - 05:15 PM	Introduction to Massive MIMO for 5G, Advantages of Massive MIMO and Properties
DAY 2: March 28th, 2019 (THURSDAY)	
09:00 AM - 10:15 AM	Signal Processing for Massive MIMO Systems, Channel Estimation for Massive MIMO, Performance with Perfect and Imperfect CSI, Pilot Contamination
10:15 AM - 10:30 AM	Tea Break
10:30 AM - 11:15 AM	Invited expert lecture on 5G NR standard by Mr Venkata Gautham, Modem Systems Engineer at Qualcomm India Private Limited
11:15 AM - 11:45 AM	Break
11:45 AM - 01:00 PM	New Modulation for 5G - Spatial Modulation (SM), Space Shift Keying (SSK) and Generalized Spatial Modulation (GSM)
01:00 PM - 2:00 PM	Lunch Break
02:00 PM - 03:15 PM	Practical Problem Solving Session - MIMO, Massive MIMO Systems, Spatial Modulation
03:15 PM - 03:45 PM	Tea Break
03:45 PM - 05:15 PM	MU-MIMO Systems, Precoding, Receive Processing and User Scheduling Techniques Block Diagonalization, Successive Optimization

DAY 3: March 29th, 2019 (FRIDAY)

09:00 AM - 10:15 AM	Invited lecture by Mr Pavan Kaivaram, Principal Engineer, Qualcomm
10:15 AM - 10:45 AM	Tea Break
10:45 AM - 12:15 PM	Introduction to OFDM - IFFT/FFT Processing, Cyclic Prefix (CP), Subcarrier Multiplexing, Subcarrier Orthogonality
12:15 PM - 2:00 PM	Lunch Break
02:00 PM - 03:15 PM	OFDM - Performance Analysis, Introduction to MIMO-OFDM Systems, Transmitter/ Receiver Architectures, Massive MIMO OFDM
03:15 PM - 03:45 PM	Tea Break
03:45 PM - 05:15 PM	OFDM PAPR Techniques and Performance – Partial Transmit Sequence (PTS), Selective Mapping (SLM), Companding

DAY 4: March 30th, 2019 (SATURDAY)

09:00 AM - 10:15 AM	Mini-Project on Wireless Channel Modeling, MIMO Wireless Systems, MIMO Receivers, MU-MIMO Systems
10:15 AM - 10:45 AM	Tea Break
10:45 AM - 12:15 PM	Mini-Project on Massive MIMO 5G Systems, Signal Processing and Channel Estimation, Performance of Massive MIMO
12:15 PM - 02:00 PM	Lunch Break
02:00 PM - 03:15 PM	Mini-Project on Spatial Modulation (SM), Space Shift Keying (SSK) for Massive MIMO
03:15 PM - 03:45 PM	Tea Break
03.45 PM - 05:15 PM	Mini-Project on OFDM Systems, IFFT/ FFT Operations, MIMO-OFDM Systems and Performance

[Map Showing Route From Mahatma Gandhi Bus Stand (MGBS) to ECE department OU]

