College of Engineering

Department of Computer Engineering

ECCE courses Syllabi

الجامعة الأهلية
AHLIA UNIVERSITY
BAHRAIN

COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

COURSE SYLLABUS / SPECIFICATION

COURSE CODE & TITLE: ECCE 201 – ELECTRIC CIRCUITS

WEIGHT: (2 - 2 - 3)

PREREQUISITE: PHYS 121 & MATH 102

NQF LEVEL ALLOCATED: 6

NQF NOTIONAL HOURS / CREDITS: 120 NOTIONAL HOURS / 12 NQF CREDIT

DESCRIPTION: THIS COURSE PROVIDES ELECTRICAL CIRCUIT ANALYSES. IT INCLUDES THE FOLLOWING TOPICS: ELECTRICAL CIRCUITS OVERVIEW, BASIC LAWS: OHM'S, KVL, KCL, AND POWER CALCULATIONS, RESISTIVE CIRCUITS: VOLTAGE AND CURRENT DIVIDER RULES. DEPENDENT SOURCES, CIRCUIT ANALYSIS TECHNIQUES: NODAL AND MESH ANALYSIS. NETWORK THEOREMS: THE VENIN'S & NORTON'S, SOURCE TRANSFORMATION, SUPERPOSITION, MAXIMUM POWER TRANSFER. TRANSIENT ANALYSIS OF RC, RL AND RLC CIRCUITS, SINUSOIDS & PHASORS, IMPEDANCE & ADMITTANCE, AC MESH & NODAL ANALYSIS, AC POWER ANALYSIS.

OBJECTIVES:

1. TO OVERVIEW COMMON ELECTRICAL CIRCUIT ELEMENTS.
2. TO INTRODUCE DIFFERENT ANALYSIS TECHNIQUES IN BOTH AC AND DC CIRCUITS.
3. TO EXPLAIN THE CONCEPTS OF PHASORS, IMPEDANCE AND ADMITTANCE.
4. TO INTRODUCE AC MESH AND NODAL ANALYSIS AND AC POWER ANALYSIS.
5. TO APPLY CIRCUIT THEOREMS: SUPERPOSITION, THEVENIN'S, NORTON'S, MAXIMUM POWER.

SEMESTER: SECOND **ACADEMIC YEAR:** 2023 - 2024

INSTRUCTOR(S): MAHA AL-SADOON **EMAIL(S):** malsaadoon@ahlia.edu.bh

OFFICE TEL.: 17298999 **EXT.** 8678

INTENDED LEARNING OUTCOMES (ILOS)

A. KNOWLEDGE AND UNDERSTANDING	NQF DESCRIPTOR / LEVEL
A1. Concepts and Theories: Understand the concepts and theories used in DC and AC electric circuits: Basic laws, Mesh and Nodal Analysis, Circuits theorems (Superposition, Thevenin and Norton's theorem).	**Knowledge**: theoretical understanding [Level 6]
A2. Contemporary Trends, Problems and Research: N/A	**-**
A3. Professional Responsibility: N/A	**-**

B. SUBJECT-SPECIFIC SKILLS	NQF DESCRIPTOR / LEVEL
B1. Problem Solving: Solve advanced DC and AC circuit problems using various analysis techniques.	**Skills:** Communication, ICT and Numeracy [Level 6] **Knowledge:** Practical Application [Level 6]
B2. Modeling and Design: Build AC and DC circuits using appropriate lab equipment.	**Knowledge:** Practical Application [Level 6]
B3. Application of Methods and Tools: Apply circuit theorems to analyze DC and AC electrical circuits. Use appropriate hardware to test and visualize the performance of AC and DC circuits (in the lab).	**Skills:** Communication, ICT and Numeracy [Level 6] **Knowledge:** Practical Application [Level 6]

C. CRITICAL THINKING SKILLS	NQF DESCRIPTOR / LEVEL
C1. Analytic: Evaluate relevant problems and solve for electrical quantities in DC and AC electric circuits using different analysis techniques.	**Skills:** Generic, Problem Solving and Analytical Skills [Level 6]
C2. Synthetic: Formulate solutions to Build DC and AC circuits using basic components in the lab.	**Skills:** Generic, Problem Solving and Analytical Skills [Level 6]
C3. Creative: N/A	**-**

D. GENERAL AND TRANSFERABLE SKILLS	NQF DESCRIPTOR / LEVEL
D1. Communication: Present solutions to problems in appropriate written and /or oral form.	**Skills:** Communication, ICT and Numeracy [Level 6]

D2. Teamwork and leadership: N/A	**-**
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
	LEC	LAB				
1	4	0	A1, B1, C1, D1	Basic concepts: Charge and Current, Voltage, Resistance, Power, Energy, Circuit Elements	Lecture, Oral Participation	*Homework *Oral Inquiry
2	4	0	A1, B1, C1, D1	Basic Laws: Ohm's Law, Kirchhoff's Voltage and Current Law, Series Circuits and Voltage Divider Rule	Lecture, Practical Exercises, Oral Participation	*Homework *Oral Inquiry
3	2	2	A1, B1, B2, B3, C1, C2, D1	Basic Laws: Parallel Circuits and Current Divider Rule, Wye-Delta Transformations	Lecture, Practical Exercises, Lab Session # 1, Oral Participation	*Homework *Oral Inquiry Lab # 1 Report
4	4	0	A1, B1, C1, D1	Methods of Analysis: Nodal Analysis, Nodal Analysis with Voltage Sources	Lecture, Practical Exercises, Oral Participation	*Homework *Oral Inquiry
5	2	2	A1, B1, B2, B3, C1, C2, D1	Methods of Analysis: Mesh Analysis, Mesh Analysis with Current Sources	Lecture, Practical Exercises, Lab Session # 2, Oral Participation	*Homework *Oral Inquiry Lab # 2 Report
6	4	0	A1, B1, C1, D1	Circuit Theorems: Superposition, Source Transformation	Lecture, Practical Exercises, Oral Participation	*Homework *Oral Inquiry Quiz # 1
7	2	2	A1, B1, B2, B3, C1, C2, D1	Circuit Theorems: Thevenin's theorem, Norton's Theorem, Maximum Power Transfer	Lecture, Practical Exercises, Lab Session # 3, Oral Participation	*Homework *Oral Inquiry Lab # 3 Report

8	4	0	A1, B1, B3, C1, D1	Capacitors and Inductors: Definitions, Series and Parallel Capacitors, Series and Parallel Inductors	Lecture, Practical Exercises, Oral Participation	*Homework *Oral Inquiry Quiz # 2
9	4	0	A1, B1, C1, D1	First Order Circuit: Introduction, The Source-Free RC Circuit, The Source-Free RL Circuit, Step Response of an RC Circuit, Step Response of an RL Circuit.	Lecture, Practical Exercises, Oral Participation	*Homework *Oral Inquiry Major Exam
10	4	0	A1, B1, C1, D1	Sinusoids and Phasors: Introduction, Sinusoids, Phasors, Phasor Relationships for Circuit Elements, Impedances and Admittances,	Lecture, Practical Exercises, Oral Participation	*Homework *Oral Inquiry
11	2	2	A1, B1, B2, B3, C1, C2, D1	Sinusoids and Phasors: Kirchhoff's Laws in the Frequency Domain, Impedances Combinations	Lecture, Practical Exercises, Lab Session # 4, Oral Participation	*Homework *Oral Inquiry Lab # 4 Report
12	4	0	A1, B1, B2, B3, C1, D1	Sinusoidal Steady State Analyses: Introduction, Nodal Analysis, Mesh Analysis, Superposition Theorem	Lecture, Practical Exercises, Oral Participation	*Homework *Oral Inquiry
13	2	2	A1, B1, B2, B3, C1, C2, D1	Sinusoidal Steady State Analyses: Source Transformation, Thevenin and Norton Equivalent Circuits	Lecture, Practical Exercises, Lab Session # 5, Oral Participation	*Homework *Oral Inquiry
14	4	0	A1, B1, C1, D1	AC Power Analysis: Introduction, Instantaneous and Average Power, Apparent Power and Power Factor	Lecture, Practical Exercises, Oral Participation	*Homework *Oral Inquiry
15	2	2	A1, B1, B2, B3, C1, C2	Review Session	Review	Final Lab Exam, Final Exam

*FORMATIVE ASSESSMENTS

TEACHING MATERIALS:

TEXTBOOK(S):	1. Chopherris K. Alexander and Matthew N. O. Sadiku, "Fundamentals of Electric circuits", International 7th Edition, McGraw Hill, 2021. 2. W. Hayt, J. Kemmerly and S. Durbin, "Engineering Circuit Analysis", 9th Edition, McGraw Hill, 2019.
HANDOUT(S):	Lecture Notes, Handouts Available on Ms Teams ECCE 201 channel
REFERENCE(S):	**1.** James W. Nilsson and Susan A. Riedel, "Engineering Circuit Analysis" 10th Edition, Pearson, 2020. **2.** Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits" 9th Edition, John Wiley & Sons, 2013.

ASSESSMENT:

TYPE OF ASSESSMENT	DESCRIPTION	LEARNING OUTCOMES	WEIGHTING
*ORAL INQUIRY	*The students will be asked random questions to assess their understanding and knowledge*	D1	*FORMATIVE
*HOMEWORK	*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.*	A1, B1, C1	*FORMATIVE
QUIZZES (2)	*Two quizzes of 20 minutes are given and consist of problem solving. (Marks of best quiz is considered).*	A1, B1, C1	10 %
MAJOR EXAM	*Closed book test, of 90 minutes duration, consisting of problem solving-based short answer questions (SAQs).*	A1, B1, C1	20 %
LAB REPORTS (5)	*Five experiments are offered in the course using kits and Matlab simulation and cover all topics of the course.* ***Lab#1**: Resistors and Ohm's Law* ***Lab#2:** Kirchhoff's Law* ***Lab#3:** Superposition Theorem*	A1, B1, B2, B3, C1, C2, D1	15 %

	***Lab#4**: Thevenin's and Norton's Theorem* ***Lab#5**: Oscilloscope Familiarization* *Consider the best four.*		
FINAL LAB EXAM	*One-hour practical exam using kits and Matlab Simulink that covers all the experiments taken in the course.*	B1, B2, B3, C1, C2	15 %
FINAL EXAMINATION	*Closed book, closed notes exam, of two hours duration and consists of problem solving-based short answer questions (SAQs).*	A1, B1, C1	40 %
		OVERALL:	**100 %**

ADMISSIONS:

PRE-REQUISITES	MATH 102, PHYS 121
MINIMUM NUMBER OF STUDENTS	5 STUDENTS.
MAXIMUM NUMBER OF STUDENTS	20 STUDENTS

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COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

COURSE SYLLABUS / SPECIFICATION

COURSE CODE & TITLE: ECCE 203 – DIGITAL LOGIC

WEIGHT: (2 - 2 - 3)

PREREQUISITE: ITCS 101

NQF LEVEL ALLOCATED: 6

NQF NOTIONAL HOURS / CREDITS: 120 NOTIONAL HOURS / 12 NQF CREDIT

DESCRIPTION: THIS COURSE INTRODUCES CONCEPTS AND IDEAS OF DIGITAL LOGIC ESIGN. IT COVERS: NUMBERING SYSTEMS, BOOLEAN ALGEBRA, LOGIC GATES AND COMBINATIONAL LOGIC CIRCUITS ANALYSIS, COMBINATIONAL NETWORK DESIGN. MSI INTEGRATED CIRCUITS IN COMBINATIONAL NETWORKS DESIGN, AND SEQUENTIAL CIRCUITS ANALYSIS AND DESIGN. INTRODUCTION TO BASIC PLDS, CPLDS, AND FPGAS, INTRODUCTION TO STATE MACHINES AND SYSTEM DESIGN WITH STATE MACHINES USING VHDL.

OBJECTIVES:

6. TO GAIN THE KNOWLEDGE OF NUMBER SYSTEM, SIGNED BINARY NUMBERS, BINARY ARITHMETIC AND BINARY CODES.
7. TO UNDERSTAND THE BASICS OF BOOLEAN ALGEBRA, ITS SIMPLIFICATION TECHNIQUES, DESIGN AND ANALYSIS OF COMBINATIONAL LOGIC CIRCUITS.
8. TO BE ABLE TO DESIGN SIMPLE LOGIC NETWORKS USING STANDARD COMBINATIONAL LOGIC MODULES.
9. TO DESIGN AND ANALYZE SIMPLE SEQUENTIAL CIRCUITS SUCH AS COUNTERS AND REGISTERS.
10. TO REINFORCE THE THEORY AND TECHNIQUES TAUGHT IN THE CLASSROOM THROUGH LABORATORY EXPERIMENTS AND COMPUTER-BASED SIMULATION PROGRAM.

SEMESTER: SECOND **ACADEMIC YEAR:** 2023 - 2024

INSTRUCTOR(S): MAHA AL-SADOON **EMAIL(S):** malsaadoon@ahlia.edu.bh

OFFICE TEL.: 17298999 **EXT.** 8672

INTENDED LEARNING OUTCOMES (ILOS)

E. KNOWLEDGE AND UNDERSTANDING	NQF DESCRIPTOR / LEVEL
A1. Concepts and Theories: Demonstrate the understanding of concepts and theories of digital logic including logical gates, combinational and synchronous sequential logic circuits.	**Knowledge**: theoretical understanding [Level 6]
A2. Contemporary Trends, Problems and Research: N/A	**-**
A3. Professional Responsibility: N/A	**-**

F. SUBJECT-SPECIFIC SKILLS	NQF DESCRIPTOR / LEVEL
B1. Problem Solving: Use appropriate mathematical skills to describe, analyze, and solve problems in number system, Boolean algebra and logic circuit design.	**Skills:** Communication, ICT and Numeracy [Level 6] **Knowledge:** Practical Application [Level 6]
B2. Modeling and Design: Design simple combinational and synchronous sequential logic circuits using standard combinational logic modules.	**Knowledge:** Practical Application [Level 6]
B3. Application of Methods and Tools: Apply Boolean algebra and simplification techniques to manipulate Boolean Equations and to express them in the general canonical form. Build and simulate simple logic circuits using various digital components and modules.	**Knowledge:** Practical Application [Level 6]

G. CRITICAL THINKING SKILLS	NQF DESCRIPTOR / LEVEL
C1. Analytic: Analyze simple systems related to digital logic.	**Skills:** Generic, Problem Solving and Analytical Skills [Level 6]
C2. Synthetic: Synthesize and build Simple logic circuits using various digital components and modules.	**Skills:** Generic, Problem Solving and Analytical Skills [Level 6]
C3. Creative Thinking and innovation: N/A	**-**

H. GENERAL AND TRANSFERABLE SKILLS	NQF DESCRIPTOR / LEVEL

D1. Communication: Express and communicate ideas and experimental results in written and oral form.	**Skills:** Communication, ICT and Numeracy [Level 6]
D2. Teamwork and leadership: N/A	-
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
	LEC	LAB				
1	4	0	A1, B1, C1	Digital Systems and Binary Numbers: Digital Systems, Binary Numbers, Number-Base Conversions, Octal and Hexadecimal Numbers.	Lecture	*Homework *Oral Inquiry
2	2	2	A1, B1, C1, D1	Digital Systems and Binary Numbers: Complements of Numbers, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic.	Lecture Lab Demonstration	*Homework *Oral Inquiry
3	2	2	A1, B1, B2, B3, C1, C2, D1	Boolean Algebra and Logic Gates: Introduction, Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Boolean Functions.	Lecture / Practical exercices Lab Session # 1 Oral Participation	*Homework *Oral Inquiry
4	2	2	A1, B1, B2, B3, C1, C2, D1	Boolean Algebra and Logic Gates: Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.	Lecture / Practical exercices Lab Session # 2 Oral Participation	*Homework *Oral Inquiry Quiz 1
5	4	0	A1, B1, B2, B3, C1	Gate-Level Minimization: Introduction, The MAP Method, Four-Variable K-	Lecture / Practical exercices Oral Participation	*Homework Lab # 1, 2 Report

				Map, Product-of-Sum Simplification, Don't-Care Conditions.		
6	2	2	A1, B1, B2, B3, C1, C2, D1	Gate-Level Minimization: NAND and NOR Implementation, Other Two-Level Implementations, Exclusive-OR Function.	Lecture / Practical exercices Lab Session #3 Oral Participation	*Homework *Oral Inquiry
7, 8	6	2	A1, B1, B2, B3, C1, C2, D1	Combinational Logic: Introduction, Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator.	Lecture / Practical exercices Lab Session #4 Oral Participation	Lab # 3 Report *Oral Inquiry Quiz 2
9, 10	6	2	A1, B1, B2, B3, C1, C2, D1	Combinational Logic: Decoder, Encoder, Multiplexers.	Lecture / Practical exercices Lab Session #5 Oral Participation	*Oral Inquiry Lab # 4 Report Major Exam
11, 12	6	2	A1, B1, B3, C1, D1	Synchronous Sequential Logic: Introduction, Sequential Circuits, Storage Elements: Latches, Storage Elements: Flip-Flops, Analysis of Clocked Sequential Circuits.	Lecture / Practical exercices Lab Session #6	*Oral Inquiry Lab # 5 Report
13	2	2	A1, B1, B2, B3, C1, C2	Registers and Counters: Registers, Shift Registers, Synchronous Counters.	Lecture	Lab # 6 Report
14	2	2	A1, B1, B2, B3, C1, C2, D1	Memory and Programmable Logic: Introduction, Random Access Memory, Memory Decoding, Read-Only Memory.	Lecture / Practical exercises Oral Participation	*Homework *Oral Inquiry

15	2	2	A1, B1, B2, B3, C1, C2, D1	Review Session All Topics	Review	Final Lab Exam, Final Exam

*FORMATIVE ASSESSMENTS

TEACHING MATERIALS:

TEXTBOOK(S):	Stephen Brown and Zvonko Vranesic, "*Fundamentals of Digital Logic with VHDL Design*", McGraw Hill, 4th International Edition, 2023
HANDOUT(S):	Lecture Notes, Handouts Available on Ms Teams "ECCE 203" channel
REFERENCE(S):	**3.** M. Morris Mano and Michael D. Ciletti, "*Digital Design*", Pearson, 6th Edition, 2019. **4.** John F. Wakerly, "*Digital Design: Principles and Practices*", Pearson, 5th Edition, 2018.

