College of Engineering

Department of Telecommunication Engineering

ECTE Courses Syllabi

COLLEGE OF ENGINEERING

DEPARTMENT OF TELECOMMUNICATION

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ECTE 201 / Data Networks

Weight: 2-2-3

Prerequisite: ITCS 101

NQF Level Allocated: 6 **NQF Notional Hours / Credits:** 120/12

Description:

This course introduces data communication networking. It includes foundational principles of computer networks, the architecture of data communication systems, the OSI model, protocols, and mechanisms used in the TCP/IP protocol suite, including the operation of both wide-area and local-area networks.

Objective:

1. To build an understanding of the fundamental concepts of data networks.
2. To explain and apply the operation of different data communications protocols and their roles within layered network architectures.
3. To discuss duties and concepts of TCP/IP and OSI networking model layers and explain the functions of each layer.
4. To identify different types of network devices and their functions within a network.
5. To illustrate the bandwidth characteristics of physical communication media.
6. To practice and experiment with simple network applications.

Semester: 1st Semester, **Academic Year:** 2023-2024

Instructor (s): Dr Salah Al Hamad

Telephone – Mobile: 39667479

Email (s): salhamad@ahlia.edu.bh

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate detailed eta knowledge and understanding of basic concepts and theories related to data networking and involved layers.	**Knowledge**: Theoretical Understanding/ [Level 6]
A2	**Contemporary Trends, Problems, and Research:** N/A	**NA**
A3	**Professional Responsibility:** N/A	**NA**

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem-Solving:** Discuss and solve problems related to data and signals, line coding, analog and digital transmission, modulation, error detection and correction, and IP distribution.	**Skills**: Generic, Problem Solving, and Analytical Skills/ [Level 6]
B2	**Modeling and Design:** Demonstrate advanced ability to model networking protocols for creating different computer networks and solving communication problems.	**Knowledge**: Practical Application/ [Level 6]
B3	**Application of Methods and Tools:** Apply and experiment with networking basics using cabling tools, Local Area Network trainer, PCs, and simulation software such as Packet tracer.	**Knowledge**: Practical Application/ [Level 5]

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Analyze different methods involved inline coding, modulation, error detection, and correction as well as analog and digital transmission.	**Skills**: Generic, Problem Solving, and Analytical Skills/ [Level 6]
C2	**Synthetic:** Link and Evaluate individual layers of duties involved in data networking to understand the internetworking process.	**Skills**: Generic, Problem-Solving, and Analytical Skills/ [Level 6]
C3	**Creative Thinking and Innovation:** N/A	**NA**

D. General and Transferable Skills (other skills relevant to employability and personal development)		NQF Descriptor/ Level
D1	**Communication:** Convey basic data network ideas and describe their processes rigorously in written and oral forms.	**Skills**: Communication, ICT and Numeracy/ [Level 5] **Competence-** Autonomy and responsibility/ [Level 6]
D2	**Teamwork and Leadership:** Work effectively as a member/leader of a group lab work on specific networking topics, taking on significant responsibility and accountability for the work of others.	**Competence:** Autonomy and responsibility/ [Level 6]
D3	**Organizational and Developmental Skills:** N/A	**NA**
D4	**Ethical and Social Responsibility:** N/A	**NA**

Course Structure

Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lec	Lab				
1	2	2	A1	**Introduction:** General concepts	Lecturing, Class discussions	**Oral inquiry***
2	2	2	A1, C2, B2, B3, D1, D2	**Network Models:** Introduction to OSI and TCP/IP models layers	Lecturing, In class supervised work,	**Oral inquiry*** Quiz 1*
3	2	2	A1, B1, C1	**Physical Layer:** Data and Signals	Lecturing, Demonstrations, in class-supervised work	**Oral inquiry*** Quiz 1*
4	2	2	A1, B1, B2, C1	**Physical Layer:** - Digital Transmission - Analog Transmission **Lab exp. 1:** Studying network topologies.	Lecturing, Demonstrations, In class-supervised work Supervised Lab work	**Oral inquiry*** Quiz 1*
5	2	2	A1, B1, C1	**Physical Layer:** Bandwidth Utilization	Lecturing, Demonstration, In-class supervised work	**Oral inquiry*** **Lab Report #1** Quiz 1*
6	2	2	A1, B1, B2, B3, C1, D1, D2	**Physical Layer:** Transmission Media **Lab exp. 2**: Introducing and implementing practically the cross-wired and straight-wired cabling using	Lecturing, Demonstration, In-class supervised work, Supervised Lab work	**Lab Report #2** **Quiz 1***

				a cable crimping tool and networks cable tester.		
7	2	2	A1, B1, B2, B3, C1, D1, D2	**Networking Hardware:** - Network Interface Card (NIC) - Introduction to the functions of connecting devices such as routers, bridges, and switches **Lab exp. 3**: Studying Ethernet LAN and Wireless LAN	Lecturing, Demonstration, In-class supervised work, Supervised Lab work	**Lab Report #3** Quiz 1*
8	0	2	A1, B1, C1	**Data Link Layer:** Error Detection and Correction	Lecturing, Demonstration, In-class supervised work	**Oral inquiry***
	2	0	A1, B1, B2, C1, C2, D1	Topics from week 1 to 7	-	**Graded Test 1**
9	0	2	A1, B2, B3, C1, C2, D1, D2	Building a Peer-to-Peer network and switched network **Lab exp. 4:** Building a Peer-to-Peer network and switched network	Lecturing, Demonstration, In-class supervised work, Supervised Lab work	**Lab Report #4** Quiz 2*
10	2	2	A1, B2, B3, C1, C2, D1, D2	**Network Layer:** - Introduction to IPv4 Addressing **Lab exp. 5:** Practicing how to distribute IP addresses to basic LAN networks	Lecturing, In class supervised work, Supervised Lab work	Oral inquiry* Quiz 2*
11	2	2	A1,B1, B2, B3, C1, D1, D2	**Network Layer:** - Routing - Network Layer Protocols **Lab exp. 6:** Network Troubleshooting using PING, TRACERT, IPCONFIG, and NSLOOKUP commands	Lecturing, Demonstration, In-class supervised work, Supervised Lab work	**Oral inquiry*** Quiz 2*
12	2	2	A1, C1	**Network Layer:** - Introduction to Network Address Translation (NAT) - Strategies used for transition from IPv4 to Ipv6	Lecturing, In-class supervised work	

13	2	2	A1, B1, B2, C1	**Transport Layer:** - Port Numbers - Transport Layer Protocols	Lecturing, Demonstration, In-class supervised work	**Oral inquiry*** **Lab Report #5** Quiz 2*
14	0	2	A1, C2	**Introduction to the Application Layer**	Lecturing, In class-supervised work	**Oral inquiry*** **Quiz 2***
	2	0	A1, B1, B2, C1, C2, D1	Topics from week 8 to 14	-	**Graded Test 2**
15	0	2	A1, C2, D1	**Review**	Lecturing, In class-supervised work	**Oral inquiry***
	0	2	B1, B2, B3, C1, C2	**All lab sessions**		**Final Lab Exam**
16	2	0	A1, B1, C1, C2	**All topics**		**Final Exam**

* Formative assessment

Teaching Materials:

Textbook(s):	Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite -6th edition McGraw-Hill educations, 2021.
Handout(s):	Lecture notes are provided on Moodle.
Reference(s):	Behrouz A. Forouzan TCP/IP Protocol Suite E/4 – 4th edition McGraw Hill Education, 2017. Kurose James F and Ross Keith W, Computer Networking – A top-down approach featuring the Internet 6th edition Pearson Education, 2017 W. Stallings, "Data and Computer Communications", 10th edition, Pearson, 2014. Jill West, Tamara Dean & Jean Andrews, "Network+ Guide to Networks", 7th edition, Cengage Learning, 2015. Douglas Comer, "Computer Networks and Internets", 6th edition, Pearson, 2015. B. A. Forouzan, "Data Communications and Networking", 5th edition, McGraw-Hill Education, 2013. Wendell Odom, "CCENT/CCNA ICND1 100-101 Official Cert Guide", 1st edition, Cisco Press, 2013. Behrouz A. Forouzan & Firouz Mosharraf, "Computer Networks: A Top-Down Approach", international edition, McGraw-Hill educations, 2012.

Assessment

Type of Assessment	Description	Learning Outcomes	Weighting

***Oral Inquiry**	Oral questions will be asked to demonstrate understanding and knowledge of the topics covered during class lectures and lab sessions; the students will also get feedback related to their answers.	A1, D1, D2	Formative Assessment
Test 1	Test one topic covered over the first seven weeks periods one-hour exam consists of short-answer, essay, and problem-solving questions covering Introduction, General concepts, and Network Models, Introduction to OSI and TCPIP models layers covered.	A1, B1, B2, C1, C2, D1,	14%
Test 2	Test two topics covered over the last seven weeks periods one-hour exam consists of short-answer, essay, and problem-solving questions covering Digital Transmission, Analog Transmission, Bandwidth Utilization: Multiplexing, Transmission Media, Error Detection and Correction, Periodic Analog Signals, Data Rate Limits, and Performance.	A1, B1, B2, C1, C2, D1,	15 %
Quizzes	Quiz one with thirty minutes covering topics discussed in week 2 to week 7.	A1, B1	Formative
	Quiz with thirty minutes covering topics discussed in week 8 to week 14.	A1, B1	Formative
Lab Reports (5)	Each student must submit a report at the end of each lab session and the best 4 labs will be selected: **Lab exp. 1**: Studying network topologies. **Lab exp. 2**: Practice cross-wired and straight-wired cabling using cable crimping tools and a network cable tester. **Lab exp. 3**: Studying Ethernet LAN and Wireless LAN. **Lab exp. 4**: Building a Peer-to-Peer network and switched network. **Lab exp. 5**: Practicing how to distribute IP addresses to basic LAN networks.	B1, B2, B3, C1, C2, D1, D2	(16 %) (Marks of the best four lab reports are selected)
Final Lab Exam	One-hour final lab exam consists of practical questions that cover the lab sessions given during the semester.	B1, B2, B3, C1, C2	15%
Final Exam	Two-hour Final Exam consists of short-answer, essay, and problem-solving questions. The exam covers all the topics in the course syllabus.	A1, B1, B2, C1, C2	40%
		Overall:	**100%**

Admissions	
Pre-requisites	ITCS 101
Minimum number of students	5
Maximum number of students	20

COLLEGE OF ENGINEERING

DEPARTMENT OF TELECOMMUNICATION

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ECTE 224 Signals and Systems

Weight: (2 – 2 – 3)

Prerequisite: ECCE 201, ECCE 204

NQF Level Allocated: 7 **NQF Notional Hours / Credits:** 120

Description: This course gives an overview of continuous-time signals and systems. It covers: Basic characteristics of signals, Fourier analysis of continuous -time signals, properties of Linear Time-Invariant (LTI) systems, The Convolution integral, Impulse and step responses of LTI systems, concept of Transfer Function including basic properties of Laplace, and applications of signals and systems concepts in control and signal processing.

Objective:

1. To introduce the fundamental concepts of continuous-time signals and systems.
2. To overview the various transform-domain techniques and their differences.
3. To introduce the concept of convolution and explain its use in the analysis of continuous linear time invariant systems.
4. To use MATLAB toolboxes and Simulink to analyze continuous–time signal and systems.

Semester: First 2023 - 2024

Instructor (s): Dr. Ali Harmouch

Office Telephone: 32021002 **Email (s):** aharmouch@ahlia.edu.bh

Intended Learning Outcomes (ILOs):

E. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Understand advanced concepts of continuous–time signals and systems and the different transform-domain techniques and their use in the analysis of such systems.	Knowledge: theoretical understanding [Level 7]
A2	**Contemporary Trends, Problems and Research:**	
A3	**Professional Responsibility:**	

F. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Solve *advanced level of* continuous-time signals or systems problems using different transform techniques such as Fourier, and Laplace transforms	Knowledge: Practical Application [Level 7] Skills: Communication, ICT and Numeracy Skills [Level 7]
B2	**Modeling and Design:**	
B3	**Application of Methods and Tools:** Ability to *use advanced* analytical tools such as different domain-transform techniques, and convolution theorem in the analysis and solution of signal and systems- related problems through the use of software tools such as MATLAB and Simulink to analyze and solve such problems.	Knowledge: Practical Application [Level 7] Skills: Communication, ICT and Numeracy Skills [Level 7]

G. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Discern between various types of continuous-	Skills: Generic

	time signals and analyze LTI systems characteristics through their impulse responses. Evaluate fundamental signal and system parameters, such as energy, power and bandwidth.	Problem Solving & Analytical skills [Level 7]
C2	**Synthetic:** Use a range of mathematical approaches to synthesize signals in Time-Domain, Frequency-Domain e.g. using Fourier Series and Fourier Transform.	Skills: Generic Problem Solving & Analytical skills [Level 7]
C3	**Creative Thinking and innovation:**	

H. General and Transferable Skills (other skills relevant to employability and personal development)		**NQF Descriptor/ Level**
D1	**Communication:** Present *advanced* solutions to problems involving continuous-time signals and LTI systems in both written and oral form.	Skills: Communication, ICT and Numeracy Skills [Level 7]
D2	**Teamwork and Leadership:**	
D3	**Organizational and Developmental Skills:**	
D4	**Ethics and Social Responsibility:**	

Course Structure (Outline)

Week	Hours	ILOs	Topics	Teaching Method	Assessment Method

1	4	A1	**Introduction to the course**	Lecture,	Oral inquiry
2	4	A1, B1,B3,C1,C2, D1	**Continuous-Time Signals:** Transformation of Continuous-Time Signals, Signal Characteristics and functions. *Lab 1: Getting started with MATLAB -Continuous (CT) Time Signals*	Lecture, Exercises, Class Discussion	Lab Report 1 Homework 1
3	4	A1,B1,B3, C1,C2, D1	**Continuous-Time Systems:** Properties of Continuous-Time Systems Impulse Representation of Continuous-Time Signals. *Lab 2: Signal Characteristics*	Lecture, exercises, in class practice-based work, in lab practice-based work,	Lab Report 2 Oral inquiry Quiz 1
4	4	A1,B1,B3, C1,C2, D1	**Continuous-Time Linear Time-Invariant Systems:** The impulse response representation of Continuous-time systems. Properties of the impulse response. Examples. *Lab 3: CT impulse*	Lecture, Class Discussion, Exercises	Homework 2 Lab Report 3
5	4	B1, B3, C1,C2, D1	**Convolution for Continuous-Time LTI Systems** . Properties of Convolution . Properties of Continuous-Time LTI Systems. Examples. *Lab 4: CT convolution 1*	Lecture, Class Discussion, In class group discussion, Lab Exercise	Homework 3 Oral inquiry Lab Report 4
6	4	A1, B1, B3, C1, C2, D1	**Fourier Series:** Approximating Periodic Signals. Definition of Fourier Series. *Lab 5: CT convolution 2*	Lecture, Class Discussion, In class group discussion,	Major Exam Lab Report 5
7	4	B1, B3, C1, C2, D1	**Fourier Series and Frequency Spectra.** Properties of Fourier Series. Fourier Series Transformation. Examples. *Lab6: CT Fourier Series*	Lecture, In class group discussion, Lab Exercise	Homework 4 Oral inquiry Lab Report 6
8	4	A1, B1, B3, C1, C2	**Fourier Transform:** Definition of the Fourier Transform. Properties and Fourier Transforms of Time Functions	Lecture, Class Discussion, In class group discussion,	Homework 5

9	4	B1, B3, C1,C2, D1	**Applications of the Fourier Transform** Energy and Power Density Spectra *Lab7: CT Fourier Transform*	Lecture, In class group discussion, Lab Exercise	Oral inquiry Lab Report 7
10	4	B1, B3, C1, C2	**Applications of the Fourier Transform:** Ideal Filters, Real Filters *(only RC Low-Pass Filter).* Bandwidth Relationship	Lecture, In class group discussion,	Homework 6
11	4	A1, B1,B3, C1,C2	**The Laplace Transform :** Definition of Laplace Transform ✓ Laplace Transforms of Functions	Lecture, Class Discussion, In class group discussion, Lab Exercise 5	Oral inquiry Quiz 2
12	4	B1, B3, C1, C2,	**Laplace Transform Properties** ✓ Examples.	Lecture, In class supervised work	Oral inquiry Homework 7
13	4	B3,C1,	**Response of LTI Systems** . LTI Systems Characteristics . Examples.	In class supervised work	Oral inquiry
14	4	A1, B1, B3 C1, C2	Review	In class supervised work	Oral and Written
15	4	B1, B3 C1, C2	All lab work		Final Lab Exam
16	2	A1, B1, B3, C1, C2	All Topics		Final Examinations

* Formative assessment

Teaching Materials:

Textbook(s):	Signals and Systems: Analysis Using Transform Methods and MATLAB, 3rd Ed. , M. J. Roberts, McGraw-Hill Education, 2018
Handout(s):	**Notes will be provided on Moodle.**
Reference(s):	Signals and Systems: A Primer with MATLAB, 1st Ed, Matthew N. O. Sadiku, Warsame Hassan Ali, Routledge, 2016

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Homework*	*Homework assignments are assigned throughout the course and consist of sets of exercises from the textbook. Answers are due within 2 weeks of assignment date. Whenever required, MATLAB is to be used in the solutions.*	A1, B1, B3, C1, C2	Formative
Oral inquiry*		A1,D1	Formative
Lab Reports(7):	*Seven experiments are offered in the course where MATLAB is used to solve various signal/systems related problems. Individual Reports on the experiments are expected to be submitted one week after the lab session.* Lab 1a - Getting Started with MATLAB Lab 1b - CT signals	B3, C1, C2, D1	15% (Average of best 5)
	Lab 2 - Signal Characteristics	B3, C1, C2, D1	
	Lab 3 - CT impulse and sifting	B3, C1, C2, D1	
	Lab 4 - CT Convolution	B3, C1, C2, D1	
	Lab 5 - impulse Convolution	B3, C1, C2, D1	
	Lab 6 - CT Fourier Series	B3, C1, C2, D1	
	Lab 7 - CT Fourier Transform	B3, C1, C2, D1	
Major Exam	*One closed book test of one hour and 30mins duration, consisting of problem solving-based short answer questions*	A1, B1, B3, C1	20 %
Quizzes (2)	*Two quizzes of 30 minutes duration each and consist of problem solving-based short answer questions.*	A1, B1, B3, C1, C2	10%
Lab Final Exam	*One lab exam of 1.5 hours duration is carried out consisting of MATLAB or Simulink modeling problems.*	B1, B3, C1, C2	15%
Final examination	*Closed book, closed notes exam, of two hours duration and consists of problem solving-based short answer questions .*	A1, B1, B3, C1, C2	40 %
Overall:			**100 %**

Admissions

Pre-requisites	ECCE 201, ECCE 204
Minimum number of students	**5**
Maximum number of students	**23**

COLLEGE OF ENGINEERING

DEPARTMENT OF TELECOMMUNICATION

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ECTE 314 Communication Systems I

Weight: (2-2-3)

Prerequisite: ECTE 224

NQF Level Allocated: 7 **NQF Notional Hours / Credits:** 120

Description: This course introduces and emphasizes essential analytical tools and theories of communication systems. It covers mainly analog communication: analog modulation (AM, FM, PM); frequency division multiplexing and filtering; A/D and D/A conversions (sampling theory, PAM, Quantization, PCM, and Delta modulation).

Objective:

1. To introduce and emphasize essential analytical tools and theories of communication systems.
2. To overview the fundamental concepts of analog communication systems.
3. To discuss and compare several analog modulation schemes.
4. To apply sampling and quantization theorems to convert analog signals to digital.
5. To simulate basic analog communications systems using Simulink.

Semester: First 2023/24

Instructor (s): Dr. Basel Ali

Mobile Telephone: 39507717 **Email (s):** bali@ahlia.edu.bh

Intended Learning Outcomes (ILOs):

I. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Understand signals types, analog modulation techniques, single-sideband modulation, vestigial sideband modulation, frequency and phase modulation, A/D & D/A conversions, PAM, PCM, and delta modulation.	**Knowledge**: Theoretical Understanding [Level 7]
A2	**Contemporary Trends, Problems and Research:**	
A3	**Professional Responsibility:**	

J. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Solve problems related to amplitude modulation, single-sideband modulation, frequency and phase modulation, PAM, PCM, and delta modulation.	**Skills**: Generic, Problem Solving and Analytical Skills [Level 7]
B2	**Modeling and Design:** Build Simulink models of AM, SSB, FM, PM, PAM, PCM, and delta modulation.	**Knowledge**: Practical Understanding [Level 7]
B3	**Application of Methods and Tools:** Gain skill in the use of equipment and simulation software related to AM, SSB, VSB, FM and PM modulator/demodulator, PAM, PCM, and delta modulation (e.g. Oscilloscope, Signal Generator, Simulink).	**Knowledge**: Practical Understanding [Level 7]

K. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Analyzing the performance of analog modulation systems, single-sideband modulation, vestigial sideband modulation, frequency and phase modulation, PAM, PCM, and delta modulation.	**Skills**: Generic, Problem Solving and Analytical Skills [Level 7]
C2	**Synthetic:** Integrating individual blocks in the analog communication system, single-sideband modulation, vestigial sideband modulation, frequency and phase modulation, PAM, PCM, and delta modulation.	**Knowledge**: Practical Understanding [Level 7]

C3	**Creative Thinking and innovation:**	

L. General and Transferable Skills (other skills relevant to employability and personal development)		**NQF Descriptor/ Level**
D1	**Communication:** Convey ideas and describe processes through group discussions and assignments.	**Communication, ICT, Numeracy** [Level 7]
D2	**Teamwork and Leadership:**	
D3	**Organizational and Developmental Skills:**	
D4	**Ethics and Social Responsibility:**	

Course Structure (Outline)

Week	Hours	ILOs	Topics	Teaching Method	Assessment Method
1	4	A1	Introduction to Communication Systems: Why do we need Communication? Typical Communication Systems.	Lecture, Group discussion	
2	4	A1, B1, C1,	Analysis and transmission of signals, Transforms of some useful functions, FT examples and FT properties Ideal versus practical Filters,	Lecture, Group discussion	
3	4	A1, B1, C1, B2, B3, C2, D1	Amplitude Modulations and Demodulations, Baseband versus Carrier Communications, Double Sideband Amplitude Modulation and Demodulation ***Lab 1: Guidance on the use of Function Generator, Guidance on the use of Oscilloscope***	Lecture, Group discussion	Lab Report 1
4	4	A1, B1, C1, B2, B3, C2, D1	Amplitude modulation: Full AM (AM-TC / AM-LC) modulation / detection. Spectrum and bandwidth Full-AM Signals Analysis and Power Efficiency:	Lecture, Group discussion	Lab Report 2 & 3

			Lab 2: Time domain and Frequency Domain ***Lab 3: Filters***		
5	4	A1, B1, C1,	Bandwidth-Efficient Amplitude Modulations, Single-Sideband (SSB), Hilbert Transform, Quadrature Amplitude Modulation (QAM),	Lecture, Group discussion	Quiz 1
6	4	A1, B1, C1 B2, B3, C2, D1	AM Receiver: Non-Coherent AM Detector (Envelope detector), Coherent vs Non-Coherent Detection issues ***Exp #4: Amplitude Modulation types***	Lecture, Group discussion	Lab Report 4
7	4	A1, B1, C1,	Angle Modulation and Demodulation, Nonlinear Modulation, The concept of Instantaneous frequency,	Lecture, Group discussion	
8	4	A1, B1, C1, B3, D1	Bandwidth of Angle-Modulated waves, Phase Modulation, ***Lab 5: Full-AM generation and Oscilloscope***	Lecture, Group discussion	Lab Report 5
9	4	A1, B1, C1,	FM waves Generation, Demodulation of FM Signals,	Lecture, Group discussion	Test
10	4	A1, B1, C1, B2, B3, C2, D1	Superheterodyne analog FM receivers, FM Broadcasting Systems. ***Lab 6: FM Generation – Matlab and Oscilloscope***	Lecture, Group discussion	Lab Report 6
11	4	A1, B1, C1, B2, B3, C2, D1	Sampling and Analog-to-Digital Conversion, Sampling Theorem, Some applications of the Sampling theorem, PAM, ***Lab 7: Demodulation of FM and AM***	Lecture, Group discussion	Lab Report 7
12	4	A1, B1, C1,	Pulse Code Modulation (PCM), Uniform Quantization, Non-uniform Quantization, Transmission bandwidth and the output SNR,	Lecture, Group discussion	Quiz 2
13	4	A1, B1, C1,	Digital Telephony: PCM T1 Carrier Systems, T1 Time Division Multiplexing, Digital Multiplexing,	Lecture, Group discussion	

		B3, D1	***Exp #8: PCM Non-uniform Quantization***		
14	4	A1, B1, C1,	Differential Pulse Code Modulation (DPCM), Analysis of DPCM, SNR Improvement	Lecture, Group discussion	
15	4	A1, B1, C1 B1, B2, B3, C1, D1	Adaptive Differential PCM (ADPCM), Delta Modulation All lab work	Lecture, Group discussion	Final Lab Exam
16	2	A1, B1, C1, D1	All Topics		Final Examinations

* Formative assessment

Teaching Materials:

Textbook(s):	John W. Leis, "*Communication Systems Principles Using MATLAB*", 1st Edition, Wiley, ©2018.
Handout(s):	**Notes will be provided on Moodle.**
Reference(s):	1. B. P. Lathi, "*Modern Digital Analog Communication System*", 4th Edition, Oxford University, 2020. 2. J. G. Proakis, Modern Communication Using Matlab, 3rd Edition, United States, Cengage, 2013. 3. J. Proakis, M. Salehi, "*Fundamentals of Communication Systems*", 2nd Edition, PEARSON, 2014.

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Homework*	*Homework are given throughout the course to help students understand the concepts and apply various methods learned in class. Homework consist of sets of exercises from the textbook or other resources and is not graded . Solutions to homework exercises are provided as handouts .*	A1, D1	**Formative**
Quizzes (2)	*Minimum of two quizzes of twenty minutes are carried out throughout the semester and consist of problem solving.*	A1, B1, C1	**10 %**

Lab Reports (Best 5)	*Lab 1: Guidance on the use of Function Generator, Guidance on the use of Oscilloscope*	B3, D1	**15 % (Average of best 5)**
	Lab 2: Time domain and Frequency Domain	B2, B3, C2, D1	
	Lab 3: Filters	B2, B3, C2, D1	
	Lab 4: AM Modulation Types	B2, B3, C2, D1	
	Lab 5: Full-AM generation and Oscilloscope	B3, D1	
	Lab 6: FM Generation – Matlab and Oscilloscope	B2, B3, C2, D1	
	Lab 7: Demodulation of FM and AM	B2, B3, C2, D1	
Tests	*One closed book test, of 1.5 hour duration, consisting of problem solving.*	A1, B1, C1	**20 %**
Lab Final Exam	*One lab exam of one hour duration is carried out consisting of Simulink modeling problem.*	B1, B2, B3, C1, D1	**15 %**
Final Exam:	*Closed book, closed notes, of two hours Final Exam consisting of essay questions. The exam will cover all the topics in the course syllabus.*	A1, B1, C1, D1	**40 %**
Overall:			**100 %**

Admissions	
Pre-requisites	ECTE 224 Signals and Systems
Minimum number of students	**5**
Maximum number of students	**20**

الجـامـعـة الأهـلـيـة
AHLIA UNIVERSITY
BAHRAIN

COLLEGE OF ENGINEERING

DEPARTMENT OF TELECOMMUNICATION ENGINEERING

COURSE SYLLABUS/ SPECIFICATION

Course Code and Title: ECTE 322: Antenna and Wave Propagation

Weight: 2-2-3

Prerequisite: MATH 205, MATH 223

NQF Level Allocated: 8 **NQF Notional Hours / Credits: 120**

Course Description: To introduce students to antennas and propagation for wireless communications as well as the analysis and design of antennas. The course begins with a review of vector calculus and coordinate transformations. It covers fundamental concepts of electrostatics, magnetostatics, electromagnetic induction and electromagnetic waves. Students gain knowledge of Maxwell's Equations and learn how to apply them to solve practical electromagnetic fields problems. Other concepts such as waveguides, resonant cavities, antennas, and radiation patterns are also introduced in this course.

Objectives:

At the completion of the course successful learners would be able to:

- Apply fundamental laws and concepts of static and time-harmonic electromagnetic fields to solve Electromagnetics (EM) problems.
- Have a complete understanding of Maxwell's equations and be able to manipulate and apply them to EM problems of wave propagation and radiation.
- Describe and analyze electromagnetic wave propagation in free space.
- **Describe and analyze transmission lines.**
- Derive fundamental antenna parameters for simple antennas starting from Maxwell's equations.
- **Describe various types of wave guides and their mode of operation.**

Semester: First **Academic Year: 2023 -2024**

Instructor(s): Dr. Ali Harmouch

Office Telephone: 32021002

Email: aharmouch@ahlia.edu.lb

Intended Learning Outcomes (ILOs)

M. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate advanced knowledge of the theory and concepts of electromagnetics such as Maxwell's equations and their application to wave propagation, concepts of antennas and radiation patterns, and propagation in transmission lines.	**Knowledge:** Theoretical active learning [Level 8]
A2	**Contemporary Trends, Problems and Research: NA**	
A3	**Professional Responsibility: NA**	

N. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Use a range of approaches to formulate solutions to problems by applying laws of electromagnetics such as the use of Maxwell's equations to solve problems of wave propagation.	**Knowledge:** practical application [Level 8]
B2	**Modeling and Design:** Building models using CST Studio Suite for designing and testing different Antenna functionality models	**Knowledge**: Practical Understanding [Level 8]
B3	**Application of Methods and Tools:** Demonstrate advanced skills in the use of various mathematical tools to solve Maxwell's equations in problems of wave propagation and radiation.	**Knowledge:** Practical application [Level 8]

O. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic:** Critically analyze given electromagnetic problems such as problems of electromagnetic wave propagation in free-space or in transmission lines and use a range of mathematical methods to evaluate their solutions.	**Skills:** Generic Cognitive skills [Level 8]
C2	**Synthetic:** Use a range of approaches to combine separate elements of an electromagnetics problem solution into a whole.	**Skills:** Generic problem solving & Analytical Skills [Level 8]
C3	**Creative Thinking and innovation: NA**	

P. General and Transferable Skills (other skills relevant to employability and personal development)		NQF Descriptor/ Level
D1	**Communication:** Use advanced skills to communicate electromagnetic concepts both orally and in writing and in a well-structured manner.	**Skills:** Generic Cognitive skills [Level 8]

D2	**Teamwork and Leadership: NA**.	**Skills:** Generic problem solving & Analytical Skills [Level 8]
D3	**Organizational and Developmental Skills: NA**	
D4	**Ethics and Social Responsibility: NA**	

Course Structure (Outline)						
Week	**Hours**		**ILOs**	**Topics**	**Teaching Method**	**Assessment Method**
	Lec.	**Lab**				
Week 1	3	-	A1, D1, D2	**Introduction to the course** **Review of Electrostatics:** Electric field intensity, flux density, energy and potential, conductors and dielectrics	Lecture	Oral Participation*
Week 2	3	-	A1, D1, D2	**Review of Magnetostatics:** steady magnetic field, magnetic flux and flux density, steady magnetic field laws.	Lecture	Oral Participation*
Week 3	3	-	A1, B1, B3, C1, C2, D1, D2	**Time-Varying Fields and Maxwell's Equations:** Faraday's law, displacement current	Lecture & problem solving session	Test 1 (week 7) Quiz # 1 (week 5) Final Exam Oral Participation* **Assignment1**
Week 4	3	-	A1, D1, D2	**Maxwell's Equations** in point form, Maxwell's equations in integral form, the retarded potentials	Lecture & problem solving session	Test 1 (week 7) Quiz # 1 (week 5) Final Exam Oral Participation*
Week 5	3	-	A1, B1, B3, C1, D1	**The Uniform Plane Wave:** Wave propagation in free space, propagation in dielectrics Poynting theorem and wave power. Skin effect, wave polarization	Lecture & problem solving session	Test 1(week 7) Final Exam Quiz # 2 (week 8) Oral Participation* **Quiz # 1**

Week 6	3	-	A1, D1, D2	**Plane wave reflection and dispersion:** Reflection of uniform plane waves, propagation, dispersion	Lecture & problem solving session	Test 1 (week 7) Final Exam Quiz # 2 (week 8) Oral Participation*
Week 7	3	-	A1, B1, B3, C1, C2, D1, D2	**Guided Waves:** Transmission line fields, basic waveguide operation, Guide analysis using the wave equation, guided wave propagation	Lecture & problem solving session	Final Exam Quiz # 2 (week 8) Oral Participation* **Assignment 2** **Test 1**
Week 8	3	-	A1, B1, C1, C2, D1	**Guided Waves:** Metallic and dielectric waveguides, resonant cavities, Optical fibers	Lecture & problem solving session	Final Exam Oral Participation* **Quiz # 2**
Week 9	3	-	A1, D1, D2	**Electromagnetic Radiation and Antennas:** Basic radiation principles, Antenna specifications, Magnetic dipole	Lecture & problem solving session	Quiz # 3 (week 11) Final Exam Oral Participation*
Week 10	3	-	A1, D1, D2	**Electromagnetic Radiation and Antennas:** Antenna arrays, linear arrays, antennas as receivers	Lecture & problem solving session	Quiz # 3 (week 11) Final Exam Oral Participation*
Week 11	3	-	A1, B1, B3, C1, C2, D1, D2	Fundamental parameters of the antennas: Radiation pattern, beamwidth, gain, directivity, efficiency	Lecture & problem solving session	Final Exam Oral Participation* **Assignment 3** **Quiz # 3**
Week 12	3	-	A1, B1, B3, C1, C2, D1	Radiation integrals and equivalent sources Linear wire antennas: small dipole, half-wavelength dipole,	Lecture & problem-solving session	Final Exam Quiz # 4 (week 14) Oral Participation* **Test 2**

Week 13	3	-	A1, D1, D2	Loop antennas, Array antennas: Linear, Planar, Circular arrays	Lecture & problem-solving session	Final Exam Quiz # 4 (week 14) Oral Participation*
Week 14	3	-	A1, B1, B3, C1	Resonant antennas, wires and patches,	Lecture & problem-solving session	Final Exam Oral Participation* **Quiz # 4**
Week 15	3	-	A1, D1, D2	Broadband antennas, helical, biconical antennas, sleeve monopole Antenna Measurements	Lecture & problem solving session	Oral Participation*
Week 16	2	-	A1, B1, B3, C1, C2	All Topics (from week 3 to week 14)		Final Exam

Teaching Materials

Textbook(s):	Antenna Theory: Analysis and Design, C.A. Balanis, 4th Edition, 2017, John Wiley & Sons.
Handout(s):	Lecture slides and home assignments available on the course page (Moodle)
Reference(s):	1. Antenna Theory and Design, Warren Stutzman and Gary Thiele, 3rd Edition, 2013, John Wiley & Sons. 2. Antennas and Propagation for Wireless Communication Systems, 2nd Edition, Simon R. Saunders, Alejandro Aragón-Zavala, ISBN: 978-0-470-84879-1 May 2007, John Wiley & Sons. 3. Engineering Electromagnetics - William H. Hayt, 8th Edition – Mc Graw Hill International Edition, 2017. 4. Theory and Computation of Electromagnetic Fields, , J-M. Jin , 2nd Edition, Wiley-IEEE, 2015. 5. Schaum's Outline of Electromagnetics, Joseph A. Edminister and Mahmood Nahvi, 4th Edition, McGraw-Hill Education, 2014.

