

Course Title	Digital Communications				
Course Code	ACOE412				
Course Type	Elective				
Level	BSc (Level 1)				
Year / Semester	4 th (Fall/Spring)				
Teacher's Name	Dr. Haris Haralambous				
ECTS	6	Lectures / week	3	Laboratories/week	1
Learning Outcomes	<p>Upon successful completion of the course students will be able to:</p> <ol style="list-style-type: none"> 1. Describe the basic principles and characteristics of digital communications. 2. Demonstrate how data can be encoded using linear block codes and convolutional codes, and analyse the error detection and/or correction capabilities of each code. 3. Analyse data encoding and digital modulation techniques. 4. Describe the techniques related to multiplexing and multiple access. 5. Use software such as MATLAB or Python to analyse linear block codes and convolutional codes, as well as to investigate the performance with respect to SNR of the digital modulation techniques such as BPSK, DPSK, QPSK, QAM. 				
Prerequisites	AELE310, AMAT301		Co-requisites	None	
Course Content	<ul style="list-style-type: none"> • Data transmission: Data transmission terminology. Parameters (amplitude, phase, frequency) of an analog and a digital signal in time and frequency domains. Comparison of analog and digital data transmission. Transmission impairments. Shannon's and Nyquist's theorems. Channel capacity over noisy and noise-free environments, Signal to Noise Ratio. • Channel coding: Linear block codes, cyclic codes and convolutional codes. Structure of coders and decoders. The ability of codes to detect and to correct errors. • Signal encoding techniques: Digital encoding schemes (RZ, NRZ-L, NRZI, Bipolar-AMI, Pseudoternary, Manchester, Differential Manchester). Digital modulation techniques (ASK, FSK, PSK, DPSK, QPSK, QAM). • Multiplexing and Multiple Access: Frequency Division, Time Division Multiplexing techniques. Orthogonal Frequency Division Multiplexing. Frequency division, time division, code division and spatial division multiple access. 				
Teaching Methodology	<p>Students are taught the course through lectures by means of computer presentations.</p> <p>Homework require students to describe, explain, justify, and illustrate the main concepts taught at lectures.</p> <p>Lecture notes and presentations are available through the web for students</p>				

	to use in combination with the textbooks.
Bibliography	<p><u>Textbooks:</u> Ali Grami , “Introduction to Digital Communications 1st Ed”, Elsevier, 2015 1st Edition.</p> <p><u>References:</u></p> <ul style="list-style-type: none"> • John Proakis, Masoud Salehi “Digital communications, 5th Ed”, Mg Grow Hill, 2020
Assessment	<p>Students are assessed on the theoretical aspects of the course through tests, and the final exam, while lab exercises cover the applied and hand-on aspects of the course. Coursework will comprise of one test, a set of lab exercises, and three-hour closed book exam. The weights for each assessment component are:</p> <ul style="list-style-type: none"> • Assignments 20% • Tests: 20% • Final Exam 60%
Language	English