ASSESSMENT:

TYPE OF ASSESSMENT	DESCRIPTION	LEARNING OUTCOMES	WEIGHTING
*ORAL INQUIRY	*The students will be asked random questions to assess their understanding and knowledge*	D1	*FORMATIVE
*HOMEWORK	*Homeworks are given throughout the course to help students understand the concepts and apply various methods learned in the lecture. Homework consists of sets of exercises from the textbook or other resources.*	A1, B1, C1	*FORMATIVE
QUIZZES (2)	*Two quizzes of 20 minutes are given consist of problem solving. And take the average.*	A1, B1, B3, C1, C2	10 %
MAJOR EXAM	*90 minutes duration, consisting of problem solving-based short answer questions (SAQs).*	A1, B1 B3, C1, C2	20 %

LAB REPORTS (6)	*Six experiments using kits in addition to Miltisim simulation are offered in the course and cover all topics of the course.* ***Lab#1**: Logic Gates* ***Lab#2:** Universal Gates* ***Lab#3:** De-Morgan's Theorem* ***Lab#4**: Seven Segment Decoder* ***Lab#5**: Adder and Subtractor* ***Lab#6**: Multiplexer/ Demultiplexer* *Consider the best five Labs*	A1, B2, B3, C1, C2, D1	15 %
FINAL LAB EXAM	*One-hour practical exam using Simulink tool that covers all the experiments taken in the course.*	A1, B1, B2, B3, C1, C2, D1	15 %
FINAL EXAMINATION	*Two hours duration and consists of problem solving-based short answer questions (SAQs).*	A1, B1, B2, B3, C1, C2	40 %
		OVERALL:	**100 %**

ADMISSIONS:

PRE-REQUISITES	ITCS 101
MINIMUM NUMBER OF STUDENTS	5 STUDENTS.
MAXIMUM NUMBER OF STUDENTS	20 STUDENTS

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UNDER THE CODE OF STUDENT CONDUCT AND DISCIPLINARY PROCEDURES (SEE WWW.AHLIA.EDU.BH/INTEGRITY FOR MORE INFORMATION).

COLLEGE OF ENGINEERING
DEPARTMENT OF COMPUTER
COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ECCE 221 / Electronic Circuits

Weight: 2-2-3

Prerequisite: ECCE 201

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

Description: This course introduces Analog electronic devices and some relevant concepts of Digital Electronics. It includes topics such as diodes (diode concepts, rectifier, and wave shaping circuits), Bipolar Junction Transistors (BJT's), Field Effect Transistors (JFET, MOSFET), DC biasing IV characteristics. Operational Amplifiers and active filters. TTL and CMOS Logic, Digital-to-Analog, and Analog-to-Digital converters.

Objective:

- To explain the operation of the main analog electronic devices (Diodes and Transistors) and introduce their most common applications.
- To employ circuit analysis techniques to determine the operational characteristics of diodes and transistor circuits.
- To design diode and amplifier circuits based on desired specifications.
- To use circuit simulation tools such as Pspice and laboratory equipment to understand the operation of basic electronic devices and circuits.
- To understand the concept and operation of operational amplifiers and their most common applications
- To introduce basic discrete electronic circuits.

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

Instructor (s): Dr Ali Harmouch

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

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Understand advanced knowledge of fundamental concepts of Electronics, particularly the operations of electronic devices and circuits such as Diodes and Transistors (BJT, JFET, MOSFET) circuits.	**Knowledge**: Theoretical Understanding/ [Level 7]
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:** Use advanced level of circuit analysis techniques to solve electronic circuits' problems, such as DC biasing and AC analysis of diodes, transistors, and amplifiers.	**Knowledge:** Practical Application **Skills:** Communication, ICT & Numeracy/ [Level 7]
B2	**Modeling and Design:** Design a circuit (a diode clipper/clamper, BJT/JFET amplifier, or operational amplifier) based on desired specifications such as limiting voltage, input resistance, or voltage/current gain.	**Knowledge:** Practical Application/ [Level 7]
B3	**Application of Methods and Tools:** Use circuit modeling software such as PSICE to analyze the circuits and predict their operation and performance.	**Knowledge**: Practical Application. **Skills:** Communication, ICT & Numeracy/ [Level 7]

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Make use of circuit analysis techniques to analyze circuits such as diode and transistor biasing circuits or Transistor amplifiers to determine the device operating points, amplifier voltage/current gain, or input/output impedance.	**Skills**: Generic Problem Solving & Analytical skills/ [Level 7]
C2	**Synthetic:** N/A	**NA**
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:** Demonstrate advanced skills in communicating ideas and present experiment results rigorously through well written reports.	**Skills**: Communication, ICT and Numeracy/ [Level 7] Autonomy, Responsibility and context/ [Level 6]

D2	**Teamwork and Leadership:** N/A	**NA**
D3	**Organizational and Developmental Skills:** N/A	**NA**
D4	**Ethics and Social Responsibility:** N/A	**NA**

Course Structure

Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lec.	Lab				
1	2	2	A1	Introduction to the course. Introduction to Electronic Circuits-Examples	Lecture	-
2	2	2	A1	**Chapter1:** Semiconductor Diodes: Introduction, Ideal diode, PN junction, Physical operation of the diode, Current-Voltage characteristic.	Lecture	-
3	2	2	A1, B1, B2, C1, D1	**Chapter1 :** Diode Models (Equivalent Circuits), Other diodes **Chapter 2**: Graphical and analytical diode circuits analysis, , the Zener diode.	Lecture Lab. Experiment#1	**Homework 1 *** **Lab 1 Report**
4	2	2	A1, B1, B2, B3, C1, D1	**Chapter2:** Diode applications: half and Full-wave rectifiers, Limiting and Clamping circuits. Multiplier circuits.	Lecture exercises	**Quiz 1** **Homework 2 ***
5	2	2	A1, B1	**Chapter3:** Bipolar Junction Transistors (BJTs): structure and operation, types, symbols and conventions, transistors current-voltage characteristics.	Lecture Exercises	**Homework 3 ***
6	2	2	A1, B1, B2, B3, D1	**Chapter3:** BJT Configurations, Power Dissipation **Chapter 4**: BJT circuits at DC, Operating regions, Biasing	Lecture Exercices Lab. Experiment#2	**Lab 2 Report**
7	2	2	A1, B1, B3, C1, D1	**Chapter5:** BJTC AC Analysis: Small signal BJT models, Single stage amplifiers (CE, CB and CC).	Lecture	**Homework 4 ***
8	2	2	A1, B1, B2 C1, B3, D1	**Chapter 6**: Field-Effect Transistors (FETs): Device structure and operation, MOSFET structure and operation, CMOS structure, Current–Voltage Characteristics.	Lecture Exercises Experiment#3	**Quiz 2** **Homework 5 *** **Lab 3 Report**

9	2	2	A1, B1, B2, B3, C1, D1	**Chapter7:** FET Circuits at DC, FET Biasing circuits, p-channel FETS.	Lecture exercises Lab. Experiment#4	**Major exam**
10	2	2	A1, B1, B2, B3, C1, D1	**Chapter8:** FET Amplifiers: FET small signal operation and models, FET AC equivalent circuit, signal stage JFET and MOSFET amplifiers (CS, CG and CD).	Lecture Exercises Lab. Experiment#5	**Homework 6 ***
11	2	2	A1, B1, C1	**Chapter10:** Operational Amplifiers: Basic OpAm, OpAm circuits	Lecture Exercises	**Homework 7 ***
12	2	2	A1, B1, B2, B3, D1	**Chapter11:** OpAm applications: constant-gain, voltage summing, controlled sources, active filters.	Lecture Exercises Lab. Experiment#6	**Quiz 3 Lab 4 Report**
13	2	2	A1, B1, B3, C1, D1	**Chapter13**: Linear Digital ICs: Comparators, A/D and D/A converters.	Lecture	**Homework 8 ***
14	2	2	A1	**Chapter13:** Other ICs: Timer circuit, Voltage- -controlled Oscillator, Interface Circuitry.	Lecture	**-**
15	2	2	B1, B2, B3	Review All experiments		**Lab Final Exam**
16	2		A1, B1, B2, C1	All Topics		**Final Examination**

* Formative assessment

Teaching Materials:

Textbook(s):	R Richard Jaeger and Travis Blalock, Microelectronic Circuit Design, 6th Edition, McGraw-Hill, 2022.
Handout(s):	Lecture Notes, Handouts: available on **Moodle**
Reference(s):	1. Thomas L. Floyd, Electronic Devices: Conventional current version, Pearson, Global Edition 10th Edition, 2018. 2. R.L. Boyles tad, L. Nasheslky, Electronic Devices, and Circuit Theory, Pearson, International Edition, 2014 3. W. Hayt, J.Kemmerly, S.Durbin, Engineering Circuit Analysis, McGraw Hill,7th Edition, 2007. 4. Sedra & Smith, Microelectronic Circuits, International 6th edition, Oxford University Press, 2011

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.*	A1, B1, C1	Formative
Major exam 20 % each	*Major Exam include topics covered over each of the first eight (8) weeks for the Major Exam. It will be a closed-book exam, of one hour and a half duration, consisting of problem-solving-based short answer questions (SAQs).*	A1, B1, B2, C1	20 %
Quizzes (2)	*Three quizzes of 30 minutes duration each are administered throughout the semester and consist of problem-solving-based short-answer questions.*	A1, B1, C1	10%
Lab Reports (6)	*Six experiments are offered in the course and the best five will be selected, Individual Reports on the experiments are to be submitted at the end of each lab session.* ***Lab#1**: The Characteristics of Si-Diode* ***Lab#2:** The Characteristics of Zener-Diode* ***Lab#3**: The Characteristics of LEDs* ***Lab#4:** Diode Clipper* ***Lab#5**: Diode Clamper* ***Lab#6:** Studying the Characteristics of BJTs in CE Mode*	B3, D1	15% *(Marks of the best five lab reports are selected)*
Final Lab Exam	*A one hour practical exam that covers some experiments taken in the course.*	B1, B2, B3	15 %
Final examination	*Closed book, closed notes exam, of two hours duration and consisting of problem-solving-based short answer questions (SAQs).*	A1, B1, B2, C1	40 %
		Overall:	**100%**

***Formative assessments**

Admissions	
Pre-requisites	ECCE 201
Minimum number of students	5
Maximum number of students	25

COLLEGE OF ENGINEERING
DEPARTMENT OF COMPUTER ENGINEERING
COURSE SYLLABUS/ SPECIFICATION

CODE & TITLE: ECCE 303 – Computer Architecture and Organization
WEIGHT: (2 - 2 - 3)
PREREQUISITES: ECCE 203

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

DESCRIPTION: This course introduces the organization and architecture of computer systems; It includes: instruction set principles and examples, Complex and Reduced Instruction Sets Computers (CISC and RISC), addressing modes, register transfer notation, performance evaluation and processor design, control unit, pipelining, microporgramming, memory hierarchy, cache and virtual memories, and fixed point and floating point arithmetic.

OBJECTIVES:

1. To introduce the basic operations of cache and main memory and I/O operations as well as to learn how to do interfacing to microprocessors.
2. To describe functions of the basic building blocks of a computer system.
3. To explain and analyze the methods of computer memory addressing and decoding as well as pipelining.
4. To demonstrate programming proficiency using various addressing modes and data transfer instructions of the target computer.
5. To apply knowledge of Intel processor's internal registers and operations by use of a PC based microprocessor simulator.

Semester: Second Academic Year: 2023/2024

Instructor: Dr. Alaaeddine Ramadan

OFFICE TEL.: 17298999 Ext.: 8958

EMAIL: aramadan@ahlia.edu.bh

INTENDED LEARNING OUTCOMES (ILOS)

A. Knowledge and Understanding		**NQF Descriptor/ Level**
A1	Concepts and Theories: Demonstrate *advanced knowledge and* understanding of the functions of microprocessors, memories, and input/output units including specialized principals and concepts associated with data representations and performance of arithmetical and logical operations performed by computers.	**Knowledge:** theoretical understanding [Level 7]
A2	Contemporary Trends, Problems and Research: N/A	-
A3	Professional Responsibility: N/A	-

B. Subject-Specific Skills		**NQF Descriptor/ Level**
B1	Problem Solving: *Solve quantitative problems* related to addressing modes, arithmetic and logic instructions, memory addressing and decoding, pipelining and memory mapping.	**Knowledge:** Practical Application **Skills:** Communications, ICT & Numeracy [Level 7]

B2	Modeling and Design: *Design and run assembly language programs* using assembler and microprocessor emulator.	**Knowledge:** Practical Application [Level 7]
B3	Application of Methods and Tools: *Gain aptitude in the use of assembly language* with respect to the application of arithmetic and logic operations of instruction set principles and addressing modes.	**Knowledge:** Practical Application **Skills:** Communications, ICT & Numeracy [Level 7]

C. Critical Thinking Skills		**NQF Descriptor/ Level**
C1	Analytic: *Critically* analyze the instructions execution process and data transfer between registers and memory based on the assembly language command used with registers and memory.	**Skills:** Generic, Problem Solving and Analytical Skills [Level 7]
C2	Synthetic: *Synthesize* concepts within the common understanding of computer architecture for integrating different memory designs to perform interfacing to microprocessors.	**Skills:** Generic, Problem Solving and Analytical Skills [Level 7]
C3	Creative: N/A	-

D. General and Transferable Skills (Other Skills Relevant to Employability and Personal Development)		**NQF Descriptor/ Level**
D1	Communication: *Convey theoretical and practical concepts of computer architecture* cogently and describe processes rigorously to peers, specialists and practitioners in oral and written form.	**Skills:** Communication, ICT and Numeracy [Level 7]
D2	Teamwork and Leadership: N/A	-
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	4	0	**A1, D1**	Basic Structure of Computers: Introduction about Processors, Memory and Input/output units	Lecturing, Class discussions	***Oral inquiry**
2	4	0	**A1, D1**	Basic Structure of Computers: Basic processor concepts, Integer Numbers Representation & Arithmetic Operations	Lecturing, Class discussions, Demonstrations	***Oral inquiry**
3	4	0	**A1, D1**	The programming model of the 16, 32 and 64 bits microprocessor architecture	Lecturing, Class discussions	***Oral inquiry**
4	4	0	**B1, B2, B3, C1, D1**	Instruction Set Architecture: Memory Locations and addressing	Lecturing, Class discussions, Demonstrations, In class supervised work	**Quiz 1** **Lab report 1**
5	4	0	**A1, D1**	Instruction Set Architecture: Memory operations, RISC and CISC computer systems, Introduction to RISC instruction sets	Lecturing, Class discussions, Demonstrations, In class supervised work	***Oral inquiry**
6	2	2	**B1, B2, B3, C1, D1**	Instruction Set Architecture: Addressing Modes	Demonstrations, In lab exercises using simulator (lab session 1), In-class Supervised Work, Oral participation	**Lab report 2**
7	2	2	**C1, B2, B3, A1, B1, D1**	Basic Processing Unit: Instruction execution, Hardware components	In-class Supervised Work In lab exercises using simulator (lab session 2)	**Quiz 2** **Lab report 3**
8	4	0	**C1**	Basic Processing Unit: Instruction fetch and execution steps, microprogramming	In-class Supervised Work	***Oral inquiry**
			A1, B1, C1, C2	Topics from week 1 to 7	**-**	**Major Exam**
9	2	2	**B1, B2, B3, C1,**	Arithmetic and logic instructions	Demonstrations,	**Lab report 4**

			D1		In lab exercises using simulator (lab session 3), In-class Supervised Work, Oral participation	
10	4	0	**A1, B1**	The memory system: RAM and ROM memories, Memory Hierarchy	Lecturing, Class discussions In lab exercises using simulator, In-class Supervised Work	**Quiz 3**
11	4	0	**B1, B2, B3, C1, D1**	The memory system: Cache Memories, mapping functions, performance considerations	Lecturing, Class discussions, Demonstrations, In-class Supervised Work, Oral participation	**Lab report 5**
12	4	0	**A1, B1**	The memory system: Virtual memories, Secondary storage	Lecturing, Class discussions, In-class Supervised Work, Oral participation	***Homework**
13	2	2	**B1, B2, B3, C1, D1**	Address Decoding	Demonstrations, In-class Supervised Work (lab session 4)	**Lab report 6**
14	4	0	**A1, B1**	Pipelining: Basic concept, Pipeline organization	Demonstrations	***Homework**
15	4	0	**A1, D1**	Review + Tutorial	Lecturing, Class discussions, Demonstrations, In-class Supervised Work, Oral participation	***Oral inquiry**
			B1, B2, B3, C1	All lab sessions		**Final Lab Exam**
16	2		**A1, B1, C1, C2**	All topics		**Final Exam**

***Formative Assessments**

TEACHING MATERIALS:

TEXTBOOK: Douglas Comer, "Essentials of Computer Architecture", 2nd Edition, 2020, Chapman and Hall/CRC.

SUPPLEMENTARY TEXTS(S): B. Brey, "Intel Microprocessors" 8th Edition, 2013, Pearson New International Edition.

C. Hamacher, Z. Vranesic, S. Zaky and N. Manjikian. "Computer Organization and Embedded Systems," 6th Edition. 2012, McGraw Hill.