Assessment**

Assessment Type	Description	ILOs	Weight
Oral Participation	Questions are asked in class during lecture time to assess students understanding of the subject. Participation is important but is not graded.	A1, D1	Formative

Quizzes (4)	Four quizzes of 15 minutes duration each are administered throughout the semester and consist of problem solving-based short answer questions. The marks of the best 4 quizzes count towards the course grade.	A1, B1, B3, C1	Average of best 3 10%
Tests (1)	One written exam of one hour and 30min duration, consisting of problem solving-based short answer questions and each covering than half the course topics in the syllabus.	A1, B1, B3, C1, C2	20%
Lab reports (4)	Four lab reports are conducted throughout the course to help students understand the concepts and examine different antenna functionalities.	B2, B3, C2, D1	15 %
Lab Final Exam	One lab exam of one hour and 30 min duration is carried out consisting of Simulink modeling problem.	B1, B2, B3, C1, D1	15 %
Final Exam	Closed book, closed notes exam, of two hours duration and consists of problem solving-based short answer questions.	A1, B1, B3, C1, C2	40%
Overall			**100%**

Ahlia University values academic integrity. Therefore, all learners must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.ahlia.edu.bh/integrity for more information).

COLLEGE OF ENGINEERING
DEPARTMENT OF TELECOMMUNICATION ENGINEERING
COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ECTE 324: Communication Systems II

Weight: (2 – 2 – 3)

Prerequisite: ECTE 314: Communication Systems I

NQF Level Allocated: 7 **NQF Notional Hours / Credits:** 120/12

Description: This course builds on the knowledge gained from the previous communication course (ECTE 314). It focuses on digital communication: digital modulation (ASK, FSK, PSK, QAM); transmission of digital data over baseband channel (line coding, block coding, scrambling); error detection and correction (hamming distance, linear block codes, cyclic codes, checksum, forward error correction); time division multiplexing.

Objective:

1. To learn how to transmit the information from a source to a destination.
2. To evaluate the quality of the received information.
3. To know what kinds of design goals to consider for a specific application.
4. To trade-off between various parameters (such as bandwidth and power) due to the design limitations and goals.
5. To analyze a digital communication system link to achieve an overall system insight.
6. To simulate digital communications systems using Simulink.

Semester: First 2023- 24

Instructor (s): Dr. Basel Ali

Office Telephone: 39507717 **Email (s):** bali@ahlia.edu.bh

Intended Learning Outcomes (ILOs):

	Q. Knowledge and Understanding	NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate *advanced* knowledge and understanding the concepts of digital communications and the different modulation techniques used in the baseband and passband data transmission and the use of error control coding principles to improve the digital communication systems performance.	**7**
A2	**Contemporary Trends, Problems and Research:** Demonstrate an *advanced* principles and core theories of recent trends and understand problems that arise in the evolution of digital communication.	**7**
A3	**Professional Responsibility:** N/A	

	R. Subject-specific Skills	NQF Descriptor/ Level
B1	**Problem Solving:** Formulate and solve *advanced* problems in the field of baseband data transmission, ISI, pulse shaping, ASK, FSK, PSK, QAM, passband data transmission, and error control coding.	**7**
B2	**Modeling and Design:** Create Simulink models of digital communication systems.	**7**
B3	**Application of Methods and Tools:** Use effectively the Matlab/Simulink models for the design of baseband, passband, and error control systems.	**7**

	S. Critical-Thinking Skills	NQF Descriptor/ Level
C1	**Analytic skills:** Analyze and *critically* evaluate the performance of digital baseband modulation and demodulation systems, passband modulation and probability of errors performance for binary systems, and error control coding.	**7**
C2	**Synthetic:** Develop and simulate individual blocks in the digital communication system, baseband modulation and demodulation systems, passband modulation and probability of errors performance for binary systems, and error control coding.	**7**
C3	**Creative Thinking and innovation:** N/A	

T. General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor/ Level

D1	**Communication:** Enhance communication skills through Discussions and develop *advanced* skills related to creative and critical thinking as well as problem solving.	**7**
D2	**Teamwork and Leadership:** Work effectively as a member/leader of a team of technical people who *is responsible to* plan, design, implement, manage, monitor and evaluate the digital communication systems performance.	**7**
D3	**Organizational and Developmental Skills:** N/A	
D4	**Ethics and Social Responsibility:** N/A	

Course Structure (Outline)

Week	Hours	ILOs	Topics	Teaching Method	Assessment Method
1	4	A1, B1	Digital Communication Signal Processing, Digital versus Analog Performance Criteria, Baseband versus Bandpass,	Lecture, Exercises,	Oral Enquiry*
2	4	A1, B1 B2, B3, C2, D1	**Baseband Modulation,** Baseband Systems, Waveform Representation of Binary Digits, M-ary Pulse Modulation Waveforms, **Exp #1:** Simulink Modeling of Pulse Code Modulation (PCM)	Lecture, Exercises, Supervised Lab work	Oral Enquiry* Lab Report 1
3	4	A1, B1	**Baseband Demodulation/Detection** Detection of Binary Signals in Gaussian Noise, Maximum Likelihood Receiver Structure,	Lecture, Exercises,	Oral Enquiry* Homework*
4	4	A1, B1 B2, B3, C1, C2, D1	**The Matched Filter,** Correlation Realization of the Matched Filter, **Exp #2:** Sampling and Reconstruction	Lecture, Exercises, Supervised Lab work	Oral Enquiry* **Quiz #1** Lab Report 2
5	4	A1, B1	Error Probability Performance of Binary Signaling, Intersymbol Interference, Pulse Shaping to Reduce ISI, Demodulation/Detection of Shaped Pulses,	Lecture, Exercises,	Oral Enquiry* Homework*
6	4	A1, B1 A1, A2, D1, D2	**Bandpass Modulation and Demodulation/Detection** Digital Bandpass Modulation Techniques, Phase Shift Keying, Frequency Shift Keying,	Lecture, Exercises, Supervised Lab work	Oral Enquiry* **Research Assignment**

		B2, B3, C2, D1	Amplitude Shift Keying, Amplitude Phase Keying, **Exp #3:** BPSK		Lab Report 3
7	4	A1, B1 A1, B1, B3, C1, C2	Detection of Signals in Gaussian Noise, Correlation Receiver,	Lecture, Exercises,	Oral Enquiry*
8	4	A1, B1, B2, B3, C2, D1	**Coherent Detection,** Coherent Detection of PSK, Sampled Matched Filter, Coherent Detection of Multiple Phase Shift Keying, Coherent Detection of FSK, **Exp #4:** QPSK	Lecture, Exercises, Supervised Lab work	Oral Enquiry* Lab Report 4
9	4	A1, B1	**Noncoherent Detection,** Detection of Differential PSK, Binary Differential PSK Example, Noncoherent Detection of FSK,	Lecture, Exercises,	Oral Enquiry* Homework*
10	4	A1, B1, B2, B3, C2, D1	**Error Performance for Binary Systems,** Probability of Bit Error for Coherently Detected BPSK, differentially Encoded Binary PSK, and Binary Orthogonal FSK, **Exp #5:** Error Rate Reduction Using a Binary Linear Code	Lecture, Exercises, Supervised Lab work	Oral Enquiry* Lab Report 5
11	4	A1, B1 A1, B1, B3, C1, C2	**Linear Block Codes,** Generator Matrix, Systematic Linear Block Codes, Parity-Check Matrix, Syndrome Testing, Error Correction, Decoder Implementation,	Lecture, Exercises,	Oral Enquiry* **Test**
12	4	A1, B1 B2, B3, C2, D1	**Cyclic Codes,** Algebraic Structure of Cyclic Codes, Binary Cyclic Code Properties, Encoding in Systematic Form, **Exp #6:** Error Control Coding using Convolutional coding and Viterbi decoding	Lecture, Exercises, Supervised Lab work	Oral Enquiry* Homework* Lab Report 6
13	4	A1, B1	**Convolutional Encoding,** Convolutional Encoder Representation, State	Lecture, Exercises,	Oral Enquiry* **Quiz #2**

		A1, B1, B3, C1, C2	Representation and the State Diagram,		
14	4	A1, B1, B3, C2	Maximum Likelihood Decoding, Channel Models: Hard versus Soft Decisions, The Viterbi Convolutional Decoding Algorithm, Time division multiplexing;	Lecture, Exercises,	Oral Enquiry* Homework*
15	4	A1, B2, B3, C1, C2	Research Assignment Presentations All Lab Work	-	**Oral Presentations Lab Final Exam**
16	2	A1, B1, B2, C1, C2	**Final Exam**		Written Exam

* Formative assessment

Teaching Materials:

Textbook(s):	• Fredric J. Harris, Bernard Sklar, "Digital Communications: Fundamentals and Applications",3rd Edition, Pearson, 2021.
Handout(s):	• Lecture Notes, Handouts: available on Moodle.
Reference(s):	• John W. Leis, "*Communication Systems Principles Using MATLAB*", Wiley, 2018. • B. P. Lathi, "*Modern Digital Analog Communication System*", 4th Edition, Oxford University, 2010. • J. G. Proakis, Modern Communication Using Matlab, 3rd Edition, United States, Cengage, 2013. • J. Proakis, M. Salehi, "*Fundamentals of Communication Systems*", 2nd Edition, PEARSON, 2014.

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Homework *	Homework is given throughout the course to help students understand the concepts and apply various methods learned in class. Homework consists of sets of exercises from the textbook or other resources and is not graded.	A1, B1	**Formative**

	Solutions to homework exercises are provided as handouts.		
Oral Enquiry*	*The learners will be assessed through various questions in the field, this assessment is formative, and feedback will be provided as part of discussions to assure the learner progression throughout the course*	A1	**Formative**
Research Assignments and *oral presentation*	A research assignment is assigned on the 6th week and is expected to be submitted on week 13 before the final exams. Students are required to work in groups and are asked to select a current Wireless Communications application of their choice and write an essay of a minimum of 5 pages consisting of an introduction, a brief but critical literature review followed by a description of the methods and tools utilized in the selected application and a justification for their use.	A1, A2, D1, D2	**10%**
Quizzes (2)	Two quizzes of thirty minutes are carried out throughout the semester and consist of problem solving.	A1, B1, B3, C1, C2	**10 %**
Test (1)	Closed book test, of one-hour duration, consisting of problem solving.	A1, B1, B3, C1, C2	**20 %**
Lab Reports (Best 5)	**Exp #1:** Simulink Modeling of Pulse Code Modulation (PCM)	B2, B3, C2, D1	**10 %**
	Exp #2: Sampling and Reconstruction	B2, B3, C2, D1	
	Exp #3: BPSK	B2, B3, C2, D1	
	Exp #4: QPSK	B2, B3, C2, D1	
	Exp #5: Error Rate Reduction Using a Binary Linear Code	B2, B3, C2, D1	
	Exp #6: Error Control Coding using Convolutional coding and Viterbi decoding	B2, B3, C2, D1	
Final Exam:	Closed book, closed notes, of two hours Final Exam consisting of essay questions. The exam will cover all the topics in the course syllabus.	A1, B1, B2, C1, C2	**40 %**
Lab Final Exam	Lab exam of one-hour duration is carried out consisting of Simulink modeling problem.	B2, B3, C1, C2	**10 %**

	Overall		**100 %**

Admissions	
Pre-requisites	ECTE 314
Minimum number of students	**5**
Maximum number of students	**20**

AHLIA UNIVERSITY
COLLEGE OF ENGINEERING

DEPARTMENT OF TELECOMMUNICATION ENGINEERING

COURSE SYLLABUS/ SPECIFICATION

Course Code	ECTE 328
Title:	Mobile Application Development
Weight:	(2 - 2 - 3)
Prerequisite:	ITCS 221 & ECTE 201
NQF Level Allocated	8
NQF Notional Hours / Credits:	120/12
Description:	The course introduces an in-depth review of concepts, design strategies, tools and Application Programme Interfaces (APIs) needed to create, test and deploy advanced applications for mobile phones and occasionally connected mobile devices. Topics include: design of mobile user interfaces, Activities, handling notifications, user interface design, user interface building, inter-process communication, data processing, content providers, background services, geo-location and mapping, networking and web services, telephony, messaging, peer-to-peer communication. The target computing environment changes overtime; currently the course explores the Android Operating System and its supporting SDK.

