19.Course Specification of Logic System Design

I.Course Identification and General Information:

.1	Course Title:	Logic System Design.				
.2	Course Code & Number:	MT102.				
.3	Credit hours:	C.H				TOTAL CR. HRS.
		Th.	Seminar	Pr.	Tu.	
		2	-	2	2	4
.4	Study level/ semester at which this course is offered:	Second Year - First Semester.				
.5	Pre –requisite (if any):	Computer Skills.				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered:	Mechatronics Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	Location of teaching the course:	Mechatronics Engineering Department.				
10.	Prepared By:	Assoc. Prof. Dr. Farouk AL-Fuhaidy.				
11.	Date of Approval:					

II.Course Description:

This course provides mechatronics students the basic concepts, logic elements, analysis, and design of digital systems. It includes: digital system numbers and codes, logic gate operations, Boolean algebra and combinational circuits simplifications, design of combinational logic circuits, analysis and design of synchronous sequential circuits. Laboratory includes experiments on combinational and sequential logic circuits. This course is important for understanding electronics II (IC design using VHDL), microprocessor-based systems, embedded systems, and mechatronics applications.

III.Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1.	Describe the knowledge of basic concepts, logic circuits elements functions and applications, analysis and design of digital systems.	A1
a2.	Characterize the principles of design to combinational and sequential circuits as a part of digital systems.	A2
b1.	Analyze digital systems problems using suitable methods for the combinational and/or sequential logic circuits.	B1
b2.	Merge economic, social, and environmental issues in design of digital systems.	B6

c1.	Conduct laboratory experiments safely to verify theoretical concepts related to digital logic systems.	C1
c2.	Solve engineering problems related to digital systems using appropriate logic elements/components and computer software.	C2
d1.	Co-operate in work as a team leader or a part of a team coherently and share learned knowledge clearly.	D1
d2.	Evaluate technical reports, discuss ideas, and justify results creatively through different forms.	D6

(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. Describe the knowledge of basic concepts, logic circuits elements functions and applications, analysis and design of digital systems.	• Active Lectures. • Tutorials.	• Written Assessment. • Short Essays.
a2. Characterize the principles of design to and sequential circuits as a part combinational of digital systems**.**	• Hands-on Laboratory work.	• Practical Assessment. • Simulation.

(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 digital systems problems using suitable methods for the combinational and/or sequential logic circuits.	• Design Work and Project. • Case Studies.	• Practical Assessment. • Reports.
b2. Merge economic, social, and environmental issues in design of digital systems.	• Active Lectures.	• Written Assessments.

© 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. Conduct laboratory experiments safely to verify theoretical concepts related to digital logic systems.	• Hands-on Laboratory Work. • Design Work.	• Practical Assessment. • Laboratory Reports.

c2. Solve engineering problems related to digital systems using appropriate logic elements/components and computer software.	• The Use of Communication and Information Technology.	• Simulations such as Computer Based Learning.

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
d1. Co-operate in work as a team leader or a part of a team coherently and share learned knowledge clearly.	• Group Learning.	• Project Reports.
d2. Evaluate technical reports, discuss ideas, and justify results creatively through different forms.	• Active Lectures.	• Project Reports.

IV.Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact Hours
1.	Course Orientation and Overview.	a1.	• Course orientation and review. • Defining digital systems and signals, impact effective of digital systems to different environments • New trends in digital systems.	1	2
2.	System Numbers and Codes.	a1, a2.	• System numbers, explanation of decimal, binary, octal, and hexadecimal numbers and how to convert between them. • Complements, 1st complement and 2nd complements for binary numbers, 7th complement and 8th complements for octal numbers, 9th complement and 10th complements for decimal numbers, 15th complement and	2	4

			16th complements for hexadecimal numbers, • Signed and unsigned numbers representation in digital systems. • Arithmetic operations, addition, subtraction, multiplication, and division for different system numbers. • Digital codes, like ASCCII, excess-3 code, BCD code, gray code, …etc.		
3.	Logic Gates.	a1, a2, c2.	• Inverter, AND Gate, OR Gate, NAND Gate, NOR Gate, Exclusive-OR Gate, Exclusive-NOR Gate, fixed function logic.	1	2
4.	Boolean Algebra and Logic Simplification.	a1, a2, b1.	• Boolean operations and expressions, laws and rules of Boolean algebra, DE Morgan's theorems, Boolean analysis of logic circuits, simplifications using Boolean algebra, standard expressions and truth Tables, the Karnaugh map. • Logic functions, representation of logic functions using Boolean algebra, standard canonical forms, SOP and POS logic expressions.	2	4
5.	Design and Implementation of Combinational Logic Circuits.	a1, a2, b1, b2.	• Design of combinational logic circuits, steps followed in the design of combinational logic circuits, examples of combinational logic circuits codes converters. • Implementing combinational logic using NAND and NOR gates.	1	2