W. Stallings, "Computer Organization and Architecture, Designing for Performance" 9th Edition. 2012, Pearson Prentice Hall

REFERENCES: None

RESOURCES(S): **MOODLE** (Lecture Notes)

ASSESSMENT:

Type of Assessment	Description	Learning Outcomes	Weighting
Major Exam	90 minutes exam consists of short-answer, essay, and problem-solving questions.	A1, B1, C1, C2	20%
Quiz 1	Three quizzes of 20 minutes are given per semester and may contain short-answer, essay, and problem-solving questions. (Marks of best two quizzes are considered).	A1, B1	10% (Marks of best two quizzes are selected)
Quiz 2		A1, B1	
Quiz 3		A1, B1	
Lab Reports (6)	Each student must submit a report at the end of each lab session. Lab session 1: Disassembling and demonstrating the main computer components and explaining each part individually. Lab session 2: Assembling, editing, linking, and executing Assembly code examples using Emu8086 Lab session 3: Assembly language programming (use of MOV instruction and get familiar with registers and memory locations). Lab session 4: Assembly language programming (use of INC, DEC, ADD and CMP, SUB, PUSH and POP commands).	B1, B2, B3, C1, D1	15%

	I Lab session 5: Interrupt DOS – Read/Write From the Keyboard Lab session 6: Interrupt DOS - convert uppercase character to lowercase.		
Homework	Students are given questions to solve and submit them as homework.	A1, B1	Formative Assessment
Oral Inquiry	Students are asked to participate orally, and they are given some inquiries to answer during class time	A1, D1	Formative Assessment
Final Lab Exam	One-hour final lab exam covers lab sessions given during the semester.	B1, B2, B3, C1	15%
Final Exam	Two-hour final exam covers all the topics in the course syllabus.	A1, B1, C1, C2	40%
		Overall:	**100%**

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 COMPUTER ENGINEERING
COURSE SYLLABUS/ SPECIFICATION

COURSE CODE & TITLE:	ECCE 323: MICROPROCESSORS
WEIGHT:	(2 - 2 - 3)
PREREQUISITE:	ECCE 303
NQF LEVEL ALLOCATED:	7
NQF NOTIONAL HOURS / CREDITS:	120 NOTIONAL HOURS / 12 NQF CREDIT

DESCRIPTION: THIS IS AN INTRODUCTORY COURSE TO INTEL MICROPROCESSORS ARCHITECTURE AND PROGRAMMING THAT BUILDS UP ON THE KNOWLEDGE GAINED FROM THE COMPUTER ARCHITECTURE AND ORGANIZATION COURSE.

TOPICS INCLUDE ISSUES WITH ASSEMBLY LANGUAGE PROGRAMMING, MICROPROCESSOR ARCHITECTURE, INSTRUCTION TYPES, MEMORY INTERFACING AND SYNCHRONIZATION, I/O MAPPING. INPUT /OUTPUT DATA TRANSFER (HANDSHAKING, INTERRUPTS, DMA), PROGRAMMABLE INTERFACE DEVICES AND APPLICATION EXAMPLES.

OBJECTIVES:

1. TO INTRODUCE THE STRUCTURE OF INTEL MICROPROCESSOR (I.E. CPU).
2. TO OVERVIEW THE FUNDAMENTAL CONCEPTS OF INSTRUCTION TYPES AND EXECUTION WITH RESPECT TO CISC, RISC AND MODERN ARCHITECTURE.
3. TO OVERVIEW THE DIFFERENT INTERFACING DEVICES (I.E TIMER 8254/53, 8255 AND 8259).
4. TO SIMULATE BASIC MICROPROCESSOR INSTRUCTIONS AND INTERFACING DEVICES.

SEMESTER: FIRST **ACADEMIC YEAR:** 2023 – 2024

INSTRUCTOR(S): DR. ALAAEDDINE RAMADAN **EMAIL(S):** aramadan@ahlia.edu.bh

OFFICE TEL.: 17298999 **EXT.** 8958

Intended Learning Outcomes (ILOs):

E. Knowledge and Understanding	NQF Descriptor/ Level
A1. Concepts and Theories: Demonstrate *advanced knowledge* and understanding of Assembly and Mixed language, Microprocessors Architecture for I/O Mapping. This includes BUS Latching/Buffering/Timing, Memory Interfacing, Interrupts, DMA and Applications of them.	Knowledge: theoretical understanding **[Level 7]**
A2. Contemporary Trends, Problems and Research: N/A	-
A3. Professional Responsibility: N/A	-

F. Subject-Specific Skills	NQF Descriptor/ Level
B1. Problem Solving: Inculcate *Program Control Instruction (e.g. Short, Near and Far Jump instructions)* to communicate and move between memory segments using Assembly Language with C/C++. Use specialist skills to solve issues with related to Pin assignments, BUS Latching/Buffering/Timing and Memory Interfacing	Knowledge: practical application **[Level 8]** Skills Communication, ICT and Numeracy **[Level 7]**
B2. Modeling and Design: *Model and/or design Microprocessors* systems using simulation or programing Microprocessor systems. Issues of modelling include Noise immunity/Fan-Out, Clock Generation, BUS Latching/Buffering/Timing, Memory Interfacing, Interrupts and DMA.	Knowledge: practical application **[Level 8]**
B3. Application of Methods and Tools: Gain skills and facility in the use of Microprocessor hardware/software in conducting experiments on the interface of Microprocessor with external peripherals using Assembly Language.	Knowledge: practical application **[Level 7]** Skills: Communication, ICT& Numeracy **[Level 7]**

G. Critical Thinking Skills	NQF Descriptor/ Level
C1. Analytic: Analyze and evaluate the performance of a Microprocessor in terms of BUS Latching/Buffering/Timing, Memory Interfacing, I/O Mapping, Interrupts, DMA and Applications.	Skills: Generic problem solving and analytical skills **[Level 7]**
C2 Synthetic: Synthesize Program Control Instructions to communicate between Memory and I/O devices and Microprocessor. Discuss the issues related to Modern Microprocessors, Pin assignments, BUS Latching/Buffering/Timing, Memory Interfacing, I/O Mapping, Interrupts, DMA and Applications.	Skills: Generic problem solving and synthetically skills **[Level 7]**
C3. Creative: N/A	-

H. General and Transferable Skills	NQF Descriptor/ Level

D1. Communication: Express and communicate ideas in written and oral form.	Skills: Communication, ICT and Numeracy **[Level 7]**
D2. Teamwork and leadership: N/A	-
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
	Lec.	Lab.				
1	2	2	A1, C1, D1	Introduction to Microprocessors: CPU, ALU, CU, Register Array, System BUS, Memory, Instruction Execution.	Lecture	Oral enquiry*
2	2	2	A1, C1, D1	Introduction to Microprocessors (cont.): CISC versus RISC.	Lecture, Class Discussion	Oral enquiry*
3	2	2	A1, B1, C1, D1	Assembly programming and addressing mode : arithmetic and logic instruction	Lecture, In class supervised work	Oral enquiry* Exercise*
4	2	2	A1, B1, D1	X86 Assembly: Conditional Branching and Flags	Class Discussion, In class supervised work Lab demonstration	Exercise* Quiz 1
5	2	2	A1, B1, B2, B3, C1, C2, D1	X86 Assembly: loops and procedures	Lecture, In class supervised work	Oral enquiry* Exercise* Lab Report 1
6	2	2	A1, B1, B2, B3, C1, C2, D1	Pipelining and Hazards	Class discussion, In class supervised work	Oral enquiry* Exercise* Quiz 2 Lab Report 2
7	2	2	A1, B1, B2, C1, C2, D1	Concept of interrupt and priority : software interrupt	Lecture, Class Discussion, In class supervised work	Oral enquiry* Exercise* Major Exam
8	2	2	A1, B1, B2,B3, C1, C2, D1	8259A programmable interrupt controller: concept and architecture	Demonstration, In class supervised work	Exercise* Oral enquiry* Lab Report 3
9	2	2	A1,B1, C1, D1	8259A programmable interrupt controller: programming the different modes	Demonstration, In class supervised work	Exercise* Oral enquiry*

10	2	2	A1, B1, B2, B3, C1, C2, D1	8254 Programmable Interval Timer: concept and architecture	Demonstration, In class supervised work	Oral enquiry* Exercise* Lab Report 4
11	2	2	A1, B1, C1, D1	8254 Programmable Interval Timer: programming the different modes	Lecture, Class Discussion, In class supervised work	**Quiz 3** Exercise*
12	2	2	A1, B1, B2, B3, C1, C2, D1	8255 Programmable Peripheral Interface : concept and architecture	Lecture, Class Discussion, In class supervised work	Oral enquiry* Exercise* Lab Report 5
13-14	4	4	A1, B1, C1, D1	8255 Programmable Peripheral Interface : programming the different modes part1	Lecture, Class Discussion, In class supervised work	Oral enquiry* Exercise*
15	**2**	**2**	B1, B2, B3, C1	All topics		**Final Lab Exam**
16	**2**		A1, B1, C1, C2	All topics		**Final Exam**

* Formative assessment

Teaching Materials:

Textbook(s):	Computer Organization and Design RISC-V Edition: The Hardware Software Interface (The Morgan Kaufmann Series in Computer Architecture and Design) 2nd Edition David A. Patterson, John L. Hennessy, 9780128203316 (Print) 2019
Handout(s):	Lecture Notes and Exercises on Moodle system
Reference(s):	• Brey, B. B. (2014) Intel Microprocessors. 8th Ed. Essex : Pearson Education Limited. • Hamacher, C., Vranesic, Z., Zaky, S. and Manjikian, N. (2012) Computer Organization and Embedded Systems. 6th Ed. New York: McGraw Hill. • Stallings, W. (2012) Computer Organization and Architecture, Designing for Performance. 9th Ed. London: Pearson Prentice Hall..

Assessment

Type of Assessment	Description	Learning Outcomes	Weighting
Major Exam	90 minutes exam consists of short-answer, essay, and problem-solving questions.	A1, B1, C1, C2	20%
Quiz 1	Two quizzes of 30 minutes are given per semester and may contain short-answer, essay, and problem-solving questions.	A1, B1	10%
Quiz 2		A1, B1	
Lab Reports (5)	LAB1: Immediate and register addressing mode. LAB2: Interrupt DOS LAB3: LOOP and JMP instructions LAB4: Interrupt DOS 21h LAB5: Display message LAB6: use memory LAB7: Timer 8254	B1, B2, B3, C1, D1	15%
Homework	Students are given questions to solve and submit them as homework.	A1, B1	Formative Assessment
Oral Inquiry	Students are asked to participate orally and they are given some inquiries to answer during class time	A1, D1	Formative Assessment
Final Lab Exam	One-hour final lab exam covers lab sessions given during the semester.	B1, B2, B3, C1	15%
Final Exam	Two-hour final exam covers all the topics in the course syllabus.	A1, B1, C1, C2	40%
		Overall:	**100%**

ADMISSIONS:

PRE-REQUISITES	ECCE 323
MINIMUM NUMBER OF STUDENTS	5 STUDENTS.
MAXIMUM NUMBER OF STUDENTS	20 STUDENTS

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 COMPUTER ENGINEERING

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title:	ECCE 324 – Principles of Control Systems
Weight:	(2 - 2 - 3)
Prerequisite:	ECTE 224 – MATH 202
NQF Level Allocated:	8
NQF Notional Hours/Credits:	120/12

Description: The course introduces the theory of LTI control Systems. Topics include: Review of Laplace Transforms. Mathematical modelling of physical control systems. Transfer functions, Signal flow graphs. State-space analysis. Transient response of first and second order systems. Stability of control systems: Routh criterion, Root locus, Frequency response methods, Nyquist stability criterion. Introduction to z-transform and digital control. Control systems applications with MATLAB are included to illustrate the concepts.

Objective: The objectives of the course are to:

- Overview of practical control systems and physical modeling.
- Discuss classical control theory and explain the mathematical modeling of control systems.
- Employ modern control systems techniques to analyze and design linear feedbacksystems.
- Design PID controllers for simple LTI systems
- Use a software tool such as MATLAB Control system toolbox and Simulink to analyze and design LTI Control Systems.

Semester: Second **Academic Year:** 2022-2023

Instructor (s): Dr. Salah Al Hamad

Mobile: 3966 74 79

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

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate advanced knowledge and understanding of the concepts and theories of Linear Time-Invariant (LTI) control systems.	**Knowledge:** Theoretical Understanding **[Level 7]**
A2	**Contemporary Trends, Problems and Research:** Demonstrate cognizance and understanding of control systems analysis and design techniques applied in current related research.	**Knowledge:** Theoretical Understanding **[Level 7]**
A3	**Professional Responsibility:** N/A	**-**

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Identify and implement relevant solutions to given control system problems using time and/or frequency domain approach.	**Skills:** Generic Problem Solving & Analytical skills **[Level 8]**
B2	**Modeling and Design:** Use mathematical models such as Transfer Function and State-Space representations torepresent LTI systems or to design appropriate PID controllers (Proportional, Derivative and Integral) for these systems given time/frequency domain specifications in order to achieve the desired system's behavior.	**Knowledge:** Practical Application **[Level 7]**
B3	**Application of Methods and Tools:** Use analytical and graphical techniques such as Routh Hurwitz and the Root Locus method along with specialized software tools for the analysis of LTI systems' performance and the design of PID controllers given certain specifications.	**Knowledge** – Practical Application **[Level 7]**

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Critically analyze and evaluate LTI control systems in order to assess their performance in terms of transient time response, steady state performance and system stability.	**Skills:** Generic Problem Solving & Analytical skills [Level 8]
C2	**Synthetic:** Critically synthesize performance analysis outcomes to design and integrate appropriate PID controllers for LTI feedback systems in order to achieve the desired system's behavior.	**Skills:** Generic Problem Solving & Analytical skills [Level 8]
C3	**Creative Thinking and innovation:** N/A	

D. 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 and describe Control Systems information through oral presentations and written reports.	**Skills:** Communication, ICT and Numeracy **[Level 7]**
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.	**Competence:** Autonomy and Responsibility **[Level 7]**
D3	**Organizational and Developmental Skills:** N/A	**-**
D4	**Ethics and Social Responsibility:** Demonstrate awareness and cognizance of ABET and IEEE Codes of Ethics for engineers in relation to the use of Control systems design in practice.	**Knowledge:** Theoretical Understanding **Competence:** Autonomy & Responsibility **[Level 7]**

Course Structure (Outline)

Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lec	Lab				
1	2	2	A1, B1, B2, B3, C1, C2, D1	Introduction to the course. **Introduction to control Systems**- Examples of Control Systems.	Lecture Discussion Exercises	Oral enquiry*
2	2	2	A1, B2, B3, C1, C2, D1	**Mathematical Models of physical Systems:** Differential Equations and the Laplace Transform	Lecture Discussion Exercises	Oral enquiry* **Test 1**
3	2	2	A1, B1, B2, B3, C1, C2, D1	**Mathematical Models of physical Systems:** Transfer Function and State-Space representation of linear systems. **Lab #1: Laplace Transform in MATLAB**	Lecture Discussion Exercises	Oral enquiry* **Test** 1 Homework #1* **Lab Report# 1**
4	2	2	A1, B1, B2, B3, C1, C2, D1	**Models of Dynamic systems**: Models of electric systems	Lecture Discussion Exercises Supervised Lab work	Oral enquiry* Homework #2* **Test 1**
5	2	2	A1, B1, B2, B3, C1, C2, D1	**Models of Dynamic systems**: Models of mechanical systems and electromechanical systems **Lab # 2: MATLAB'S Control Systems Toolbox**	Lecture Discussion	Oral enquiry* Homework #3* **Test 1** **Lab Report# 2**
6	2	2	A1, B1, B2, B3, C1, C2, D1	**Block diagram models**: block diagram models and reduction	Lecture Exercises	Homework #4* **Test 1**

					Supervised Lab work	
7	2	2	A1, A2, D1, D2, D4	**State Variable models of Dynamic systems:** State differential equation and state space models	Lecture Discussion Exercises	Oral enquiry* **Project** **Test 2**
8	2	2	A1, B1, B2, C, D1	**Dynamic Response**: First –Order systems- Time domain specifications **Lab # 3:** Block Diagram Reduction	Lecture Discussion Exercises Supervised Lab work	Oral enquiry* **Project** **Lab Report# 3** **Test 2**
9	2	2	A1, B1, B2, B3, C1, C2, D1	**Dynamic Response**: Second –Order systems, Effect of poles and zeros, Time domain specifications	Lecture Discussion Exercises Supervised Lab work	Oral enquiry* Homework # 5* **Project** **Test 2**
10	2	2	A1, B1, B2, B3, C1, C2, D1	**Dynamic Response:** Stability and the Routh-Hurwitz criterion	Lecture, Discussion Supervised Lab work	Oral enquiry* Homework #6* **Project** **Test 2**
11	2	2	A1, B1, B2, B3, C1, C2, D1	**Feedback Control systems:** Properties of feedback, basic equations of control **Lab # 4:** System's response	Lecture Exercises Supervised Lab work	Oral enquiry* Homework #7* **Test2** **Lab Report# 4**
12	2	2	A1, B1, B2, B3, C1, C2, D1	**Feedback Control Systems:** Steady-State Error and performance indices	Lecture Discussion Exercises	Oral enquiry* Homework #8* **Test 2**
13	2	2	A1, B1, B2, B3, C1, C2, D1	**Design of Feedback systems**: The Root Locus method	Lecture Discussion Exercises Supervised	Oral enquiry* **Project and presentation**
14	2	2	A1, C1, D1	**Frequency domain methods:** controller design and stability, Nyquist Stability Criterion	Lecture Discussion Exercises	Oral enquiry* **Project and presentation**
15	2	2	B2, B3, C1, C2, D1	Research Assignment Presentations All lab work	-	**Final Lab Exam**
16	2	0	A1, B1, B2, C1, C2, D1, D4	All Topics		**Final Examination**