Objectives:

1. To design, and develop effective software systems for cell phones and other occasionally connected mobile devices based on the selected operating system,
2. To apply the life-cycle mechanism to mobile software,
3. To construct rich multi-threaded graphical interfaces sensitive to tactile, oral, and positional interactions,
4. To utilize advanced mobile data-stores, and integrate multimedia objects in their solutions,
5. To develop location-aware applications, and deploy the available sensors on mobile devices to enhance user interaction.
6. To interact with external hardware using Mobile devices

Semester: First Academic Year: 2023/2024

Instructor: Dr. Ammar Aldallal

Office Tel.: 17298999 Ext. 8654

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INTENDED LEARNING OUTCOMES (ILOS)

A. Knowledge and Understanding		**NQF Descriptor/ Level**
A1	**Concepts and Theories:** *Demonstrate knowledge and understanding of key concepts and techniques of programming environments to design, encode, test and deploy mobile applications.*	**Knowledge**: Theoretical understanding [Level 8]
A2	**Contemporary Trends, Problems and Research:** *To understand the new trends in hardware based Mobile Applications.*	**Knowledge**: Theoretical Understanding [Level 8]
A3	**Professional Responsibility:** *Continuously discover, evaluate, and implement new technologies to maximize development efficiency.*	Knowledge: demonstrate creativity in the application of knowledge, understanding and/or practices. [Level 8]

B. Subject-Specific Skills		**NQF Descriptor/ Level**
B1	**Problem Solving:** *Encode, and deploy efficiently mobile applications using Intents, Activities, Widgets and Services.*	Knowledge: Practical application [Level 8]
B2	**Modeling and Design:** *Design the architecture of mobile applications which comprises the user interface and its components and the main functionalities of the mobile application, having in mind the different designs of mobile applications reported in current research.*	Skills: Use a range of approaches to: identify and implement relevant solutions [Level 8]

B3	**Application of Methods and Tools:** *Gain skills in the use of appropriate development tools such as Android Studio and Android Development Tools (ADT) to develop and manipulate mobile applications.*	Skills: Communication, ICT and Numeracy [Level 8]

C. Thinking Skills		**NQF Descriptor/ Level**
C1	**Analytic**: *Critically evaluate and test the results of output of the developed mobile applications.*	Skills: Generic Cognitive Skills [Level 8]
C2	**Synthetic**: *Construct and reuse the multiple components of software/system for developing the mobile applications.*	Competence: Context [Level 8]
C3	**Creative**: *Create efficient and innovative Modern User Interfaces for the mobile applications.*	Skills: Generic Cognitive Skills [Level 8]

D. General and Transferable Skills (Other Skills Relevant to Employability and Personal Development)		**NQF Descriptor/ Level**
D1	**Communication**: *Express and communicate ideas effectively, in written and oral form to their colleagues and/or Instructor, as appropriate.*	Skills: Communication, ICT and Numeracy [Level 8]
D2	**Teamwork and Leadership**: *Work effectively as a member/leader of a team to portray the robust designs or programming for user or device constraints.*	Competence: Operate at a specialist level in defined and some undefined areas of work. [Level 8]
D4	**Ethical and Social Responsibility:** *Maintain integrity and independence in professional judgment and in the best interests of clients and employers consistent with the public interest.*	Competence: Autonomy and Responsibility [Level 8]

Course Structure (Outline)						
Week	**Hours**		**ILOs**	**Topics**	**Teaching Method**	**Assessment Method**
	Lec.	**Lab**				
1	2	2	A1, C1	Introduction to Android Development Environment, Understanding Activity lifecycle	Lecture, Lab session demo	-

			B3, C2, D1			
2	2	2	A1, B1, B2, B3, C1, C2, C3, D1	Intents and Services, Lab Exp # 1: Creating a "Hello World Application"	Lecture, Supervised Lab work	Lab Report #1 Oral Enquiry*
3	2	2	A1, B2, B3 C1, C3, D1	UI Design : Layouts & Controls Lab Exp # 2: Creating applications with different layouts	Lecture, Supervised Lab work	Oral Enquiry* Lab Report #2
4	2	2	B1, B2, B3, C2, D1, D4	Working with Data,	Lecture, Supervised Lab work	Oral Enquiry*
5	2	2	A1, A3, B1, B3, C2, D1	Alerts, Notifications and Security architectures Lab Exp # 3: Creating applications with images	Lecture, Supervised Lab work	Oral Enquiry* Lab Report #3
6	2	2	A1, B1, B2, B3, C1, C3, D1	Telephony Manager, Network and the Web Lab Exp # 4: Reading and writing files	Lecture, Supervised Lab work	Lab Report #4 **Programming Project**
7	2	2	B1, B2, B3, C1, C3, D1	Graphics and Animation Lab Exp # 5: Intents	Lecture, Supervised Lab work	Oral Enquiry* Lab Report #5
8	2	2	A1, B1, B2, B3, C1, C2, D1	Location-based Services Google Maps and GPS	Lecture, Supervised Lab work	**Midterm Exam**
9	2	2	A1, B1, B2, B3, C1, C2, C3, D1	Using touchscreen and Sensors Lab Exp # 6: Dialog Boxes	Lecture, Supervised Lab work	Oral Enquiry* Lab Report # 6
10-11	4	4	A1, B1, B2 B3, C2, D1	APIs for Bluetooth, WiFi, and NFC	Lecture, Supervised Lab work	Oral Enquiry*

12	2	2	A1, B1, B2, B3, C1, C3, D1, D4	Publishing the App to Play Store. Lab Exp # 7: Toast Widget	Lecture, Supervised Lab work	Oral Enquiry* Lab Report # 7
13	2	2	A1, B1, B3, C2, C3 D1	Interacting with Arduino hardware through the Mobile Device (part 1)	Lecture, Supervised Lab work	Oral Enquiry*
14	2	2	A1, B1, C3 B3, C2, D1	Interacting with Arduino hardware through the Mobile Device (Part 2)	Lecture, Supervised Lab work	Oral Enquiry*
15	2	2	A1, A2, A3, C1, C3, D1 D2, D4	Programming Project Presentations All Lab work		Oral Presentations Lab Final Exam
16&17			A1, B1, B2, C1, C2, C3	Comprehensive Assessment		Final Exam

TEACHING MATERIALS:

TEXTBOOK(S):	Neil Smyth, Android Studio 4.1 Development Essentials - Java Edition: Developing Android 11 Apps Using Android Studio 4.1, Java and Android Jetpack, 2020.
HANDOUT(S):	Lecture Notes, Material provided in eLearning (Moodle)
REFERENCE(S):	1. Alexander Makarov, *Yii Application Development Cookbook* 2nd Ed., Packt Publishing 2013 ISBN 978-1-78216-310-7 2. Joseph Annuzzi, Jr. Lauren Darcey, Shane Conder, *Introduction to Android Application Development*, 4th Ed. Addison-Wesley, 2014 ISBN-13: 978-0-321-94026-1 3. Komatineni and MacLean, *Pro Android 4*, Apress, 2012, ISBN: 978-1430239307 4. Burnette, *Hello, Android (3rd ed.),* Pragmatic Bookshelf, 2010, ISBN: 978-1934356562 5. Burnette, Ed, *Hello, Android: Introducing Google's Mobile Development Platform, 3rd Ed.,* Pragmatic Bookshelf, 2010. 6. B. Phillips and B. Hardy, Android Programming: The Big Nerd Ranch Guide, Big Nerd Ranch Guides, 2013.

	7. Reto Meier, *Professional Android 4 Application Development*, 3rd Ed., Wrox Professional Press, 2012. 8. I. G. Clifton, *Android User Interface Design: Turning Ideas and Sketches into Beautifully Designed Apps*, Addison-Wesley Professional, 2013. 9. Google, Android Developer Resources, https://developer.android.com/index.html

Assessment:

Type of Assessment	Description	ILO's	Weighting
Oral Enquiry*	Oral questioned will be asked to demonstrate understanding and knowledge of the topics covered during class lectures and lab sessions and provide feedback.	A1, C1, D1	Formative
Programming Project	Students are required to build a complete Android application and implement it on a mobile device. The purpose of the assignment is to assess students where they have to demonstrate their extensive and detailed knowledge and critical understanding of key concepts of mobile development.	A1, A2, A3, C1, C3, D1 D2, D4	(*report: 10 +Presentation: 5)* 15%
Midterm Exam	The test will be an in-class 1.5-hour exam that will consists of short-answer, essay, and problem solving questions and cover the topics studied in the first 8 weeks.	A1, B1, B2, C1	20%
7 Lab Reports (Best 5)	Lab Exp # 1: Creating a "Hello World Application" Lab Exp # 2: Creating applications with different layouts. Lab Exp # 3: Creating applications with images Lab Exp # 4: Reading and writing files Lab Exp # 5: Intents Lab Exp # 6: Dialog Boxes Lab Exp # 7: Toast Widget	B1, B2, B3, C1, C3, D1	10%
Lab Final Exam	Lab exam of 2 hours duration is carried out consisting of mobile applications problems.	B1, B2, B3, C1	15%
Final Exam	The final exam is comprehensive, and will be of two hours duration. It will consist of short-answer, essay and problem-solving questions.	A1, B1, B2, C1, C2, C3	40%
		Overall	100%

Admissions	
Pre-requisites	None
Minimum number of students	**5**
Maximum number of students	**20**

COLLEGE OF ENGINEERING, DEPARTMENT OF TELECOMMUNICATION ENGINEERING

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ECTE 329 Computer Networks

Weight: (2-2-3)

Prerequisite: ITCS 214/ECCE 203

NQF Level Allocated: 7 **NQF Notional Hours / Credits:** 120 /12

Description: This course focuses on the underlying concepts and technologies of computer networking. Topics covered include standards; transmission basics and media; TCP/IP protocol; network topologies; network hardware, switching, routing, and virtual networks; and network applications such as e-mail and the Web, peer-to-peer file sharing.

Objective:

3. To critically understand the concepts and specialist theories of data communication and networks.
4. To describe the data communications and telecommunications models, topologies, protocols.
5. To discuss the concepts and the building blocks of today's data communication networks such as switches, routers, and cabling.
6. To critically understand the bandwidth characteristics of several types of physical communication media.
7. To understand the effect of various topologies, applications, and devices on network performance.
8. To overview the methods of error detection/correction and data compression.
9. To provide an overview of the Internet and its applications.
10. To demonstrate an advanced knowledge and understanding of Network Management and Administration using different protocols
11. To overview the basic of Internet security

Semester: First 2023/24

Instructor (s): Dr. Alaaeddine Ramadan

Office Telephone: 17298 999 **Email (s):** aramadan@ahlia.edu.bh

Intended Learning Outcomes (ILOs):

	U. Knowledge and Understanding	NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate critical understanding of data communications and telecommunications models, topologies, protocols, OSI model, and the building blocks of data communication networks such as switches, routers, and cabling.	Knowledge: theoretical understanding [Level 7]
A2	**Contemporary Trends, Problems and Research:**	
A3	**Professional Responsibility:**	

	V. Subject-specific Skills	NQF Descriptor/ Level
B1	**Problem Solving:** Critically analyze and identify different problems of computer networks, and solve them using various devices, techniques, and communication protocols.	Knowledge: practical application [Level 7] Skills: Communication, ICT and Numeracy [Level 7]
B2	**Modeling and Design:** Demonstrate an ability to model and design communication protocols for solving communication problems.	Knowledge: practical application [Level 7]
B3	**Application of Methods and Tools:** Apply computer networks simulation tools in order to implement the concepts of computer networks (packet Tracer).	Knowledge: practical application [Level 7]

	W. Critical-Thinking Skills	NQF Descriptor/ Level
C1	**Analytic skills:** Critically analyze the efficiency of computer networks, by analyzing the effect of different types of physical communication media, topologies, and devices on computer networks performance.	Generic problem solving and analytical skills [Level 7]
C2	**Synthetic:**	
C3	**Creative Thinking and innovation:**	

X. General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor/ Level

D1	**Communication:** Express and communicate ideas in written and oral form.	Communication, ICT and Numeracy Skills [Level 7]
D2	**Teamwork and Leadership:**	
D3	**Organizational and Developmental Skills:** Demonstrate ability to organize ideas and effectively allocate time in given assignment.	Competence: Autonomy, Responsibility and Context [Level 7]
D4	**Ethics and Social Responsibility:**	

Course Structure (Outline)

Week	Hours	ILOs	Topics	Teaching Method	Assessment Method
1	4	A1, B1, B2, C1	**Introduction Computer Network?** (Definition, topology, media, protocol etc.)	Lecture In-class discussion	Major Exam (week 9) Quiz 1
2	4	A1, B1, B2, C1	**The different layers of Model OSI**	Lecture In-class discussion	Major Exam (week 9) Quiz 1
3	4	A1, B1, B2, C1, D3	**Physical Layer:** encoding signal	Lecture In- class Exercises Lab session#1	Major Exam (week 9) Quiz 1
4	4	A1, B1, B2, B3, C1, D1, D3	**Wireless LANs & Security**	Lecture In- Class Exercises Demonstration	Major Exam (week 9)
5	4	A1, B1, B2, C1, D3	**Data Link Layer:** Error detection and correction	Lecture In- class Exercises Lab session #2	Major Exam (week 9) Lab Report 1
6	4	A1, B1, B2, B3, C1, D3	**Network Layer:** Router and switch, Djikastra algorithm	Lecture Simulation Software In- class Exercises Lab session #3	Major Exam (week 9) Lab Report 2
7	4	A1, B1, B2, B3, C1, D1, D3	**Network Layer:** IP/ TCP protocol	Lecture In- class Exercises Lab session#4	Major Exam (week 9) Lab Report 3
8	4	A1, B1, B2, B3, C1, D1, D3	**Transport Layer**	Lecture In- Class Exercises	Major Exam (week 9) Quiz 2
9	4	A1, B1, B2, B3, C1, D1, D3	**Transport Layer**	Lecture/ In- Class Exercises / lab session#5	Major Exam (week 9) Quiz 2
10	4	A1, B1, B2, C1	Major Exam (It will cover topics studied in the first 8 weeks)		
		A1, B1, B2, B3, C1, D1, D3	**Session and presentation layers**	Lecture In- Class Exercises	Quiz 3
11	4	A1, B1, B2, B3, C1, D1, D3	**Session and presentation layers**	Lecture In- Class Exercises	Quiz 3
12	4	A1, B1, B2, B3, C1, D1, D3	**Network Management and Administration Applications layer:** ✓Web and HTTP	Lecture In- Class Exercises	Quiz 3

			✓Email and SMTP ✓FTP ✓Telnet		
13	4	A1, B1, B2, B3, C1, D1, D3	**Network Management and Administration Applications layer:** ✓Web and HTTP ✓Email and SMTP ✓FTP ✓Telnet	Lecture In- Class Exercises Lab session#6	Quiz 3 Lab Report 4
14	4	A1, B1, B2, B3, C1, D1, D3	**The Internet:** ✓The organization of the Internet ✓Internet versus intranet ✓Network address translation (NAT)	Lecture Case Studies In- Class Exercises	
15	4	B1, B2, B3, C1	All Topics		Lab Exam
16	2	A1, B1, B2, C1	Final Examinations		Written Exam

* Formative assessment

Teaching Materials:

Textbook(s):	• Kurose, Ross, *Computer Networking: A Top-Down Approach Featuring the Internet*, 8th Global Edition, Pearson, 2020.
Handout(s):	**Notes will be provided on Moodle.**
Reference(s):	• Larry L. Peterson, Bruce S. Davie, *Computer Networks: A Systems Approach*, Sixth Edition, Morgan Kaufmann Publishers Inc., 2021 • Kuzmiakova, *Computer Networks and Communications*, First Edition, Arcler, 2021. • Padallan, *Computer Networks and Communications*, First Edition, Arcler, 2019. • Multimedia Networking Technology, Protocol, and Architecture, First Edition, Artech House, 2019.

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Quizzes (3) (Best 2)	Three written quizzes are used to assess students' understanding of the concepts of computer networks. Best two quizzes are considered.	A1, B1	10 %

In-class exercises	For each student needs to do and discuss in-class exercises.	B1, B2	0%
Lab report (4) (Best 3)	"Each student needs to submit a report after lab sessions". Lab 1: Switch Startup and Initial Configuration. Lab 2: IP addressing, Router Configuration and Static Routing. Lab 3: Classless Sub-netting and RIPv2. Lab 4: TCP and UDP Communications.	B1, B2, B3, C1, D1, D3	15%
Final Lab exam	One-hour final lab exam covers lab sessions given during the semester	B1, B2, B3, C1	15%
Major Exam	One written test to be given to students. The major test is a written, in-class 90 minutes test. It will cover topics studied in the first 8 weeks. Most of the test's questions are short answers, problem solving and analysis questions.	A1, B1, B2, C1,	20 %
Final Exam	The final exam is a comprehensive, written exam and will be of two hours. It will consist mainly of problem solving and analysis questions.	A1, B1, B2, C1	40%
Overall:			**100 %**

Admissions	
Pre-requisites	ITCS 214/ ECCE 203
Minimum number of students	**5**
Maximum number of students	**21**

COLLEGE OF ENGINEERING
DEPARTMENT OF TELECOMMUNICATION ENGINEERING
COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ECTE 406: Multimedia Communications

Weight: (2 – 2– 3)

Prerequisite: ECTE 450: Digital Signal Processing

NQF Level Allocated: 8 **NQF Notional Hours / Credits:** 120/12

Description: This course introduces technologies for multimedia communications. The course considers each part of a multimedia application, i.e. voice, video, and data individually, and how to effectively represent multimedia data, including text, image, audio, and video. Covering different issues related to general behaviors, format, representation, multimedia coding standards, including Huffman coding, JPEG/JPEG-2000, H.26x, MPEG, encoding-decoding techniques, and telecommunication media requirements.

Objective:

1. To equip students with in-depth knowledge of multimedia components and their representation.
2. To enable students to analyze and understand the relevance and underlying infrastructure of the multimedia systems.
3. To enhance critical insight of different multimedia technologies and standards (Digital Audio, Graphics, Video, VR, data transmission/compression).
4. To provide students with advanced knowledge and comprehensive understanding of different multimedia systems performance, integration and Evaluation.