6.	Mid-Term Exam	a1, a2, b1, b2, c1, c2	• The first 5 chapters.	1	2
7.	Basic Combinational Logic Circuits Analysis and Functions.	a1, a2, b1, b2, c2.	• Basic adder, parallel binary adders, comparators, decoders, encoders, multiplexers, demultiplexers.	2	4
8.	Basic Sequential Logic Circuits Elements (Latches and Flip-Flops).	a1, a2, b1, b2, c2.	• Latches, SR-latch, D-latch, latches with enables. • Edge triggered flip-flops, SR-FF, D-FF, T-FF, JK-FF. • Flip-flops transition table. • Flip-flops applications.	1	2
9.	Analysis and Design of Sequential Logic Circuits.	a1, a2, b1, b2, c2.	• Analysis of sequential circuits. • Steps followed in the design of sequential logic circuits. • Design of sequence detector circuits. • State reduction techniques, partitioning and implication table techniques.	2	4
10.	Counters.	a1, a2, b1, b2, c2.	• Counters and timers, design of synchronous up and/or down counters, cascaded counters, counter applications as a timers.	1	2
11.	Shift Registers.	a1, a2, b1, b2, c2.	• Basic shift register operations, serial in/serial out shift register, serial in/parallel out shift register, parallel in/serial out shift register, parallel in/parallel out shift register, bidirectional shift register, shift register counters, shift register applications. • Design of common bus system.	1	2
12.	Final Exam.	a1, a2, b1, b2, c1, c2.	• All the chapters.	1	2

Number of Weeks /and Units Per Semester	**16**	**32**

B - Tutorial Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes
1.	Course Orientation and Overview.	1	2	a1.
2.	System Numbers and Codes.	2	4	a1, a2.
3.	Logic Gates.	1	2	a1, a2, c2.
4.	Boolean Algebra and Logic Simplification.	2	4	a1, a2, b1.
5.	Combinational Logic Analysis and Design.	2	4	a1, a2, b1, b2, c2, d1, d2.
6.	Latches, Flip-Flops, Timers.	1	2	a1, a2, c2.
7.	Sequential Circuits Design and Analysis.	2	4	a1, a2, b1, b2, c2, d1, d2.
8.	Counters.	2	4	a1, a2, b1, b2, c2, d1, d2.
9.	Shift Registers.	1	2	a1, a2, b1, b2, c2, d1, d2.
Number of Weeks /and Units Per Semester		**14**	**28**	

C - Practical Aspect: (Started from the 3rd Semester's week)

Order	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes
1.	Orientation (Course Syllabus and regulations). Laboratory instrument and logic simulation software familiarization.	1	2	a1, b1, c2
2.	Constructing a Logic Probe Logic families (TTL, CMOS) - typical parameters: voltage characteristic, current, dissipated power from a logic device, input load (FAN-IN), output load (FAN-OUT), noise margin, transition and propagation time.	1	2	a1, c1, c2, d1

