

## **TCOM 552: Introduction to Mobile Communication Systems Sections 001 and DL1. Fall 2019**

**Instructor:** Shyam Pandula, Ph.D.  
Office: Engineering Building, Room 3253.  
Office phone: (703)-993-7585.  
E-mail: [spandula@gmu.edu](mailto:spandula@gmu.edu)

**Time and Place:** Saturday 9:00- 11:45 am. Nguyen Engineering Building, Room 1108.

**Office Hours:** Thursday 2:30 - 4:00 pm, Friday 2:30 - 4:00 pm, and by appointment.

**Teaching Assistant:** TBA.

### **Course Description**

This course provides an introduction to the fundamental concepts and techniques underlying modern cellular communication networks. Topics include mobile radio propagation, multicarrier modulation and physical layer aspects of 3GPP LTE air interface.

### **Course Objective**

By the end of the course, students should be able to:

Understand propagation characteristics of wireless channels.

Learn key engineering principles and system evaluation methods used in design of cellular networks

Understand the LTE network architecture and the role of different functional elements and interfaces. Understand key LTE enabling radio technologies like OFDM and MIMO.

### **Reference Books**

1. *Fundamentals of LTE*, Arunabha Ghosh, Jun Zhang, Jeffrey Andrews and Rias Muhamed, Prentice Hall, 2011.
2. *Wireless Communications: Principles & Practice*, Theodore S. Rappaport, Prentice Hall PTR, 2<sup>nd</sup> Edition, 2002.
3. *LTE for 4G Mobile Broadband*, Farooq Khan, Cambridge University Press, 2009.

There is no required textbook for this course. The above listed reference books are available electronically at the GMU library 'Safari Tech Books Online' database.

### **Course Material**

All course materials, including the syllabus, lecture slides and homework assignments will be posted on the Blackboard course page {<http://mymason.gmu.edu> }. Login using your GMU email ID and password.

**Distance learning section** is offered synchronously via the web using Blackboard Collaborate software. Collaborate student instructions and guidelines for proctored tests are posted on the Blackboard.

**Homework** will be assigned weekly and is due the following week. Late homework will be penalized by 20%.

### **Grading**

Homework: 20%; Two midterm exams: 50%; Final Exam: 30%;

### **Tentative Course Schedule**

- Week 1: Aug 31  
Introduction and course overview
- Week 2: Sept 7  
LTE Network Architecture; User plane and control plane protocols.
- Week 3: Sept 14  
Mobile Radio Propagation: Pathloss; Shadow fading; Empirical pathloss models
- Week 4: Sept 21  
Mobile Radio Propagation: Small-scale fading; delay spread and coherence bandwidth; Doppler spread and coherence time
  
- Week 5: Sept 28  
**Midterm Exam 1**
  
- Week 6: Oct 5  
Mobile Radio Propagation: Link budgets
- Week 7: Oct 12  
Cellular Concept: Channel reuse; co-channel interference; cell sectoring; cell splitting; reuse partitioning
- Week 8: Oct 19  
Multicarrier Modulation: OFDM
- Week 9: Oct 26  
Cellular Multiple Access Techniques: OFDMA; SC-FDMA.
- Week 10: Nov 2  
LTE Frame Structure; Uplink and downlink resource grids.
  
- Week 11: Nov 9  
**Midterm Exam 2**
  
- Week 12: Nov 16  
LTE Channel Structure: Logical, transport and physical channels; LTE Air Interface Procedures.
- Week 13: Nov 23  
Guest lecture: Live LTE signal demo.
- Week 14: Dec 7  
TBA
  
- Week 15: Dec 14. **Final Exam.**

### **Academic Integrity**

It is expected that students adhere to the George Mason University Honor Code: "Student members of the George Mason University community pledge not to cheat, plagiarize, steal and/or lie in matters related to academic work." More information about the Honor Code, including definitions of cheating, lying, and plagiarism, can be found at the Office of Academic Integrity website at <http://oai.gmu.edu>