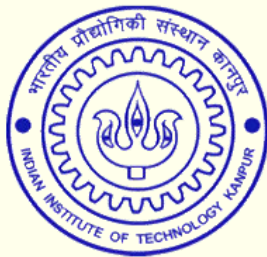
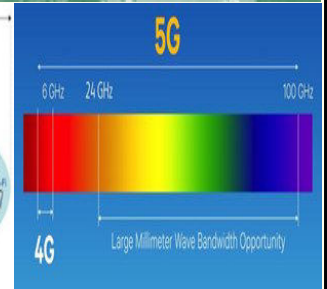
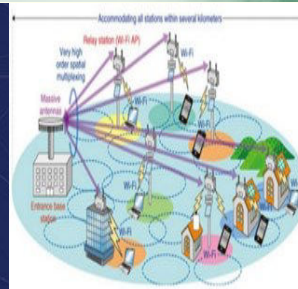


Organized by Prof. Aditya K. Jagannatham, EE Department , IIT Kanpur  
Website: <http://www.iitk.ac.in/mwn/mimo5G>  
January 3<sup>rd</sup> – 6<sup>th</sup>, 2019

**MATLAB Project Course  
On  
Massive MIMO and  
Millimeter Wave (mmWave)  
MIMO Technologies for  
5G Networks**



**Important Dates**

**Course Dates**

January 3<sup>rd</sup> - 6<sup>th</sup>, 2019

**Last Date for Registration**

December 17<sup>th</sup>, 2018

**Venue**

**Seminar Hall,**

Pioneer Batch Building,  
Visitor's Hostel,  
IIT Kanpur,  
Kanpur 208016,  
Uttar Pradesh, India.

**Contact**

**Prof. Aditya K. Jagannatham**

Department of  
Electrical Engineering  
IIT Kanpur  
Kanpur-208016  
U.P., India

**E-mail**

[mimo5G.iitk@gmail.com](mailto:mimo5G.iitk@gmail.com)

**Massive MIMO and mmWave MIMO** are considered to be the key enablers for 5G wireless networks. A Massive MIMO system employs an antenna array with a very large number of antennas (~ 64 – 128), which significantly enhances the throughput of the system along with simplifying the signal processing required. Moreover, these systems have the ability to support a very large number of users, thus leading to a tremendous increase in the network capacity. On the other hand, mmWave MIMO technology leverages the vast spectrum in the mmWave band (30 – 300 GHz) to achieve up to 100X increase in data rates over current systems, which facilitates the realization of novel applications such as WirelessHD, WiGig, V2V/ V2I Communication, VR Headsets and various others. Due to the smaller wavelength, large antenna arrays can be employed in the mmWave regime, leading to a significantly higher throughput via spatial multiplexing.

However, the challenges in realizing these technologies are immense. Massive MIMO requires efficient and fast algorithms for optimal decoding, low complexity schemes for channel estimation and optimal precoding. mmWave technology is highly challenging due to the significantly higher propagation losses at higher carrier frequencies, increased signal blockage coupled with sparse multipath propagation and the increased complexity of hardware required. Therefore, Hybrid RF-Baseband processing has emerged as a popular architecture for mmWave MIMO systems, which requires a fundamental redesign of the signal processing modules related to channel estimation, beamforming, precoding and combining. This course will present a comprehensive analytical development of the various concepts in massive MIMO and mmWave MIMO technologies for 5G together with practical insights and problem solving. A practical MATLAB session will also be conducted to introduce participants to hands on implementation and research methodology in massive MIMO and mmWave MIMO.

**Target Audience**

- Ph.D. scholars pursuing research in Wireless Technologies
- M.Tech/ B.Tech students doing thesis/ projects in Wireless
- ECE/ EEE/ CSE Faculty of Government and Private engineering colleges/ universities
- Engineers from Wireless Industry and R&D Institutions

For more details and registration information, visit the website  
<http://www.iitk.ac.in/mwn/mimo5G/>