Sana'a University
Faculty of Engineering
Electrical Engineering Department
B.Sc. of Computer and Control Engineering

23. Course Specification of Logic Circuits 2

I. Course Identification and General Information:

1.	Course Title:	Logic Circuits 2				
2.	Course Code & Number:	CCE112				
3.	Credit hours:	C.H				TOTAL
		Th.	Tu.	Pr.	Tr.	
		2	-	2	-	3
4.	Study level/ semester at which this course is offered:	2nd Level/ 2nd Semester				
5.	Pre –requisite (if any):	Logic Circuits 1 (CCE111)				
6.	Co –requisite (if any):	None				
7.	Program (s) in which the course is offered:	Computer Engineering and Control				
8.	Language of teaching the course:	All materials are in English; Lectures / discussions are in English and Arabic				
9.	Location of teaching the course:	Class room + lab				
10.	Prepared By:	Asst. Prof. Dr. Osama H. Alshibami				
11.	Date of Approval					

II. Course Description:

This course aims to develop engineering base knowledge for computer-based systems main components. Therefore, the principles and operations of sequential circuits, starting from Flip flops till complete synchronous sequential circuits will be covered. It will also cover the analysis design and realization of counters, analysis and realization of shift registers, design of main memory and Computer aided design tool for logic circuits and digital systems. Through Lab works, by hands-on & computer-based works, students develop their practical and problem-solving skills as well as throughout term project for solving industrial and marketing problems related to the digital system design.

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	III. Course Intended learning outcomes (CILOs) of the course	Referenced PILOs	I, E, A
a1.	Recognize the principles and operations of sequential circuits, starting from Flip flops till complete sequential circuits.	A1	E
a2.	Acquire knowledge on digital system sequential elements such as counters & registers to meet desired needs within realistic constraints.	A2, A3	I
b1.	Analyze the requirements of a range of computer-based systems and examine the design alternatives based on the constraints imposed by society, organizations, and technology	B2, B4	E
b2.	Design synchronous and asynchronous sequential digital circuits using basic logic gates, flip-flops, counters, registers and main memory.	B3, B4	E
c1.	Use appropriate computer-based design support tools	C1	E
c2.	Appreciate the features of complex computing hardware and software and operate on effectively	C2,C4	I
d1.	Strike the balance between self-reliance and seeking help when necessary in new situations.	D2	I
d2.	Demonstrate significantly enhanced group working abilities.	D1	E

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(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1- Recognize the principles and operations of sequential circuits, starting from Flip flops till complete sequential circuits.	- Active lectures sessions, - Interactive class discussion,	- Written Exam - Quizzes - Assignment - Test
a2- Acquire knowledge on digital system sequential elements such as counters & registers to meet desired needs within realistic constraints.	- Active lecture sessions, - Interactive class discussion,	- Quizzes - Assignment - Test

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Analyze combinational and sequential circuits using VHDL systems	- Active lectures sessions, - Individual and Group, - Hands on Lab Work, - Computer-based Lab Work, - Interactive class discussion,	- Quizzes - Assignment - Lab Assessments & Reports - Test
b2- Analyze the requirements of a range of computer-based systems and examine the design alternatives based on the constraints imposed by society, organizations, and technology.	- Active lectures sessions, - Individual and group work, - Computer-based Lab Work, - Lab and projects.	- Quizzes - Assignment - Lab Reports - Project Reports - Test

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© Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1- Use appropriate computer-based design support tools	- Individual and group work, - Computer-based Lab Work, - Lab and projects.	- Quizzes - Assignment - Lab Reports - Project Reports - Test
c2- Appreciate the features of complex computing hardware and software and operate on effectively	- Individual and group work, - Computer-based Lab Works, - Lab and projects.	- Quizzes - Assignment - Lab Reports - Project Reports - Test

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1- Strike the balance between self-reliance and seeking help when necessary in new situations.	- Individual and group work, - Lab and projects.	- Quizzes - Lab Reports - Project Reports
d2- Demonstrate significantly enhanced group working abilities.	- Individual and group assignments, - Class exercises, - Labs and projects.	- Quizzes - Lab Reports - Project Reports