Head of the Department
Assoc. Prof. Dr. Abdul-Malik Momin

Quality Assurance Unit
Assoc. Prof. Dr. Mohammad Algorafi

Dean of the Faculty
Prof. Dr. Mohammed AL-Bukhaiti

Academic Development Center & Quality Assurance
Assoc. Prof. Dr. Huda Al-Emad

Rector of Sana'a University
Prof. Dr. Al-Qassim Mohammed Abbas

	Verify the truth table of different logic gates.			
3.	Experimental derivation of Boolean functions and laws. Minimization of logic circuits using Karnaugh maps and experimental testing.	1	2	a1, a2, b2, c1, c2, d1
4.	Design and investigation of single step half- and full adders Design and investigation of a 4-bit full adder with parallel Output Cascaded 4-bit full adder Investigation of encoders and decoders: decimal encoder/decoder, BCD Display driver and 7-segment display BCD, LED visualization Investigation of multiplexers and Demultiplexers functions.	3	6	a1, b2, c1, c2, d1, d2
5.	Investigation of the operation of S-R Latch, D Latch, D flip-flops , S-R flip-flops , and JK flip-flops One Shots and Astable Multivibrators.	1	2	a1, b2, c1, c2, d1
6.	Investigation of the operation of Asynchronous and synchronous counters Design and construction of synchronous counters and verify their output sequences. Design and investigation of binary-coded up and down Counters.	2	4	b1, b2, c1, c2, d1, d2
7.	Design and construction of shift registers with serial and parallel outputs and testing with real circuits Construction of one or more application of Shift Register Circuits.	1	2	b1, b2, c1, c2, d1, d2
8.	Projects Presentations.	1	2	b1, b2, c1, c2, d1, d2
9.	Final Practical Exam.	1	2	a1, a2, b1, b2, c1, c2, d1, d2
Number of Weeks /and Units Per Semester		**12**	**24**	

V.Teaching strategies of the course:

- Active Lectures
- Discussions.
- Laboratory Hands-on Work.
- Tutorials.
- Work Groups.
- Projects and Report Presentations.

VI.Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	System Numbers and Arithmetic Operations	a1, a2	2nd & 3rd	1
2.	Logic Gates, Boolean Algebra, and K-Map	a1, a2, b1, b2, c2	4th to 6th	2
3.	Design of Combinational Logic Circuits.	a1, a2, b1, b2, c2, d1, d2	7th & 9th	2
4.	Adders/Subtractors, Multiplexers, and Decoders.	a1, a2, b1, b2, c2, d1, d2	10th & 11th	2
5.	Latches and Flip-Flops.	a1, a2, b1, b2, c2	12th	1
6.	Design of Sequential Circuits.	a1, a2, b1, b2, c2, d1, d2	13th & 14th	2
7.	Registers and Counters.	a1, a2, b1, b2, c2, d1, d2	15th	2
Total				**12**

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 & HomeWorks	2nd to 15th	24	12%	a1, a2, b1, b2, c2, d1, d2
2.	Lab work and experiments reports	4th to 13th	20	10%	c1, c2, d1, d2
3.	Practical Term-Project and Presentation	3rd to 14th	20	10%	b1, b2, c1, c2, d1, d2

4.	Mid-Term Exam (Theoretically)	8th	16	8%	a1, a2, b1, b2, c2
5.	Final-Term Exam (Practically)	14th	20	10%	a1, a2, b1, b2, c1, c2, d1, d2
6.	Final-Term Exam (Theoretically)	16th	100	50%	a1, a2, b1, b2, c2
Total Assessments Mark/Percentage			**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- Thomas L. Floyd – 2009 - Digital Fundamentals - 10th Edition – New Jersey, USA – Pearson Prentice Hall
2- M. Morris Mano, Michael D. Ciletti – 2013 - Digital Design – 5th edition - Pearson Prentice Hall
3- Charles H. Roth, JR, Larry L. Kinney -2010- Fundamentals of logic design- 6th Edition-Stanford, USA-Cengage Learning. Inc

2- Essential References.

1- Morris Mano – 2009 – Computer System Architecture – 3rd Edition – New Jersey, USA – Pearson Prentice Hall
2- C. Roth, Digital Systems Design Using VHDL (2nd Edition), CL-Engineering Publisher, March 2007 (ISBN-10: 0534384625, ISBN-13: 978-0534384623)

3- Electronic Materials and Web Sites *etc*.

1- http://www.ocw.mit.edu/courses.
2- http://www.pearsoned.co.in/MMorrisMano/
3- http://nptel.iitm.ac.in
4- Lectures will be prepared by lecturer

IX.Course Policies:

1.	Class Attendance: - The students should have more than 75% of attendance according to rules and regulations of the faculty.
2.	Tardy: - The students should respect the timing of attending the lectures. They should attend within 15 minutes from starting of the lecture.
3.	Exam Attendance/Punctuality: - The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for mid-term exam and final 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: - If any cheating occurred during the examination, the student is not allowed to continue and he has to face the examination committee for enquiries.
6.	Plagiarism: - If one student attends the exam on another behalf; he will be dismissed from the faculty according to the policy, rules and regulations of the university.
7.	**Other Policies:** -All the teaching materials should be kept out the examination hall and mobile phones are not allowed. -Mutual respect should be maintained between the student and his teacher and also among students. Failing in keeping this respect is subject to the policy, rules and regulations of the university.