* Formative assessment

Teaching Materials:

Textbook(s):	Norman S. Nise John Wiley & Sons, "Control Systems Engineering," 8th Edition, EMEA Edition, John Wiley & Sons, January 2020, ISBN: 978-1-119-63634-2
Handout(s):	- Lecture Notes - Other selected readings and lectures videos on course website (Moodle System)
Reference(s):	**Books:** 1. Norman S. Nise, Control Systems Engineering, 7th Edition International Student Version, Wiley, 2015 2. G.F. Franklin & J.D. Powell, A.E.Emami-Naeini, "Feedback Control of Dynamic Systems", Global Edition(7th) , Pearson Higher Ed, 2014 3. R.C. Dorf & R.H. Bishop, "Modern Control Systems", 12th edition, Prentice Hall, 2010 **Periodicals/Articles/Websites:** 1. Control Theory and Technology, Springer, available at: http://link.Springer. com/ journal/11768 2. IET Control Theory and Applications, IET Digital Library, available at: http:// digital-library.theiet.org/content/journals/iet-cta 3. International Journal of Control Theory and Applications, International Science Press, available at : http://www.serialsjournals.com/journal-detail.php?journals_id=268 4. Control Engineering: News, Tutorials, applications and Research on control systems, available at : http://www.controleng.com/ 5. Some ideas for research topics available at: http://www.engineering.auckland . ac.nz/en/about/our-research/foe-research-projects.html 6. ABET Code of Ethics for Engineers, www.codex.vr.se/texts/ ABET%20Code %20of%20Ethics.doc

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Oral enquiry	*Questions are asked throughout the lectures and exercise sessions to assess students' understanding and learning.*	A1, C1, D1	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, B2, B3,C1,C2	Formative
Test 1	*Tow quizzes are administered throughout the semester covering different topics of the course and consisting of short problem-solving questions. The*	A1, A2, B1, B2, C1, C2	8%

	tow quiz grades contribute towards the course grade.		
Test 2	*One closed book test, of 1-hour duration, consisting of problem solving-based short answer questions.*	A1, A2, B1, B2, B3, C1, C2, D1, D2, D4	8%
Project report and presentation	*A short research assignment is assigned on the 7th week and is expected to be submitted on week 14 before the final exams. Students are required to work in groups and are asked to select control theory applications 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. The report should be concluded with a paragraph summarizing the study. Students present their findings in a 15 min presentation.*	A1, A2, B1, B2, B3, C1, C2, D1, D2, D4	**10% + 3%**
Lab Reports	*Four supervised in-Lab assignments are given in which students are to use MATLAB to generate/analyze LTI systems transfer functions and analyze/model or design P/PD/PID controllers for given specifications. Individual reports on the assignments are expected to be submitted within a week of the lab session.*	B2, B3, C1, C2, D1	Four Lab (4*4) 16%
Final Lab Exam	*One lab exam of one-hour duration is carried out consisting of different practical exercises covering a selected set of experiments taken in the course.*	B2, B3, C1, C2, D1	15%
Final Examination	*Closed book, closed notes, of two hours Final Exam consisting of problem-solving questions. The exam covers most of the topics taught in class.*	A1, B1, B2, C1, C2, D1, D4	40 %
Overall:			**100 %**

Assessment Admissions	
Pre-requisites	ECTE 224 – MATH 202
Minimum number of students	**5**
Maximum number of students	**20**

COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

COURSE SYLLABUS/SPECIFICATION

Code and Title:	ECCE 326: Digital Logic Design
Weight:	(2 – 2 – 3)
Prerequisite:	ECCE 203
Description:	This course provides a modern introduction to logic design and the basic building blocks used in digital systems. Topics include modular design of combinational and sequential circuits, finite state machine design, control and datapath design, modern digital design techniques using hardware description languages and programmable logic devices (FPGA, CPLD), introduction to VHDL design styles (data flow, behavioral, structural), simulation and synthesis of digital systems with VHDL. Students also learn to use industrial EDA tools such as XILINIX and ModelSim for VHDL synthesis and simulation.
Objectives:	1. Describe the behavior of logic systems using finite state machine and state machine charts. 2. Understand the various optimization and synthesis techniques used in Logic Design. 3. Model and simulate digital logic circuit with hardware Description Language (HDL). 4. Implement digital systems using reconfigurable programmable logic devices such as FPGAs and CPLDs. 5. Use modern CAD tools for simulation, analysis and synthesis of digital systems.

Semester: First 2023-24

Instructor(s): Dr. Basel Ali Mobile: 39507717, Email: bali@ahlia.edu.bh

Intended Learning Outcomes (ILOs):

I. Knowledge and Understanding	NQF Descriptor/ Level
A1. Concepts and Theories Demonstrate the ability to describe digital systems using the different VHDL design styles (data flow, behavioral, structural).	Knowledge: theoretical understanding [Level 8]
A2. Contemporary Trends, Problems and Research: Recognize the current applications and trends in CPLDs and FPGAs.	Knowledge – Practical Application [Level 8]
A3. Professional Responsibility: N/A	-

J. Subject-Specific Skills	NQF Descriptor/ Level
B1 Problem Solving: Derive and optimize the state diagram/table from a given problem statement describing the behavior of a sequential machine	Communication, ICT, Numeracy **[Level 8]**
B2 Modelling and Design: Modeling combinational and sequential logic circuits using the behavioral, dataflow and structural styles of writing HDL codes.	Competence - Context **[Level 8]**
B3 Application of Methods and Tools: Use modern industrial CAD tools such as XILINIX and ModelSim to simulate and synthesize logic circuits with VHDL.	Communication, ICT, Numeracy **[Level 8]**

K. Critical Thinking Skills	NQF Descriptor/ Level
C1. Analytical: Experiment and analyze the outcomes of VHDL modelling techniques.	Skills Generic, Problem Solving and Analytical Skills **[Level 8]**
C2. Synthetic: Synthesize digital circuits at several levels of abstractions.	Skills Generic, Problem Solving and Analytical Skills. **[Level 8]**
C3. Creative: N/A	-

L. General and Transferable Skills	NQF Descriptor/ Level
D1. Communication: Convey ideas and describe processes rigorously through discussions during lectures and lab sessions and research project.	Communication,ICT, Numeracy **[Level 8]**
D2. Teamwork and leadership: Develop teamwork and leadership skills through implementing a group project.	Competence: Autonomy, Responsibility **[Level**

	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	4	0	**A1**	Revision to Combinational and sequential logic	Lecture	**-**
2	4	0	**A1, B1**	Derivation of state tables and graphs for FSM (Mealy and Moore machines)	Lecture In-class exercises	**Quiz 1**
3	4	0	**A1, A2**	Introduction to programmable logic devices	Lecture	
4	2	2	**A1, B1, D1**	Finite State Machine Optimization and Design Implementation of finite state machine with PLDs	Lecture 1 Simulation tools demonstration	**Tutorial** **Experiment 0**
5	2	2	**B1, B2, C2**	Design the datapath and control units of real world digital system and arithmetic circuits	Lecture Lab session 1	**Experiment 1** **Quiz 2**
6, 7,	4	2	**A1,B1**	Introduction to Hardware Description Languages, VHDL Basics: Operators, variables, Signals, Constants, Arrays, processes.	Lecture Lab session 2	**Experiment 2**
8	2	2	**A1, B2**	VHDL modelling construct: data flow, behavioral, structural approach	Lecture Lab session 3	**Experiment 3**
9, 10	4	4	**A1,B2,B3,C1,C2, D1**	Modelling combinational circuits in VHDL	Lecture Lab session 4	**Quiz 3** **Experiment 4**

11, 12	4	4	**A1, B1,B2,B3,C2,D1**	Modelling sequential circuits in VHDL	Lecture Lab session 5	**Experiment 5**
11, 12	4	4	**A1, B1 ,B2,B3,C1,C2,D1**	Modelling FSM in VHDL	Lecture	**Midterm Test** **Group Project**
13	0	4	**A1,B1,B2,B3** **C1,C2,D1,D2**	Design and implementation of digital systems into FPGA	Lecture	**Group Project**
14	2	2	**A1, B1, B2, B3, C1, C2, D1, D2**	Finalizing and presenting the group project	Lecture,	**Group Project**
15	2	0	**A1, B1, B2, C1, C2**	All topics		**Final Exam**

* Formative assessment

Teaching Materials:

Textbook(s):	Charles H. Roth, Jr., Lizy K. John, Digital Systems Design Using VHDL, 3rd edition, Cengage Learning, 2018, ISBN: 1337515086, 9781337515085.
Handout(s):	- Lecture Notes - Other selected readings and lectures videos on course website (Moodle System)
Reference(s):	1. M. Morris R. Mano and Michael D. Ciletti, Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog (6th Edition), Mar 17, 2017. 2. Peter J. Ashenden, The Designer's Guide to VHDL, (3rd Edition), 2008, 978-0120887859 3. Brock J. LaMeres, In *will accumulate* both *theoretical* understanding and *practical* experience through four graded *projectsstruct*troduction to Logic Circuits & Logic Design with VHDL, Springer, 2016, ISBN: 3319341952, 9783319341958. 4. IET Control Theory and Applications, IET Digital Library, available at: http:// digital-library.theiet.org/content/journals/iet-cta

Assessment

Type of Assessment	Description	Learning Outcomes	Weighting

In-class Exercises	The student solve problem and exercises related to the specific chapter	A1,A2,B1,B2,C1C2	formative
Midterm test	One-hour test covering topics discussed in the first 5 weeks.	A1, B1, B2, C1, C2	20%
Quizzes (3)	three quizzes are administered, and the average of the best two grades is considered.	A1, B1, C2	Best 2 of 3 10%
Research project **Final Lab Exam**	The students are divided into groups and each group design and implement a digital system into FPGA.	B1, B2, B3, C1, C2, D1, D2	10% + 10%
Lab Experiments	Each student has to conduct an experiment and submit a report after each lab session	B1, B2, B3 C1, C2, D1	10%
Final Exam	Two-hour final exam covers all the topics in the course syllabus.	A1,B1,B2,C1, C2	40%
		Overall:	**100%**

Admissions	
Pre-requisites	ECCE 203
Minimum number of students	**5 Students**
Maximum number of students	**25 Students, depending on the class size**

COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

COURSE SYLLABUS / SPECIFICATION

COURSE CODE & TITLE: ECCE 403-EMBEDDED SYSTEMS

WEIGHT: (2 - 2 - 3)

PREREQUISITE: ECCE 323

NQF LEVEL ALLOCATED: 8

NQF NOTIONAL HOURS / CREDITS: 120 NOTIONAL HOURS / 12 NQF CREDIT

DESCRIPTION: THIS COURSE BUILDS ON THE KNOWLEDGE GAINED FORM THE MICROPROCESSOR COURSES (ECCE 323). IT FOCUSES ON EMBEDDED MICROPROCESSOR-BASED SYSTEMS. IT COVERS MICROCONTROLLER HARDWARE ARCHITECTURE. HIGH LEVEL PROGRAMMING AND REAL TIME OPERATING SYSTEMS FOR EMBEDDED SYSTEMS. SOFTWARE AND HARDWARE TRADEOFFS. MEMORY INTERFACING. I/O INTERFACING TECHNIQUES FOR DEVICES SUCH AS INPUT/OUTPUT PERIPHERALS, SENSOR/ACTUATOR DEVICES, UARTS, DIGITAL AND ANALOG I/O, TIMERS AND INTERRUPTERS.

OBJECTIVES:

1. TO INTRODUCE MICROCONTROLLERS ARCHITECTURE AND DESCRIBE THEIR FUNCTIONS AND BASIC OPERATIONS.
2. TO OVERVIEW THE FUNDAMENTAL CONCEPTS OF INSTRUCTIONS TYPES AND THEIR EXECUTION.
3. TO DEMONSTRATE THE FUNDAMENTALS OF PROGRAMMING LANGUAGE COMMANDS.
4. TO ANALYSE PROCESSING OPERATION OF BASIC MICROCONTROLLERS INSTRUCTIONS AND INTERFACING DEVICES.
1. TO DEVELOP PROGRAMS CONTROLLING EMBEDDED SYSTEMS USING QUICK AND EFFICIENT DESIGN METHODS.

SEMESTER: FIRST **ACADEMIC YEAR:** 2022– 2023

INSTRUCTOR(S): DR. AHMED JEDIDI **EMAIL(S):** ajedidi@ahlia.edu.bh

OFFICE TEL.: 17298999 **EXT.** 8674

INTENDED LEARNING OUTCOMES (ILOS)

A. KNOWLEDGE AND UNDERSTANDING	NQF DESCRIPTOR / LEVEL
A1. Concepts and Theories: Demonstrate critical knowledge and understanding the functions of Microcontrollers, memories, Input/output units, and explain how different operations are performed by Microcontrollers.	**Knowledge**: theoretical understanding [Level 8]
A2. Contemporary Trends, Problems and Research: N/A	**-**
A3. Professional Responsibility: N/A	**-**

B. SUBJECT-SPECIFIC SKILLS	NQF DESCRIPTOR / LEVEL
B1. Problem Solving: Solve specialized problems related to real time scheduling, embedded systems, the instructions execution process and data transfer between registers and memory.	**Skills:** Communication, ICT and Numeracy [Level 8] **Knowledge:** Practical Application [Level 8]
B2. Modeling and Design: Design and conduct experiments related to Microcontroller based systems.	**Knowledge:** Practical Application [Level 8]
B3. Application of Methods and Tools: Use the different tools to design, programming and simulate embedded systems (mikroC, ISIS proteus and Arduino).	**Knowledge:** Practical Application use simulation tools [Level 8]

C. CRITICAL THINKING SKILLS	NQF DESCRIPTOR / LEVEL
C1. Analytic: Critically analyse and evaluate the outcomes of conducted experiments to understand Microcontrollers' execution process.	**Skills:** Generic, Problem Solving and Analytical Skills [Level 8]
C2. Synthetic: Integrate different Microcontroller based systems to perform interfacing to different I/O devices.	**Skills:** Generic, Problem Solving and Synthetically Skills [Level 8]
C3. Creative: N/A	**-**

D. GENERAL AND TRANSFERABLE SKILLS	NQF DESCRIPTOR / LEVEL

D1. Communication: Convey ideas and describe processes rigorously through discussions during lectures and lab sessions and research project.	**Skills:** Communication, ICT and Numeracy [Level 8]
D2. Teamwork and leadership: Enhance teamwork and leadership skills through research project.	**Competence:** Autonomy and Responsibility [Level 8]
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
	LEC	LAB				
1	4	0	A1, B1, B2	Introduction to Embedded Systems and Microcontroller-Based Circuit Design.	Lecture.	-
2	4	0	A1, A2, B1, B2	Real time system: introduction and requirement.	Lecture, In-class exercises.	In-class exercises.
3	4	0	A1, B1, C1	Scheduling real time systems algorithm.	Lecture, In-class exercises.	In-class exercises.
4	2	2	A1, B2, B3, C2, D1	Architecture of microcontroller and the design flow of the embedded system 'co-design.	Lecture.	Quiz 1.
5	2	2	A1, B1, B2, B3, C1, C2, D1	Introduction to mikroC Programming	Lecture, Simulation tools, Demonstration.	-
6	4	0	A1, B1, B2, B3, C1, C2, D1, D2	Introduction in ISIS proteus tool	Lecture, Lab Session #1.	Lab Report 1.
7	4	0	A1, B1, B2, B3,	Analog I/O Peripherals	Lecture, Lab Session #1.	Lab Report 1.

			C1, C2, D1, D2			
8	4	0	A1, B1, B3, C2	I/O: Parallel Ports, Direction registers, Logical and shift operations.	Lecture.	-
9	4	0	A1, B1, B2, C1, C2	Arithmetic: Addition / subtraction operations. Condition code bits, Conditionals.	Lecture.	Midterm Exam.
10	2	2	A1, B1, B2, B3, C1, C2, D1	Board: Demonstration of the board (bring your board to class) Switch Input and LED Output.	Lecture, Lab Session #2.	, Lab Report 2.
11	4	0	B1, B3, C2	Control structures: If-then, Loops. Modular programming: Subroutines and the Stack.	Lecture, Lab Session #3.	Lab Report 3.
12	2	2	A1, B1, B2, B3, C1, C2, D1	LCD interface: LCD programming, I/O Synchronization, Fixed-point numbers, Number conversions.	Lecture.	Quiz 2.
13	2	2	A1, B1, B2, B3, C1, C2, D1	Digital-to-Analog Conversion (DAC): Sound Generation	Lecture, Lab Session #4.	Lab Report 4.
14	2	2	A1, B1, B2, B3, C1, C2, D1	Analog-to-Digital Conversion (ADC):	Lecture,	
15	2	2	A1, B1, B2, B3, C1, C2, D1	Stepper Motors: Motor control, Controller state machines	Lecture.	Research Presentation

16	0	2	A1, B1, B2, B3, C1	Review.	Final Lab Exam
	2	0	A1, B1, B2, C1,	All Topics.	Final Exam

*FORMATIVE ASSESSMENTS

TEACHING MATERIALS:

TEXTBOOK(S):	1. C Programming for the PIC Microcontroller: Demystify Coding with Embedded Programming, Hubert Henry Ward, Apress 2019, 9781484255247 2. Steve McClure, "*Designing Embedded Systems: Guidebook*", 2014, CreateSpace Independent Publishing Platform, ISBN 499117590, 9781499117592.
HANDOUT(S):	Lecture Notes, Handouts Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
REFERENCE(S):	1. Ying Bai, "*Practical Microcontroller Engineering with ARM*" 1st Edition, 2015, Wiley-IEEE Press. 2. Manish K Patel, "*The 8051 Microcontroller Based Embedded Systems*". 2014, McGraw Hill Education. 3. Panachakel Jerrin Thomas. "*Microcontroller Based System Design using 8051 and ARM*". 2015, LAP Lambert Academic Publishing. 4. Dogan Ibrahim. "*PIC Microcontroller Projects in C: Basic to Advanced*" 2nd Edition. 2014. 5. Tim Warren, "*Raspberry Pi: The complete guide to raspberry pi, including raspberry pi projects, tips, troubleshooting, and more*", 2015, Create Space Independent Publishing. 6. Jack Purdum, "*Beginning C for Arduino: Learn C Programming for the Arduino*" 2nd Edition, 2015.