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IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact hours
1.	Introduction	a1, a2, b1, b2	▪ Combinational and Sequential Circuits. ▪ Synchronous and asynchronous Sequential Circuits. ▪ State Diagram and State Variables	2	4
2.	Flip Flops	a1, a2, b1, b2	▪ Introduction ▪ The Bitable Element ▪ The SR Flip-Flop ▪ The Clocked SR Latch ▪ The D-Type Latch ▪ The JK Flip-Flop ▪ Triggering the Flip-flops	2	4
3.	Counters	a1, a2, b1, b2	▪ Introduction ▪ Asynchronous Ripple Counters ▪ Arbitrary Count Asynchronous Counters ▪ Synchronous Counters ▪ Arbitrary Count Synchronous Counters ▪ IC Synchronous Counters ▪ Up/Down Synchronous Counters ▪ Cascaded Counters ▪ Counter Decoding ▪ Counter Applications	2	4

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4.	Registers	a1, a2, b1, b2	▪ Introduction ▪ Shift Register ▪ Bidirectional Shift Registers ▪ The Universal Shifts Counters ▪ The use of Shift Registers as Counters	1	2
5.	Registers (Cont.)	a1, a2, b1, b2	▪ Sequence Generators ▪ The Ring Counter ▪ The Johnson Counter ▪ MLS Shift Registers	1	2
6.	Synchronous Sequential Circuits	b1, b2, c2	▪ Introduction ▪ Analysis Procedure ▪ Design Examples ▪ Design Procedure	2	4
7.	The Main Memory	b1, b2, c2	▪ Introduction ▪ Read Only Memory ▪ Programmable ROMs ▪ ROM Applications ▪ Read Write Memories ▪ Dynamic RAMs ▪ Memory Expansion	2	4
8.	Sequential Logic Programming	b1, b2, c2	▪ Introduction ▪ The FPGA and sequential programming ▪ Implementing counters and registers ▪ Using the VHDL language to implement a general sequential circuit.	2	4
Number of Weeks /and Units Per Semester				**14**	**28**

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B - Practical Aspect:				
Order	**Tasks/ Experiments**	**Number of Weeks**	**Contact hours**	**Learning Outcomes**
1.	**S-R Laches(Active Low and Active High**	**1**	**2**	a1, b.1, b.2, c.1, c.2, d.1
2.	S-R Laches with ENABLE	**1**	**2**	a1, b.1, b.2, c.1, c.2, d.1
3.	**S-R, J-K, D, and T Flip Flop**	**1**	**2**	a1, b.1, b.2, c.1, c.2, d.1
4.	**J-K** Flip Flop with SET and CLEAR	**1**	**2**	a1, b.1, b.2, c.1, c.2, d.1
5.	Asynchronous Counter	**1**	**2**	a2, b.1, b.2, c.1, c.2, d.1
6.	Decade Asynchronous Counter	**1**	**2**	a2, b.1, b.2, c.1, c.2, d.1
7.	Synchronous Counter	**1**	**2**	a2, b.1, b.2, c.1, c.2, d.1
8.	**Decade S**ynchronous Counter	**1**	**2**	a2, b.1, b.2, c.1, c.2, d.1
9.	**Counter with count enable & Up-Down counter**	**1**	**2**	a2, b.1, b.2, c.1, c.2, d.1
10.	**Johnson &Ring counters**	**1**	**2**	a2, b.1, b.2, c.1, c.2, d.1
11.	**Counters design by using Karnaugh Map**	**1**	**2**	a2, b.1, b.2, c.1, c.2, d.1
12.	**Shift Registers**	**1**	**2**	a2, b.1, b.2, c.1, c.2, d.1
13.	Review	**1**	**2**	a1, a2, b.1, b.2, c.1, c.2, d.1, d2

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14.	Final Submission and Presentation of Term Project Report	**1 (started from the 4th week)**	**2**	a1, a2, b.1, b.2, c.1, c.2, d.1, d2
Number of Weeks /and Units Per Semester		**14**	**28**	

V. Teaching strategies of the course:

The knowledge and skills are delivered to students through:

- Active lecture sessions,
- Interactive Class Discussion,
- individual and group assignments,
- Lab and projects.
- Computer-based Lab Work,

VI. Assignments & Reports:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Latches & Flip-Flops Lab Reports	a.1, a.2, b.1, b.2, c.2, d.2	3rd	1
2.	Counters Repots	a.1, a.2, b.1, b.2, c.2, d.2	5th	2
3.	Registers Repots	b.1, b.2, c.2, d.2	7th & 9th	2
4.	Sequential Logic Circuits Design Assignments & Repots.	b.1, b.2, c.1, c.2, d.1, d.2	11th	4
5.	Memory & VHDL Programming Search Web and prepare short reports to solve problems related to digital	b.1, b.2, c.1, c.2, d.1, d.2	12th & 14th	6

