MTE 7201 Wireless & Mobile Communications

AIMS:

- To discuss the evolution of mobile systems, the convergence of mobile telecommunications and the internet, and the challenges for future mobile systems
- To study the foundations of mobile and wireless communications systems including the physical layer issues underpinning such systems e.g. pathloss, multipath and inter symbol interference, multiple access techniques and their capacities, diversity, equalization and other techniques aimed at improving mobile communication systems.
- To evaluate today's cutting edge research problems in wireless and mobile communications.

Detailed Course Content:

- Overview of Wireless Communication Systems: Cellular telephony and WLANs), Cellular Network Concepts, Existing Wireless Systems (GSM, 3G, IEEE 802.11)
- Large scale radio propagation effects: path loss and shadowing
- Small scale radio propagation effect: multipath fading
- Narrowband fading (Rayleigh fading, Ricean fading, Nakagami fading) and Wideband fading (channel scattering function, channel coherence bandwidth, power delay profile, channel coherence time, Doppler power spectrum)
- Capacity of wireless channels: AWGN channels; LTI channels (SISO, SIMO, MISO, frequency selective channels) and flat fading channels (slow and fast fading, with or without CSI at tx)
- Overview of Analog & digital modulation and detection - Signal Spaces, Basis Functions
- Performance of digital modulation over wireless channels
- Techniques to improve performance of wireless systems: Diversity, Adaptive modulation, Multiple antennas and space-time coding, Equalization, Multi-carrier modulation (OFDM), Spread spectrum (Direct sequence SS and frequency hopping SS), RAKE receivers
- Research Areas in Wireless Systems: Communication Protocol Layers, Routing Strategies, Network Reliability, Congestion Issues, MANETs, Sensor Networks

Teaching and Learning Pattern

The teaching of students will be conducted through lectures, tutorials, short classroom exercises, case studies, group discussions among the students and projects aimed at solving real life problems. The lecture material will be availed to the students in advance to enable them have prior reading. Solving real life problems in each theme or a number of topics will enhance the students' understanding of the problem based learning techniques.

Assessment method

Assessment will be done through coursework which will include assignments, class room and take home tests, project work and presentations and a written examination. Course work will carry a total of 40% and written examination carries 60%. Coursework marks will be divided into; Assignments 5%, Tests 10% and Practical/project Work 25%.

References:

1. Andrea Goldsmith, "Wireless Communications", Cambridge University press, 2005.
2. T. Rappaport, " Wireless communications: principles and practice", 2nd edition
3. D.N. Tse & P. Viswanath, "Fundamentals of wireless communication", Cambridge University press, first published 2005.
4. G. Stuber, "Principles of mobile communication", 2nd edition
5. J.G. Proakis, "Digital communications", 4th edition