جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Special Topics in Communications - EE 390F

Division	Computer, Electrical and Mathematical Sciences & Engineering
Course Number	EE 390F
Course Title	Special Topics in Communications
Academic Semester	Summer
Academic Year	2018/2019
Semester Start Date	06/16/2019
Semester End Date	08/08/2019
Class Schedule (Days & Time)	02:00 PM - 05:00 PM | Mon Wed

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Mohamed-Slim Alouini	slim.alouini@kaust.edu.sa	+966128080283		Dr. Mohamed-Slim Alouini; E-mail: mohamed.alouini@kaust.edu.sa; Office: Al-Khwarizmi (Applied Math) Building (Building 1) – Office Number: 3-123; Tel: 02-808-0283; Office hours: Wed 5-7 PM.

Teaching Assistant(s)

Name	Email
Amr Abdelhady and Wafa Hedhly	amr.abdelhady@kaust.edu.sa and wafa.hedhly@kaust.edu.sa

Course Information

Comprehensive Course Description	This is an advanced course in wireless communication theory, providing a brief review of fundamental concepts in wireless communications followed by in-depth discussions on several topics related to the performance analysis of modern wireless communication systems and networks. It includes the topics of wireleless channel modeling, diversity techniques, multiple-input/multiple-output communications, opportunistic communication, cooperative communication, cognitive radio systems, and advanced wireless communication systems. It serves as an excellent basis from which to commence research in the performance analysis of wireless communication systems and networks. Various aspects of the course bring students up to date with the very latest developments in this field, as reported in recent publications.
Course Description from Program Guide	
Goals and Objectives	At the end of this course, it expected that the participant should: (i) be familiar with wireless channel models and the effects of shadowing and fading on the transmitted signals, (ii) have developed an understanding of various techniques used in modern wireless communication systems, (iii) have developed an understanding of performance analysis methods used to evaluate the performance of these systems, and (iv) be able to apply the covered methods for the performance analysis and design of other advanced wireless communication systems.
Required Knowledge	EE244 or approval of instructor. Good understanding of probability, random variables, random processes and linear signal & systems theory are expected.
Reference Texts	Wireless Communications - Principles and Practice by T. S. Rappaport. 2nd Ed. Prentice Hall, 2001. Principles of Mobile Communications by G. L. Stuber. 2nd Ed. Kluwer Academic Publishers, 2001. Fundamentals of Wireless Communication by D. Tse and P. Viswanath, Cambridge University Press, 2005. Microwave Mobile Communications, W. C. Jakes, Wiley: 1974. Also IEEE Press: 1993. The Mobile Radio Propagation Channel, J.D. Parsons, Wiley: 1992. Digital Communication Techniques: Signal Design and Detection, M. K. Simon, S. M. Hinedi, and W. C. Lindsey, Prentice Hall: 1995. Digital Communications, J.G. Proakis, 4th Ed., McGraw-Hill: 2001. Digital Communications over Fading Channels, M. K. Simon and M.-S. Alouini, Wiley: 2004.
Method of evaluation	**40.00**% - Written report **30.00**% - Quiz(zes) **10.00**% - Others - Please specify **20.00**% - Homework /Assignments

Nature of the assignments	1- Homework sets will be assigned on Wednesdays and will be due in TA office or by email on the following Sunday by 5 PM. Some homework assignments may require use any mathematical software of your choice (such as Matlab, Mathematica, Maple or Mathcad) for calculations and/or plots. Homeworks will be graded and solutions will be provided. 2- The weekly quizzes have a duration of 20 minutes and will be held at the beginning of the Monday lectures in Building 9 (LH1). The quizzes will be based on the homework problems and the examples covered during the lectures. 3- The project will be on a topic chosen by each student on a particular mathematical tool/performance analysis method recently published in the open literature. A project proposal is due in class by Wed July 10, 2019 at 2 PM.. 4- The final report will be related to the project and is due by email to instrcutor on Wed Aug 7, 2019 at 2 PM. It should be written in a tutorial style and should be designed to help the reader to become familiar with and learn something specific about a chosen topic. The specific topic of the tutorial, its objectives, and the background required by the reader should be clearly identified at the outset. Examples of topics include: Importance Sampling, Random Matrix Theory, Contract Theory Framework for Wireless Networking, Stochastic Geometry, Majorization Theory and Matrix Monotone Functions, Extreme Value Theory, Convex Gaussian Min-max Theory, Order Statistics, GPU Programming, Game Theory, Epidemic Spreading Theory, Stochastic Differential Equation Theory, Random Processes Level Crossing Rate.
Course Policies	1- Late homeworks will not be accepted (except in university established cases of illness or emergency). Also collaboration and checking answers on homeworks is allowed and encouraged. Of course copying homework is not tolerated. In brief you are allowed to collaborate on all homework problems according to the following rules: You must first attempt to solve each problem on your own. If you get stuck you can then talk to any student currently enrolled in the class about the problem, as well as the instructor. However solutions should not be exchanged (i.e., you still must work through the details of the problem after you have gotten help, write the final solutions alone, and understand them fully). 2- The lowest homework grade will not be counted. If you dispute your grade on any homework or exam, you may request a regrade only within one week of receiving the graded homework or exam. 3- The weekly quizzes are closed books and closed notes
Additional Information	

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Mon 06/17/2019 Wed 06/19/2019	Overview of Wireless Com Systems and Networks + Wireless Channel Modeling 1: Path Loss, Shadowing, Link Analysis, and Coverage Analysis
2	Mon 06/24/2019 Wed 06/26/2019	Wireless Channel Modeling 2: Multipath Fading
3	Mon 07/01/2019 Wed 07/03/2019	Performance of Wireless Com Systems: Probability of Error + Capacity and Receiver Diversity Systems
4	Mon 07/08/2019 Wed 07/10/2019	Transmit Diversity Systems + Multiple Input Multiple Output Systems
5	Mon 07/15/2019 Wed 07/17/2019	Cooperative Communications
6	Mon 07/22/2019 Wed 07/24/2019	Cognitive Radio Networks
7	Mon 07/29/2019 Wed 07/31/2019	Non-Orthogonal Multiple Access (NOMA)
8	Mon 08/05/2019 Wed 08/07/2019	Energy-Harvesting Communication Networks

Note

The instructor reserves the right to make changes to this syllabus as necessary.