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	system design as suggested by the lecturer			
	Total			**15**

VII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Assignments & Reports	3rd to 14th	15	10%	a.1, a.2, b.1, b.2, c1, c.2, d.2
2.	Quizzes	5th , 10th & 14th	10	6.67%	a.1, a.2, b.1, c.1
3.	Midterm Exam (Theory)	8th	20	13.33%	a.1, a.2, b.1, b.2
4.	Final Lab. Exam (including Course Project Evaluation)	14th & 15th	30	20%	a1, a2, b.1, b.2, c.1, c.2, d.1, d2
5.	Final Exam (Theory)	16th	75	50%	a1, a2, b.1, b.2, c.2
Total Marks/ Percentage			**150**	**100%**	

VIII. Learning Resources:

- *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

1- Required Textbook(s) (maximum two).

	1 -Thomas L. Floyd, 2009, Digital Fundamentals, 10th Edition, Pearson Education International

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	2- Ronald J. Tocci, Neal S.Widmer, Gregory L. Moss, 2007, Digital Systems : Principles and Applications, 10th Edition,. Pearson Prentice Hall
2- Essential References.	
	1-Douglas L. Perry, 2002, VHDL Programming by Example, 4th Edition, McGraw-H 2 -M. M. Mano, M. D. Ciletti, 2007, Digital Design, 4th Edition, Prentice-Hall
3- Electronic Materials and Web Sites *etc*.	

IX. Course Policies:

1.	**Class Attendance:** -A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic
2.	**Tardy:** - For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3.	**Exam Attendance/Punctuality:** - A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4.	**Assignments & Projects:** - The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5.	**Cheating**: - For cheating in exam, a student will be considered as failure. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6.	**Plagiarism**: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proved a plagiarism of a student, he will be disengaged

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	from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7.	**Other policies:** - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. Lecture notes and assignments my given directly to students using soft or hard copy

Reviewed By	**Vice Dean for Academic Affairs and Post Graduate Studies: Asst. Prof. Dr. Tarek A. Barakat** **President of Quality Assurance Unit: Assoc. Prof. Dr. Mohammed Algorafi** **Name of Reviewer from the Department: Assoc. Prof. Dr. Farouk Al-Fuhaidy**
	Deputy Rector for Academic Affairs Asst. Prof. Dr. Ibrahim AlMutaa **Assoc. Prof. Dr. Ahmed Mujahed** **Asst. Prof. Dr. Munasar Alsubri**

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23. Template for Course Plan of Logic Circuits 2

I. Information about Faculty Member Responsible for the Course:

Name of Faculty Member	AssDr. Osama H. Alshibami	**Office Hours**					
Location& Telephone No.	Faculty of Engineering	**SAT**	**SUN**	**MON**	**TUE**	**WED**	**THU**
E-mail	Alshibami@yemen.net				10-2		

II. Course Identification and General Information:

1.	Course Title:	Logic Circuits 2				
2.	Course Number & Code:	CCE112				
3.	Credit hours:	C.H				Total
		Th.	Tu.	Pr	Tr.	
		2	-	2	-	3
4.	Study level/year at which this course is offered:	2nd Level/ 2nd Semester				
5.	Pre –requisite (if any):	Logic Circuits 1 (CCE111)				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered	Computer Engineering and Control				
8.	Language of teaching the course:	All materials are in English; teaching and lectures/discussions are in English and Arabic				
9.	System of Study:	Regular				
10.	Mode of delivery:	Lecture				
11.	Location of teaching the course:	Class + Lab				

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III. Course Description:

This course aims to develop engineering base knowledge for computer-based systems main components. Therefore, the principles and operations of sequential circuits, starting from Flip flops till complete synchronous sequential circuits will be covered. It will also cover the analysis design and realization of counters, analysis and realization of shift registers, design of main memory and Computer aided design tool for logic circuits and digital systems. Through Lab works, by hands-on & computer-based works, students develop their practical and problem-solving skills as well as throughout term project for solving industrial and marketing problems related to the digital system design.