Semester: Second 2023/24

Instructor: Dr. Basel Ali

Office Telephone: 39507717 **Email (s): bali@ahlia.edu.bh**

Intended Learning Outcomes (ILOs):

	Y. Knowledge and Understanding	NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate in-depth knowledge and understanding of the essential concepts and requirements of multimedia systems, the formats of different media signals and the compression algorithms for text, image, audio and video.	**8**
A2	**Contemporary Trends, Problems and Research:** Demonstrate *detailed* knowledge of contemporary issues and techniques in the field of multimedia communications.	**8**
A3	**Professional Responsibility:** N/A	

	Z. Subject-specific Skills	NQF Descriptor/ Level
B1	**Problem Solving:** Identify, formulate, and solve *advanced* problems in the field of multimedia representation, encoding-decoding and the compression algorithms for text, image, audio and video.	**8**
B2	**Modeling and Design:** Design creative approach in application of multimedia devices, equipment and systems.	**8**
B3	**Application of Methods and Tools:** Use specialized software tools such as MATLAB to apply compression techniques for Text, Image, Audio and Video.	**8**

	AA. Critical-Thinking Skills	NQF Descriptor/ Level
C1	**Analytic skills:** *Critically* analyze and evaluate the requirements of multimedia systems, the formats of different media signals and the compression algorithms for text, image, audio and video.	**8**
C2	**Synthetic:** Develop and critically synthesize media compression and the transmission of digital audio and video across computer networks.	**8**
C3	**Creative Thinking and innovation:** N/A	

	BB. General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor/ Level
D1	**Communication:** Enhance communication skills through group discussion and develop skills related to creative and critical thinking as well as problem solving.	**8**
D2	**Teamwork and Leadership:** Work effectively as a member/leader of a	**8**

	project team to plan, design, implement and evaluate a multimedia communication system performance.	
D3	**Organizational and Developmental Skills:** N/A	
D4	**Ethics and Social Responsibility:** N/A	

Course Structure (Outline)

Week	Hours	ILOs	Topics	Teaching Method	Assessment Method
1	4	A1, C1, D1	**Multimedia Communications:** Multimedia information representations, Multimedia networks	Lecture Exercise session Group discussion	Oral Enquiry*
2	4	A1, C1, D1 B2, B3, C2, D1	Multimedia applications and networking terminology Lab1: Sampling and Quantization	Lecture Exercise session Group discussion	Oral Enquiry* Homework*
3	4	A1, C1, D1	**Multimedia information representations:** Digitization Principles, Analog signals, Encoder design, Decoder design	Lecture Exercise session Group discussion	Oral Enquiry*
4	4	A1, C1, D1 B2, B3, C2, D1	**Text:** Unformatted text, Formatted text, Hypertext **Images:** Graphics, Digitized documents, Digitized pictures Lab2: Voice and Audio Digitization and Sampling Rate Conversion	Lecture Exercise session Group discussion	Oral Enquiry* Homework*
5	4	A1, B1, C1, D1 B2, B3, C2, D1	**Audio:** PCM speech, CD-quality audio, Synthesized audio Lab3: Color TV Transmission: Multiplexing/Demultiplexing of YIQ	Lecture Exercise session Group discussion	Oral Enquiry* Quiz 1
6	4	A2, D1, D2	**Video:** Broadcast television, Digital video, PC video, Video content	Lecture Exercise session Group discussion	**Research Assignments**
7	4	A1, C1, D1 B2, B3, C2, D1	**Text and Image Compression Principles:** Source encoders and destination decoders, Lossless and lossy compression, Entropy encoding, Source encoding Lab4: Image Filtering and Transform	Lecture Exercise session Group discussion	Oral Enquiry* Homework* Test 1
8	4	A1, B1, C1, D1	**Text Compression:** Static Huffman coding, Dynamic	Lecture	Oral Enquiry*

			Huffman coding, Arithmetic coding, Lempel-Ziv coding, Lempel-Ziv-Welsh coding	Exercise session Group discussion	Quiz 2
9	4	A1, C1, D1 B2, B3, C2, D1	Image Compression: Graphical interchange format Lab5: Image Compression	Lecture Exercise session Group discussion	Oral Enquiry* Homework*
10	4	A1, C1, D1	Tagged image file format, Digitized documents, Digitized pictures, and JPEG	Lecture Exercise session Group discussion	Oral Enquiry*
11	4	A1, B1, C1, D1 B2, B3, C2, D1	**Audio and Video compression principles: Audio compression: -** Differential pulse code modulation (DPCM) Lab6: Speech and Audio Signals Compression	Lecture Exercise session Group discussion	Oral Enquiry* Quiz 3
12	4	A1, C1, D1	Adaptive differential PCM, Adaptive predictive coding	Lecture Exercise session Group discussion	Oral Enquiry* Test 2
13	4	A1, C1, D1 B2, B3, C2, D1	Linear predictive coding, Code-excited LPC, Perceptual coding, MPEG audio coders, Dolby audio coders Lab7: Motion Estimation for Video Coding	Lecture Exercise session Group discussion	Oral Enquiry* Homework*
14	4	A1, B1, C1, D1 B2, B3, C2, D1	**Video compression principles:** H.261, H.263, MPEG, MPEG-1, MPEG-2, MPEG-4 Lab8: Video Streaming Over Internet	Lecture Exercise session Group discussion	Quiz 4
15	4	A1, A2, D1, D2	Research Assignment Presentations		**Oral Presentations**
16	2	A1, B1, B3, C1, D1	Comprehensive assessment		**Final Examination**

* Formative assessment

Teaching Materials:

Textbook(s):	• Ze-Nian Li, Marks S. Drew, Jiang Chuan Liu "Fundamentals of Multimedia", 3rd Edition, Springer, 2021.
Handout(s):	• Lecture Notes, Handouts: available on Moodle.
Reference(s):	• K. Rao; Z. Bojkovic; D. Milovanovic, "Multimedia Communication Systems: Techniques, Standards, and Networks", Pearson Education, 2007. • Halsall, "Multimedia Communications", Addison-Wesley, 2001.

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Homework *	*Homework is given throughout the course to help students understand the concepts and apply various methods learned in class. Homework consists of sets of exercises from the textbook or other resources and is not graded. Solutions to homework exercises are provided as handouts.*	A1	**Formative**
Oral Enquiry*	*Students are asked to participate orally, and they are given some inquiries to answer during class time*	A1, C1, D1	**Formative**
Research Assignments and Oral Presentation	*A research assignment is assigned on the 6th week and is expected to be submitted on week 13 before the final exams. Students are required to work in groups and are asked to select a current Digital Communications application of their choice and write an essay of a minimum of 5 pages consisting of an introduction, a brief but critical literature review followed by a description of the methods and tools utilized in the selected application and a justification for their use.*	A2, B1, D1, D2	**10 %**
Quizzes (2)	*Four quizzes of twenty minutes are carried out throughout the semester and consist of problem solving.*	A1, B1, C1	**10 %**
Test (1)	*Two closed book tests, of one-hour duration, consisting of problem solving.*	A1, B1, C1	**20 %**
Lab Reports (Best 5)	*Exp #1: Sampling and Quantization*	B2, B3, C2, D1	**10 %**

	Exp #2: Voice and Audio Digitization and Sampling Rate Conversion	B2, B3, C2, D1	
	Exp #3: Color TV Transmission: Multiplexing/Demultiplexing of YIQ	B2, B3, C2, D1	
	Exp #4: Image Filtering and Transform	B2, B3, C2, D1	
	Exp #5: Image Compression	B2, B3, C2, D1	
	Exp #6: Speech and Audio Signals Compression	B2, B3, C2, D1	
	Exp #7: Motion Estimation for Video Coding	B2, B3, C2, D1	
	Exp #8: Video Streaming Over Internet	B2, B3, C2, D1	
Lab Final Exam	Lab exam of one-hour duration is carried out consisting of Simulink modeling problem.	B2, B3, C1, C2	**10 %**
Final Exam:	*Closed book, closed notes, of two hours Final Exam consisting of essay questions. The exam will cover all the topics in the course syllabus.*	A1, B1, B3, C1, D1	**40 %**
		Overall:	**100 %**

*Formative Assessment

Admissions	
Pre-requisites	ECTE 450: Digital Signal Processing
Minimum number of students	**5**
Maximum number of students	**20**

الجامعة الأهلية
AHLIA UNIVERSITY
BAHRAIN

COLLEGE OF ENGINEERING

DEPARTMENT OF TELECOMMUNICATION ENGINEERING

COURSE SYLLABUS/ SPECIFICATION

Code and Title: ECTE 421: Network Design and Security

Weight: (2 - 2 - 3)

Prerequisite: ECTE 349

NQF Level Allocated: 8 **NQF Notional Hours / Credits:** 120/12

ption: **Description:** This course provides an overall scheme for designing secure multimedia networks. It covers several models of network design such as CISCO model and top-down model including the following concepts: Application requirements Analysis, Switching Technology, Quality of Servers in terms of queuing techniques and traffic shaping. Network Security topics start with confidentiality and message integrity. Then explains the internet security protocols such as: IPSec, SSL/TLS, PGP and firewalls.

Objectives:

1. To demonstrate critical knowledge and understanding of application requirements in Network Design and Security.
2. To integrate the core theories, principles and concepts of Traffic Modelling and Security Protocols in Network Design.
3. To critically analyze and evaluate switching techniques and the QoS (Quality of Service) improvements techniques.
4. To discuss security issues in the internet.
5. To compare between the different security methods in a Network Design such as IPSec, SSL/TLS, PGP and Firewall.

Semester: Second Academic Year: 2023-2024

Instructor(s): Dr. Ammar Sami Aldallal

Office Telephone: 17298999, ext 8654

Email: aaldallal@ahlia.edu.bh

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		**NQF Descriptor/ Level**
A1.	**Concepts and Theories:** Demonstrate a critical and detailed knowledge and understanding of concepts and required theories of Network Application Requirements Analysis, Switching Technology, Traffic Modelling and QoS and Security in the internet	**Knowledge**: Theoretical understanding [Level 8]
A2.	**Contemporary Trends, Problems and Research:** Grapple with contemporary issues and investigative techniques in Network Design and Security using different security protocols such as IPSec, SSL/TLS, PGP, VPN and others.	**Knowledge**: Theoretical Understanding [Level 8]
A3.	**Professional Responsibility:** N.A	

B. Subject-specific Skills		**NQF Descriptor/ Level**
B1.	**Problem Solving:** Solve problems related to Network Switching, QoS improvements and congestion prevention and Network Security protocols.	Knowledge: Practical application [Level 8]
B2	**Modeling and Design:** Plan and design secured networks using simulation software i.e. Packet Tracer to meet desired needs within realistic engineering constraints.	Skills: Use a range of approaches to: identify and implement relevant solutions [Level 8]
B3.	**Application of Methods and Tools:** Apply standard research and investigative methods and tools to undertake defined projects of development in Network Designing and Security.	Skills: Communication, ICT and Numeracy [Level 8]

C. Thinking Skills		**NQF Descriptor/ Level**
C1.	**Analytic:** Critically analyze and evaluate issues and problems associated with Network Switching, Congestion, QoS techniques and Security protocols used in the internet with a view to practical implementation and solutions in Network designs.	Skills: Generic Cognitive Skills [Level 8]
C2.	**Synthetic:** Identify and integrate information and concepts within the common understating of Network Design to implement Secured	Competence: Context [Level 8]

	Network with respect to Application Requirement Analysis, Switching Technologies, Traffic Modelling and QoS.	
C3.	**Creative:** N.A	

D. General and Transferable Skills (other skills relevant to employability and personal development)		**NQF Descriptor/ Level**
D1.	**Communication:** Convey ideas and describe processes rigorously through oral discussions, laboratory exercises and research report related to Network Design and Security.	Skills: Communication, ICT and Numeracy [Level 8]
D2.	**Teamwork and Leadership:** Work effectively as a member of a team project on Network Design and Security to implement Secure Networks Designs with undefined and unpredictable security parameters.	Competence: Operate at a specialist level in defined and some undefined areas of work. [Level 8]
D3.	**Organizational and Developmental Skills:** N.A	
D4.	**Ethical and Social Responsibility:** N.A	

Course Structure (Outline)

Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lec.	Lab				
1	2	2	A1	**Introduction to Networking technology**	Lecture	Oral enquiry
2	2	2	A1, B1	**Application Requirements Analysis:** System Approach, Requirement Analysis, Business goal and constraints, Application types	Lecture, class discussion, in class practice-supervised work	Oral enquiry, problems set
3	2	2	A1, B1, C1	**Application Requirements Analysis:** User Requirements vs. Performance Requirements, Host requirements, Network management and migration	Lecture, class discussion, in class practice-supervised work	Exercises 1, Oral Enquiry, Problem sets, Case study
4	2	2	A1, B1	**Switching Technology:** Circuit, Packet and Message Switching	Lecture, class discussion, in class practice-supervised work	Oral enquiry, problems set
5	2	2		**Switching Technology:** Structure of Network switches	Lecture, class discussion, in class practice-supervised work,	Exercises 2, Oral Enquiry,

			A1, B1, C1, B2, B3, D1, D2	Lab1: Network Design	in lab supervised-work, practical skills laboratory, oral participation, in class group-work	Problem sets, Case study Quiz 1 Lab Report 1, in-lab exercises, oral participation, group discussions
6	2	2	A1, B1	**Traffic Modeling and QoS:** Data Traffic, Congestion, Congestion Control, Two Examples	Lecture, class discussion, in class practice-supervised work	Oral enquiry, problems set
7	2	2	A1, B1, C1,	**Traffic Modeling and QoS:** Quality of Service (QoS), Techniques to improve QoS,	Lecture, class discussion, in class practice-supervised work,	Oral Enquiry, Problem sets, Case study
8	2	2	A1, B1, C1, C2 B2, D1, D2	**Traffic Modeling and QoS:** Quality of Service (QoS), Techniques to improve QoS, Lab 2: Connectivity and Troubleshooting	Lecture, class discussion, in class practice-supervised work, in class practice-supervised work, oral participation,	Exercises 3 Oral Enquiry, Problem sets, Case study Major Exam Lab Report 2, in-lab exercises, oral participation, group discussions
9	2	2	B1, C1, C2	**Traffic Modeling and QoS:** Integrated Services, Differentiated Services, QoS in Switched Networks	Lecture, In class practice-based, in class supervised work	oral enquiry, In-class exercises, case analysis
10	2	2	B1, C1, C2	**Traffic Modeling and QoS:** Integrated Services, Differentiated Services, QoS in Switched Networks	Lecture, In class practice-based, in class supervised work	Exercises 4, In-class exercises, oral enquiry

11	2	2	A1, A2, B1, C1 C2, B2, B3 D1, D2	**Basics of computer security: Symmetric/Asymmetric Encryption** Lab 3: Routing and Security	Lecture, Class discussion, Independent learning, in class supervised work, oral participation, in class group-work	Oral Enquiry, Problem sets, Case study Lab Report 3, in-lab exercises, oral participation, group discussions
12	2	2	A2, B1, B3, C2	**Security in the Internet:** SSL/TLS	Independent learning, in class supervised work	Exercises 5, research project, in-class exercises, case analysis Quiz 2
13	2	2	A2, B1, B3, C2	**Security in the Internet:** PGP Lab 4: Introduction to Wireshark	Independent learning, in class supervised work	research project, in-class exercises, case analysis
14	2	2	A2, B1, B3, C2	**Security in the Internet:** Firewalls Lab 5: Network Security- SSL using Wireshark	Independent learning, in class supervised work in class practice-supervised work,	Exercises 6, research project, in-class exercises, case analysis, in-lab exercises, group discussions
15	2	2	A1, A2, B1, B2, B3, C1, C2, D1, D2	Submission of Research Report lab Exam Revision	Independent learning, simulation, out-of-class writing practice, group research project -	writing literature reviews and research, project, case study and analysis, research report, Final Lab Exam Oral enquiry
16			A1, B1, B3, C1, C2	**All topics**		**Final Exam**

Teaching Materials

Textbook(s): James F. Kurose and Amherst Keith Ross, “Computer Networking”, 8th Edition, 2021.

Handout(s): Lecture notes and course materials are available on Moodle.

Reference(s): B. A. Forouzan, "Data Communications and Networking", 5th edition, McGraw-Hill educations, 2013

W. Stallings, “Data and Computer Communications”, 9th edition, Pearson, 2011.

CCNA Routing and Switching Study Guide - Lammle, Todd, ©2016

Alex Kesselman, Kirill Kogan, and Michael Segal; “Packet mode and QoS algorithms for buffered crossbar switches with FIFO queuing”, Distributed Computing, Volume 23, Issue 3, pp 163-175, November 2010.

M. Sundarambal, M. Dhivya, and P. Anbalagan; “Performance evaluation of bandwidth allocation in ATM networks”, International Journal of Business Information Systems, Volume 6, Number 3, pp. 398-417, 2010.