ASSESSMENT:

TYPE OF ASSESSMENT	DESCRIPTION	LEARNING OUTCOMES	WEIGHTING

IN-CLASS EXERCISES	*Each week, the student solve problem and exercises related to the specific chapter*	A1, B1, B2, C1, C2	*FORMATIVE
MIDTERM EXAM	*"90 minutes exam covering topics discussed in the first 5 weeks".*	A1, B1, B2, C1, C2	20 %
QUIZZES	*"two quizzes each 30 minutes in week 4, , 12".*	B1, B2	10 %
LAB REPORTS + PRACTICAL REPORTS	*Five experiments are offered in the course and cover all topics of the course.* ***Lab#1**: LED controlling via PIC 16f877.* ***Lab#2:** Display 7 segments controlling via PIC 16f877.* ***Lab#3:** Stepper motor controlling via PIC 16F877.* ***Lab#4**: LCD display controlling via PIC 16F877.*	B1, B2, B3, C1, C2, D1, D2	10 %
RESEARCH PROJECT	*The students are divided into groups and each group choose one of many research subject and prepare paper and presentation in the end of semester.*	B1, B2, C1, C2, D1, D2	10 %
FINAL LAB EXAM	*One hour practical exam that covers all the lab sessions taken in the course.*	A1, B1, B2, B3 C1,	10 %
FINAL EXAMINATION	*Open book exam of two hours duration and consists of problem solving-based short answer questions (SAQs).*	A1, B1, B2, C1	40 %
		OVERALL:	**100 %**

ADMISSIONS:

PRE-REQUISITES	ECCE 323
MINIMUM NUMBER OF STUDENTS	5 STUDENTS.
MAXIMUM NUMBER OF STUDENTS	20 STUDENTS

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 Computer Engineering

Course Syllabus/Specification

Code and Title:	ECCE 413: Internet of Things
Weight:	(2 - 2 - 3)
Prerequisite:	ECTE 329
NQF Level Allocated	8 NQF Notional Hours / Credits: 120/12
Description:	This course covers the basic building blocks of the Internet of Things and develops the necessary skills required to design and implement IoT products and services. Students will be able to use sensors and an Arduino microcontroller to read data from physical world and control actuators. Use Python to program a Single Board Computer (Raspberry Pi) to perform more complex embedded program. Learn the principal application protocols for the transfer of sensor data, for example, MQTT and CoAP and infrastructure for IoT: LoRa-Wan, 6LoWPAN, 5G and SigFox.
Objectives:	1. To demonstrate advanced knowledge on internet of things and its hardware & software components. 2. To design and build IoT systems for sensing, processing, actuation, and wireless communication using mobile single-board computers. 3. To demonstrate the ability to interface I/O devices, sensors and communication modules and the ability to remotely monitor data and control devices. 4. To identify and describe the main network architectures and protocols of IoT systems. 5. To demonstrate the ability of using a simulation software i.e. Cisco Packet Tracer, and microcontrollers and single- board computers to develop real life IoT based projects

Semester: Academic Year:

Instructor(s):

Mobile Phone:

Email:

Intended Learning Outcomes (ILOs):

E. Knowledge and Understanding		**NQF Descriptor/ Level**
A1	Concepts and Theories: Demonstrate advanced knowledge and understanding of concepts and theories in Internet of things including IOT sensors and actuators, IOT protocols, common issues, etc.	Knowledge: theoretical understanding [Level 8]
A2	Contemporary Trends, Problems and Research: Be cognizant of up-to-date trends, problems, research issues, and methods in internet of things.	Knowledge: theoretical understanding [Level 8]
A3	Professional Responsibility: N.A	Knowledge: theoretical understanding [Level 8]

F. Subject-specific Skills		**NQF Descriptor/ Level**
B1	Problem Solving: Perform exercises based on the concepts and scenarios of Internet of Things.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT and Numeracy Skills [Level 8]
B2	Modeling and Design: Design, build and integrate IoT platforms, incorporating different types of sensors and actuators, micro-controllers like Arduino and single board computers such as Raspberry Pi.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT and Numeracy Skills [Level 8]
B3	Application of Methods and Tools: Use the different tools to design, programming and simulate IOT systems (Python, Packet Tracer, Arduino, and Raspberry Pi).	Knowledge: Practical Application [Level 8]

		Skills: Communication, ICT and Numeracy Skills [Level 8]

G. Thinking skills		**NQF Descriptor/ Level**
C1	Analytic: Critically analyze case studies of real life and formulate an IoT solution for an identified business or society need.	Skills: Generic Problem Solving & Analytical skills [Level 8]
C2	Synthetic: Integrate the advanced skills within the common understanding of IOT to find, evaluate, and apply internet of things and its hardware & software components to form a desired network	Skills: Generic Problem Solving & Analytical skills [Level 8]
C3	Creative Thinking and innovation: equip students with a Global Problem Solver mindset and skillset, and fuels their imagination through a deeper understanding of the transformative impact Internet of Things technologies.	Skills: Generic Problem Solving & Analytical skills [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, laboratory exercises and reports related to Internet of Things.	Skills: Communication, ICT and Numeracy Skills [Level 8]
D2	Teamwork and Leadership: Enhance teamwork and leadership skills through research project.	Competence: Autonomy, Responsibility & Context [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	**Internet of Things (IoT) Overview** The "Internet of Things", The Technology of the Internet of	Lecture, class discussion	Oral enquiry

				Things, Historical background of IoT		
2	2	2	A1, B1	**Design Principles for Connected Devices** The various types of devices connected to internet, components of IOT Devices, IOT Devices and physical world interfacing.	Class discussion, in class and practice-based supervised work	Oral enquiry
3	2	2	A1, B1, C1	**IoT Network Architecture and Design** The IOT Stack, Devices/Things, gateway, Data Management and intelligence, API, Application PaaS (Platform as a service), End Applications, iPaaS (Integration Platform as a service)	Class discussion, in class and practice-based supervised work	Oral enquiry, problem sets, case analysis
4	2	2	A1, B1, B2, B3, C1, D1	**The Things in IoT: Sensors and Actuators** Overview, IOT Sensors, RFID, IOT Actuators, behavior & selection. Lab1:	Class discussion, in class and practice-based supervised work In-lab supervised exercise, in-class group work	Oral enquiry, problem sets, in-lab exercises, case analysis **Quiz 1**
5	2	2	A1, B1, B2, B3, C1, D1	**IoT Standards and Communication Protocols** Types of wireless communication, Major wireless Short-range communication devices, properties, comparison of these devices (Bluetooth, WIFI, ZigBee, 6LoWPAN) Lab2:	Class discussion, in class and practice-based supervised work In-lab supervised exercise, in-class group work	Oral enquiry, problem sets, in-lab exercises, case analysis Lab Report 1
6	2	2	A1, B1, B2, B3, C1, D1	**IoT Standards and Communication Protocols** Major wireless Long-range communication devices, properties, comparison of these devices (Cellular IoT, LPWAN)	Class discussion, in class and practice-based supervised work In-lab supervised exercise, in-class group work	Oral enquiry, problem sets, case analysis Lab Report 2

7	2	2	A1, B1, B2, B3, C1, D1	**IoT Standards and Communication Protocols** Higher layer IoT related protocols such as CoAP, MQTT, AMQP	Class discussion, in class and practice-based supervised work	Oral enquiry, problem sets, case analysis
			A1, B1, B2, C1, C2	Topics from week 1 to 6	-	**Major Exam**
8	2	2	A1, B1, B2, B3, C1, C2, D1, D2	**Introduction to Arduino Programming** **Integration of Sensors and Actuators with Arduino.** Lab 3:	Class discussion, in class and practice-based supervised work	Oral enquiry, problem sets, in-lab exercises, case analysis
9	2	2	A1, B1, C1 B2, B3, C2, D1, D2	**Getting started with Raspberry Pi** Introduction to Python programming, Booting Up RPi- Operating System and Linux Commands. Working with RPi using Python, Sensing Data using Python Lab 4:	Class discussion, in class and practice-based supervised work In-lab supervised exercise, in-class group work	Oral enquiry, problem sets, in-lab exercises, case analysis **Quiz 2** Lab Report 3
10	2	2	A1, B1, C1	**IoT Applications based on Raspberry Pi** LAMP Web-server, GPIO Control over WebBrowser, Creating Custom Web Page for LAMP Lab 5:	Class discussion, in class and practice-based supervised work	Oral enquiry, problem sets, case analysis Lab Report 4
11	2	2	A1, B1, C1	**IoT Applications based on Raspberry Pi** Communicating data using on-board module, Home automation using Pi,	Class discussion, in class and practice-based supervised work	Oral enquiry, problem sets, in-lab exercises, case analysis

			B2, B3, C2, D1, D2	Agriculture, Healthcare, Connected Vehicles,… Lab 6:	In-lab supervised exercise, in-class group work	Lab Report 5
12	2	2	A1, B1, C1 B2, B3, C2, D1, D2	**Arduino and Raspberry Pi integration using PyFirmata** Lab 7:	Class discussion, in class and practice-based supervised work	Oral enquiry, problem sets, in-lab exercises, case analysis **Quiz 3** Lab Report 6
13	2	2	A1, B1, C1	**Cloud and IoT Integration**	Class discussion, in class and practice-based supervised work In-lab supervised exercise, in-class group work	Oral enquiry, problem sets, in-lab exercises, case analysis case analysis Lab Report 7
14	2	2	A1, B1, C1	**Internet of Things Security and Privacy**	Class discussion, in class and practice-based supervised work	Oral enquiry, problem sets. research group presentation (15 min for each group)
15	2	2	A1, B1, B2, B3, C1, C2	Revision session Final Lab Exam		Lab Exam
16	2	0	A1, B1, B2, C1, C2	All topics		Final Exam

***Formative Assessment**

Teaching Materials

Textbook(s):

1. Ammar Rayes and Samer Salam, "Internet of Things from Hype to Reality -The Road to Digitization", Second Edition, ISBN 978-3-319-99516-8, Springer, 2019.
2. Milan Milenkovic, "Internet of Things: Concepts and System Design", Springer International Publishing, ISBN 978-3-030-41345-3, 2020

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

Reference(s):

1. Surya Durbha and Jyoti Joglekar, "Internet of Things", OXFORD Higher Education, ISBN: 9780190121099, 2021
2. David Hanes, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", Cisco Systems, 2017.
3. Internet of Things: principles and paradigms, Buyya, Rajkumar and Amir Vahid Dasterdji (eds.), Morgan Kaufmann, 2016.

Assessment

Type of Assessment	Description	Learning Outcomes	Weighting
Exercises	Exercises based on the concepts and scenarios of Internet of Things	**A1, B1, B2, C1, C2**	**Formative**
Lab Reports (7)	7 Lab Exercises based on the concept taught. 7 Lab Reports (Lab 1, 2,3, 4, 5,6,7)	**B2, B3, C1, C2, D1, D2**	**5%**
Quizzes (3)	Quiz 1 having 30 Minutes duration with questions from the topics covered. Quiz 2 (Hands-on Quiz) having 30 Minutes duration from the topics covered. Quiz 3 (Hands-on Quiz) having 30 Minutes duration from the topics covered. *The average of best 2 counts towards the final course grade.*	**A1, B1**	**10%**
Group Projects: **Research**	A short research assignment is assigned and is expected to be submitted **on week 14** before the final exams. Students are required to work in groups and are asked to select one topic of their choice which is related to IOT topics covered in class.	**A1, A2, C3, D1, D2**	**15%**

(report and presentation)	Students should 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. The report should be concluded with a paragraph summarizing the study. Students present their findings in a 15 min presentation.		
Major Exam	One hour Test consisting of Theory based questions.	**A1, B1, C1, C2**	**20%**
Final Lab Exam	One hour lab exam covering topics discussed in the class	**B1, B2, B3, C1, C2**	**10%**
Final Exam	Two hours Final Exam cover all the topics in the course syllabus.	**A1, B1, B2, C1, C2**	**40%**
Overall:			**100%**

Admissions	
Pre-requisites	ECCE 303 & ECTE 329
Minimum number of students	5
Maximum number of students	20

الجامعة الأهلية
AHLIA UNIVERSITY
BAHRAIN

College of Engineering

Department of Computer Engineering

Course Syllabus/Specification

Course Code and title **ECCE 424: Cyber Security**

Weight: **(2 - 2 - 3)**

Prerequisite: **STAT 302**

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

Description: This course will cover the most important concepts of cyber security, including topics such as cryptography, software security, malicious software, network security

and intrusion detection. Learners would gain knowledge of various cyber security terminologies, technologies, protocols, threat analysis, security principles, security mechanisms, web security, policies, forensics, incidence response, and methods/practices to secure systems.

Objectives: The objectives of the course are to:

6. Overview various cyber security threats and countermeasures to those threats.
7. Gain understanding of software and operating system security.
8. Implement symmetric and asymmetric-key encryption.
9. Identify the spectrum of security activities, methods, methodologies, and procedures.
10. Write and formulate authentication polices of users for a given system.
11. Perform IT Security management and risk assessment.
12. Formulate a computer and cyber security strategy.

SEMESTER: Second **ACADEMIC YEAR:** 2023/2024

INSTRUCTOR: Dr. Ammar AlDallal

OFFICE TEL.: 17298999, ext 8654

EMAIL: aaldallal@ahlia.edu.bh

Intended Learning Outcomes (ILOs)

E. Knowledge and Understanding		**NQF Descriptor/ Level**
A1	**Concepts and Theories:** Demonstrate a critical knowledge and understanding of properties, techniques, concepts, principles, and theories relating to cyber security services	**Knowledge**: Theoretical understanding [Level 8]
A2	**Contemporary Trends, Problems and Research**: Gain a ***critical*** understanding of research methods/investigation techniques to shed light of current threats and countermeasures with respect to cyber security	**Knowledge**: Theoretical Understanding [Level 8]
A3	**Professional Responsibility**: understand *detailed knowledge* of the role cryptography as a tool for deploying security software.	**Knowledge**: Theoretical Understanding. [Level 8]

F. Subject-Specific Skills	**NQF Descriptor/ Level**

B1	**Problem Solving**: Perform ***advanced*** calculations with respect to cyber security	**Knowledge**: Practical application [Level 8]
B2	**Modeling and Design**: ***Demonstrate creativity and*** design a computer-based cyber security system to address a range of security problems (authentication, software, operating system, and networks)	**Skills**: Generic problem solving & Analytical Skills [Level 8] **Knowledge**: Practical application [Level 8]
B3	**Application of Methods and Tools**: apply ***advanced*** security tools and techniques to encrypt/decrypt messages with a focus on cryptographic algorithms such as DES, AES, and RSA.	**Skills**: Communication, ICT and Numeracy [Level 8]

G. Thinking Skills		**NQF Descriptor/ Level**
C1	**Analytic**: ***Critically*** analyze the scale of threats with respect to software, operating system, and networks to evaluate the effectiveness of countermeasures"	**Skills**: Generic problem solving & Analytical Skills [Level 8]
C2	**Synthetic:** ***Identify*** and integrate a range of security solutions to address cyber security threats.	**Skills**: Generic problem solving & Analytical Skills [Level 8]
C3	**NA**	

H. General and Transferable Skills (Other Skills Relevant to Employability and Personal Development)		**NQF Descriptor/ Level**
D1	**Communication**: Express and communicate effectively with persons and specialists and be able to make formal presentations in the area of cyber security.	**Skills**: Communication, ICT and Numeracy [Level 8]
D2	**Teamwork and Leadership**: Work effectively as a member of a project team and demonstrate understanding of individual responsibility within the team	**Competence**: Autonomy, Responsibility and Context [Level 8]
D3	**NA**	
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 the field of computer security.	Context [Level 8] **Knowledge**: Theoretical understanding [Level 8]

Course Structure (Outline)						
Week	**Hours**		**ILOs**	**Topics**	**Teaching Method**	**Assessment Method**
1	3	-	A1	Chapter 1: Cyber security Fundamentals • What is Cyberspace? • What is Cyber security? • Why is Cyber security Important? • What is a Hacker?	Lecture Discussion	-
2	3	-	A1, B1, D1, D2	Chapter 2: Symmetric Encryption, Lab 1: implement Symmetric Encryption	Lecture/ Discussion/ Exercice	Test1 (week 6)/ Exercise 1* Oral Participation*
3	3	-	A1, B1, D1, D2	Chapter 3: Asymmetric Encryption	Lecture/ Discussion/ Exercice	Test1 (week 6)/ Exercise 1* Oral Participation*
4	3	-	A1, B1, D2, D4	Chapter 4: User Authentication and Access Control Lab2: Implement of Asymmetric Encryption	Lecture Discussion Exercise	Test1 (week 6) /Quiz 1/ Exercise2*
5	3	-	A1, B1, D2	Chapter 5: Operating System Security	Lecture Discussion Exercise	Test1 (week 6) / Exercise 3*
6	3	-	A1, D4	Chapter 6: Malicious Software Lab 3: Wireshark	Lecture Discussion	Test1
8	3	-	A1, C1	• Chapter 11: Software Security	Lecture Discussion	Test2 (week 12)
7	3	-	A1, C1	Chapter7: Social Network Security (human factors) • Social engineering, e.g., phishing • Don't Reveal Location • Keep Birthdate Hidden • Have Private Profile • Don't Link Accounts	Lecture Discussion	Test2 (week 12)/Quiz 2