IV. Intended learning outcomes (ILOs) of the course:

- Brief summary of the knowledge or skill the course is intended to develop**:**

1. Recognize the principles and operations of sequential circuits, starting from Flip flops till complete sequential circuits.
2. Acquire knowledge on digital system sequential elements such as counters & registers to meet desired needs within realistic constraints.
3. Analyze the requirements of a range of computer-based systems and examine the design alternatives based on the constraints imposed by society, organizations, and technology
4. Design synchronous and asynchronous sequential digital circuits using basic logic gates, flip-flops, counters, registers and main memory.
5. Use appropriate computer-based design support tools
6. Appreciate the features of complex computing hardware and software and operate on effectively
7. Strike the balance between self-reliance and seeking help when necessary in new situations.
8. Demonstrate significantly enhanced group working abilities.

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V. Course Content:

Distribution of Semester Weekly Plan Of course Topics/Items and Activities.

A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Number of Weeks	Contact hours
1	Introduction	▪ Combinational and Sequential Circuits. ▪ Synchronous and asynchronous Sequential Circuits. ▪ State Diagram and State Variables	1st , 2nd	4
2	Flip Flops	▪ Introduction ▪ The Bitable Element ▪ The SR Flip-Flop ▪ The Clocked SR Latch ▪ The D-Type Latch ▪ The JK Flip-Flop ▪ Triggering the Flip-flops	3rd ,4th	4
3	Counters	▪ Introduction ▪ Asynchronous Ripple Counters ▪ Arbitrary Count Asynchronous Counters ▪ Synchronous Counters ▪ Arbitrary Count Synchronous Counters ▪ IC Synchronous Counters ▪ Up/Down Synchronous Counters ▪ Cascaded Counters ▪ Counter Decoding ▪ Counter Applications	5th ,6th	4
4	Registers	▪ Introduction ▪ Shift Register ▪ Bidirectional Shift Registers ▪ The Universal Shifts Counters ▪ The use of Shift Registers as Counters	7th	2
5	Mid Term Exam		8th	2

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6	Registers (Cont.)	▪ Sequence Generators ▪ The Ring Counter ▪ The Johnson Counter ▪ MLS Shift Registers	9th	2
7	Synchronous Sequential Circuits	▪ Introduction ▪ Analysis Procedure ▪ Design Examples ▪ Design Procedure	10th ,11th	4
8	The Main Memory	▪ Introduction ▪ Read Only Memory ▪ Programmable ROMs ▪ ROM Applications ▪ Read Write Memories ▪ Dynamic RAMs ▪ Memory Expansion	12th ,13th	4
9	Sequential Logic Programming	▪ Introduction ▪ The FPGA and sequential programming ▪ Implementing counters and registers ▪ Using the VHDL language to implement a general sequential circuit.	14th ,15th	4
10	Final Exam		16th	2
Number of Weeks /and Units Per Semester			**16**	**32**

B – Practical Aspect:

Order	Topics List	Week Due	Contact Hours
1.	S-R Laches(Active Low and Active High	1st	2
2.	S-R Laches with ENABLE	2nd	2
3.	S-R, J-K, D, and T Flip Flop	3rd	2
4.	J-K Flip Flop with SET and CLEAR	4th	2

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5.	Asynchronous Counter	5th	2
6.	Decade Asynchronous Counter	6th	2
7.	Synchronous Counter	7th	2
8.	Decade Synchronous Counter	8th	2
9.	Counter with count enable & Up-Down counter	9th	2
10.	Johnson &Ring counters	10th	2
11.	Counters design by using Karnaugh Map	11th	2
12.	Shift Registers	12th	2
13.	Review	13th	2
14.	Final Submission and Presentation of Term Project Report	14th (started from the 4th week)	2
15.	Lab Exam	15th	2
	Number of Weeks /and Units Per Semester	**15**	**30**

VI. Teaching strategies of the course:

The knowledge and skills are delivered to students through:

- Active lectures sessions,
- Interactive Class Discussion,
- individual and group assignments,
- Lab and projects
- Computer-based Lab Work

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VII. Assignments & Reports:

No	Assignments	Week Due	Mark
1.	Latches & Flip-Flops Lab Reports	3rd	1

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2.	Counters Repots	5th	2
3.	Registers Repots	7th & 9th	2
4.	Sequential Logic Circuits Design Assignments & Repots.	11th	4
5.	Memory & VHDL Programming Search Web and prepare short reports to solve problems related to digital system design as suggested by the lecturer	12th - 14th	6
	Total		**15**

VIII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1.	Assignments & Reports	3rd to 14th	15	10%
2.	Quizzes	5th , 10th & 14th	10	6.67%
3.	Midterm Exam (Theory)	8th	20	13.33%
4.	Final Lab. Exam (including Course Project Evaluation)	14th & 15th	30	20%
5.	Final Exam (Theory)	16th	75	50%
	Total		**150**	**100%**

IX. Learning Resources:

• *Written in the following order: (Author – Year of publication – Title – Edition – Place of publication – Publisher).*

1- Required Textbook(s) (maximum two).

