The University of Jordan
School of Engineering
Electrical Engineering Department
2nd Semester – A.Y. 2020/2021

Course: **Cellular Communications – 0953522 (3 Cr. – Elective Course)**

Instructor: Prof. Jamal Rahhal
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Office Hours: Will be posted soon

Course website: http://elearning.ju.edu.jo/

Catalog description: Introduction to telephony and traffic theory. Calculating the probability of blocking for parallel and series links. Cellular communication design and frequency assignment. Traffic management and call setup, hand-offs and calculating C/I ratio. Propagation models: Knife edge model and effect of multiple edges. Performance enhancement by proper cell site design and sectorization. Modulation for cellular systems. Probability of error rate performance in fading multi-path channels. Source and channel coding for cellular systems. Voice coders and GSM compression formats. Error correcting and convolutional codes. Interleaving and deinterleaving. Encryption and decryption. Case studies.

Prerequisites by course: **EE** **0953422** Communications (II) (pre-requisite)

Prerequisites by topic: Students are assumed to have a background in the following topics:
• Digital communication analysis techniques.
• Signal representation and analysis techniques.

Textbook: **From GSM to LTE-Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband by Martin Sauter, Wiley, 3rd edition, 2017.**

References:

1. Wireless Communications: Principles and Practice by Theodore S. Rappaport, Prentice Hall, 2nd Edition, 2002.
2. An Introduction to LTE: LTE, LTE-Advanced, SAE, VoLTE and 4G Mobile Communications by Christopher Cox, Wiley, 2nd edition, 2014.
3. Telecommunications Crash Course by Steven Shepard, McGraw-Hill Education, 3rd Edition, 2014.
4. Cellular Communications: A Comprehensive and Practical Guide by Nishith Tripathi and Jeffrey H. Reed, Wiley-IEEE Press, 1st edition, 2014.
5. Fundamentals of Network Planning and Optimisation 2G/3G/4G: Evolution to 5G by Ajay R. Mishra, Wiley, 2nd edition, 2018.

6. Understanding LTE with MATLAB: From Mathematical Modeling to Simulation and Prototyping by Houman Zarrinkoub, Wiley, 1st Edition, 2014.
7. Practical Guide to LTE-A, VoLTE and IoT: Paving the way towards 5G by Ayman Elnashar and Mohamed A. El-saidny, Wiley, 1st Edition, 2018.
8. The Physics and Mathematics of Electromagnetic Wave Propagation in Cellular Wireless Communication by Tapan K. Sarkar, Magdalena Salazar Palma and Mohammad Najib Abdallah, Wiley-IEEE Press, 1 edition, 2018.

Schedule: 16 Weeks, 42 lectures (50 minutes each) plus exams.

Course goals: The overall objective is to introduce the student to the basic concepts of cellular communications and its design principles, and provide a comprehensive knowledge of current cellular communication standards.

Course learning outcomes (CLO) and relation to ABET student outcomes (SO):

Upon successful completion of this course, a student will:	[SO]
1. Be able to describe the main concepts and components of a cellular communication system.	[1]
2. Understand the concepts of frequency reuse, frequency planning and call setup in cellular systems.	[1]
3. Be able to calculate the required parameters to design and analyze the cellular communication system.	[1]
4. Be able to analyze the different performance measures of a cellular system.	[1]
5. Be able to design a simple cellular communication system.	[1, 2]

Course topics:	Hrs
1. Introduction to telephony and traffic theory.	3
2. Cellular communication design principles.	7
3. Cellular communications environment (channel effects).	6
4. Modulation for cellular communications.	6
5. Error control coding for cellular communication systems.	6
6. Audio compression for cellular communication systems.	6
7. 2 G, 2.5G, 3G, 4G, and 5G cellular communication systems and WiMax.	8

Ground rules: Attendance is required and highly encouraged. To that end, attendance will be taken every lecture. Eating and drinking are not allowed during class, and cell phones must be set to silent mode. All exams (including the final exam) should be considered cumulative. Exams are closed book. No scratch paper is allowed. You will be held responsible for all reading material assigned, even if it is not explicitly covered in lecture notes.

Assessment & grading policy:

Assignments	0%	Quizzes	0%
First Exam	30%	Projects	0%
Midterm Exam	30%	Lab Reports	0%
Final Exam	40%	Presentation	0%
		Total	**100%**

Last Revised: March 2021