				• Identity Theft • Harassment • Cyberstalking		
9	3	-	A1, A2, A3, B1, B2, B3, D1, D2, D4	Chapter 7: Types of Cyber Attacks • Password Attacks • Denial of Service Attacks • Passive Attack • Penetration Testing Lab 4: practice on IDS using packet tracer	Lecture Discussion	Test2 (week 12)
10	3	-	A1, B1, D1, D2	Chapter 8: Network Security • PGP and S/MIME • SSL and TLS • IPsec	Lecture Discussion	Test2 (week 12)/ Quiz 3 Exercise 4*
11	3	-	A1, B1, D1, D2	Chapter 9: Cloud security services	Lecture Discussion	Test2 (week 12)/ Final Written Exam (week 16) Exercise 5*
12	3	-	A1, B1, C1, D1	Chapter 10: Intrusion Detection and Response Lab 5 practice setting up firewall using packet tracer	Lecture Discussion	Test2/ Final Written Exam (week 16)
13	3	-	A1, D4	Chapter 11: Ethical hacking	Lecture Discussion	Final Written Exam (week 16) Quiz 4
14	3		A1, D1	Chapter 12: Firewalls, VPNs, and Wireless security	Lecture Discussion	Final Written Exam (week 16)
15	3	-	A1, A2, A3, D1, D2, D4	Project presentation and review	Lecture Discussion	Final Written Exam (week 16)
16			A1, B1, C1, C2	Comprehensive assessment		**Final Examination**
(*) = formative assessment						

TEACHING MATERIALS:

TEXTBOOK(S):	Cryptography and Network Security, Fourth Edition, ©2019 | Kahate | McGraw-Hill Higher Education — India
HANDOUT(S):	Material provided in eLearning (Moodle)
REFERENCE(S):	Textbook: 1. Stallings, "Cryptography and Network Security: Principles & Practice", 8th edition, Pearson, 2019. References: 2. Saydjari, Engineering Trustworthy Systems: Get Cybersecurity Design Right the First Time, ©2018, McGraw-Hill Professional — USA 3. Linux Essentials for Cybersecurity, Pearson, 2019 Articles/Research papers: 1. Aldallal, A. Toward Efficient Intrusion Detection System Using Hybrid Deep Learning Approach. Symmetry 2022, 14, 1916. SCOPUS, Q1. https://doi.org/10.3390/sym14091916 2. Mhawi, D.N.; Aldallal, A.; Hassan, S. Advanced Feature-Selection-Based Hybrid Ensemble Learning Algorithms for Network Intrusion Detection Systems. Symmetry 2022, 14, 1461. SCOPUS, Q1. https://doi.org/10.3390/sym14071461 3. Aldallal A, Alisa F. "Effective Intrusion Detection System to Secure Data in Cloud Using Machine Learning". Symmetry. 2021; 13(12):2306. SCOPUS Q1, https://doi.org/10.3390/sym13122306, 4. Ammar Aldallal, "Exploring DOM-Based Cross-Site Scripting", International Conference on Recent Advances in Engineering and Technology (ICRAET), Berlin, Germany, 3-4 Oct. 2017, pp.1-4. 5. Ammar Aldallal and Kashif Shabbir, "Protecting Web Applications from Cross-Site Scripting Attacks", Journal of Applied Engineering Research, volume 2017, issue 3, July – August, pp.1-21 6. M. A. Ambusaidi, X. He, P. Nanda, and Z. Tan, "Building an Intrusion Detection System Using a Filter-Based Feature Selection Algorithm," in IEEE Transactions on Computers, vol. 65, no. 10, pp. 2986-2998, 1 Oct. 2016. 7. http://www.scientificamerican.com/article.cfm?id=fact-fiction-encryption-prevents-digital-eavesdropping 8. Hands on sessions: CSX Cybersecurity Hands-On Basics Labs, Apply fundamental cybersecurity concepts in a live environment. available on https://nexus.isaca.org/products/133

Assessment:

Method of Assessment	Description	Learning Outcomes	Weighting
Test (1)	One major test covering topics discussed in first 8 weeks.	A1, B1, C1	20%
Quizzes (4) **Best 3**	The best three of four quizzes, each is a 30-minute test covering topics discussed in each 4 weeks	A1, B1, C1	10%
Group Projects: **Research**	This project is a group project where each group must write a research project about one of the security topics covered in class (Students may use the article references as references for the project)	A1, A2, A3, D1, D2, D4	10% Reports + presentation
Lab Reports **(Best 5)**	The student has to submit the design and results obtained during the lab experiment	B2, B3, C2, D1, D2	10%
Lab Final Exam	Lab exam of one-hour duration is carried out consists of a modeling problem.	B2, B3, C1, C2	10 %
Final Exam:	Two hours Final Exam consisting of problem-solving and essay questions. The exam will cover all the topics in the course syllabus.	A1, B1, C1, C2	40%
Exercises	Selective practice questions during the lecture	A1, B1	*Formative Assessment
Oral Participation	Questions and discussion during the lecture	A1, D1	*Formative Assessment
Overall:			**100%**

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

College of Engineering

Computer Engineering Department

COURSE SYLLABUS/ SPECIFICATION

Code and Title: ECCE 425 - Engineering Management

Weight: (3 - 0 - 3)

Prerequisite: (Completion of 90 credits)

Course Description: The course introduces advanced engineering management with professional engineers to provide a technical solution and a cost and resource-effective solution. In addition, an engineer must make things happen, and manage the end-to-end processes that can lead to the transformation of a technical solution into reality. Professional Engineers are unlikely to remain in a technical position for long and will rapidly progress into some management activity. Thus, there is a need to bridge the gap between engineers and businesspeople to meet the demands of the highly competitive engineering industry using a toolkit for future engineers.

Objectives: **On successful completion of the course, students will be able to:**

1. Demonstrate and apply knowledge management and strategic decision-making principles within the engineering industry.
2. Develop the ability to investigate and solve operational issues through informed judgment and effectively communicate their findings to plan, implement, and close a project successfully.
3. Recognize, formulate, analyze, and solve cash flow models and budgeting controls in practical situations for users of engineering in an informative manner.
4. Reflect on the legal aspects of product development, corporate social responsibility, and human resource management within an engineering organization.
5. To apply cost-benefit analysis among alternative investment projects and communicate the results of the modeling process in the engineering industry.

Semester: Summer Academic Year: 2022/2023

Instructor(s): Dr. Salah Al Hamad

Telephone: 39667479

Email: salhamad@ahlia.edu.bh

INTENDED LEARNING OUTCOMES (ILOS)

I. Knowledge and Understanding		**NQF Descriptor/ Level**
A1.	**Concepts and Theories:** Demonstrate the core theories and key concepts related to engineering Management, such as Project Management (PM) theory, cost theories (traditional and modern), Capital Assets Pricing Model (CAPM), and Life-Cycle Cost	**Knowledge**: Theoretical understanding [Level 8]
A2.	**Contemporary Trends, Problems, and Research:** Recognize contemporary trends, issues, and problems of current engineering management, and financial issues and identify areas for research in the fields of corporate managerial	**Knowledge**: Theoretical Understanding [Level 8]
A3.	**Professional Responsibility:** Understand the professional responsibility in the engineering Management economy and identify the primary activities of the financial manager involved in Project Management (PM).	**Knowledge:** Theoretical Understanding. [Level 8]

J. Subject-specific Skills		**NQF Descriptor/ Level**
B1.	**Problem-Solving:** Undertake advanced skills and techniques to resolve problems related to evaluating projects, determining the cost of capital, and quantifying organizations' financial risks.	**Knowledge**: Practical application [Level 8]
B2.	**Modeling and Design:** Measuring output efficiency using production possibility, border engineering model which can be used to analyze opportunity trade-offs, planning, designing, controlling routine operations for decisions on capital investments and external reporting to shareholders and potential investors in financial markets	**Skills**: Generic problem solving & Analytical Skills [Level 8] **Knowledge**: Practical application [Level 8]
B3.	**Application of Methods and Tools: NA**	

K. Thinking Skills	**NQF Descriptor/**

		Level
C1.	**Analytic:** Carry out critical analysis such as Organizing critical functions of engineering management and Project Scheduling CPM, PDM, and PERT Activities (Project Forward Path, Backword Path Duration, critical path, floating Time Management, and Timelines (Gantt Charts), and explicit costs, Implicit Costs breakeven analysis, sensitivity analysis, or scenario analysis to evaluate project risk.	**Skills**: Generic problem solving & Analytical Skills [Level 8]
C2.	**Synthetic:** Synthesize various organization financial models such as Project Budgeting and estimating, Cost Management, Fixed/Variable, Total Costs Cash flow, internal rate of return (IRR), capital asset pricing model (CAPM), Relationship Between Short-Run and Long-Run Average Total Costs and market model to estimate the firm's future cash flows.	**Skills**: Generic problem solving & Analytical Skills [Level 8]
C3.	**Creative:** NA	-

L. General and Transferable Skills (other skills relevant to employability and personal development)		**NQF Descriptor/ Level**
D1.	**Communication:** Communicate with professional-level peers, senior colleagues, and specialists to demonstrate and debate current issues in inappropriate written and oral forms to generate products and services that are highly technical.	**Skills**: Communication and ICT [Level 8]
D2.	**Teamwork and Leadership:** Use several exercises that require teamwork, engaging in group work, and motivating others to accomplish goals and sustain profitability by applying unique technologies and other core competencies.	**Competence**: Autonomy, Responsibility, and Context [Level 8]
D3.	**Organizational and Developmental Skills:** Engage in life-long learning and continuing self-development to enhance and practice program and project management skills directly affects the customers' overall perception of product/service quality, their tendency to come back for repeat business, and the gross margin realizable by an enterprise	Competence: Autonomy, Responsibility, and Context [Level 8]
D4.	**Ethics and Social Responsibility:** Demonstrate awareness of the social responsibility, ethical, moral, and legal issues related to engineering management. operation at a professional level in demonstrating a critical understanding of managing various projects' social responsibility.	**Competence**: Autonomy, Responsibility, and Context [Level 8]

Course Structure (Outline)					
Week	**Hours**	**ILOs**	**Topics**	**Teaching**	**Assessment Method**

	Lec	Lab			**Method**	
1	3	0	A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	Introduction to Management Challenges for Engineers and the Functions of Engineering Management, Project Management Essentials	Lecture/ Class discussion Lecture/ case studies	Class Participation **Case studies, Midterms, Group Projects, *Homework** **Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3)
2	3	0	A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	Project Initiation, Project Organizing, Leadership, and Project Teams *Human Resource Management*	Lecture/ Class discussion Lecture/ case studies	Class Participation **Case studies, Midterms, Group Projects, *Homework** **Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3)
3	3	0	A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	Project Planning Integration and Scope Management Planning with who will do what, how, where, when, and with which resources	Lecture/ Class discussion Lecture/ case studies	Class Participation **Case studies, Midterms, Group Projects, *Homework** **Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4)
4	3	0	A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	Organizing critical functions of engineering management and Project Scheduling CPM, PDM, and PERT Activities (Project Forward Path, backward path Duration, critical path, floating Time Management, and Timelines (Gantt Charts).	Lecture/ Class discussion Lecture/ case studies	Class Participation **Case studies, Midterms, Group Projects, *Homework** **Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4)
5	3	0	A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	Project Budgeting & Estimating Cost Management, . Project Cash Flows . Initial Project Screening Methods: Payback screening and Discounted Cash Flow Analysis . Variations of Present-Worth Analysis	Lecture/ Class discussion Lecture/ case studies Exercises,	Class Participation **Assignments, Case studies, Midterms, Group Projects, *Homework** **Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4)

6	3	0	A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	. Comparing Mutually Exclusive Alternatives Resource Allocation *Cost and Cost Accounting Management* Special Topics in Engineering Management Cost Concepts and Design Economics . Replacement Decisions . Capital Budgeting Decisions **Group Assignment**	Lecture/ Class discussion Lecture/ case studies Exercises,	Class Participation **Assignments, Case studies, Midterms, Group Projects, *Homework** **Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4)
7	3	0	A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	-Project monitoring and control and organizing of the critical function of engineering management. -Evaluating a Single Project -Annual Equivalent-Worth Criterion .	Lecture/ Class discussion Lecture/ case studies Exercises,	Class Participation **Case studies, Midterms, Group Projects, *Homework** **Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4)
8	3	0	A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	. Capital Costs versus Operating Costs . Applying Annual-Worth Analysis . Life-Cycle Cost Analysis . Design Economics Project Quality, Earned Value Management **Case studies**	Lecture/ Class discussion Lecture/ case studies Exercises,	Class Participation **Case studies, Midterms, Group Projects, *Homework** **Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4)
9	6	0	A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	- Risk Management Leading, - Effective action, - Financial Accounting **Midterm Exam**	Lecture/ Class discussion Lecture/ case studies Exercises,	Class Participation **Assignments, Case studies, Midterms, Group Projects, *Homework** **Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4)
10	6	0	A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	- Engineering managers (Leadership) . - Short-term strategies - Long term strategies - Action Plan and monitoring **Group Project**	Lecture/ Class discussion Lecture/ case studies Exercises,	Class Participation **Assignments, Case studies, Group Projects, *Homework** **Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4)

11	3	0	A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	-Quality Assurance -Quality Procurement Management -Communication,	Lecture/ Class discussion Lecture/ case studies Exercises,	Class Participation **Assignment, Case studies, Group Project, *Homework** **Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4)
12	3	0	A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	-Marketing management, -Controlling Business essentials, -Connection project.	Lecture/ Class discussion Lecture/ case studies Exercises,	Class Participation **Assignment, Case studies, Group Project, *Homework** **Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4)
13	3	0	A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	Operational Excellence, Globalization of Engineering Management in the New Millennium, Portfolio Management and	Lecture/ Class discussion Lecture/ case studies Exercises,	Class Participation **Assignment, Case studies, Group Project, *Homework** **Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4)
14	3	0	A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	Project Selection Future Work: Life-long Learning and Continuing Self-Development **Presentations of Student Team Projects**	Lecture/ Class discussion Lecture/ case studies Exercises,	Class Participation **Assignment, Case studies, Group Project, *Homework** **Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4)
15	3		A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	Wrapping up the course, Conclusion, and Insight.	Class discussion Exercises,	**Revision** (A1, A2, A3, B1, B2, C1, C2, D1, D2, D3, D4)
16	3		A1, A2, A3, B1, B2, C1, C2, D1, D4	All Topics	-	**Final Exam** (A1, A2, A3, B1, B2, C1, C2, D1, D4)

*Formative Assessment

TEACHING MATERIALS:

Admissions	
TEXTBOOK(S):	*Jack R. Meredith, Scott M. Shafer, Samuel J. Mantel Jr. Project Management: A Managerial Approach, 11th Edition 2021 Wiley*
HANDOUT(S):	Lecture notes will be posted in Moodle.
REFERENCE (S):	1. *B. Kumar Industrial Engineering Management is a book for engineering students 10th Edition 2018 Khanna Publishers – New Delhi.* 2. *Martand T TelsangIndustrial Engineering and Production Management is a book for engineering students by Martand T Telsang, published in 2018* by *McGraw Hill.* 3. *ByC. M. Chang, Engineering Management, Meeting the Global Challenges, 2nd Edition 2016* 4. *Meredith, Jack R., Mantel, Samuel J., & Shafer, Scott M., Project Management a Managerial Approach, 9th Edition, Wiley, 2015.* 5. *Gitman, Zutter, Elali, and AlRoubaie, Principles of Managerial Finance, Arab World Edition, Pearson, Essex, England, 2013. (ISBN: 13 – 978-1-408-27158-2)* 6. *Neftci, Salih, Principles of Financial Engineering, 2nd Edition, Academic Press, 2008 (ISBN 9780123735744)* 7. *Brigham, Eugene, (2009), South-Western, 10th Edition, (ISBN 9780324594690)* 8. *Brigham, Eugene, Fundamentals of Financial Management, 5th Edition, The Dryden Press, 1989, (ISBN 0030254825)* 9. *Meredith, Jack R., Mantel, Samuel J., & Shafer, Scott M., Project Management a Managerial Approach, 9th Edition, Wiley, 2015.* 10. **Project Management Journal**, PMI https://www.pmi.org/learning/publications/project-management-journal **11. Project Smart** https://www.projectsmart.co.uk/articles.php More references are available on the course website in Moodle.