1. Thomas L. Floyd, 2009, Digital Fundamentals, 10th Edition, Pearson Education
2. International Ronald J. Tocci, Neal S.Widmer, Gregory L. Moss, 2007, Digital Systems : Principles and Applications, 10th Edition,. Pearson Prentice Hall

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2- Essential References.
1. Douglas L. Perry, 2002, VHDL Programming by Example, 4th Edition, McGraw-Hill 2. M. M. Mano, M. D. Ciletti, 2007, Digital Design, 4th Edition, Prentice-Hall
3- Electronic Materials and Web Sites *etc*.
1-

X. Course Policies:

1.	**Class Attendance:** -A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic
2.	**Tardy:** - For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3.	**Exam Attendance/Punctuality:** - A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4.	**Assignments & Projects:** - The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5.	**Cheating**: - For cheating in exam, a student will be considered as failure. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6.	**Plagiarism**: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proved a plagiarism of a student, he will be disengaged

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	from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7.	**Other policies:** - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. Lecture notes and assignments my given directly to students using soft or hard copy

24. Course Specification of Electrical Circuits 2

I. Course Identification and General Information:						
1.	Course Title:	Electrical circuits 2				
2.	Course Code &Number:	PME112				
3.	Credit hours:	C.H				Total
		Th.	Tu.	Pr.	Tr.	
		2	2	2	-	4
4.	Study level/ semester at which this course is offered:	Second year /Second term				
5.	Pre –requisite (if any):	Electrical circuits 1 (PME111)				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered:	Electrical Programs (All Three Programs)				
8.	Language of teaching the course:	English				
9.	Location of teaching the course:	Faculty of Engineering, Sana'a University, Electrical Engineering Department				
10.	Prepared By:	Asst. Prof. Dr. Eng. Mohammad Ali Nasr Saif				
11.	Date of Approval					

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	Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad

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II. Course Description:

This course is the second basic course on electrical circuits and it is also essential in the department. It is intended to enhance the knowledge of students with regard to electrical AC circuits and to develop their skills.

The course topics focus on fundamentals, calculations and analysis of AC circuits, and it inclu impedance, admittance, voltage, current and powers of AC circuits and their components also the use of different techniques, laws, and theorems to analyze the simple and complex types of the AC circuits. This course enables students to:

- Perform the calculation techniques of the AC circuits using time-domain forms of AC quantities.
- Understand the effect of the frequency on the AC circuit impedance.
- Draw the diagrams (triangles) of impedance and admittance of an AC circuit
- Perform the calculation techniques of the AC circuits using phasor-domain (complex) forms of AC quantities.
- Calculate the powers of an AC circuit.
- Know the importance of power factor in AC circuits.
- Draw the phasor diagram of powers of an AC circuit.
- Understand the magnetically coupled circuits, applications and their calculation techniques.
- Understand the poly-phase circuits, their importance and calculation techniques.
- Understand the tow-port circuits, their rules and calculation techniques.

III. Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1	Define the difference between the DC and AC quantities and circuits.	A1
a2	Acquire knowledge of the impedance, admittance and the parameters of the pure (ideal) and normal elements in the AC circuit.	A1
a3	Acquire knowledge of representing an AC quantity on the time-domain plane (as a waveform) and/or on the (complex) plane (as a phasor diagram) and the difference between the two representations.	A1

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a4	Recognize the poly-phase circuits, their importance and calculation techniques.	A2
b1	Analyze the AC simple circuits by the use of phasor, non-sinusoidal and sinusoidal time-domain AC quantities.	B2
b2	Solve the complex and tow-port AC circuits using different circuit analyzing techniques.	B1
c1	Apply the time-domain sinusoidal, non-sinusoidal and phasor AC quantities to solve AC circuits.	C2
c2	Practice related computer software to design simple AC circuits.	C4
d1	Enhance the self-learning activities using faculty library and computer and internet resources.	D5

