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

Course: **Communications (II) – 0953422 (3 Cr. – Required Course)**

Instructor: Prof. Jamal Rahhal
Office: E306, Telephone: 06/5355000 ext 22857, Email: rahhal@ju.edu.jo
Office Hours: Will be posted soon

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

Catalog description: Introduction. Digital modulation formats. Optimum receiver design. Matched filter derivation and design of digital modulation formats. Signal space representation. Performance evaluation for digital modulation formats in AWGN channel. Probability of symbol and bit error for the different modulation formats. Fading channel models. Evaluation of the probability of symbol and bit error in fading channels. Spread Spectrum Communication. Channel Coding. Hamming Codes. Convolutional Codes. Linear block codes. Error correcting capability of linear block codes.

Prerequisites by course: **EE** **0953421** Communications (I) (pre-requisite)

Prerequisites by topic: Students are assumed to have a background in the following topics:
• Fourier transform and signal analysis, analog modulation techniques, basics of digital modulation techniques.
• Probability and random variables.
• Basics of electronic devices and electric circuits.

Textbook: **Modern Digital and Analog Communications Systems by B. P. Lathi and Zhi Ding, Oxford University Press, 5th Edition, 2018.**

References:

1. Fundamentals of Communication Systems by John G. Proakis and Masoud Salehi, Prentice Hall, 2nd Edition, 2013.
2. Analog and Digital Communications (Schaum's Outlines) by Hwei P. Hsu, McGraw-Hill, 2nd Edition, 2002.
3. Digital and Analog Communication Systems by Leon W. Couch, Prentice Hall, 8th Edition, 2012.
4. Digital Communications: Fundamentals and Applications by Bernard Sklar, Prentice Hall, 2nd Edition, 2017.
5. Digital Communications, by John Proakis and Masoud Salehi, McGraw-Hill Education, 5th Edition, 2007.

6. Digital Communication Systems by Simon Haykin, Wiley; 1st Edition, 2013.
7. Contemporary Communication Systems using MATLAB by John G. Proakis, Masoud Salehi and Gerhard Bauch, Thomson-Engineering, 3nd Edition, 2012.

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

Course goals: The overall objective is to introduce the student to the basics of communications theory. This course emphasizes:
• Analysis and design of modern digital communications systems in presence of noise and over fading channels.
• Analysis and design of baseband digital communications systems.
• Basics of channel coding and information theory.

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 analyze and design communication systems that carry digital modulated signals (including ASK, FSK, and PSK) over appropriate communications channels.	[1]
2.	Be able to analyze and design communication systems that carry digital baseband signals for data transmission.	[1]
3.	Be able to analyze and estimate the performance of various digital receivers in the presence of noise.	[1]
4.	Understand the properties and mathematical models of fading channels.	[1]
5.	Be able to apply source, line and channel encoding /decoding techniques.	[1]

Course topics:		**Hrs**
1.	Review of signals and orthogonality principles.	**3**
2.	Introduction to digital communication systems.	**3**
3.	Digital baseband techniques. Binary and non-binary transmission. Matched filter receiver. Bit error rate in AWGN channels.	**9**
4.	Bandpass digital modulation techniques. Binary and M-ary modulation. Bit error rate in AWGN channels.	**9**
5.	Differential Digital modulation techniques.	**4**
6.	Fading channel models.	**3**
7.	Coded modulation and spread-spectrum modulation.	**4**
8.	Channel Coding: linear block codes, cyclic codes, CRC and convolutional codes.	**7**

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