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. Head of Mechatronics Engineering Department: Assoc. Prof. Dr. Abdul-Malik Momin.
	Deputy Rector for Academic Affairs Assoc. Prof. Dr. Ibrahim AlMutaa. Assoc. Prof. Dr. Ahmed Mujahed.. Asst. Prof. Dr. Munaser Alsubari.

Head of the Department Assoc. Prof. Dr. Abdul-Malik Momin	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad	Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas

Template for Course Plan of Logic System Design

I.Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Assoc. Prof. Dr Farouk AL-Fuahidy.	Office Hours					
Location& Telephone No.	777909815.	SAT	SUN	MON	TUE	WED	THU
E-mail	farouqakh@gmail.com.						

II.Course Identification and General Information:						
1.	Course Title:	Logic System Design.				
2.	Course Number & Code:	MT102.				
3.	Credit hours:	C.H				Total Cr. Hrs.
		Th.	Seminar	Pr.	Tu.	
		2	-	2	2	4
4.	Study level/year at which this course is offered:	Second Year - First Semester.				
5.	Pre –requisite (if any):	Computer Skills.				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered:	Mechatronics Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	System of Study:	Semesters.				
10.	Mode of delivery:	Lectures, Tutorials and Lab. Work.				
11.	Location of teaching the course:	Mechatronics Engineering Department.				

III.Course Description:

This course provides mechatronics students with the basic concepts, logic elements, analysis, and design of digital systems. It includes; digital system numbers and codes, logic gate operations, Boolean algebra and combinational circuits simplifications, design of combinational logic circuits, analysis and design of synchronous sequential circuits. Laboratory includes experiments on combinational and sequential logic circuits. This course is important for understanding electronics II (IC design using VHDL), microprocessor-based systems, embedded systems, and mechatronics applications.

IV.Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1.	Describe the knowledge of basic concepts, logic circuits elements functions and applications, analysis and design of digital systems.	A1
a2.	Characterize the principles of design to combinational and sequential circuits as a part of digital systems.	A2
b1.	Analyze digital systems problems using suitable methods for the combinational and/or sequential logic circuits.	B1
b2.	Merge economic, social, and environmental issues in design of digital systems.	B6
c1.	Conduct laboratory experiments safely to verify theoretical concepts related to digital logic systems.	C1
c.2	Solve engineering problems related to digital systems using appropriate logic elements/components and computer software.	C2
d1.	Co-operate in work as a team leader or a part of a team coherently and share learned knowledge clearly.	D1
d2.	Evaluate technical reports, discuss ideas, and justify results creatively through different forms.	D6

V.Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1.	Course Orientation and Overview.	• Course orientation and review. • Defining digital systems and signals, impact effective of digital systems to different environments • New trends in digital systems.	1	2
2.	System Numbers and Codes.	• System numbers, explanation of decimal, binary, octal, and hexadecimal numbers and how to convert between them. • Complements, 1st complement and 2nd complements for binary numbers, 7th complement and 8th complements for octal numbers, 9th complement and 10th complements for decimal numbers, 15th	2,3	4

		complement and 16th complements for hexadecimal numbers, • Signed and unsigned numbers representation in digital systems. • Arithmetic operations, addition, subtraction, multiplication, and division for different system numbers. • Digital codes, like ASCCII, excess-3 code, BCD code, gray code, …etc. •		
3.	Logic Gates.	• Inverter, AND Gate, OR Gate, NAND Gate, NOR Gate, Exclusive-OR Gate, Exclusive-NOR Gate, fixed function logic.	4	2
4.	Boolean Algebra and Logic Simplification.	• Boolean operations and expressions, laws and rules of Boolean algebra, DE Morgan's theorems, Boolean analysis of logic circuits, simplifications using Boolean algebra, standard expressions and truth Tables, the Karnaugh map. • Logic functions, representation of logic functions using Boolean algebra, standard canonical forms, SOP and POS logic expressions.	5,6	4
5.	Design and Implementation of Combinational Logic Circuits.	• Design of combinational logic circuits, steps followed in the design of combinational logic circuits, examples of combinational logic circuits codes converters. • Implementing combinational logic using NAND and NOR gates.	7	2
6.	Mid-Term Exam.	• The first five chapters.	8	2
7.	Basic Combinational Logic Circuits Analysis and Functions.	• Basic adder, parallel binary adders, comparators, decoders, encoders, multiplexers, demultiplexers.	9,10	4
8.	Basic Sequential Logic Circuits Elements	• Latches, SR-latch, D-latch, latches with enables.	11	2