ASSESSMENT:

Type of Assessment	Description	ILOs	Weighting
Class Participation and Homework	Students will be questioned orally to demonstrate their understanding and knowledge of the topics covered during class lectures. It will also be used to assess students' progress to provide corrective action if needed. Class participation also involves being clear about a student's position defending it and being willing to seek alternative perspectives on the situation. Students are expected to participate effectively during class, including analyzing, commenting, questioning, and building on others' contributions and homework	A1, A3, B1, C1, C2, D1, D4	Formative
Group Assignment	**In week 5** Students will work in groups to find out key concepts related to engineering Management, such as Project Management (PM) theory, cost theories (traditional and modern), Capital Assets Pricing Model (CAPM), and Life-Cycle Cost related to financial issues and identify areas of corporate managerial, determining the cost of capital, and quantifying organizations' financial risks and Carry out critical analysis such as Organizing through	A1,A2, A3, B1, C1, D1, D3, D4	10%

	several exercises that require teamwork, engaging in group work, and motivating others to accomplish goals and sustain profitability by applying unique technologies and other core competencies and take in the consideration of the awareness of the social responsibility, ethical, moral, and legal issues related to engineering management. **The Group Assignment will be subjected to the Turnitin report with less than 15%**		
Case studies	**In Week 8** An intensive case study that is aimed to generalize over several units to describe an intensive, systematic investigation of individual student Organizing, Leadership, Project Teams, Human Resource Management, Project Planning, Integration, Scope Management, Project Scheduling (CPM & PERT), Time Management, Project Budgeting & Estimating Cost Management, Project Monitoring and Control, and Project Quality Earned Value Management. Risk Management - Quality Assurance, Procurement Quality, Procurement Management, and Communication - Portfolio Management and Project Selection, Conclusion, Insight into Future Work Life-long learning, and Continuing Self-Development The assignment will cover the topics studied in the first **Four weeks**. **The Case studies will be subjected to the Turnitin report with less than 15%**	A1,A2, B1, B2, C1, D1, D3, D4	15%
Midterm Test	One-and-a-half hours of the exam consists of four parts: problem-solving, case study analysis, and development of a project feasibility study. The assessment will cover the first four weeks of the summer semester. Students will be assigned individual networking designs as part of the planning phase of projects, and time optimization cases will also be assigned.	A1, A2, A3,, B1, B2, C1, C2, D1, D3, D4	20 %
Group Project **(Reports and presentations)**	**In Week 10** In Students will be organized into teams to develop, manage, and present a project. Students (team) can choose anything for a project, providing it meets the PMI definition. Previous examples of projects students have presented for smartphones, a wedding reception, the expansion of a microbrewery, covering a residential house from traditional energy sources to solar energy, developing and building a soccer stadium for Northern Virginia, etc. The professor must approve all projects. Your projects will consist of two components; a written component of about 15 – 20 pages and a PowerPoint presentation. Examples of previous projects can be found on Moodle under "Projects." You should think of this as a project proposal and show how the various project processes will be covered. **The project will be subjected to the Turnitin report with less than 15%**	A2, A3, B1, B2, C1, C2, D1, D2, D3, D4	15 %

Final Exam	Two-hour duration closed the book and notes exam consisting of essay-type questions, modeling, problem-solving applications, and Case Exercises.	A1, A2, A3, B1, B2, C1, C2, D1, D4	40%
		Overall	**100%**

Admissions	
Prerequisites	**Completion of 90 credits**
Minimum number of students	**4**
Maximum number of students	**25**

Notes/Remarks:

Attending regularly scheduled sessions, make-up classes, and other course meetings is a fundamental student responsibility. Attendance at every scheduled session for the entire session is strongly encouraged. In case of emergency and class cancellation, students will be notified via Email or Moodle.

Academic Integrity:

All academic work is subject to The University of Greenwich has two London-based campuses and one at Medway in Kent- E
For more information, see the following:

- *https://www.gre.ac.uk/undergraduate-courses/content/ajax/courses-ajax-call?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZuZWxzb24uZ3JlLmFjLnVrJTJGcGxzJTJGY3JzZ*

- Leeds Beckett University – Leeds Base-Uk -Engineering Management Top-Up – College of Computing and Engineering- B
For more information, see the following:
- https://www.leedsbeckett.ac.uk/search/?start_rank=31&form=partial&query=Courses&f.Filters%7Cleedsbeckett-
STATE UNIVERSITY OF NEW YORK SOET 370 – ENGINEERING ECONOMICS, Texas A&M University-Commerce syllab
homework, assignments, examinations, and other graded coursework are to be completed in conformance with the AU Code
For more information, see the following:

- *QwMDM0JTI2Y29kZSUzRCZhbGw9MQ%3D%3D*
- http://www.canton.edu/middlestates/review/SOET370.pdf
- http://www.tamuc.edu/academics/cvSyllabi/syllabi/201320/22192.pdf
- https://www.newcastle.edu.au/course/MECH6830
- http://wmich.edu/sites/default/files/attachments/u883/2016/IEE%203100%20Generic.pdf
- The Code: http://www.gwu.edu/~ntegrity/code.html
- The Procedures: http://www.gwu.edu/~ntegrity/procedures.html
- The FAQs: http://www.gwu.edu/~ntegrity/faq.html

Furthermore, Ahlia University values academic integrity. All students must understand the meaning and consequences of che

COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

COURSE SYLLABUS / SPECIFICATION

COURSE CODE & TITLE:	ECCE 443-APPLIED ROBOTICS
WEIGHT:	(2 - 2 - 3)
PREREQUISITE:	ECCE 323
NQF LEVEL ALLOCATED:	8
NQF NOTIONAL HOURS / CREDITS:	120 NOTIONAL HOURS / 12 NQF CREDIT

DESCRIPTION: The course introduces robotics-related technologies, including computer programming methodologies, data acquisition methods for sensors (such as infrared and optical imagers), and control methods for actuators and servo motors via microcontrollers. In addition, the course covers maintaining robotic system in terms of troubleshooting and servicing.
The course addresses advanced robotic topics, such as computer Vision and Artificial intelligent that leads to innovative and futuristic robotic systems.

OBJECTIVES:

5. To introduce Robotics, types and evolutions in industrial sectors.
6. To overview the specialised principles and concepts of Robotics and their industrial applications.
7. To demonstrate the critical knowledge and understanding of robotics programming and advanced technologies.
8. To critically analyse the different parts of Robotic systems.
9. To design, develop and demonstrate insight of programs controlling innovative robotic systems.

SEMESTER: **ACADEMIC YEAR:** 2020 – 2021

INSTRUCTOR(S): DR. AHMED JEDIDI **EMAIL(S):** ajedidi@ahlia.edu.bh

OFFICE TEL.: 17298999 **EXT.** 8674

INTENDED LEARNING OUTCOMES (ILOS)

M. KNOWLEDGE AND UNDERSTANDING	NQF DESCRIPTOR / LEVEL
A1. Concepts and Theories: Demonstrate critical knowledge and understanding of the functions of Robotics Sensing and End-of-Arm Tooling.	**Knowledge**: theoretical understanding [Level 8]
A2. Contemporary Trends, Problems and Research: Apply standard research to investigate contemporary issues in the field of Applied Robotics.	**Knowledge** Practical Application [Level 8]
A3. Professional Responsibility: N/A	-

N. SUBJECT-SPECIFIC SKILLS	NQF DESCRIPTOR / LEVEL
B1. Problem Solving: Solve specialized problems related to Robotic systems.	**Skills:** Communication, ICT and Numeracy [Level 8] **Knowledge:** Practical Application [Level 8]
B2. Modeling and Design: Design and conduct experiments related to Robotic systems where data is limited and comes from different source.	**Knowledge:** Practical Application [Level 8]
B3. Application of Methods and Tools: Use different tools to design, program, simulate and implement where possible Robotic systems	**Knowledge:** Practical Application use simulation tools [Level 8]

O. CRITICAL THINKING SKILLS	NQF DESCRIPTOR / LEVEL
C1. Analytic: Critically analyze and evaluate Robotic design solutions and the outcomes of conducted experiments to understand the Robotic system function	**Skills:** Generic, Problem Solving and Analytical Skills [Level 8]
C2. Synthetic: Integrate different Robotic systems to perform interfacing to different I/O devices using computer vision and AI	**Skills:** Generic, Problem Solving and Synthetically Skills [Level 8]
C3. Creative: Demonstrate creativity in the application of Robotic systems using AI and Computer Vision	**Skills:** Generic, Problem Solving and Synthetically Skills [Level 8]

P. GENERAL AND TRANSFERABLE SKILLS	NQF DESCRIPTOR / LEVEL
D1. Communication: Convey ideas and describe processes rigorously through discussions during lectures and lab sessions and research project.	**Skills:** Communication, ICT and Numeracy [Level 8]
D2. Teamwork and leadership: Enhance teamwork and leadership skills through research project.	**Competence:** Autonomy and Responsibility [Level 8]
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
	LEC	LAB				
1	4	0	A1, B1, B2	Introduction to Robotics	Lecture.	-
2	4	0	A1, A2, B1, B2	Fundamentals of Robotics	Lecture,	In-class exercises.
3	4	0	A1, B1, C1	Robot Programming (Methods)	Lecture,	In-class exercises.
4	2	2	A1, B2, B3, C2, D1	Robot Programming (Types)	Lecture.	Quiz 1.
5	2	2	A1, B1, B2, B3, C1, C2, D1	Industrial Applications	Lecture, Simulation tools, Demonstration.	-
6	4	0	A1, B1, B2, B3, C1, C2, D1, D2	Sensors	Lecture, Lab Session #1.	Lab Report 1.
7	4	0	A1, B1, B2, B3, C1, C2, D1, D2	End Effectors	Lecture, Lab Session #2.	Lab Report 2.

8	4	0	A1, B1, B3, C2	Computer Systems and Digital Electronics	Lecture. Lab Session #3	- Lab Report 3
9	4	0	A1, B1, B2, C1, C2	Interfacing and Vision Systems (Interfacing)	Lecture.	Midterm Exam.
10	2	2	A1, B1, B2, B3, C1, C2, D1	Interfacing and Vision Systems (machine vision)	Lecture, Lab Session #4.	, Lab Report 4
11	4	0	B1, B3, C2	Maintaining Robotic Systems (Troubleshooting, general servicing)	Lecture, Lab Session #4.	Lab Report 4.
12	2	2	A1, B1, B2, B3, C1, C2, D1	Robotic Innovations: Artificial intelligence	Lecture. Lab Session #5.	Lab Report 5. Quiz 2.
13	2	2	A1, B1, B2, B3, C1, C2, D1	Robotic Innovations: Artificial intelligence	Lecture, Lab Session #5.	Lab Report 5.
14	2	2	A1, B1, B2, B3, C1, C2, D1	Robotic in modern manufacturing	Lecture,	
15	2	2	A1, B1, B2, B3, C1, C2, D1	Review.	-.	Research Presentation
16	0	2	A1, B1, B2, B3, C1	All Topics.		Final Lab Exam
	2	0	A1, B1, B2, C1,	All Topics.		Final Exam

*FORMATIVE ASSESSMENTS

TEACHING MATERIALS:

TEXTBOOK(S):	Industrial Robotics Fundamentals: Theory and Applications, 3rd Edition, Larry T. Ross, Stephen W. Fardo, and Michael F. Walach ISBN-13: 9781631269417 Pub. Date: 01/30/2017 Publisher: Goodheart-Willcox Publisher
HANDOUT(S):	Lecture Notes, Handouts Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
REFERENCE(S):	7. Ying Bai, "*Practical Microcontroller Engineering with ARM*" 1st Edition, 2015, Wiley-IEEE Press. 8. Manish K Patel, "*The 8051 Microcontroller Based Embedded Systems*". 2014, McGraw Hill Education. 9. Panachakel Jerrin Thomas. "*Microcontroller Based System Design using 8051 and ARM*". 2015, LAP Lambert Academic Publishing. 10.

ASSESSMENT:

TYPE OF ASSESSMENT	DESCRIPTION	LEARNING OUTCOMES	WEIGHTING
IN-CLASS EXERCISES	*Each week, the student solve problem and exercises related to the specific chapter*	A1, B1, B2, C1, C2	*FORMATIVE
MIDTERM EXAM	*"90 minutes exam covering topics discussed in the first 5 weeks".*	A1, B1, B2, C1, C2	20 %
QUIZZES	*"average of two quizzes each 30 minutes in week 4, , 12".*	B1, B2	10 %
LAB REPORTS + PRACTICAL REPORTS	*Five experiments are offered in the course and cover all topics of the course.*	B1, B2, B3, C1, C2, D1, D2	10 %
RESEARCH PROJECT	*The students are divided into groups and each group choose one of many research subject and prepare paper and presentation in the end of semester.*	B1, B2, A2, C2, C3, D1, D2	10 %
FINAL LAB EXAM	*One hour practical exam that covers all the lab sessions taken in the course.*	A1, B1, B2, B3 C1,	10 %

FINAL EXAMINATION	*exam of two hours duration and consists of problem solving-based short answer questions (SAQs).*	A1, B1, B2, C1	40 %
		OVERALL:	**100 %**

ADMISSIONS:

PRE-REQUISITES	ECCE 403
MINIMUM NUMBER OF STUDENTS	5 STUDENTS.
MAXIMUM NUMBER OF STUDENTS	20 STUDENTS

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).

الجامعة الأهلية
AHLIA UNIVERSITY
BAHRAIN

College Of Engineering

Computer Engineering Department

COURSE SYLLABUS/ SPECIFICATION

Code and Title: ECCE 451**:** Machine Learning

Weight: (2 - 2 - 3)

Prerequisite: STAT 302 AND MATH 205

Description: Machine Learning is the study of how to build computer systems that learn from experience. This course on *Machine Learning* will explain how to build systems that learn and adapt using real-world applications. Some of the topics to be covered include concept learning, neural networks, genetic algorithms, reinforcement learning, instance-based learning, and so forth.

Objectives:

1. To identify the various applications of machine learning algorithms.
2. To perform supervised learning techniques: linear and logistic regression.
3. To understand classification data and models.
4. To create robust Machine Learning models.
5. To choose the best algorithms among many for any given Machine Learning problem.
6. To use unsupervised learning algorithms including deep learning, clustering, and recommendation systems.

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):

I. Knowledge and Understanding		**NQF Descriptor/ Level**
A1	**Concepts and Theories:** The student will Demonstrate critical knowledge and understanding of the key algorithms and theories that form the foundation of machine learning and computational intelligence. Also he will be able to deeply explain the principles, advantages, limitations such as overfitting and possible applications of machine learning	**Knowledge**: Theoretical understanding [Level 8]
A2	**Contemporary Trends, Problems and Research**: The students will apply standard research and investigative methods related to the machine learning where he is exposed to the latest techniques developed in this field.	**Knowledge**: Theoretical Understanding [Level 8]
A3	**Professional Responsibility**: NA	**Knowledge**: Theoretical

		Understanding. [Level 8]

J. Subject-Specific Skills		NQF Descriptor/ Level
B1	**Problem Solving**: The student will apply selected machine learning algorithms to solve specialized problems such as Decision Tree.	**Knowledge**: Practical application [Level 8]
B2	**Modeling and Design**: Students will be able to *model* and *conduct in-depth experiments* related to some given real world machine learning problems, using MATLAB and the toolbox of practical methods presented in the lectures	**Skills**: Generic problem solving & Analytical Skills [Level 8] **Knowledge**: Practical application [Level 8]
B3	**Application of Methods and Tools**: apply ***advanced*** machine learning tools: Students will be able to implement a set of practical methods and algorithms in Python.	**Skills**: Communication, ICT and Numeracy [Level 8]

K. Thinking Skills		NQF Descriptor/ Level
C1	**Analytic**: Demonstrate creativity to use the different tools to design, calculate and simulate optical communication system (Python).	**Skills**: Generic problem solving & Analytical Skills [Level 8]
C2	**Synthetic**: Given a complex problem, students will be able to: (a) identify sub-problems that are amenable to solution using Machine Learning techniques, (b) provide creative solutions to those sub-problems, and evaluation of the solutions.	**Skills**: Generic problem solving & Analytical Skills [Level 8]
C3	**NA**	

L. General and Transferable Skills (Other Skills Relevant to Employability and Personal Development)		NQF Descriptor/ Level
D1	**Communication**: Express and communicate ideas effectively and rigorously 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 group members.	**Competence**: Autonomy, Responsibility and Context [Level 8]
D3	**NA**	
D4	Ethical and Social Responsibility: Demonstrate a sophisticated awareness of ethical implications relevant to the use of data such as using "big data".	Context [Level 8] **Knowledge**: Theoretical understanding [Level 8]

Course Structure (Outline)

Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lec	Lab				
1	3	0	A1	**Introduction:** Introduction to Artificial Intelligence and Machine Learning	-Lecturing -Class Discussions	-
2	3	0	A1, B1, D1	**Techniques of Machine Learning:** ❑ Supervised learning ❑ Unsupervised learning ❑Basics of Python	Lecturing -Class Discussions	In-class exercises Quiz 1 Major Exam Final Exam
3	3	2	A1, B1, B2, D1	**Techniques of Machine Learning** ❑ Semi-supervised and Reinforcement learning ❑ Bias and variance trade-off ❑ Representation learning	Lecturing - Supervised Lab work	Quiz 1 Major Exam Final Exam
4	3	2	A1, B1, B2, B3, C1, C2, D1	**Data Preprocessing** ❑ Data preparation ❑ Feature engineering ❑ Feature scaling ❑ Datasets	- Lecturing -Class Discussions - Supervised Lab work	In-class exercises Major Exam Lab report 1 Final Exam

				❑ Dimensionality reduction **Lab 1:** data reprocessing		Final Lab Exam
5	3	0	B1, B2	**Math Refresher** ❑ Concepts of linear algebra ❑ Eigenvalues, eigenvectors, and eigendecomposition	-Lecturing -Class Discussions	Final Lab Exam
6	3	2	B1, B2	**Math Refresher** ❑ Introduction to Calculus ❑ Probability and statistics	-Lecturing -Class Discussions - Supervised Lab work	Lab report 2 Final Lab Exam
7	3	0	A1, B1, B2, B3, C1, C2, D1	**Classification** ❑Meaning and types of classification ❑Decision tree classifier **Lab 2**: decision tree	Lecturing -Class Discussions	In-class exercises Final Exam Final Lab Exam
8	3	2	A1, B1, B2, C1, C2	**Classification** ❑Random forest classifier ❑ Logistic regression	- Lecturing - Supervised Lab work	Final Exam Final Lab Exam
9	3	0	A1, B1, B2, B3, C1, C2, D1	**Classification** ❑ K-nearest neighbors ❑ Support vector machines **Lab 3:** K-nearest neighbors	- Lecturing -Class Discussions	Lab report 3 Quiz 2 Final Lab Exam
10	3	2	A1, B1, B2, C1, C2	**Classification** ❑ Kernel support vector machines ❑ Naive Bayes	-Lecturing -Class Discussions - Supervised Lab work	In-class exercises Final Exam Final Lab Exam
11	3	0	A1, B1, C1, C2	**Regression** ❑ Regression and its types	Lecturing, Group Discussion	In-class exercises Final Exam

				❏ Linear regression: Equations and algorithms		
12	3	2	A1, B1, B2, B3, C1, C2, D1	**Unsupervised learning: Clustering** ❏ Clustering algorithms ❏ K-means clustering **Lab 4**: K-means	-Lecturing - Supervised Lab work	Lab report 4 Final Lab Exam
13	3	0	A1, C1, C2, D1, D4	**Introduction to Deep Learning** ❏ Meaning and importance of Deep Learning ❏ Artificial Neural Networks ❏ Genetic algorithm	-Lecturing -Class Discussions	In-class exercises Final Exam
14	3	0	A1, A2, C1, C2, D1, D2, D4	**Project presentation**	-Class Discussions	In-class exercises Major Exam Final Exam
15	3	0	B2, B3, C1, C2	**Revision – Final Lab Exam**	-Class Discussions -In class Practice	***Oral Enquiry**
16			A1, B1, C1	**Final Examinations**		**Final Exam**

*Formative Assessment

Teaching Materials

Textbook(s): Machine Learning with Python for Everyone (Addison-Wesley Data & Analytics Series) 1st Edition, 2020.

