IV Year B.Tech. ECE I - Semester

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EC445 CELLULAR & MOBILE COMMUNICATIONS (Dept.Elective-IV)

Course Description & Objectives:

This course will provide the basics to the students for applying math and engineering concepts in the analysis and design of mobile communication systems. The main objective is to have an understanding of digital cellular systems (GSM, CDMA), 3G systems, PANs like WLAN, Bluetooth technologies

Course Outcomes:

Upon successful completion of this course, students should have:

1. *Familiarity with basic wireless access techniques for mobile communication*
2. *Understanding of the radio conditions like interference fading etc. in the mobile environment,*
3. *Gained the basic design concepts of cellular systems*
4. *Knowledge about different generations of cellular technologies evolution*
5. *Gained the basic design concepts Personnel Area Networks such as WLAN, Bluetooth*

UNIT I - Introduction to Wireless Communications & Multiple Access Techniques for Wireless Communication

Evolution of Mobile Radio Communications, Mobile radiotelephony in USA and around the world, Examples of wireless Communication Systems – Paging, Cordless Telephone systems and Cellular Telephone systems, Trends in Wireless and Personnel Communications. FDMA, TDMA, Spread Spectrum, Multiple access, SDMA, Packet radio, Packet radio protocols, CSMA protocols, Reservation Protocols

UNIT II - The Cellular Concept – System Design Fundamentals :

Introduction, Frequency reuse, Channel Assignment strategies, Handoff Strategies – Prioritizing Handoffs, Practical Handoff Considerations, Interference and System Capacity – Co-channel Interference and System Capacity, Channel Planning for Wireless Systems, Adjacent Channel Interference, Power Control for Reducing Interference, Trunking and Grade Of Service, Improving Coverage and Capacity in Cellular Systems – Cell Splitting, Sectoring, Repeaters for Range Extension, A Microcell Zone Concept.

UNIT III - Cellular Wireless Networks :

Principles of Cellular Networks - Cellular Network Organization, Operation of Cellular System, Mobile Radio Propagation Effects, Handoff and Power Control, First Generation Analogue System – Spectral Allocation, Operation, AMPS Control channels, Second Generation (2G) TDMA Systems - First and Second Generation Cellular Systems, TDMA Design consideration, GSM Network and its Architecture, GSM Signalling Protocol Architecture , 2G CDMA Systems – CDMA, CDMA design consideration, IS-95, 3G Systems – CDMA Design Considerations, 3G WCDMA(UMTS), 3GCDMA 2000, 3G TD-SCDMA.

UNIT IV - Wireless Networking :

Cordless systems, Wireless local loop, IEEE 802.16 fixed broadband wireless access standard, Mobile IP & Wireless application protocol.

UNIT V - Wireless LANS & Bluetooth and IEEE 802.15 :

WLAN Overview, Infrared LANs, Spread spectrum LANs, Narrowband microwave LANs, IEEE 802 Protocol architecture, IEEE 802.11 Architecture and services, IEEE 802.11 Medium access control, IEEE 802.11 Physical layer. Bluetooth overview, Radio specification, Baseband specification, Link manager specification, Logical link control and adaptation protocol, IEEE 802.15 standards

TEXT BOOKS:

1. Theodore. S. Rapport, “Wireless Communications”, 2nd edition, Pearson education, 2002.
2. William Stallings, “Wireless Communications and Networks”, 2nd Edition, Pearson education, 2005

REFERENCE BOOKS :

1. W.C.Y. Lee, “Mobile Cellular Telecommunications”, 3rd edition, McGraw Hill, 2006.
2. R Blake, “Wireless Communication Technology”, Thompson Asia Pvt. Ltd., 2004.
3. Jon W. Mark and Weihua Zhqung, “Wireless Communication and Networking”, PHI, 2005.