	(Latches and Flip-Flops).	• Edge triggered flip-flops, SR-FF, D-FF, T-FF, JK-FF. • Flip-flops transition table. • Flip-flops applications.		
9.	Analysis and Design of Sequential Logic Circuits.	• Analysis of sequential circuits. • Steps followed in the design of sequential logic circuits. • Design of sequence detector circuits. • State reduction techniques, partitioning and implication table techniques.	12,13	4
10.	Counters.	• Counters and timers, design of synchronous up and/or down counters, cascaded counters, counter applications as a timers.	14	2
11.	Shift Registers.	• Basic shift register operations, serial in/serial out shift register, serial in/parallel out shift register, parallel in/serial out shift register, parallel in/parallel out shift register, bidirectional shift register, shift register counters, shift register applications. • Design of common bus system.	15	2
12.	Final-Exam.	All the chapters..	16	2
Number of Weeks /and Units Per Semester			**16**	**32**

B - Tutorial Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes
1.	Course Orientation and Overview.	1	2	a1.
2.	System Numbers and Codes.	2,3	4	a1, a2.
3.	Logic Gates.	4	2	a1, a2, c2.
4.	Boolean Algebra and Logic Simplification.	5,6	4	a1, a2, b1.
5.	Combinational Logic Analysis and Design.	7,8	4	a1, a2, b1, b2, c2, d1, d2.
6.	Latches, Flip-Flops, Timers.	9	2	a1, a2, c2.

7.	Sequential Circuits Design and Analysis.	10,11	4	a1, a2, b1, b2, c2, d1, d2.
8.	Counters.	12,13	4	a1, a2, b1, b2, c2, d1, d2.
9.	Shift Registers.	14	2	a1, a2, b1, b2, c2, d1, d2.
Number of Weeks /and Units Per Semester		**14**	**28**	

C - Practical Aspect: (Started from the 3rd Semester's week)

Order	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes
1.	Orientation (Course Syllabus and regulations). Laboratory instrument and logic simulation software familiarization.	3	2	a1, b1, c2
2.	Constructing a Logic Probe Logic families (TTL, CMOS) - typical parameters: voltage characteristic, current, dissipated power from a logic device, input load (FAN-IN), output load (FAN-OUT), noise margin, transition and propagation time. Verify the truth table of different logic gates.	4	2	a1, c1, c2, d1
3.	Experimental derivation of Boolean functions and laws Minimization of logic circuits using Karnaugh maps and experimental testing.	5	2	a1, a2, b2, c1, c2, d1
4.	Design and investigation of single step half- and full adders Design and investigation of a 4-bit full adder with parallel Output Cascaded 4-bit full adder Investigation of encoders and decoders: decimal encoder/decoder, BCD Display driver and 7-segment display BCD, LED visualization Investigation of multiplexers and Demultiplexers functions.	6,7,8	6	a1, b2, c1, c2, d1, d2

5.	Investigation of the operation of S-R Latch, D Latch, D flip-flops , S-R flip-flops , and JK flip-flops One Shots and Astable Multivibrators.	9	2	a1, b2, c1, c2, d1
6.	Investigation of the operation of Asynchronous and synchronous counters Design and construction of synchronous counters and verify their output sequences. Design and investigation of binary-coded up and down Counters.	10,11	4	b1, b2, c1, c2, d1, d2
7.	Design and construction of shift registers with serial and parallel outputs and testing with real circuits Construction of one or more application of Shift Register Circuits.	12	2	b1, b2, c1, c2, d1, d2
8.	Projects Presentations.	13	2	b1, b2, c1, c2, d1, d2
9.	Final Practical Exam.	14	2	a1, a2, b1, b2, c1, c2, d1, d2
Number of Weeks /and Units Per Semester		**12**	**24**	

VI.Teaching strategies of the course:

- Active Lectures
- Discussions.
- Laboratory Hands-on Work.
- Tutorials.
- Work Groups.
- Projects and Report Presentations.