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1- Define the difference between the DC and AC quantities and circuits.	▪ Lecture, ▪ Tutorials, ▪ Interactive class discussion, ▪ Laboratory experimental work	▪ Assignments, ▪ Written exams, ▪ Quizzes, ▪ Laboratory exams ▪ Written report
a2- Acquire knowledge of the impedance, admittance and the parameters of the pure (ideal) and normal elements in the AC circuit.		
a3- Acquire knowledge of representing an AC quantity on the time-domain plane (as a waveform) and/or on the (complex) plane (as a phasor diagram) and the difference between the two representations.	▪ Lecture, ▪ Tutorials, ▪ Interactive class discussion, ▪ Laboratory experimental work	▪ Assignments, ▪ Written exams, ▪ Quizzes, ▪ Laboratory exams ▪ Written report

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a4- Recognize the poly-phase circuits, their importance and calculation techniques.	▪ Lecture, ▪ Tutorials, ▪ Interactive class discussion, ▪ Laboratory experimental work	▪ Assignments, ▪ Written exams, ▪ Quizzes, ▪ Laboratory exams ▪ Written report

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Analyze the AC simple circuits by the use of phasor, non-sinusoidal and sinusoidal time-domain AC quantities.	▪ Lectures, ▪ Tutorials, ▪ Interactive class discussion, ▪ Exercises, ▪ Series of laboratory Experiment coursework.	▪ Home works ▪ Assignments.
b2- Solve the complex and tow-port AC circuits using different circuit analyzing techniques.		

©Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1- Apply the time-domain sinusoidal, non-sinusoidal and phasor AC quantities to solve AC circuits.	▪ Lectures, ▪ Tutorials, ▪ Interactive class discussion, ▪ Exercises, ▪ Series of laboratory Experiment coursework.	▪ Laboratory assignments ▪ Reports, ▪ Homework, ▪ Midterm ▪ Final exam.

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c2- Practice related computer software to design simple AC circuits.	▪ Lectures, ▪ Tutorials, ▪ Interactive class discussion, ▪ Exercises, ▪ Series of laboratory Experiment coursework.	▪ Laboratory assignments ▪ Reports, ▪ Homework, ▪ Midterm ▪ Final exam.

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1- Enhance the self-learning activities using faculty library and computer and internet resources.	▪ Lectures, ▪ Tutorials, ▪ Interactive class discussion, ▪ Exercises, ▪ Series of laboratory Experiment coursework.	▪ Homework ▪ assignments, ▪ presentation, ▪ written tests.

IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact hours
1.	General Introduction to the course. AC Circuit elements	a1,a2,d1	▪ Introduction to electrical AC circuits. ▪ The objectives, requirements and	1	2

			guidelines to comply with the course. ▪ Impedance, admittance, parameters and AC quantities of a pure element in AC Circuits. ▪ Representing the pure element quantities in time-domain and complex planes.		
2.	AC Circuit elements	a1,a2,d1	▪ Impedance, admittance, parameters and AC quantities of a normal element in AC Circuits. ▪ Waveform, phasor diagram or/and triangle of the normal element quantities in an AC circuit. ▪ Frequency effect on the impedance and parameters of an element in AC circuit.	1	2

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3.	Calculations of AC Networks:	a1,a2,a3,b1,d1	▪ Calculations of ac circuits using non-sinusoidal time-domain quantities: - With a simple-pure element circuit. - With a simple-normal element circuit. ▪ Calculations of ac circuits using sinusoidal phasor-domain (complex) quantities: - Complex numbers - Complex numbers forms. - Mathematical operations of complex numbers. - Conversion between time-domain and phasor - domain (complex) quantities. ▪ Representation of time-domain and	2	4

			phasor-domain quantities of an AC circuit: - waveform representation of the time-domain sinusoidal and non- sinusoidal quantities. - Phasor diagram (or triangle) representation of the phasor - domain (complex) quantities.		
4.	Series and Parallel AC Circuits:	a1,a2,a3, b1,c1,d1	▪ Input impedance, admittance, parameters, voltage, current and power of series AC circuits. ▪ Division of the input current and power on the elements of series AC circuit: - Kirchhoff's voltage law (KVL). - Voltage divider rule (VDR).	2	4

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			▪ Input admittance, impedance, parameters, voltage, current and power of parallel AC circuits. ▪ Division of the input voltage and power on the elements of parallel AC circuit: - Kirchhoff's current law (KCL). - Current divider rule (CDR). ▪ Single- and double-subscripts voltages notations in AC circuits. ▪ Input and output powers of series or parallel AC circuits: - Complex powers rules.		
5.	Series-Parallel AC Circuits:	a1,a2,a3,b1,c1,d1	▪ Techniques used in analyzing the circuit: - Reduce and return approach. - Block diagram approach. - Ladder circuits.	1	2

