



SECOND SEMESTER 2020-21
COURSE HANDOUT

Date: 16.01.2021

In addition to part I (General Handout for all courses appended to the Time table) this portion gives further specific details regarding the course.

Course No : **EEE G592**
Course Title : **Mobile & Personal Communication**
Instructor-in-Charge : **Dr. Sandeep Joshi**
Instructor(s) :
Tutorial/Practical Instructors: **Dr. Sandeep Joshi**

1. Course Description:

History of mobile radio; the mobile radio signal environment; review of statistical techniques; pathover 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.

2. Scope and Objective of the Course:

- To equip the students with a comprehensive knowledge of the fundamentals and latest developments in the cellular, mobile, and personal communication technologies along with an overview of the emerging personal communication technologies.
- To develop foundations of research in the field of wireless communications.
- To understand the theory of different wireless propagation environments, fading phenomenon, and design of wireless communication systems.
- To be able to design and simulate the wireless communication systems.
- The latest topics in the wireless communications will be introduced with a research focus.

3. Text Books:

1. “Wireless Communications”, A. Goldsmith, Cambridge Univ. Press, 2005.
2. “Wireless Communications: Principles and Practice”, by T.S. Rappaport, 2nd ed., Prentice Hall, 2002.

4. Reference Books:

1. “Fundamentals of Wireless Communication”, D. Tse and P. Viswanath, Cambridge Univ. Press, 2005.
2. “Wireless Communications & Networks”, William Stallings, Pearson Education, Asia, 2002.
3. “Modern Wireless Communications”, S. Haykin and M. Moher, Pearson Education, 2005.
4. “Mobile Cellular Telecommunications Systems”, WCY Lee, McGraw Hill International Ed., 1990.
5. “Digital Communications over Fading Channels”, M.K. Simon and M.-S. Alouini, 2nd Ed., Wiley: 2005.
6. “Principles of Mobile Communication “, G.L. Stuber, Springer. 4th Ed., 2017.



5. Course Plan:

Module	Lecture Session	Coverage	Ref.	Learning outcomes
Introduction	1-4	<p>Introduction to wireless and mobile communications: history and evolution, future trends-5G and beyond 5G</p> <p>Overview of basic communications system: block diagram, functionality, and introduction to wireless networks</p> <p>Spectrum: frequency bands, frequency allocation, new bands-mm Wave, THz</p> <p>Multiple access schemes-OMA, NOMA-duplexing, and switching</p>	Ch-1 (T1, T2, R1) and class notes	Students will learn the overview and the classification of various generations of mobile communications, technology, and future trends
Cellular Concept	5-9	<p>Frequency reuse, cell splitting, handoff, channel assignment, interference characterization, performance metrics: capacity, SNR and SINR, coverage, outage</p> <p>Comparison of old and new cellular architectures, cross layer adaptations</p>	Ch-3 (T2) and class notes	Concepts which form the basis of mobile communications will be discussed along with the architectural changes in the network
Mobile Radio Propagation	10-18	<p>Mobile radio environment: indoor and outdoor, channel characteristics: coherence time/frequency, Doppler spread, Jake's model</p> <p>Propagation models: reflection, scattering, diffraction, large-scale fading, multipath fading, statistical models, Poisson point processes</p>	Ch-2, 3 (T1) Ch-4, 5 (T2) and class notes	Wireless channel characterization and aspects of fading which defines the wireless channel will be covered in detail
Modulation and Coding Techniques for Mobile Communications	19-26	<p>Digital modulation schemes, spread spectrum, and performance analysis in fading channels</p> <p>Equalization and diversity techniques</p> <p>Coding techniques: STBC, Turbo</p>	Ch-5, 6, 7, 8 (T1), Ch -6, 7, 8 (T2) and class notes	Students will learn the modulation and coding schemes used in the mobile communications along with diversity concepts
Wireless Networks and standards	27-33	Wireless networks, MAC layer scheduling, queueing theory analysis, DECT and CDMA WLL, UMTS, GSM, CDMA (IS-95), CDMA 2000, PCS, ISM band communication, WLAN, WPAN, Bluetooth, WiMAX, LTE	Ch-10 (T1) and class notes	Students will learn the basics of wireless networks and their design/architecture aspects
New trends in wireless networks	34-40	Introduction to: OFDM, MIMO, Cooperative communications, D2D communications, and AI in wireless communications	Class notes and Research papers	Students will be introduced to the new trends in the mobile networks which will open research areas to explore



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6. Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of component (Close Book/ Open Book)
Mid-Semester Test	90 Min.	30		Closed Book
Lab evaluation	--	15	To be announced in class	Open Book
Term paper	--	20	To be announced in class	Open Book
Comprehensive Examination	120 Min.	35		Closed Book

7. Chamber Consultation Hour: To be announced in the class

8. Notices: All notices will be put up in the classroom link

9. Make-up Policy: No make-up will be given for surprise quizzes, however for other components; make-up will be given ONLY in cases of sickness (hospitalization). In such cases, students must produce sufficient proof or must have taken the prior permission from the Instructor.

10. Note (if any):

Instructor-in-charge
Course No. EEE G592