VII.Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	System Numbers and Arithmetic Operations	a1, a2	2nd & 3rd	1

2.	Logic Gates, Boolean Algebra, and K-Map	a1, a2, b1, b2, c2	4th to 6th	2
3.	Design of Combinational Logic Circuits.	a1, a2, b1, b2, c2, d1, d2	7th & 9th	2
4.	Adders/Subtractors, Multiplexers, and Decoders.	a1, a2, b1, b2, c2, d1, d2	10th & 11th	2
5.	Latches and Flip-Flops.	a1, a2, b1, b2, c2	12th	1
6.	Design of Sequential Circuits.	a1, a2, b1, b2, c2, d1, d2	13th & 14th	2
7.	Registers and Counters.	a1, a2, b1, b2, c2, d1, d2	15th	2
Total				**12**

VIII.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 & HomeWorks	2nd to 15th	24	12%	a1, a2, b1, b2, c2, d1, d2
2.	Lab work and experiments reports	4th to 13th	20	10%	c1, c2, d1, d2
3.	Practical Term-Project and Presentation	3rd to 14th	20	10%	b1, b2, c1, c2, d1, d2
4.	Mid-Term Exam (Theoretically)	8th	16	8%	a1, a2, b1, b2, c2
5.	Final-Term Exam (Practically)	14th	20	10%	a1, a2, b1, b2, c1, c2, d1, d2
6.	Final-Term Exam (Theoretically)	16th	100	50%	a1, a2, b1, b2, c2
Total Assessments Mark/Percentage			**200**	**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 – New Jersey, USA – Pearson Prentice Hall

	2. M. Morris Mano, Michael D. Ciletti – 2013 - Digital Design – 5th edition - Pearson Prentice Hall 3. Charles H. Roth, JR, Larry L. Kinney -2010- Fundamentals of logic design- 6th Edition-Stanford, USA-Cengage Learning. Inc
	2- Essential References.
	1. Morris Mano – 2009 – Computer System Architecture – 3rd Edition – New Jersey, USA – Pearson Prentice Hall 2. C. Roth, Digital Systems Design Using VHDL (2nd Edition), CL-Engineering Publisher, March 2007 (ISBN-10: 0534384625, ISBN-13: 978-0534384623)
3.	**3- Electronic Materials and Web Sites etc.**
	1. http://www.ocw.mit.edu/courses. 2. http://www.pearsoned.co.in/MMorrisMano/ 3. http://nptel.iitm.ac.in 5- Lectures will be prepared by lecturer

X.Course Policies:

Unless otherwise stated, the normal course administration policies and rules of the Faculty of Engineering apply. For the policy, see: ----------

1.	Class Attendance: - The students should have more than 75% of attendance according to rules and regulations of the faculty.
2.	Tardy: - The students should respect the timing of attending the lectures. They should attend within 15 minutes from starting of the lecture.
3.	Exam Attendance/Punctuality: - The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for mid-term exam and final 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: - If any cheating occurred during the examination, the student is not allowed to continue and he has to face the examination committee for enquiries .
6.	Plagiarism: - If one student attends the exam on another behalf; he will be dismissed from the faculty according to the policy, rules and regulations of the university.
7.	Other Policies: - All the teaching materials should be kept out the examination hall and mobile phones are not allowed.

	- Mutual respect should be maintained between the student and his teacher and also among students. Failing in keeping this respect is subject to the policy, rules and regulations of the university.

20.Course Specification of Properties and Strength of Materials

I.Course Identification and General Information:						
.1	Course Title:	Properties and Strength of Materials.				
.2	Course Code & Number:	.103MT				
.3	Credit hours:	C.H				TOTAL CR. HRS.
		Th.	Seminar	Pr.	Tu.	
		2	-	-	2	3
.4	Study level/ semester at which this course is offered:	Second Year-First Semester.				
.5	Pre –requisite (if any):	Engineering Mechanics 1 (Statics).				
.6	Co –requisite (if any):	None				
.7	Program (s) in which the course is offered:	Mechatronic Engineering Program.				
.8	Language of teaching the course:	English Language.				
.9	Location of teaching the course:	Mechatronics Engineering Department.				
.01	Prepared By:	Assoc. Prof. Dr. Khalil Al-Hatab.				
.11	Date of Approval:					

II.Course Description:

This course presents the basic concepts, theory and principles of strength of materials as well as common mechanical properties of materials necessary for engineering design of various machine components. It concentrates on concepts of stress and strain, mechanical properties of materials, analysis of deformation, strain and stress that occurs in structural members under axial, torsion and bending loading conditions. This course also covers: shear and moment diagrams; stress and strain transformations; Mohr's circle; thin wall pressure vessels; combined stresses and static failure theories; and beam deflections.