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6.	Advanced analysis methods in AC Circuits:	a1,a2,a3,b1,c1,d1	▪ Branch current analysis method in AC circuits. ▪ Mesh analysis method in AC circuits. ▪ Nodal analysis method in AC circuits.	1	2
7.	Network theorems in AC Circuits:	a1,a2,a3,b1,c1,d1	▪ Superposition theorem. ▪ Millman's theorem. ▪ Thevenin's theorem. ▪ Norton's theorem. ▪ Maximum power transfer theorem.	1	2
8.	Poly-phase systems:	a1,a2,a3,,a4,b1,c1,d1	▪ ABC sequence. ▪ ACB sequence. ▪ Y-connected three-phase balanced system. ▪ □-connected Three-phase balanced system. ▪ Voltage, current and power of Y-and □-connected three-phase balanced systems. ▪ Y- Y three-phase balanced systems.	2	4

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			▪ □- □ three-phase balanced systems. ▪ Y- □ three-phase balanced systems. ▪ Calculations in a three-phase balanced circuit.		
9.	Magnetically coupled circuits:	a1,a2,a3,b1,c1,d1	▪ Air-core and iron-core magnetic (coil) circuits. ▪ Self and mutual inductances of coil circuits. ▪ Series connection of the magnetically coupled coils. ▪ Electrical networks with the magnetically coupled coils.	1	2
10.	Tow-port networks:	a1,a2,a3,b1,c1,d1	▪ Types of two-port networks. ▪ Input and output impedance and admittance of two-port networks. ▪ Two-port cascade networks. ▪ Input and transfer parameters of the impedance and	1	2

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			admittance of two-port network. ▪ Hybrid parameters of two-port network. ▪ Hybrid input and output impedance of two-port network.		
11.	General Review and consultancy		All main subjects by requirement.	1	2
Number of Weeks /and Units Per Semester				**14**	**28**

B- Tutorials Aspect:

Order	Tutorial Skills List	Nº of Weeks	C.H.	CILOs
1.	▪ Features of different types of pure and normal impedances. ▪ Responses of AC quantities applied to different types of pure and normal impedances. ▪ Waveforms and phasor diagrams of the responses of different types of pure and normal impedances with applying different AC quantities. ▪ Power phasor diagrams and power factors of different types of pure and normal impedances.	2	4	a1,a2,d1
2.	▪ Calculations of series and parallel AC circuits by the use of sinusoidal, non sinusoïdal and phasor quantities. ▪ Analysis of different types of series and parallel AC circuits. ▪ Phasor diagrams of the input and output of voltage, current and power of series and parallel AC circuits.	2	4	a1,a2,a3, b1,d1

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3.	▪ Calculations of different series-parallel AC circuits by the use of sinusoidal and phasor quantities. ▪ Analysis of different types of series-parallel AC circuits.	2	4	a1,a2,a3,b1 ,c1,d1
4.	▪ Applying mesh and nodal analyses to a complex AC circuit. ▪ Analaysis of different complex AC circuits using mesh and nodal analyses.	2	4	a1,a2,a3,b1, c1,d1
5.	▪ Applying network theorems to a complex AC circuit. ▪ Analaysis of different complex AC circuits using different network theorems.	2	4	a1,a2,a3,b1, c1,d1
6.	▪ Analaysis Poly-phase networks using abc and cba sequences.	1	2	a1,a2,a3,,a4, b1,c1,d1
7.	▪ Calculations of different Magnetically coupled circuits	2	4	a1,a2,a3,b1, c1,d1
8.	▪ Analaysis of tow-port networks	1	2	a1,a2,a3,b1, c1,d1
Number of Weeks /and Units Per Semester		**14**	**28**	

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact hours	Learning Outcomes
1.	Orientation	**1**	**2**	**all**
2.	Average and RMS values	**1**	**2**	**all**
3.	Response of RLC circuits	**1**	**2**	**all**
4.	Phasor relationships for simple circuits	**1**	**2**	**all**
5.	Input impedance and active circuits	**1**	**2**	**all**
6.	Capacitors and series RC circuits	**1**	**2**	**all**
7.	Inductors and series RL circuits	**1**	**2**	**all**