Assessment

Type of Assessment	Description	Learning Outcomes	Weighting
Exercises*	Homework are given throughout the course to help students understand the concepts and apply various methods learned in class. Homework consists of sets of exercises from the textbook or other resources and is not graded. Solutions to homework exercises are provided as handouts .	A1, B1, B3, C1, C2, D1	Formative
Major Exam	“1.5 hours Test covering topics discussed in the class.”	A1, B1, C1, C2	20%
Quizzes (best 3 of 4)	Best two of three quizzes of 15 minutes duration each are administered throughout the semester and consist of problem solving-based short answer questions.	A1, B1, C1, C2	10%

Lab Reports (best 4 of 5)	The student has to submit the design and results obtained during the lab experiment.	B2, B3, C1, C2, D1, D2	10%
Lab Exam	One lab exam of 2 hours duration is carried out consisting of CISCO Packet Tracer modelling problem	B1, B2, B3, C1, C2	10%
Research Report (individual/group)	This project is individual or group project where each group has to write a research project about one of the network security topics	A1, A2, B3, C1, C2, D1, D2	10%
Final Exam	"Two-hour Final Exam that includes essay questions and problem solving. The exam will cover all the topics in the course syllabus".	A1, B1, B2, C1, C2	40%
		Overall:	**100%**

*Formative Assessment

Ahlia University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.ahlia.edu.bh/integrity for more information).

COLLEGE OF ENGINEERING
DEPARTMENT OF TELECOMMUNICATION ENGINEERING
COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ECTE 424 – Wireless Communications

Weight: (2 – 2 – 3)

Prerequisite: ECTE 324: Communication Systems II

NQF Level Allocated: 8 **NQF Notional Hours / Credits:** 120/12

Description: This course introduces Modern wireless communication principles and techniques. It focuses on Cellular communication fundamentals (design, interference and capacity, trunking and traffic models, air interface, propagation models and mechanisms, large/small scale fading, diversity techniques); spread spectrum coding; current and future wireless systems and standards, and an introduction to optical communication.

Objective:

1. To equip students with in-depth knowledge of wireless and mobile communications system concepts.
2. To enable students to analyze, design and implement the current generation communication systems.
3. To enhance critical insight of different wireless and mobile communication standards and multiple access techniques.
4. To develop a comprehensive radio frequency and signal processing knowledge and the knowledge of leading-edge tools and techniques for mobile communication systems.
5. To provide students with advanced knowledge and comprehensive understanding of wireless and optical communications systems and networks, their analysis and design techniques and of details of new concepts and technologies relevant to the area.
6. To simulate wireless communications systems using Simulink.

Semester: First 2023 – 2024

Instructor (s): Dr. Ali Harmouch

Office Telephone: 32021002 **Email (s):** aharmouch@ahlia.edu.bh

Intended Learning Outcomes (ILOs):

	CC.Knowledge and Understanding	NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate *in-depth* knowledge and understanding of the essential concepts and required theories of wireless communications.	**8**
A2	**Contemporary Trends, Problems and Research:** Demonstrate an informed and *critical* awareness of recent trends and understand problems that arise in the evolution of mobile and wireless communication technologies.	**8**
A3	**Professional Responsibility:** N/A	

	DD. Subject-specific Skills	NQF Descriptor/ Level
B1	**Problem Solving:** Formulate and solve *advanced* problems in the field of mobile radio propagation, large-scale path loss, small-scale fading and multipath, multiple access techniques for wireless communications.	**8**
B2	**Modeling and Design:** Model general wireless communication systems dedicated for mobile cellular systems.	**8**
B3	**Application of Methods and Tools:** *Demonstrate creativity in* the use of equipment and simulation software such as Matlab and Simulink modeling related to AMPS system, Direct-Sequence Spread Spectrum CDMA system, Wireless Communications System – Basic Notations, Delay Spread, Doppler Spread, and Diversity Techniques in Wireless Communications.	**8**

	EE. Critical-Thinking Skills	NQF Descriptor/ Level
C1	**Analytic skills:** *Critically* analyze the performance of wireless communication systems such as AMPS system, Direct-Sequence Spread Spectrum CDMA system, Wireless Communications System – Basic Notations, Delay Spread, Doppler Spread, and Diversity Techniques in Wireless Communications.	**8**
C2	**Synthetic:** Build and investigate wireless communication systems by integrating individual blocks of AMPS system, Direct-Sequence Spread Spectrum CDMA system, Wireless Communications System – Basic Notations, Delay Spread, Doppler Spread, and Diversity Techniques in Wireless Communications.	**8**
C3	**Creative Thinking and innovation:** N/A	

	FF. General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor/ Level

D1	**Communication:** Enhance communication skills through Discussions and develop *special* skills related t*o creative and critical thinking as well as problem solving.*	**8**
D2	**Teamwork and Leadership:** Work effectively as a member/leader of a project team *responsible to* plan, design, implement and evaluate a wireless communication system performance.	**8**
D3	**Organizational and Developmental Skills:** N/A	
D4	**Ethics and Social Responsibility:** N/A	

Course Structure (Outline)

Course Structure (Outline)						
Week	**Hours**		**ILOs**	**Topics**	**Teaching Method**	**Assessment Method**
	Lec.	**Lab**				
1	3	0	A1, C1	**Introduction to Wireless Communication Systems:** Evolution of Mobile Radio Communications. Examples of Wireless Communication Systems. Trends in Cellular Radio and Personal Communications. Examples of Wireless Communication Systems. Trends in Cellular Radio and Personal Communications.	Lecture	Oral Enquiry*
	3	0	A1, C1	**Multiple Access Techniques for Wireless Communications:** Frequency Division Multiple Access (FDMA). Time Division Multiple Access (TDMA). Spread Spectrum Multiple Access. Space Division Multiple Access (SDMA). Capacity of Cellular Systems.	Lecture	Oral Enquiry* Homework*
2	2	1	A1, B1, C1	**Wireless Communication Systems and Standards:** AMPS and ETACS. Second Generation (2G) Cellular Networks United States Digital Cellular (IS-54 and IS-136). Global System for Mobile (GSM). CDMA Digital Cellular Standard (IS-95). Third Generation (3G) Wireless Networks. WCDMA/CDMA2000. LTE/4G systems. Wireless Communications Research	Lecture, In-class exercises,	Oral Enquiry* **Research Assignment**
			B2, B3,		In-lab Supervised work	Lab Report #1

			C2, D1	***Exp. #1: Simulink Modeling of DSB – SC FDM System.***		
	3	0	A1, B1, C1	**The Cellular Concept - System Design Fundamentals:** Frequency Reuse. Channel Assignment Strategies. Handoff Strategies. Interference and System Capacity. Trunking and Grade of Service. Improving Coverage & Capacity in Cellular Systems.	Lecture, In-class exercises,	Oral Enquiry* Homework* **Quiz 1**
3	3	0	A1, B1, C1	Interference and System Capacity. Trunking and Grade of Service. Improving Coverage & Capacity in Cellular Systems. Properties of Electromagnetic Wave Propagation.	Lecture, In-class practice Supervised work,	Oral Enquiry* Homework*
	3	0	A1, B1, B2, C1, C2	Spread Spectrum Multiple Access. Space Division Multiple Access (SDMA). Capacity of Cellular Systems.	Lecture, In-class practice-based/supervised work	Oral Enquiry* **Quiz 2**
4	2	1	A1, B1, B2, C1, C2	Mobile Radio Propagation: Large-Scale Path Loss: Radio Wave Propagation. Free Space Propagation Model.	Lecture, In-class Practice.	Oral Enquiry* Homework*
			B2, B3, C2, D1	***Exp. #2: Direct-Sequence Spread Spectrum CDMA Simulink Model***	In-lab supervised work	Lab Report #2
	3	0	A1, B1, C1	The Three Basic Propagation Mechanisms. Reflection.	Lecture, In-class practice-	Oral Enquiry*

					based/supervised work	**TEST 1**
5	3	0	A1, B1, B2, C1 C2	Plane Earth Model: Ground Reflection (Two-Ray) Model. Diffraction. Scattering. Noise modeling.	Lecture, In-class supervised work,	Oral Enquiry* Homework*
	3	0	A1, B1, C1	Practical Link Budget Design Using Path Loss Models. Outdoor Propagation Models. Indoor Propagation Models.	Lecture, In-class practice-based/supervised work	Oral Enquiry* Homework*
6	3	0	A1, C1 A2, D1, D2	Mobile Radio Propagation: Small-Scale Fading and Multipath: Small-Scale Multipath Propagation. Impulse Response Model of a Multipath Channel. Small-Scale Multipath Measurements	Lecture, In-class practice-based /supervised work	Oral Enquiry* **Quiz 3**
	2	1	A1, B1, C1	Link budget in wireless networks. Exercises	Lecture, In-class In-lab supervised work	Lab Report #3
			B2, B3, C2, D1	***Exp #3: Wireless Communications System – Basic Notations.***		
7	3	0	A1, B1, B2, C1, C2	Parameters of Mobile Multipath Channels. Types of Small-Scale Fading. Rayleigh and Rice Distributions. Statistical Models for Multipath Fading Channels; The Doppler Effect.	Lecture, In-class practice-based /supervised work	Oral Enquiry* Homework*
	2	1	A1, B1, B2,	Modulation and Diversity Techniques for Mobile Radio: Spread Spectrum Modulation Techniques.	Lecture, In-class	Oral Enquiry*

			C1, C2		practice-based /supervised work	Homework*
			B2, B3, C2, D1	***Exp #4: Delay Spread and Doppler Spread.***	In-lab supervised work	Lab Report #4
8		2	B1, B2, B3, C1	All topics		**Lab Final Exam**
	2		A1, B1, C1, C2	All topics		**Final Exam**

* Formative assessment

Teaching Materials:

Textbook(s):	• Randy L. Haupt, "Wireless Communications Systems: An Introduction", 1st Edition, Wiley-IEEE Press, 2020.
Handout(s):	• Lecture Notes, Handouts: available on Moodle.
Reference(s):	**1. Books** **a.** Keith Q. T. Zhang, "Wireless Communications: Principles, Theory and Methodology", 1st Edition, Wiley, 2016. **b.** Theodore Rappaport, Robert Heath Jr., Robert Daniels, and James Murdock, Millimeter Wave Wireless Communications, 1st Edition, Prentice Hall, 2014. **c.** Dharma P. Agrawal and Qing-An Zeng, "Introduction to Wireless and Mobile Systems", 4th Edition, CENGAGE Learning, 2014. **d.** H. Chen and M. Guizani, "Next Generation Wireless Systems and Networks", John Wiley & Sons, 2006. **e.** Andrea Goldsmith, "Wireless Communications", 1st Edition, CENGAGE Learning, 2005. **f.** A. Molisch, "Wireless Communications", John Wiley & Sons, 2005. **g.** T. Rappaport, Wireless Communications: Principles and Practice, 2nd Edition, Prentice Hall, 2002. **2. Articles** **a.** Payaswini P., Manjaiah D.H., "Challenges and issues in 4G – Networks Mobility Management", Int. Journal of Computer Trends and Technology (IJCTT) – vol. 4, issue5-May 2013.

	b. P. Gautam, … "Review Paper on 4G Wireless Technology", Int. Journal of Advances in Science and Technology (IJAST), Vol. 2, issue 1, March 2014. **c.** S.M. Zafi, A.W. Umrani, and A.Memon, "Performance Comparison of OFDM, MC-CDMA and OFDMA for 4G Wireless Broadband Access and Beyond", PIERS Proceedings, Marrakesh, March 20-23, 2011. **3. Supplementary Materials** • Mohammed R. AbdulBari, Ahmed J. Jameel, "Performance Enhancement of LTE Transceiver using SLM and PTS PAPR Reduction Techniques", Accepted for publication in the International Journal of Wireless & Mobile Networks, July 2017. • Ahmed J. Jameel, M. Shafiei, "QoS Performance Evaluation of Voice over LTE Network", *Journal of Electrical & Electronic Systems*, Vol. 6, No. 1, pp. 1 – 10, March 2017, OMICS International. • Ahmed J. Jameel, "PAPR Reduction of Localized Single Carrier FDMA using Partial Transmit Sequence in LTE Systems", *International Journal of Computing and Network Technology*, Vol. 5, No. 1, pp. 21 – 26, January, 2017, University of Bahrain Scientific Publishing Center. • Ahmed J. Jameel, "Partial Transmit Sequence based Localized Single Carrier FDMA for PAPR Reduction in LTE Systems", *IEEE 3rd International Conference on Electrical, Electronics, Engineering Trends, Communication, Optimization and Sciences*, 1st – 2nd June 2016, Andhra Pradesh, India.

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Oral Enquiry*	*Students are asked to participate orally, and they are given some inquiries to answer during class time*	A1, C1	**Formative**
Homework *	*Homework is given throughout the course to help students understand the concepts and apply various methods learned in class. Homework consists of sets of exercises from the textbook or other resources and is not graded. Solutions to homework exercises are provided as handouts.*	A1, B1, C1	**Formative**
Research Assignments and oral presentation	*A research assignment is assigned on the 6th week and is expected to be submitted on week 13 before the final exams.* *Students are required to work in groups and are asked to select a current Wireless Communications application of their choice and write an essay of a minimum of 5 pages consisting of an introduction, a brief but critical literature review followed by a*	A1, A2, D1, D2	**10%**

	description of the methods and tools utilized in the selected application and a justification for their use.		
Lab Reports	*Exp #1: Simulink Modeling of SSB – SC FDM System.*	B2, B3, C2, D1,	**10 %**
	Exp #2: Direct-Sequence Spread Spectrum CDMA Simulink Model	B2, B3, C2, D1,	
	Exp #3a: Wireless Communications System – Basic Notations.	B2, B3, C2, D1,	
	Exp #4: Delay Spread and Doppler Spread.	B2, B3, C2, D1,	
Test (1)	*Closed book test, of a 90 minutes duration, consisting of problem solving.*	A1, B1, B2, C1, C2	**20 %**
Quizzes	*three quizzes of 30 minutes are carried out throughout the semester and consist of problem solving. The average of the best two will be awarded.*	A1, B1, C1	**10 %**
Lab Final Exam	*Lab exam of 90 minutes duration is carried out consisting of Simulink modeling problems.*	B1, B2, B3, C1, C2	**10 %**
Final Exam:	*Closed book, closed notes, of two hours Final Exam consisting of essay questions. The exam will cover all the topics in the course syllabus.*	A1, B1, B2, C1, C2	**40 %**
		Overall:	**100%**

Admissions	
Pre-requisites	ECTE 324 and PHYS 321
Minimum number of students	**5**
Maximum number of students	**20**

COLLEGE OF ENGINEERING

DEPARTMENT OF ENGINEERING

TELECOMMUNICATION

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ECTE 450 – Digital Signal Processing

Weight: (2 - 2 - 3)

Prerequisite: ECTE 224

NQF Level Allocated: Level 8 **NQF Notional Hours / Credits:** 120/12

Description: This course presents the theory and practice of digital signal processing. It covers: Discrete-time signals, sampling and reconstruction of signals, time and frequency analysis of discrete-time signals and systems, Z-transform applications to signal processing; discrete Fourier transform: properties, applications and computation methods with emphasis on fast Fourier transform; analysis and design of digital filters and DSP applications. The course concludes with a brief introduction to 2-D signal (image) processing.

Objectives: The objectives of the course are:

- To overview the concepts and advanced principles of Discrete-time signals and Systems and their properties.
- To employ transforms such as the z-transform and the Discrete Fourier Transform (DFT) in analyzing and designing discrete-time systems.
- To use efficiently the FFT algorithm in digital signal processing applications.
- To design FIR and IIR digital filters using different filter realizations and time/frequency domain specifications.
- To overview current DSP applications.
- To use specialized software tools such as MATLB DSP toolbox and Simulink to analyze and design discrete –time signals and systems.