III.Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1.	Characterize knowledge and understanding the type of load/stress and the deformations/strain produced on the deformable bodies subjected to axial, torsion and bending loading.	A1
a2.	Describe basic principles of strength of materials and mechanical behavior of materials in engineering applications and mechatronics design problems.	A2

a3.	Identify a working knowledge of stress and strain analysis of common mechanical systems and the ability to develop computer programs to calculate stress, strain, and their relations.	A3
a4.	Discuss the different types of engineering materials failures under static loads and their relevance on the solving of machine design problems.	A4
b1.	Explore solution to problems that involve the stress and strain analysis of linear elastic solids under tension, compression, torsion load.	B1
b2.	Categorize the body section under the which the force, torque or moment act and be aware of the influence of the stress concentration factors affecting the design.	B2
c1.	Apply computer programs necessary tests to check the validity of engineering materials.	C1
c2.	Apply computer programs for solving the shearing force and bending moment diagrams, Mohr's circle and illustrate stress variations over the cross-section of the members.	C2
d1.	Review ideas with others and apply quantitative reasoning skills to solve problems	D1
d2.	Examine effectively in written, oral and electronic forms.	D2

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to IV.Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
a1. Characterize knowledge and understanding the type of load/stress and the deformations/strain produced on the deformable bodies subjected to axial, torsion and bending loading.	• Active lectures. • Tutorials. • Interactive class discussions. • Hands on laboratory work.	• Written tests. • Coursework activities. • Home works and assignments • Practical assessment • Lab. reports.
a2. Describe basic principles of strength of materials and mechanical behaviour of materials in engineering applications and mechatronics design problems.	• Active lectures. • Tutorials. • Interactive class discussions.	• Written tests. • Coursework activities. • Home works and assignments. • Practical assessment • Lab reports.

	• Hands on laboratory work.	
a3. Identify a working knowledge of stress and strain analysis of common mechanical systems and the ability to develop computer programs to calculate stress, strain, and their relations.	• Active lectures. • Tutorials. • Interactive class discussions. • Hands on laboratory work.	• Written tests. • Coursework activities. • Home works and assignments. • Practical assessment. • Lab. reports.
a4. Discuss the different types of engineering materials failures under static loads and their relevance on the solving of machine design problems.	• Active lectures. • Tutorials. • Interactive class discussions. • Hands on laboratory work.	• Written tests. • Coursework activities. • Home works and assignments. • Practical assessment. • Lab. reports.

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

Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
b1. Explore solution to problems that involve the stress and strain analysis of linear elastic solids under tension, compression, torsion load.	• Active lectures. • Tutorials. • Interactive class discussions.	• Written tests. • Coursework activities. • Home works and assignments. • Case studies.
b2. Categorize the body section under the which the force, torque or moment act and be aware of the influence of the stress concentration factors affecting the design.	• Active lectures. • Tutorials. • Interactive class discussions.	• Written tests. • Coursework activities. • Home works and assignments. • Case studies.

© 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 computer programs. necessary tests to check the validity of engineering materials.	• Active lectures.	• Simulation. • Course work reports.
c2. Apply computer programs for solving the shearing force and bending moment illustrate diagrams, Mohr's circle and stress variations over the cross-section of the members.	• Active lectures. • Problem based learning. • Case study. • Directed self- study.	• Simulation. • Course work reports. • Case studies reports.

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1. Review ideas with others and apply quantitative reasoning skills to solve problems	• Exercises and home works. • Problem based learning.	• Quizzes. • Coursework activities. • Home works and assignments. • Case studies.
d2. Examine effectively in written, oral and electronic forms.	• Exercises and home works. • Problem based learning.	• Quizzes. • Coursework activities • Home works and assignments. • Case studies reports.

