



University of Tehran
School of Electrical and Computer Engineering

Course:	8101451 – Cellular Communications									
Course type:	EE*						CE*			Credit: 3
	Com	E	P	B	Con	D	SW	HW	IT	
	Required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Elective	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level:	Undergraduate <input type="checkbox"/> Graduate <input checked="" type="checkbox"/>									
Co-requisite(s):	Advanced Digital Communications (8101167)									
Prerequisite(s):	Communications II (8101355)									
Prerequisite by topic:	Digital Communications Theory									
Textbook(s):	<p>[1] E. Dahlman, J. Skold, <i>4G: LTE/LTE-Advanced for Mobile Broadband</i>, Elsevier Reference, 2011.</p> <p>[2] T. S. Rappaport, <i>Wireless Communications Principles and Practice</i>, 2nd Edition, Pearson Education, 2009.</p> <p>[3] A. Goldsmith, <i>Wireless Communications</i>, Cambridge University Press, 2005.</p> <p>[4] M. Rumney, <i>LTE and the Evolution to 4G Wireless, Design and Measurement Challenges</i>, J Wiley and Sons, 2009.</p> <p>[5] H. G. Myung, D. J. Goodman, <i>Single Carrier FDMA, A New Air Interface for Long Term Evolution</i>, J. Wiley and Sons, 2008.</p> <p>[6] D. Tse, P. Viswanath, <i>Fundamentals of Wireless Communication</i>, Cambridge University Press, 2005.</p>									
Coordinator:	Maryam Sabbaghian									
Goals:	The course is designed for graduate level. It provides an overview of design issues and practical problems in each generation of cellular systems. It also introduces and analyzes the transmission schemes developed in each generation. Moreover, it discusses the novel techniques to be considered in 5G.									
Outcome:	<p>Upon successful completion of the course, students will be able to</p> <ol style="list-style-type: none"> 1. analyze the practical issues and learn goals in each generation of cellular systems. 2. acquire knowledge regarding clustering and frequency reuse. 3. analyze TDMA, CDMA, OFDMA, and SC-FDMA systems. 4. obtain fundamental knowledge about LTE-Advanced standard. 5. understand the goals in 5G and the general solutions to obtain those goals. 									
Topics:	1- Review of different generations of cellular systems (1 lecture)									

	<p>2- Basic concepts in cellular communications (6 lectures)</p> <ul style="list-style-type: none"> -Frequency reuse -Channel assignment strategies - Spectrum design - Interference <p>3- 2G:GSM (4 lectures)</p> <ul style="list-style-type: none"> - Network structure - TCH, BCH, CCCH <p>4- 3G (4 lectures)</p> <ul style="list-style-type: none"> - UMTS - CDMA2000 <p>5- 4G (1 lectures)</p> <ul style="list-style-type: none"> - LTE versus LTE-Advanced - Spectrum flexibility - Transmission schemes <p>6- Equalization (2 lectures)</p> <p>7- OFDM (1 lecture)</p> <p>8- Peak to Average Power Ratio (1 lecture)</p> <p>9- Generalized multi-carrier systems (3 lectures)</p> <ul style="list-style-type: none"> - OFDMA -SC-FDMA <p>10- Channel Estimation (2 lectures)</p> <p>11- Relaying (4 lectures)</p> <p>12- Issues, goals, and solutions in 5G (4 lectures)</p>		
Computer usage:	MATLAB		
Assignments:	8 problem sets and simulation problems		
Projects:	Term paper		
Grading:	Assignments	15%	
	Term paper	15%	
	Midterm exam	25%	
	Final exam	45%	
Further readings:	<p>[1] Editors: M. Döttling, W.Mohr, A. Osseiran, <i>Radio Technologies and Concepts for IMT-Advanced</i>, J. Wiley and Sons, 2009.</p> <p>[2] Editor: V. Tarokh, <i>New Directions in Wireless Communications</i>, Springer, 2008.</p> <p>[3] K.J. Ray Liu, A. K. Sadek, W. Su, and A. Kwasinski, <i>Cooperative Communications and Networking</i>, Cambridge University Press, 2009.</p> <p>[4] 3rd Generation Partnership Project, Documents available at: www.3gpp.org/specification</p>		
Prepared by:	Maryam Sabbaghian		
Date:	Dec., 2017		
*EE: Electrical Engineering	CE: Computer Engineering		
Com	Communications	SW	Software
E	Electronics	HW	Hardware
P	Power	IT	Information Technology

B	Bioelectronics		
Con	Control		
D	Digital System		