# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

## COURSE CONTENT

| CELLULAR AND MOBILE COMMUNICATIONS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| V Semester: ME | | | | | | | | |
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | CIA | SEE | Total |
| AECD23 | Elective | 3 | - | - | 3 | 40 | 60 | 100 |
| Contact Classes: 48 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 48 | | |
| Prerequisite: There are no prerequisites to take this course. | | | | | | | | |

### I. COURSE OVERVIEW:

This course introduces the students to Comprehensive fundamental and technical knowledge of mobile cellular communications understanding of cellular systems, interference management, antenna technologies, wireless standards, and intelligent network concepts, enabling them to analyze, design, and contribute to advanced research in wireless and mobile cellular programs.

### II. COURSES OBJECTIVES:

**The students will try to learn**

I. Analyze and design wireless and mobile cellular systems.
II. Understand impairments due to multipath fading channel and be able simulate standard stochastic channel models for various environments.
III. Evaluate the fundamental techniques to overcome the different fading effects.
IV. Interpret current and proposed cellular technologies.
V. Able to work in advanced research wireless and mobile cellular programs.

### III. COURSE OUTCOMES:

**At the end of the course students should be able to:**

CO1 Understand the basics of mobile cellular communications.
CO2 Understand of the cellular concept frequency reuse, handoff strategies
CO3 Understand of Co-channel and Non-Co channel Interference.
CO4 Understand of fading, cell coverage for signal and traffic diversity techniques and mobile antennas.
CO5 Understanding of frequency management channel assignment and types of handoff.
CO6 Knowledge of the Wireless Networks and Standards, contribute to advanced research in wireless and mobile cellular programs.

## IV. COURSE CONTENT:

**MODULE - I: CELLULAR MOBILE RADIO SYSTEMS (10)**
Introduction to cellular mobile System, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, hexagonal shaped cells, analog and digital Cellular systems, General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni directional Antenna system, Cell splitting, consideration of the components of Cellular system.

**MODULE –II: INTERFERENCE AND CELL COVERAGE FOR SIGNAL AND TRAFFIC (09)**
Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, design of Antenna system, Antenna parameters and their effects, fading , diversity receiver, non-cochannel interference different types, Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation antenna height gain, form of a point to point model.

**MODULE –III: CELL SITE AND MOBILE ANTENNAS (08)**
Sum and difference patterns and their synthesis, omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas, Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units.

Channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment, Handoff, dropped calls and cell splitting, types of handoff, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

**MODULE –IV: WIRELESS SYSTEMS AND STANDARDS (08)**
Second generation and Third generation Wireless Networks and Standards, WLL, Bluetooth, GSM, IS95, DECT, GSM architecture, GSM channels, multiplex access scheme, TDMA, CDMA

**MODULE –V: INTELLIGENT NETWORK FOR WIRELESS COMMUNICATIONS (10)**
Intelligent cell concept, advanced intelligent network, SS7 network and ISDN for AIN, AIN for mobile communication, asynchronous transfer mode technology, future public land mobile telecommunication system, wireless information superhighway.

## V. TEXTBOOKS:


1. W.C.Y. Lee, "Mobile Cellular Telecommunications", Tata McGraw-Hill, 2nd Edition, 2006.
2. Gordon L. Stuber, "Principles of Mobile Communications", Springer International, 2nd Edition, 2007.
3. Yi-Bing Lin and Imrich chlantae, “Wireless and Mobile Network Architecture”, John Wiley, 1st Edition, 2006.


## VI. REFERENCE BOOKS:


1. Theodore. S. Rapport, "Wireless Communications", Pearson Education, 3rd Edition, 2003.
2. Lee, "Wireless and Mobile Communications", McGraw Hill, 3rd Edition, 2006.
3. Jon W. Mark and Weihua Zhqung, "Wireless Communication and Networking", PHI, 1st Edition, 2005.
4. R. Blake, "Wireless Communication Technology", Thompson Asia Pvt. Ltd., 1st Edition 2004.


## VII. ELECTRONICS RESOURCES:

1. https://accessengineeringlibrary.com
2. http:// www.radio-electronics.com
3. https://www.jntubook.com
4. http://www.iare.ac.in

## VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech talk topics

4. Open end experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper - II
9. Lecture notes
10. E-learning readiness videos (ELRV)
11. Power point presentation