

**Course Title: Wireless Communications**

**Course Code: ETEG 432**

**Credit Hours: 3**

**Course Description:**

This course intends to provide the fundamental theory, technical issues and design aspects associated with high capacity wireless communications systems.

**Course Contents:**

**Unit 1: Introduction**

Overview of wireless communications; Evolution of wireless systems and standards; Cellular telecommunication generations

**Unit 2: Cellular System Fundamentals**

Cellular Concept- Cell structure and cluster, Frequency reuse distance, Frequency management, Channel assignment, Cluster size and system capacity, Sectoring, Handover, Signal to Interference Plus Noise Ratio (SINR) Roaming, Routing.

**Unit 3: Wireless Channel Models, Diversity and Channel Estimation Technique**

Path Loss and Shadowing Models; Statistical Fading Models; Narrowband Fading; Wideband Fading Models; Capacity of wireless fading channel; Diversity technique- Microscopic and Macroscopic; Channel estimation methods- Training sequence based method, Blind method;

**Unit 4: Multiple Access Techniques**

Introduction of Frequency Division Duplex (FDD) and Time Division Duplex (TDD); Multiple access spectral efficiency; Multiple access schemes- Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), Space Division Multiple Access (SDMA), Spread Spectrum Multiple Access (SSMA), Hybrid multiple access technique.

**Unit 5: Wideband Modulation and Adaptive Modulation**

Multicarrier Modulation- Orthogonal Frequency Division Multiplexing (OFDM); Spread Spectrum Modulation- Direct sequence, Frequency and time hopping; Practical Considerations in Adaptive Modulation, Equalization, Adaptive Equalization.

**Unit 6: Multi-antenna System**

Smart Antennas and beam forming; Multiple Input Multiple Output (MIMO) antenna system, MIMO diversity.

**Unit 7: Wireless Networks**

Broadcast Networks- Digital Video Broadcasting (DVB), Direct to Home (DTH); Ad Hoc Network- Bluetooth, WiFi, WiMAX, Wireless sensor network, Zigbee, Ultra-wideband (UWB); Other Networks- IoT, Millimeter Wave Network, Machine to Machine (M2M) communication network, Near Field Communication (NFC), Radio Frequency Identification (NFC), Voice over LTE (VoLTE) network.

### **Unit 8: Cognitive Radio**

Evolution of Cognitive radio, Cognitive network and architecture, Spectrum sensing, Efficiency, Coexistence strategies and applications

#### **References:**

1. Theodore S. Rappaport, *Wireless Communications: Principles & Practice*, Prentice Hall
2. Andrea Goldsmith, *Wireless Communications*, Cambridge University Press.
3. Jon W. Mark and Wihua Zhuang, *Wireless Communications and Networking*, PHI 2005.

#### **Evaluation:**

In-Semester Evaluation: 50%

End-Semester Evaluation: 50%