Semester: First 2023 - 2024

Instructor: Dr. Ali Harmouch

Office Telephone: 32021002 Email: aharmouch@ahlia.edu.bh

Intended Learning Outcomes (ILOs):

GG.	Knowledge and Understanding	NQF Descriptor/ Level
A1	**Concepts and Theories:** Inculcate a detailed knowledge and critical understanding of advanced concepts of discrete –time (DT) signals and systems and the different transform-domain techniques and their use in the analysis and design of such systems.	**[Level 8]** Knowledge – Theoretical Understanding
A2	**Contemporary Trends, Problems and Research:** Demonstrate cognizance and critical understanding of modern digital signal processing techniques applied in current research in the fields of Computer Engineering and Telecommunication Engineering.	[Level 8] Knowledge – Theoretical Understanding
A3	**Professional Responsibility:** N/A	-

HH.	Subject-specific Skills	NQF Descriptor/ Level
B1	**Problem Solving:** Identify and implement relevant solutions to discrete time signals or systems problems using different transform techniques, e.g., Z-transform and Fourier Transform and convert analog signals to digital form while satisfying certain specifications.	**[Level 8]** Knowledge – Practical Application Skills - Communication, ICT and Numeracy
B2	**Modeling and Design:** Use advanced modeling schemes such difference equations, Z-domain transfer functions or delay-block diagram realizations to model and design DT systems such as FIR or IIR digital filters based on time-domain or frequency domain specifications.	**[Level 8]** Knowledge – Practical Application
B3	**Application of Methods and Tools:** Use specialized software tools such as MATLAB and Simulink to analyze and solve DSP problems and evaluate their related systems' performance.	**[Level 8]** Skills – Communication, ICT and Numeracy Knowledge – Practical Application

II.	Critical-Thinking Skills	NQF Descriptor/ Level
C1	**Analytic skills:** Critically analyze discrete-time signals and systems to determine their time-domain and frequency- domain characteristics such as frequency spectra and time/ frequency response.	**[Level 8]** Skills - Generic Problem Solving & Analytical skills
C2	**Synthetic:** Develop and critically synthesize discrete-time systems such as a FIR or IIR digital filters using appropriate filter realizations.	**[Level 8]** Skills - Generic Problem Solving & Analytical skills
C3	**Creative Thinking and innovation:** Demonstrate creativity or originality in the application of DSP techniques to design different DT systems such as digital filters with minimal realizations.	**[Level 8]** Skills - Generic Problem Solving & Analytical skills

JJ.	General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor/ Level
D1	**Communication:** Communicate clearly in a well-structured manner to convey DSP information and ideas through oral presentations and written report.	**[Level 7]** Skills – Communication,

		ICT and Numeracy
D2	**Teamwork and Leadership:** Work effectively as a member/leader of a project team on specific DSP topics, taking on significant responsibility for the work of others.	**[Level 8]** Competence – Autonomy and Responsibility
D3	**Organizational and Developmental Skills:** N/A	-
D4	**Ethics and Social Responsibility:** Demonstrate awareness and cognizance of ABET and IEEE Codes of Ethics of engineers in relation to the use and practice of Digital Signal Processing.	**[Level 7]** Competence – Autonomy and Responsibility

Course Structure (Outline)

Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lec.	Lab				
1	4	0	A1	Course Overview and Introduction to Digital Signal Processing (DSP).	Lecture Discussion	
2	2	2	A1, B1 B3, D1	Discrete-Time Signals Properties of DT signals Lab work #1: Basic Discrete Signals	Lecture Exercises Supervised Lab work	 Lab Report #1
3	4	0	A1, B1, C1	Sampling of continuous-Time signals	Lecture exercises	Homework 1* Quiz 1
4	2	2	B3, C1, D1	Discrete- Time LTI Systems: Impulse Response of DT LTI systems(convolution) Lab work #2: Sampling and Aliasing	Lecture Exercises Supervised Lab work	 Lab Report # 2
5	4	0	A1, B1, C1	Properties of DT LTI systems Difference Equation Models	Lecture Exercises	Homework 2* Quiz 2
6	4	0	A1, A2, C3, D1, D2, D4	Response of DT LTI systems Block Diagram Representation	Lecture exercises	Research Assignment
7	2	2	A1, B1, C1 B2, B3, C1, D1	The z-Transform and the Inverse Z-transform Lab work #3: Convolution and Filtering	Lecture Exercises Supervised Lab work	Quiz 3 Lab Report# 3
8	4	0	A1, B1, C1	Z-transform properties LTI system applications of z-transform.	Lecture exercises	Homework 3*
9	4	0	A1, B1, B2, C1	Fourier Transforms: Discrete Fourier Transform	Lecture exercises	Major Test

10	2	2	A1, B1, B2, C1 B2, B3, D1	Properties of the Discrete Fourier Transform Lab work #4: Z-Transform in MATLAB	Lecture exercises Supervised Lab work	Homework 4* Quiz 4 Lab Report#4
11	4	0	A1, B1, B2, C1, C3	Fast Fourier Transform and Fourier Transform applications	Lecture Exercises	Homework 5*
12	2	2	A1, B1, B2, B3, C1, C2 B2, B3, C1, D1	Introduction to Filters. Digital Filters and their realizations Lab work#5: Discrete Fourier Transform (DFT)	Lecture Exercises Supervised Lab work	Homework 6* Quiz 5 Lab Report #5
13	4	0	A1, B1, C1, C2	FIR and IIR Filters: Frequency Response Design of FIR and IIR Digital Filters	Lecture Exercises	Homework 7*
14	2	2	A1, A2 B1, C1, C2 B2, B3, C1, C2, C3, D1	Overview of some DSP applications in modern signal and image processing. Lab work #6: FIR and IIR Digital Filters	Lecture Discussion Supervised Lab work	Homework 8* Quiz 6 Lab Report #6
15	2	2	A1, A2, C3, D1, D2, D4 B2, B3 C1, C2, C3	Research Assignment Presentations All lab work	-	Oral Presentations Practical Examination (Lab exam)
16	2	0	A1, B1, B2, C1, C2, C3	All Topics		Final Examination

* Formative assessment

Teaching Materials:

Textbook(s):	Lizhe Tan, Jean Jiang," Digital Signal Processing: Fundamentals and Applications", 3th Edition, 2019, Elsevier, eBook ISBN: 9780128150726 Paperback ISBN: 978012815071
Handout(s):	Lecture Notes, Handouts: available on Moodle
Reference(s):	1. Books: a. J.G. Proakis, D.G. Manolakis, Digital Signal Processing, Pearson International Edition, 4th Edition, 2014 b. Robert J. Schilling and Sandra L Harris, Fundamentals of Digital Image Processing using MATLAB, Cengage Learning, 2011 c. R.G. Lyons, Understanding Digital Signal Processing, International Edition, Prentice Hall, 2012 d. Monson Hayes, Schaums Outline of Digital Signal Processing, McGraw-Hill Education, 2nd Edition, 2011 2. Articles:

	a. Sanjit K Mitra,'Digital Signal Processing Applications', http://www.cems.uvm.edu/~gmirchan/classes/EE275/Mitra_4/ b. Paulo S. R.Diniz,' Digital Signal Processing : Applications in Medicine" , *Electrical Engineering*, Volume I, http://www.eolss.net/sample-chapters/c05/e6- 39a-02-03.pdf c. Nasser Kehtarnavaz *et.al*, 'Teaching Digital Signal Processing on Smartphones A Mobile DSP Laboratory', http://www.engpaper.net/dsp-digital-signal- processing-research-papers-recent.htm d. Deepali Y Loni , 'DSP Based Speech Operated Home Appliances Using Ze Crossing Features', *Signal Processing: An International Journal (SPIJ)*, Volume (6) : Issue (2) , 2012, http://citeseerx.ist.psu.edu/viewdoc/download? doi=10. 1.1.233.3760&rep=rep1& type=pdf e. DSP Digital Signal Processing Research papers, http://www.engpaper.net/dsp-digital-signal-processing-research-papers-recent.htm f. Ram Sathappan , "DSP for Smart Biometric Solutions", http://www.ti.com/lit/wp/spra894a /spra894a.pdf g. Shivi Chaturvedi,"The role of digital signal processors (DSP) for 3G mobile communication systems", International Journal of Emerging Technology, http://researchtrend.net/ijet /5%20SHIVI.pdf h. ABET Code of Ethics for Engineers, www.codex.vr.se/texts/ ABET%20 Code %20of%20Ethics.doc

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Homework	*Homework is given throughout the course to help students understand the concepts and apply various methods learned in class. Homework consists of sets of exercises from the textbook or other resources and is not graded. Solutions to homework exercises are provided and made available on the course website (Moodle).*	A1, B1, B2, C1, C2, C3	Formative
Research Assignment (report and presentation)	*A research assignment is assigned on the 6th week and is expected to be submitted on week 13 before the final exams. Students are required to work in groups and are asked to select a current DSP application of their choice and write an essay of a minimum of 5 pages consisting of an introduction, a brief but critical literature review followed by a description of the DSP methods and tools utilized in the selected application and a justification for their use. Students are encouraged to implement DSP techniques and demonstrate some creativity in analyzing or implementing the techniques. The report should be concluded with a paragraph summarizing the study. Students present their findings in a 15 min presentation.*	A1, A2, C3, D1, D2, D4	10%
Major Test	*A closed book exam, of one hour and 30min duration, consisting of problem solving-based short answer questions*	A1, B1, B2, C1	20 %
Quizzes (4)	*Six quizzes of 15 minutes duration each are administered throughout the semester and consist of problem solving-based short answer questions.*	A1, B1, C1, C2	Average of best 2 quizzes 10 %

Lab Reports (6)	*Six supervised in-Lab assignments are given in which students are to use MATLAB to generate/analyze DT signals and analyze/model or design DT systems using methods learned and practiced in class. Individual Reports on the assignments are expected to be submitted within a week of the lab session.*	B2, B3, C1, C2, C3, D1	Average of 6 reports 10%
Practical (Lab) Final Exam	*Practical examination of 1-hour and 30 min duration in which the student is asked to work on parts of a number of experiments undertaken in the course.*	B2, B3 C1, C2, C3	10%
Final Examination	*Closed book, closed notes exam, of two hours duration and consists of problem solving-based short answer questions.*	A1, B1, B2, C1, C2, C3	40 %
Overall:			**100 %**

Admissions	
Pre-requisites	**ECTE 224**
Minimum number of students	**5**
Maximum number of students	**26**

الجامعة الأهلية
AHLIA UNIVERSITY
BAHRAIN

COLLEGE OF ENGINEERING

DEPARTMENT OF TELECOMMUNICATION

COURSE SYLLABUS/ SPECIFICATION

Code and Title:	ECTE 474: **Optical Communications**
Weight:	(2 – 2 – 3)
Prerequisite:	ECTE 324
Description:	The course provides an overview of optical communication system (from source to destination) with a particular focus on physical and protocol parts of optical systems. Topics include Optics and wave propagation for fiber optics, light emitting diodes and diode lasers, optical fiber, optical amplifiers, dispersion, wavelength multiplexing, detectors and noise, system architecture for optical communication. Students will then learn and understand the point-to-point optical communication concept and will be introduced to the WDM concept. Finally, GMPLS protocol will be briefly discussed.

Objectives:

The objectives of the course are to :

1. Understand fiber optic concept to information transmission and the fiber structure, wave guiding and fabrication
2. Provide advanced knowledge to Calculate and simulate the attenuation and signal degradation.
3. Deliver a critical knowledge to the structure, the performance and the signal analysis of optical sources.
4. Deliver a critical knowledge to the structure, the performance and signal analysis of optical detectors.
5. Design and evaluate the optical communication system with the concept of WDM
6. Understand the GMPLS protocol

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Semester: First

Academic Year:2023/2024

Instructor(s):Dr. Ahmed Jedidi:

Tel. 17298934

Email:ajedidi@ahlia.edu.bh

INTENDED LEARNING OUTCOMES (ILOS)

E. Knowledge and Understanding	
A1	Concepts and Theories: Demonstrate critical knowledge and understanding the optical communication system (from the source to destination).
A2	Contemporary Trends, Problems and Research: Demonstrate *critical* advance understanding of recent trends and problems that arise in the evolution of the optical communication systems.

F. Subject-Specific Skills	
B1	Problem Solving: Solve specialized problems related to optical communication such as attenuation optical fiber mode etc.
B2	Modelling and Design: modelling and conduct in-depth experiments related to optical communication system
B3	Application of Methods and Tools: Demonstrate creativity to use the different tools to design, calculate and simulate optical communication system (MATLAB, and PTDS Virtual Photonics).

G. Critical Thinking Skills	
C1	Analytic: *Critically analyse and evaluate* the outcomes of conducted experiments to understand optical communication

H. General and Transferable Skills (Other Skills Relevant to Employability and Personal Development)

D1	Communication: Convey ideas and describe processes *rigorously* through discussions during lectures and lab sessions and research project.
D2	*Teamwork and Leadership:* Work effectively as a member/leader of a project team on specific control systems topics, taking on responsibility for the work of others.

Course Structure (Outline)						
Week	**Hours**		**ILOs**	**Topics**	**Teaching Method**	**Assessment Method**
	Lec.	**Lab.**				
1	4	0	**A1**	Introduction to the optical theory	Lecture	-
2	2	2	**A1**	The evolution of fiber optic systems	Lecture In-class exercises	In-class exercises
3	2	2	**A1, B1,B2**	Optical fiber modes and configurations	Lecture In-class exercises	In-class exercises
4	2	2	**A1,B1,B3, C1**	Mode Theory and waveguide equations	Lecture	**Quiz 1**
5	2	2	**A1,B1,B3,C1**	Single-Mode and graded-index fiber structure description	Lecture Simulation tools demonstration	In-class exercises
6	2	2	**A1,B1,B2,B3,C1, D1**	Signal degradation in optical fibers	Lecture Lab session 1	**Lab report 1**
7	2	2	**A1, B1,B2,B3,C1,D2,D1**	Optical Sources	Lecture Lab session 2	

						Lab report 2
8	2	2	**A1 ,B1,B2,B3,C1, ,D1**	Photo detectors	Lecture	In-class exercises **Quiz 2**
9	2	2	**A1 ,B1,B2,B3,C1, ,D1,D2**	Optical amplifier and devices	Lecture Lab session 3	**Lab report 3** **Major Exam**
10	2	2	**A1, B1, B2, B3, C1, D2, D1**	Optical Routers	Lecture, Lab session 4	**Lab report 4**
11	2	2	**A1, B1, B2, B3, C1, D1**	Wavelength division Multiplexing (WDM)	Lecture Lab session 5	In-class exercises **Lab report 5**
12	2	2	**A1,B1, B2, B3, C1**	Optical communication system : Design and performance	Lecture,	**Quiz 3**
13	2	2	**B2, B3, C1, D1**	Generalized Multi-Protocol Label Switching (GMPLS)	Lecture,	In-class exercises
14	2	2	**B1, B2, C1,D2**	Wireless optical communication	Lecture,	In-class exercises
15	2	2	**A1, A2, B1, B2, B3,C1 ,D1,D2**	Review		**Research project/ Final Lab Exam**
16	2	0	**A1, B1, B2, C1**	All topics		**Final Exam**

TEACHING MATERIALS:

TEXTBOOK:

1- "Essentials of Modern Optical Fiber Communication", Reinhold Noé, Springer, 2016, 2 edition, ISBN: 3662496232, 9783662496237.

2- "Noises in Optical Communications and Photonic Systems", Le Nguyen Binh., CRC Press, 2016, ISBN: 1315355442, 9781315355443.

HANDOUT(S): Lecture Notes on Moodle system. `

REFERENCES:

1- R. Rejeb, M. S. Leeson and R. J. Green, Fault and Attack Management in All-Optical Networks, IEEE Communications Magazine, vol. 44, no. 11, pages 79-86, November 2006, Washington, DC, USA

2- Ahmed. Jedidi, and Mohamed Abid, Optimal Crosstalk Detection and Localization Method for Optical Time Division Multiplexed Transmission Systems Networks, Journal of telecommunication, Volume 2 issue 1, isbn 2042-8839, April 2010,London, UK

ASSESSMENT:

Type of Assessment	Description	Learning Outcomes	Weighting
In-class Exercises	The student solve problem and exercises related to the specific chapter	A1,B1,B2,C1	formative
Major Exam	"90 minutes exam covering topics discussed in the first 5 weeks".	A1, B1, B2, C1	20%
Quizzes(3)	Three quizzes are administered and the average is considered.	A1,B1	Average of 2 best quizzes 10%
Research project	The students are divided into groups and each group chooses one of many research subjects and prepares paper and presentation for the end of semester	A1,A2,B1, B2, C1, D1,	10%
Lab Reports(6)	Each student has to submit a report after each lab session :	B1, B2, B3 C1, D2, D1,	10%

	1- Dispersion in an Optical Fiber 2- Fiber Optic Communication Systems design and Simulations 3- Characteristics of light sources /detectors 4- Set up of time division multiplexing using fiber optics 5- EDFA Gains in Optical Fibers using Nonlinear Coupled Differential Equations 6- WDM Fiber Optic Direct Detection Communication Systems		
Final Lab Exam	One hour final lab exam covers lab sessions given during the semester.	B1,B2, B3, C1	10%
Final Exam	Two-hour final exam covers all the topics in the course syllabus.	A1,B1,B2,C1,	40%
		Overall:	**100%**

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الجـامـعـة الأهـلـيـة
AHLIA UNIVERSITY
BAHRAIN

COLLEGE OF ENGINEERING

COLLEGE OF INFORMATION TECHNOLOGY

COURSE SYLLABUS/ SPECIFICATION

Code and Title:	IERM 498: Research Methods in Information Technology & Engineering
Weight:	(3 - 0 - 3)
Prerequisite:	(Completion of 90 credits)
NQF Level Allocated	8
NQF Notional Hours / Credits:	**120/12**

Description: The course introduces the essential aspects of designing, supporting, and conducting a research project. It enables students to develop the capacity to conduct small, simple research projects while at the university. The course spans multiple elements, including time management, writing and presentation skills, literature search, and general considerations for experiment design and planning.

