

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI,
HYDERABAD CAMPUS
SECOND SEMESTER 2022-2023
Course Handout (Part-I)**

Date: 6/01/2023

Course No. : EEE G592

Course Title : Mobile and Personal Communications

Instructor-in-charge : Dr. Prashant K. Wali

Course Description:

History of mobile radio; the mobile radio signal environment; review of statistical techniques; path over flat as well as hilly terrain; effects of RF system design on propagation; received signal envelope and phase characteristics; modulation schemes employed; functional design of mobile radio systems, diversity schemes - space; frequency and polarization diversity; mobile radio system functional design; signal error analysis versus performance criteria; multiple access schemes; classification of the concepts of sensitive topics; new concepts data transmission via cellular; spectrum and technology of WLL.

Evolution of wireless cellular technologies, Fundamentals of wireless communications, Application of the concepts to 4G standard

1. Scope and Objective:

With the exponential increase in the number of mobile devices there has been a lot of advancement in industrial and academic research towards designing and modeling the new heterogeneous wireless communication networks. The advances in the wireless communications have been in the new techniques for modulation, multiple access, and network designing.

a) This course aims to introduce the students to the fundamentals of wireless communications and expose them to the research options available for applications in the real world implementation of the next generation wireless networks.

b) The course will introduce the students to current trends in the wireless industry with a specific focus on 4G communication networks.

c) The course aims to equip students with tools for designing the engineering aspects of the wireless communications.

2. Text Book(s):

1. Andrea Goldsmith, Wireless Communications, Cambridge University Press.
2. Theodore Rappaport, Wireless Communications: Principles and Practice

3. Reference Book(s):

1. David Tse and Pramod Viswanath, Fundamentals of Wireless Communications, Cambridge University Press.
2. Stefan Sesia, Issam Toufik and Mathew Baker, "LTE-The UMTS Long Term Evolution, From Theory to Practice", Wiley, 2nd Edition

4. Course Plan:

| Lecture No. | Topic | Learning Objective | Ref. To TB/RB |
|-------------|---|--|----------------------------|
| 1 | Evolution of wireless communications and technologies | How wireless communication has evolved, wireless systems, cellular networks. | Text Book [1,2] Ref [1] |
| 2 - 4. | Wireless Channel Modeling - Large Scale Fading | Path Loss, Shadowing, Combined Path Loss and Shadowing, Outage Probability | Text Book [1,2] |

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|-------|---|---|--|
| 5-16 | Wireless Channel Modeling – Small Scale Narrowband Fading | Time varying channel impulse response, Doppler Spread, Narrowband Fading Models, Autocorrelation, Cross Correlation, Power Spectral Density Slow Fading, Fast Fading, Envelope and Power Distributions, Coherence Time, Coherence Bandwidth, Discrete Time Models, Capacity Concept for wireless channels | Text Book [1], Ref [1] |
| 17-19 | Small Scale Wideband Fading and ISI | Frequency Selective wireless channel, ISI, Delay Spread, Mean Excess Delay. | Text Book [1], Ref [1] |
| 20-35 | Point-to-point communication: detection, diversity, and channel uncertainty | Point-to-Point Communication: Detection, Diversity and Channel Uncertainty, Time Diversity, Frequency Diversity (OFDM), Space Diversity - Transmit Diversity, Receive Diversity, MIMO. | Text Book [1], Ref [1] |
| 36-42 | Wireless Standards, WLAN, Cellular Standards - 4G LTE | 4G Physical Layer Frame Structure, Control channels, Data channels, Traffic Scheduling | Ref Book [2], published papers and Internet Resources. |

5. Evaluation Scheme

| Component | Duration | Weightage | Marks | Date & Time | Evaluation type |
|---------------|----------|-----------|------------|---------------------|-----------------|
| Mid sem | 90 min | 30% | 60 | 13/03 2.00 - 3.30PM | Closed Book |
| Lab | | 20% | 40 | - | Open Book |
| Term Project | | 20% | 40 | - | Open Book |
| Compre. Exam. | 3 hours | 30% | 60 | 09/05 FN | Closed Book |
| Total | | | 200 | | |

6. Chamber Consultation Hour: To be announced in the class
email: wali@hyderabad.bits-pilani.ac.in
Notices: EEE Notice Board and CMS.

7. Make-up Examination:

Make-up examination will be given only in **extremely genuine cases** for which prior permission of the instructor-in-charge is required.

8.Academic Honesty and Integrity Policy: Academic honesty and Integrity are to be maintained by all the student's throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
EEE G592