MUTAH UNIVERSITY
Faculty of Engineering
Department of Electrical Engineering

Course Syllabus

Course Code	Course Name	Credits	Contact Hours
0401521	Digital Communications	3	3T

INSTRUCTOR/COORDINATOR	
Name	Dr. Aser M. Matarneh
Email	aser.matarneh@mutah.edu.jo
Office Hours	10:00-11:00 (Sun, Tues, Thur)
Classroom/Time	---

TEXTBOOK	
Title	B. Sklar, Digital Communications: Fundamentals and Applications, Prentice Hall.
Author/Year/Edition	Senior, J. M
Other Supplemental Materials	
Title	J. Proakis, Digital Communications, McGraw-Hill
Author/Year/Edition	J. Proakis

SPECIFIC COURSE INFORMATION

A. Brief Description of the Content of the Course (Catalog Description)

The content of "Digital Communication Systems" represents the basic knowledge necessary for sampling, encoding, transmitting, receiving, decoding and conversion of digital information using today's digital communication technologies. This course will cover random signals/noise, spectral analysis, information theory, sampling theory, encoding/decoding and digital signal modulation/demodulation. Matched filtering and quadrature detection for binary demodulation will be studied. Sampling theory will cover impulse and flat top sampling techniques.
The modulation techniques covered will include On/Off Keying (OOK), Phase Shift Keying (PSK), Frequency Shift Keying (FSK), and quadrature modulation and demodulation (QAM). Information theory will include topics of Channel Capacity, Entropy, and be applied to encoding/decoding techniques. Finally, system error will be conducted.

B. Pre-requisites (P) or Co-requisites (C)

Communications (2) (0401422*) (P)*
C. Course Type (Required or Elective)
Required
SPECIFIC GOALS
A. Course Learning Outcomes (CLOs)
CLO 1: Understand sampling theorem, quantization, and pulse code modulation [1]. **CLO 2:** Recognize the digital modulation techniques [1]. **CLO 3:** Demonstrate digital demodulation and Detection [1]. **CLO 4:** Explain equalization and matched filters [1]. **CLO 5:** Apply system error performance [1].
B. Student Learning Outcomes (SOs) Addressed by the Course

1	2	3	4	5	6	7
✓						

BRIEF LIST OF TOPICS TO BE COVERED		
List of Topics	**No. of Weeks**	**Contact Hours**
Related Background • Signals and systems • Probability and random processes • General structure of a communication system • Why “digital” instead of “analog”?	1	3
• Classification of signals • Power and energy spectral densities • Autocorrelation • Noise in communication systems	1	3
• Sampling and quantization techniques • The Sampling Theorem and Nyquist theorem • Aliasing • Why Oversample? • Signal Interface for a Digital System • Sources of Corruption • Sampling and Quantizing Effects • Channel Effects • Signal-to-Noise Ratio for Quantized Pulses • Pulse Code Modulation	4	12
Digital Bandpass Modulation Techniques • Phasor Representation of a Sinusoid • Phase Shift Keying • Frequency Shift Keying • Amplitude Shift Keying • Differential Modulations • Quadrature Amplitude Shift keying	3	9

Baseband Demodulation/ Detection • Error-Performance Degradation in Communication Systems • Demodulation and Detection • The Basic SNR Parameter for Digital Communication Systems • Why E_b/N_0 Is a Natural Figure of Merit • Detection of Signals in Gaussian Noise • Intersymbol Interference • Equalization	2	6
• Coherent Detection\ • Noncoherent Detection	1	3
• Error Performance for Binary Systems • Symbol Error Performance for M-ary Systems (M > 2) • Introduction to channel coding.	2	6
Total	*14*	*42*

EVALUATION		
Assessment Tool	**Due Date**	**Weight (%)**
Mid Exam	According to the university calendar	30
Course Work (Homeworks, Quizzes, Projects, …etc.)	One week after being assigned	20
Final Exam	According to the university calendar	50

ABET's Students Learning Outcomes (Criterion # 3)		
	Relationship to program outcomes	
ABET 1-7		**Engineering Student Outcomes**
1	√	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2		an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3		an ability to communicate effectively with a range of audiences.
4		an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5		an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6		an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7		an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.