Objectives:

7. To use a significant range of experimental methods of IT/Engineering research.
8. To understand research ethics and the importance of effective time management.
9. To demonstrate with literature, search the use of electronic databases.
10. To design and write a research proposal.
11. To conduct academic report writing and research projects.
12. To discuss University guidelines for the major project: xxx 499.

Semester:	First	Academic Year:	2023/2024
Instructor(s):	Dr. Salah Al Hamad		
Telephone:	39667479		
Email:	salhamad@ahlia.edu.bh		

Intended Learning Outcomes (ILOs):

E. Knowledge and understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate critical knowledge and understanding of the concepts and theories related to research methods applied to IT and Engineering fields.	**Knowledge**: Theoretical understanding [Level 8]
A2	**Contemporary Trends, Problems, and Research:** Demonstrate creativity in applying knowledge, understanding, and/or practicing the established research methods to enable students to grapple with contemporary issues and investigative techniques in the field of IT and engineering.	**Knowledge**: Theoretical Understanding [Level 8]
A3	**Professional Responsibility:** Operate and lead multiple project tasks with personal decision-making and IT and Engineering responsibilities.	**Knowledge:** Theoretical Understanding. [Level 8]

F. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Identify techniques, quantitative and qualitative, utilize in addressing components of the research problem and, where appropriate, generate solutions using a wide range of routine skills and some advanced and specialized skills. Particular to the research discipline	**Knowledge**: Practical application [Level 8]
B2	**Modeling and Design:** Discuss and adopt various steps involved in an academic research process, including problem formulation, proposal, and academic report writing to plan defined projects of development, research, or investigation of issues and problems in IT and Engineering.	**Skills**: Generic problem-solving problem-solving & Analytical Skills [Level 8] **Knowledge**: Practical application [Level 8]
B3	**Application of Methods and Tools:** Apply standard research and investigative methods and tools to undertake defined development projects in IT and Engineering.	**Skills**: Communication and ICT [Level 8]

G. Thinking skills	NQF

		Descriptor/ Level
C1	**Analytic:** Critically analyze and evaluate complex professional-level problems and issues encountered in the articulated research problem, including diagnostics, to generate professional-level insights and interpretations pertinent to the particular discipline concerned in the field of IT and Engineering.	**Skills**: Generic problem solving & Analytical Skills [Level 8]
C2	**Synthetic:** Identify and devise solutions related to research problems and make judgments in situations where data is limited and comes from various sources through structured proposals, reports, and presentations.	**Skills**: Generic problem solving & Analytical Skills [Level 8]
C3	**Creative Thinking and Innovation:** Demonstrate originality and creativity in the formulation and tackling of the articulated research problem in a way that addresses professional-level issues associated with the particular discipline in varied contexts.	**Skills**: Informed judgments [Level 8]

H. General and Transferable Skills (other skills relevant to employability and personal development)		**NQF Descriptor/ Level**
D1	**Communication:** Convey ideas and describe processes rigorously through oral discussions and presentations related to research questions in IT and Engineering.	**Skills**: Communication and ICT [Level 8]
D3	**Organizational and Developmental Skills:** Recognize the need for and demonstrate the ability to engage in life-long learning and continuing self-development to hone professional and organizational skills.	**Competence**: Autonomy, Responsibility, and Context [Level 8]
D4	**Ethical and Social Responsibility:** Emphasis on personal and organizational ethics and accept accountability for conducting independent learning according to ethical and social norms in IT and Engineering research.	Context [Level 8] **Knowledge**: Theoretical understanding [Level 8]

Course Structure

Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lec	Lab				
1	3	0	A1	**Introduction:** General concepts	- online Lecturing -Class Discussions	* Oral Enquiry

2	3	0	A1, D1	**Research:** "A way of thinking." Research Nature, Applications of Research, and Research Process	Lecturing -Class Discussions -Independent Learning	* Oral Enquiry Final Exam
3	3	0	B2, D1	**Research:** A way of Thinking, Research design, Research Approach, Research Strategies and Scope of Work **Project outline and the project Idea**	-In-class Practice -Supervised work - Independent Learning	*** Oral Enquiry** **Project outline** **Final Exam**
4	3	0	A1, B2, B3	**The Research Process:** Quick Glance The Process, Characteristics, and Types of Research	- Lecturing -Class Discussions -In-class Practice -Supervised work	*** Participation** **Assignment 1** Final Exam
5	3	0	B2, B3, D1, D4	**The Research Process:** A Quick Glance and Research Process "Eight Step Model." **Project outline**	-In-class Practice -Supervised work - Independent Learning	*** Participation** **Project outline** **Final Exam**
6	3	0	A1, A2, C1, C2, B2, B3, D1, D4	**Reviewing the Literature** General and Specific Functions Way of searching for the Existing Literature in Areas of Study. Reviewing the Selected Resources Developing the Concept of Project Framework	Lecturing -Class Discussions -In-class Practice -Supervised work - Independent Learning	*** Participation** **Final Exam**
7	3	0	B2, B3, C1, C2	**Citation and reference list** Bibliography Sources Books, Journals, The Internet, Web Site, Magazine and Newspaper:	-In-class Practice - Independent Learning	*** Oral Participation** **Final Exam**
8	3	0	A1, A2, B2, B3, C1, D1, D4	**Research problem** Formulating a Research Problem, The Most Important Step of Research Aims	Lecturing -Class Discussions -In-class Practice	*** Enquiry** **Assignment 2** **Final Exam**

				Objectives and Research Question	-Supervised work - Independent Learning	
9	3	0	A3, D1	**Writing a research proposal** - Concept of a research design - Use of appropriate methods - Main function of research design - Selection of an appropriate research design. **Midterm Test**	-Lecturing -Class Discussions -Independent Learning	*** Oral Participation** **Final Exam** **Midterm Test**
10	3	0	B2, B3, C1, C2, D1, D4	**Way of Writing Abstract** Summary of the entire work project work – Aim, Scope, Methodology, and result.	-In-class Practice - Independent Learning	***Oral Participation** **Assignment 2** **Final Exam**
11	3	0	A3, B2, B3, C1, C2, D1, D4	**Academic report writing – Way of developing.** Developing an outline Idea and quality of the work Project or research constraints Project outline	Lecture, Group Discussion	*** Oral Enquiry** **Assignment 2** **Final Exam**
12	3	0	A3, B2, B3, D1, D4	**Project Poster and Presentation Skills** Poster and presentation templates and guidelines	-Lecturing -Class Discussions -In-class Practice Supervised work - Independent Learning	*** Oral Participation** **Final Exam**
13	3	0	A1, A3, B1, B2, B3, C1, C2, C3, D1, D4	**University Guidelines for the Major Project 499**	-Lecturing -Class Discussions -In-class Practice -Supervised work - Independent Learning	*** Oral Participation** **Assignment 2** **Final Exam**

14	3	0	A1, A3, B1, B2, B3, C1, C2, C3, D1, D4	**Proposed Project and project Presentation**	-Individual and group Presentation	*** Oral Participation Project**
15	3	0	A1, A2, B1, B2, B3, C1, C2, D3, D4	**Revision**	-Class Discussions -In-class practice	*** Oral Participation**
16			A1, A2, B1, B2, B3, C1, C2, D3, D4	**Comprehensive Assessment**		**Final Exam**

*Formative Assessment

TEACHING MATERIALS:

TEXTBOOK(S):	Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners 5th Edition, Sage Publications Ltd, 5th edition, 2019.
HANDOUT(S):	The material provided in eLearning (Moodle)
REFERENCE(S):	- Shyama Prasad Mukherjee, A Guide to Research Methodology: An Overview of Research Problems, illustrated edition, CRC Press, 2019. - Safiah Sidek, Writing A Research Proposal 1st Edition, UTeM Press Malaysia, 2019 - Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, Sage Publications Ltd, 4th edition, 2014. - William, Trochim & James P. Donnelly, The Research Methods Knowledge Base, Atomic Dog, 3rd edition, 2007. - University Guideline for the significant project: xxx 499. In addition to the following references, students are free to choose other specialized references within their field that support their research studies and dissertations in consultation with their supervisors.

ASSESSMENT

Type of Assessment	Description	Learning Outcomes	Weighting
Assessment (Midterm Test) 20%	Midterm test include topics covered over each of the 9-week periods which includes researching a Way of Thinking, research process, reviewing the literature, formulating a research problem, critical step of research aims, objectives, research question, citation for a reference list, and way of writing abstract	A1, A2, A3, B1, B3, C1, C2, C3, D3, D4	**20 %**

Assignments 1 **8%**	The first assignment is about how to formulate a research problem, write a research objective, and formulate research questions or hypotheses.	A1, A2, B1, B3, C1, C2, C3, D4	**8 %**
Assignments 2 **8%**	The students shall refer to the dummy articles' (from Moodle) context to practice and construct the Article's Aim and objectives, Articles Scope, or Hypotheses, Articles Methodology Adopted, Methods/Techniques used for Analyses, to outline an effective poster and PowerPoint presentation with careful planning and design.	A1, A3, B2, C1, C2, D1, D4	**8 %**
Assessment (Presentation and Poster Skills) **8%**	The assessments include Project, Poster, and Presentation skills for IT and Engineering students. Students must submit and present an A1 size landscape poster as per the poster and presentation template	A1, A3, B1, B2, B3, C1, C2, C3, D1, D4	**8%**
Project report **16%**	Students will systematically refer to different resources to develop a research proposal in line with the University Guidelines for the report and presentation. The research proposal should contain the following: - Titles related to the students filed. - Abstract - Three Chapters (Introduction, Literature, and Methodology) with standard references	A1, A3, B1, B2, B3, C1, C2, C3, D1, D4	**16%**
Final Examination **40%**	**Two Hours** Essay exam, which covers all the topics in the course syllabus.	A1, A2, B1, B2, B3, C1, C2, D3, D4	**40%**
		Overall:	**100%**

Admissions	
Prerequisites	None
Minimum number of students	**5**

Maximum number of students	**20**

COLLEGE OF ENGINEERING

DEPARTMENT OF TELECOMMUNICATION ENGINEERING

COURSE SYLLABUS/ SPECIFICATION

Code and Title:	INTR 462 – BSMNE Internship
Weight:	(0 - 0 - 3)
Prerequisite:	Completion of at least 90 Credits and CGPA ≥ 2.0
Description:	The main objective of the Internship is to integrate the concepts that students learn in the Mobile and Network Engineering programme with practical experience by providing a training program that supplements and complements classroom work.
Objectives:	The BSMNE internship is a form of experiential learning that aims :

1. To provide students from the college with an opportunity to integrate knowledge, skills and competencies learned in the classroom with practical application and skills enhancement in a related work-based/professional environment.

2. To give students an opportunity to gain experience in a work environment and to network with professionals in the field of Mobile and Network Engineering.

3. To enhance student employability and at the same time to build relationships between the university, businesses and the local community. To give employers an opportunity to guide and also evaluate future talent in the field of Networking and Wireless Communication.

Semester: **Academic Year:**

Instructor(s):

Office Hours:

Tel.

Email:

INTENDED LEARNING OUTCOMES (ILOS)

I. Knowledge and Understanding	
A1	**Concepts and theories:** Gain insight into the practical application of concepts and theories of jobs related to Mobile and Network Engineering. Appreciate limitations inherent in those theories in a practical setting.
A2.	**Contemporary Trends, problems and Research:** N/A
A3.	**Professional responsibility** Demonstrate awareness of business professional etiquette while carrying out during the achievement of internship responsibilities including a holistic appreciation of day-to-day obligations as a practitioner in the field of Networking and Wireless Communications. Demonstrate knowledge and understanding of decision-making processes, power-sharing and work colleague interaction, as well accountability and feedback processes in the organization and in relation to its vision and mission.

J. Subject-Specific Skills	
B1	**Problem solving:** Use numerical and technical skills to solve practical real-world problems encountered in the use of Mobile and Network Engineering hardware and software.
B2	**Modeling and design:** N/A
B3	**Application of methods and tools:** Use technical, software and some programming skills to build, solve and maintain practical applications or solutions related to Mobile and Network Engineering.

K. Critical Thinking Skills	
C1	**Analytic:** Apply skills of internal and external criticism, employ logic and, where appropriate, interpret output of crunched numeric data utile in a decision-making process in the field of Mobile and Network Engineering.
C2	**Synthetic:** Draw together information and, where relevant, output of analysis, to yield cogent conclusions in the field of Mobile and Network Engineering.
C3	**Creative:** Think out of the box as an aid to generating innovative solutions in the field of Mobile and Network Engineering.

L. General and Transferable Skills (Other Skills Relevant to Employability and Personal Development)	
D1	**Communication:** Communicate effectively orally and written to a variety of stakeholders of the organization (spanning end-users of technology, managers without engineering backgrounds, non-MNE engineers and peer and senior-level MNE engineers) who manifest different levels of technical expertise and knowledge.
D2	**Teamwork and Leadership:** Take part, where applicable, in designated team-work, shouldering burdens, as part of a team that adds value to group output in the organization. Exercise initiative to support, encourage and contribute to the output of

	other team members fostering a positive team environment
D3	**Organizational and development skills:** Demonstrate skills utile to keeping organized and meeting deadlines and develop a facility to learn on the job. Such organizational skills may include storing and presenting data and the use of logical diagrams (flow charts, timelines)
D4	**Ethics and Social Responsibility**: Perform job functions in light of ethical and social norms in a way that contributes to the social responsibility of the organization.

Teaching Materials

Handout(s): Ahlia University Undergraduate Internship Programme Guidelines.

Assessments: The student will be given grade PASS or FAIL based on his/her total points achieved on the undertaken Tasks. A letter grade P will be issued for the student if he/she obtained 70 points or more on the tasks shown above in the grading Scheme table and a letter grade F if he/she obtained less than 70 points.

Type of Assessment	**Description**	**Learning Outcomes**	**Weighting**
Site Supervisor Mid Evaluation	The site supervisor evaluates the student after the completion of the first month of the internship period and assesses the student personal qualities and professional skills. A 5-points scale is used to evaluate the student. The assessment is based on the quality of the work done, the attitude demonstrated by the student as well as the site supervisor continuous contact with the student and the academic supervisor during the internship period. The completed form is discussed with the student to help him/her in his/her professional development.	A3 B1, B3 C1, C2, C3 D1, D2, D3, D4	25%
Site Supervisor Final Evaluation	The site supervisor evaluates the student after the completion of the internship period. The evaluation form consists of two parts. In the first part, a 5-points scale is used to evaluate the student personal qualities and professional skills. The second part of	A3 B1, B3 C1, C2, C3	25%

Type of Assessment	Description	Learning Outcomes	Weighting
	the evaluation consists of two questions concerning the student strengths and weaknesses as well as the site supervisor recommendations to prepare the student for the workplace. The assessment is based on the quality of the work done, the attitude demonstrated by the student as well as the site supervisor continuous contact with the student and the academic supervisor during the internship period. The completed form is discussed with the student to help him/her in his/her professional development.	D1, D2, D3, D4	
Academic Supervisor Evaluation	The academic supervisor evaluates the student after the completion of the internship period and assesses the student personal qualities and professional skills. A 5-points scale is used to evaluate the student. The assessment is based on the two site visits conducted by the academic supervisor to the student as well as the academic supervisor continuous contact with the student and the site supervisor during the internship period. The completed form is discussed with the student to help him/her in his/her professional development.	A3 B1, B3 C1, C2, C3 D1, D2, D3, D4	10%
Monthly Reports (2)	The student must write his activities weekly in the log book (via Moodle). Where the student describe by details each activity or mission achieve during his internship.	A1, D1,	2* 10%
Student Final Report	After the completion of the internship, the student must write a final report of 10 – 15 pages to be submitted to the academic supervisor 3 days before the day of the oral presentation. The report should consist of the following: ▪ Introduction: A brief outline of the Internship programme, the name of the employing company, the names of the academic and site supervisors.	A1, B1, C1, D1, D3, D4	15%

Type of Assessment	Description	Learning Outcomes	Weighting
	▪ The employing organization: Its set-up, objectives, working operations and role. ▪ Work specifications: The need for, nature of, and objectives of the tasks assigned to the student during the Internship. ▪ Relevance/Usefulness: On how useful the programme was to the student and to the employing organization and comments on the use made of theoretical knowledge acquired in the BSCCE courses taken prior to the internship. ▪ Discussion: Of the value of the Internship, including any suggestions for change or improvement. ▪ References: A list of books, websites,		
Oral presentation	Oral presentation of 10 minutes in length delivered by the student one week after the student has finished the internship. The assessment of the presentation is performed by a committee composed of two college faculty members.	D1, D3	5%
		Overall	**100%**

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