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8.	Parallel RC and LC circuits	1	2	all
9.	Power relationships and power factor	1	2	**all**
10.	Analysis of some AC circuits by MATLAB computer software	5	10	**all**
Number of Weeks /and Units Per Semester		**14**	**28**	

V. Teaching strategies of the course:

- Lectures
- Dialogue and discussion
- Brainstorming
- Problem Solving
- Practical application
- Assignments and Reports

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Exercises & Homework	a1, a2, a3, b1, c1, d1	2, 5, 8, 11,13	20
2.	Written Test (1)	a1, a2, a3, a4, b1, c1, d1	8	15
3.	Written Test (2)	a1, a2, a3, a4, b1, c1, d1	12	15
4.	Laboratory reports	a1, a2, a3, a4, b1, c1, c2, d1	Weekly from week 3 to 10	20
5.	Laboratory mini project.	a1, a2, a3, a4, b1, c1, c2, d1	14	20
6.	Laboratory exam.	a1, a2, a3, a4, b1, c1, c2, d1	15	10
7.	Final Exam (theoretical)	a1, a2, a3, a4, b1, c1, d1	To be arranged by the examination board of faculty at the End of the term	100

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	Total grades		**200**

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VII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Exercises & Homework	2, 5, 8, 11,13	20	10%	a1,a2,a3,b1,c1,d1
2.	Written Test (1)	8	15	7.5%	a1,a2,a3,,a4,b1,c1,d1
3.	Written Test (2)	12	15	7.5%	a1,a2,a3,,a4,b1,c1,d1
4.	Laboratory reports	Weekly from week 3 to 10	20	10%	a1,a2,a3,,a4,b1,c1,c2,d1
5.	Laboratory mini project.	14	20	10%	a1,a2,a3,,a4,b1,c1, c2,d1
6.	Laboratory exam.	15	10	5%	a1,a2,a3,,a4,b1,c1, c2,d1
7.	Final Exam (theoretical)	To be arranged by the examination board of faculty at the End of the term	100	50%	a1,a2,a3,,a4,b1,c1,d1
	Total grades		**200**	**100%**	

VIII. Learning Resources:

- *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

1- Required Textbook(s) (maximum two).

1. Robert L. Boylestad, 2007, Introductory circuit analysis,11Ed, Pearson Prentice Ha New Jersey, USA.
2. Mahmood Nahvi & Joseph A. Edminister, 2003, Electric circuits, 4th Ed, Schaum' Outline Series, McGRAW-HILL, New York, USA.

2- Essential References.

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	1. Charles K. Alexander & Matthew N. O. Sadiku, 2001, Fundamentals of Electric circuits, **2.** 3rd Ed McGRAW-HILL, New York, USA. McGRAW-HILL, New York, USA. **3.** Charles A. Desoer, Ernest S. Kuh, 2009, Basic Circuit Theory, McGraw-Hill Education (India). **4.** Allan H. Robbins, Wilhelm C. Miller, 2012, Circuit Analysis: Theory And Practice, Fifth Edition, Cengage Learning.
3- Electronic Materials and Web Sites *etc*.	
	1. All About Circuits: Free Electric Circuits Textbooks **2.** www.allaboutcircuits.com/ **3.** http://www.uta.edu/ee/hw/pspice/ **4.** http://www.youtube.com/watch?feature=player_detailpage&v=dZUPBLNuaHk **5.** http://denethor.wlu.ca/PSpice/pspice_tutorial.html **6.** www.seas.upenn.edu/~jan/.../PSpice_LibraryguideOrCAD.pdf **7.** www.ladyada.net/learn/soldering How to Do It: Basic Soldering - YouTube **8.** http://www.youtube.com/watch?v=BLfXXRfRIzY

IX. Course Policies:

1.	**Class Attendance:** A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic
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4.	**Assignments & Projects:** The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time-
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Reviewed By	**Vice Dean for Academic Affairs and Post Graduate Studies: Asst. Prof. Dr. Tarek A. Barakat** **President of Quality Assurance Unit: Assoc. Prof. Dr. Mohammed Algorafi** **Name of Reviewer from the Department: Asst. Prof. Dr. Adel Ahmed Al-Shakiri**
	Deputy Rector for Academic Affairs Asst. Prof. Dr. Ibrahim AlMutaa **Assoc. Prof. Dr. Ahmed Mujahed** **Asst. Prof. Dr. Munasar Alsubri**

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