Handout (s): Notes will be provided, additional learning material are available on Moodle at: http://www.cs.cmu.edu/~tom/mlbook.html

Reference(s):

1. **Aldallal, A.** Toward Efficient Intrusion Detection System Using Hybrid Deep Learning Approach. *Symmetry* 2022, *14*, 1916. https://doi.org/10.3390/sym14091916
2. Mhawi, D.N.; **Aldallal, A.;** Hassan, S. Advanced Feature-Selection-Based Hybrid Ensemble Learning Algorithms for Network Intrusion Detection Systems. Symmetry 2022, 14, 1461. SCOPUS, Q1 https://doi.org/10.3390/ sym14071461

3. **Aldallal A**, Alisa F. "Effective Intrusion Detection System to Secure Data in Cloud Using Machine Learning". *Symmetry*. 2021; 13(12):2306. SCOPUS Q1, https://doi.org/10.3390/sym13122306
4. Machine Learning, Tom Mitchell, McGraw Hill, 2017 ISBN-10: 1259096955.
5. Python Machine Learning, Sebastian Raschka, Packt Publishing Ltd, Dec 2019
6. Machine Learning Algorithms, Giuseppe Bonaccorso, Packt Publishing Ltd, Jul 24, 2017

Assessment

Type 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 consist of sets of exercises from the textbook or other resources and is not graded. Solutions to homework exercises are provided as handouts.	A1, B1, B2, B3, C1, C2	formative
Test	Written test covers the topics of first 8 weeks.	A1, B1, C1	**20 %**
Four Quizzes (best 3 of 4)	Two quizzes covering topics discussed in the lectures	A1, B1, B3, C1, C2	**10 % (Average)**
Group Project (report and presentation)	A short research assignment is assigned and is expected to be submitted on week 14 before the final exams. Students are required to work in groups and are asked to select one topic of their choice which is related to machine learning and write an essay of a minimum of 5 pages consisting of an introduction, description of the methods and tools utilized in the selected application and a justification for their use and the detailed results obtained. The report should be concluded with a paragraph summarizing the study.	A1, A2, C1, C2, D1, D2, D4	**10%**
Lab Reports	Six supervised in-Lab assignments are given in which students are going to use Python 1. *Basics of Python + data generation* 2. *Data manipulation and cleaning* 3. *decision tree* 4. *K-nearest neighbors* 5. *K-Mean*	B2, B3, C1, C2, D1	**10% (Average)**
Lab Final Exam	One lab exam of 1hour duration is carried out consisting of different Python problems covering a selected set of experiments taken in the course.	B2, B3, C1, C2	**10%**

Final Examination	Two hour essay Exam and cover all the topics in the course syllabus	A1, B1, C1	**40%**
		Overall:	**100%**

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 COMPUTER ENGINEERING

COURSE SYLLABUS/SPECIFICATION

CODE & TITLE:	ECCE 452 – **Computer vision**
WEIGHT:	(2 - 2 - 3)
PREREQUISITE:	ITCS 224
DESCRIPTION:	This course aims to provide students with the fundamentals of Computer Vision including Image Processing and classification. Topics include: Digital Images and their Properties, Image Formation, Image Acquisition, Image Segmentation and Boundary Extraction, Feature Detection and Matching, Image Classification, Scene Matching and Detection, Object Recognition, Motion Estimation, Tracking, and Classification, Computer vision applications

OBJECTIVES:

The objectives of the course are to :

- Recognize and describe both the theoretical and practical aspects of computing with images. Connect issues from Computer Vision to Human Vision
- Describe the foundation of image formation and image analysis. Understand the basics of 2D and 3D Computer Vision.
- Become familiar with the major technical approaches involved in computer vision. Describe various methods used for registration, alignment, and matching in images.
- Get an exposure to advanced concepts leading to object and scene categorization from images.
- Build computer vision applications.

Instructor(s):

Office Telephone:

Emails:

Intended Learning Outcomes (ILOs)

A. Knowledge and Understanding	
A1	**Concepts and Theories:** Demonstrate critical knowledge and understanding of the problems encountered in computer vision and the principles and techniques used to address them.
A2	**Contemporary Trends, Problems and Research:** Demonstrate Critical knowledge and understanding of computer vision system and design techniques applied in current related research
A3	**Professional Responsibility :** N/A

B. Subject-Specific Skills	
B1.	**Problem Solving:** Use standard computer vision reference sources to identify approaches, methods and techniques for solving practical computer vision problems.
B2.	**Modeling and Design:** Design an appropriate solution to a given computer vision problem, such as object detection and recognition, and create a software implementation.
B3.	**Application of Methods and Tools:** Use analytical and graphical techniques to design and evaluate computer vision system via CAD tools (such as MATALB)

C. Critical Thinking Skills	
C1.	**Analytic Skills:** Critically evaluate the performance and drawbacks of a proposed solution to a computer vision problem.
C2.	**Synthetic:** Devise and construct plans for the management and development of an imaging system.
C3	**Creative Thinking and Innovation:** N/A

D. General and Transferable Skills (Other Skills Relevant to Employability and Personal Development)	
D1.	**Communication:** Communicate clearly in a well structured manner to convey and describe computer vision system, analysis and design solutions through oral presentations and written report.

D2	**Teamwork and Leadership:** Work effectively as a member/leader of a project team on specific computer vision topics, taking on responsibility for the work of others.
D3	**Organizational and Developmental Skills:** N/A
D4	**Ethical and Social Responsibility**: N/A

12. Course Structure (Outline)

Week	Hours		ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
	Lec	Lab				
1	2	2	A1,	Introduction to the computer vision system	Lecture Discussion Exercises	Oral enquiry* Research Assignment
2	2	2	A1, B2, B3, C1, C2, D1	Image formation and image processing	Lecture, Exercises	Oral enquiry* **Lab Report # 1**
3	2	2	A1,B1, B2, B3, C1, C2, D1	Image projections and scene representation.	Lecture Exercises	Oral enquiry* **Quiz #1** Homework 1*
4	2	2	A1,B1, B2, B3, C1, C2, D1	Brightness, CCD cameras, the human visual system.	Lecture Discussion Exercises	Oral enquiry* **Lab Report# 2**

5	2	2	A1,B1, B2, C1, C2, D1	**Vision and image processing :** Convolution and correlation.	Lecture Discussion	Oral enquiry* Homework 2 *
6	2	2	A1,B1, B2, B3, C1, C2, D1	**Vision and image processing** : Noise and smoothing.	Lecture Exercises	**Quiz # 2** **Lab Report# 3**
7	2	2	A1, A2, D1,	**Vision and image processing :** Edge detection and corner detection.	Lecture Exercises	Oral enquiry*
8	2	2	A1, B1, B2, C1, D1	**Vision and image processing :** Interest points and corners	Lecture Discussion Exercises	Oral enquiry* **Major Test**
9	2	2	A1,B1, B2, B3, C1, C2, D1	**Vision and image processing :** Model fitting and RANSAC	Lecture Discussion Exercises	Oral enquiry* **Lab Report #4** Homework 3 *
10	2	2	A1, B1, B2, B3, C1, C2, D1	**Image interpretation :** Basic object recognition.	Lecture, Discussion	**Quiz # 3**
11	2	2	A1, B1, B2, B3, C1, C2, D1	**Image interpretation :** General classifiers.	Lecture Exercises	**Lab Report # 5**
12	2	2	A1, B1, B2, B3, C1, C2, D1	**Mobile Robots:** Simple robot control.	Lecture Discussion Exercises	Oral Enquiry* Homework 4 *

13	2	2	A1, B1, B2, B3, C1, C2, D1	**Using computer vision:** Applications in medicine	Lecture Discussion Exercises	**Lab Report # 6**
14	2	2	A1,C1, D1	**Using computer vision:** Applications industry, and surveillance.	Lecture Discussion Exercises	Oral Enquiry*
15	2	2	A1, 2, B2, B3, C1, C2, D1, D2, A2	Research Assignment Presentations All lab work	-	Research Assignment Presentations **Final Lab Exam**
16	2	0	A1,B1, B2, C1, C2, B3	**Final Examination**		
(*) = formative assessment						

Teaching Materials:

Textbook(s):
- " Digital Image Processing and Analysis: Human and Computer Vision Applications with CVIPtools", Scott E Umbaugh, Second Edition, CRC Press, 2016, ISBN 1439802068, 9781439802069

Handout(s):
- Lecture Notes
- Other selected readings and lectures videos on course website (Moodle System)

Reference(s):

Books:

1- "Machine Learning: a Probabilistic Perspective", Kevin Patrick Murphy, edition 2013.

2- "Computer Vision: Algorithms and Applications", Richard Szeliski, September 2010 , Springer

Assessment:

Type of Assessment	Description	Learning Outcomes	Weighting
Oral enquiry	*Questions are asked throughout the lectures and exercise sessions to assess students understanding and learning*	A1,C1, D1	formative
Homework	*Homework is 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,B1,B2, B3,C1,C2	formative
Quizzes	*Three quizzes are administered throughout the semester covering different topics of the course and consisting of short problem solving questions. The best two quiz grades are counted towards the course grade.*	A1, B1, C1, C2	Average of best 2 quizzes 10%
Major Test	*One closed book tests, of 1 hr 15 min duration, consisting of problem solving-based short answer questions.*	A1, B1, B2, C1	20%
Research Assignment	*A short research assignment is assigned on the first week and is expected to be submitted on week 14 before the final exams. Students are required to work in groups and are asked to select computer vision*	A1,A2,D1,D2	10%

(report and presentation)	*applications 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. The report should be concluded with a paragraph summarizing the study. Students present their findings in a 15 min presentation.*		
Lab Reports	*Six supervised in-Lab assignments are given in which students are to use MATLAB* *1. MATLAB Primer* *2. Image Filtering and Hybrid Images* *3. Edge detection and corner detection* *4. Local Feature Matching* *5. Convolutional Neural Nets* *6. Camera Calibration and Fundamental Ma Estimation*	B2,B3,C1,C2, D1	10% (Average)
Lab Final Exam	*One lab exam of 1hour duration is carried out consisting of the computer vision problems covering a selected set of experiments taken in the course.*	B2, B3, C1, C2	10%
Final examination	*Closed book, closed notes, of two hours Final Exam consisting of problem solving questions. The exam covers most of the topics covered in class.*	A1, B1, B2,B3,C1, C2	40 %
		Overall:	**100%**

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COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

COURSE SYLLABUS/SPECIFICATION

CODE & TITLE: ECCE 499 – PROJECT IN COMPUTER AND COMMUNICATION ENGINEERING

WEIGHT: (0 - 6 - 3)

PREREQUISITE: **ETHC 392 & IERM 498**

DESCRIPTION: Each student or a group of students (max of 2) is required to solve real engineering problem and work under faculty supervision. All phases of project life cycle should be documented starting from feasibility study then designing followed by implementation and eventually testing and verification. By the end of registered semester student should submit a report that follow the approved University guidelines for project report and defend a presentation.

OBJECTIVES:

1. To provide an opportunity for conducting independent research on certain chosen topic in the field of computer and communication engineering that involves literature review, research methodology, analysis, practical implementation and drawing defensible conclusions.
2. To allow students to demonstrate independence, research ethics, academic integrity, critical thinking, problem-solving and creativity in the application of knowledge, understanding and practices. and writing skills, as well as organization and time-management skills.
3. To operate at specialist level with significant responsibility for the work with others, organization and time-management skills as well as decision making responsibilities.

SEMESTER: **ACADEMIC YEAR:**

INSTRUCTOR:

OFFICE TEL.:

EMAIL:

INTENDED LEARNING OUTCOMES (ILOS)

E. Knowledge and Understanding	
A1	*Concepts and Theories: **N/A***
A2	Contemporary Trends, Problems and Research: Demonstrate an informed and critical awareness of research issues and methods, technological advancements, and current solutions related to some important problems in the field of computer and communication engineering
A3	Professional Responsibility: *D*emonstrate cognizance of and adhere to professional code of conduct as a computer and communication engineering practitioner and researcher.

F. Subject-Specific Skills	
B1	Problem Solving: Identify, formalize, and solve computer and communication engineering problems; plan, design, and implement their computable solutions.
B2	Modeling and Design: Design and develop models for embedded system systems, computer system, or processes to meet desired needs within realistic constraints.
B3	Application of Methods and Tools: Use effective research methods to gather data and demonstrate proficient use of engineering laboratory hardware and software as required for the research being undertaken.

G. Thinking Skills	
C1	Analytic: *A*nalyze problems; identify the appropriate computational resources (input) needed to solve them and analyze the effectiveness and efficiency of output accordingly generated.

C2	Synthetic: Develop and integrate engineering solution to real life problem and document it in a well-structured project.
C3	Creative: Create new or improve existing ideas, concepts, techniques, methods, tools, and theories in the field of a computer and communication engineering and identify ways in which these can be applied to solve existing, new or anticipated problems.

H. General and Transferable Skills (Other Skills Relevant to Employability and Personal Development)	
D1	Communication: Express and communicate ideas cogently, persuasively and effectively, in written and oral form, to a diverse range of audiences and stakeholders.
D2	*Teamwork and Leadership:* Demonstrate the ability to work cooperatively in group and accomplish each phase on time and assemble all phases into a final project or product.
D3	Organizational and Developmental Skills: Engage in life-long learning and continuing self-development to improve professional and organizational and time management as well as presentation skills to write a project within certain timeline.
D4	Ethical and Social Responsibility: Recognize, accept, and follow research ethics and social responsibility and respond positively to the needs of society by identifying, employing and utilizing effectively the advanced computing and information solutions and technologies.

Course Structure (Outline)

The course consists of the following components:

1. Conducting scientific research and writing project in consultation with the supervisor through regular meetings using Ahlia University's *project presentation guidelines XXXX 499.* The timeline and the key milestones are typically as follows:

Key Milestones	Timeline
Introduction and Problem Definition - Write a draft Introduction chapter and seek advice from supervisor - Revise the chapter accordingly	1 week
Literature Review - Update the literature review of the selected topic in IERM 498 - Write a draft chapter on Literature Review and discuss with supervisor - Revise the chapter accordingly	3 weeks

Approach, Conceptual Model, Research Method and Tools - Revise the selected conceptual model, hardware/software and tools to be used - Write a draft chapter on Conceptual Model, Research Methods and Tools - Consult with supervisor and revise accordingly	1 week
Project Development, Experiments, Data Gathering and Analysis - Solicit any software/hardware requirements if needed - Design, implement and evaluate any hardware/software or experiments - Gather and record any required data - Record, study, analyze and interpret findings and raw data - Discuss with supervisor results and conclusions and revise accordingly	8 weeks
Drafting Main Chapters in Project - Describe the development and implementation process of your project hardware, software and experiments, if any - Summarized your raw findings and data using, e.g., tables and charts - Discuss scientifically and critically your findings, implications and conclusions - Document any limitations and possible future work - Discuss the final chapters with supervise, revise and finalize the dissertation accordingly	4 weeks

TEACHING MATERIALS:

TEXTBOOK(S): N/A

HANDOUT(S): *GUIDELINES FOR THE UNDERGRADUATE PROJECT (XXXX 499), VERSION: 4.0*

Ref: UC/P 329 /2018.

REFERENCE(S): Students are free to choose the references that support their research studies in consultation with their supervisors. Scientific journal references are highly appreciated.

ASSESSMENT:

The student research work, written report, oral presentation/defense, and other supplemented documentations or hardware/software is evaluated by an examination Committee according to the University regulations described in the Project Presentation Guidelines XXXX 499, V. 4 Ahlia University. The student has to defend his/her project in front of the examination committee which

consists of three examiners consisting of the supervisor, and two internal examiners. The student work will be evaluated as follows:

	Criteria	Marks	ILOs	Total
Written Report	Problem Definition	5	B1	**50%**
	Literature Search	10	A2, C1, D4	
	Methodology & Analysis	25	B2, C3	
	Format	5	D1	
	Documentation	5	A3, D3, D4	
Oral Presentation	System Design & Demonstration	20	B3, C2	**50%**
	Time Management & Presentation Skills	10	D1, D3	
	Questions & Answers	20	A2, B3, C1, D1, D2	
	Total	**100**		**100%**

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