V.Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact Hours
1.	Concept of Stress.	a1, a2, a3,b1, b2,d1.	• Course overview and introduction. • Equilibrium of deformable body. • Average normal and shear stresses and bearing stress. • Allowable stress & factor of safety. • General and typical states of stress.	1	2

2.	Concept of Srain.	a1, b1, b2,d1.	• Displacements and deformation. • Normal and shear strain. • Plane strain. • Thermal strain.	1	2
3.	Mechanical Behaviour of Materials.	a2, a3, a4, b1, b2, d1, d2.	• The tension test. • Hooke's law. • Poisson's ratio. • Unit volume change. • Generalized Hooke's law in 2D.	1	2
4.	Axially Loaded Members.	a1, a2, a3,a4, b1, b2,c2,d1.	• Elastic deformation of axially loaded members. • Principle of superposition • Statically indeterminate. • Stress concentration factors.	2	4
5.	Torsion.	a1, a2, a3,a4, b1, b2, c2,d1.	• Torsional shear strain. • Torsional formula. • Angle of twist. • Stress concentration.	2	4
6.	Mid-Term Exam.	a1, a2, a3, a4. b1, b2, c1, c2.	• The first 5 chapters.	1	2
7.	Equilibrium of Beams.	a3, b1, b2, c2, d1.	- Transverse loading and type of loads. - Shear and moment in beams. - Methods for constructing S. F. & M. Diagrams: • Summation method • Graphical method. • Discontinuity functions.	1	2
8.	Bending Theory.	a1, a2, a3, a4, b1, b2, c2,d1.	• Flexural strains. • Analysis of bending stresses in beams. • Stress concentration	1	2

			• Bending due to an eccentric axial load.		
9.	Shear Stress in Beams.	a1, a2, a3, a4, b1, b2, c2, d1.	- The shear stress formula. - The first moment of area. - Shear stresses in beams of: - Rectangular cross section • Circular cross section - Shear stresses in webs of flanged beams.	1	2
10.	Stress Transformations.	a1, a2, a3,a4, b1, b2,c2, d1.	• Plane stress transformations. • Principal & maximum shear stresses. • Mohr's circle.	1	2
11.	Strain Transformations.	a1, a2, a3,a4, b1, b2, c2, d1.	• Plane strain transformations. • Strain measurements. • Generalized hooks' law.	1	2
12.	Combined Loading & Failure Theories.	a1, a2, a3, a4, b1, b2,c2, d1.	• Combined axial and torsional loads. • General combined loadings. • Theories of failure.	1	2
13.	Beam Deflections.	a1, a2, a4,b1, b2,c1, c2, d1.	- Moment–curvature relationship. - The differential equation of the elastic curve - Determining deflections by: • The method of integration. • The discontinuity functions. • The method of superposition.	1	2
14.	Final Exam	a1, a2, a3, a4. b1, b2, c1, c2.	– All the chapters.	1	2
Number of Weeks /and Units Per Semester				**16**	**32**

Head of the Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Assoc. Prof. Dr. Abdul-Malik Momin	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

B - Tutorial Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes
1.	Concept of Stress.	1	2	a1, a2, a3,b1, b2,d1.
2.	Concept of Srain.	1	2	a1, b1, b2,d1.
3.	Mechanical Behaviour of Materials.	1	2	a2, a3, a4, b1, b2, d1, d2.
4.	Axially Loaded Members.	2	4	a1, a2, a3,a4, b1, b2,c2,d1.
5.	Torsion.	2	4	a1, a2, a3,a4, b1, b2, c2,d1.
6.	Equilibrium of Beams.	1	2	a3, b1, b2, c2, d1.
7.	Bending Theory.	1	2	a1, a2, a3, a4, b1, b2, c2,d1.
8.	Shear Stress in Beams.	1	2	a1, a2, a3, a4, b1, b2, c2, d1.
9.	Stress Transformations.	1	2	a1, a2, a3,a4, b1, b2,c2, d1.
10.	Strain Transformations.	1	2	a1, a2, a3,a4, b1, b2, c2, d1.
11.	Combined Loading & Failure Theories.	1	2	a1, a2, a3, a4, b1, b2,c2, d1.
12.	Beam Deflections.	1	2	a1, a2, a4,b1, b2,c1, c2, d1.
Number of Weeks /and Units Per Semester		**14**	**28**	

VI.Teaching strategies of the course:

The teaching strategies of the course are as follows:

- Active lectures.
- Tutorials.
- Interactive class discussions.
- Exercises and home works.
- Directed self- study.
- Hands on laboratory work.
- Case studies.

VII.Assignments:

Order	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Tutorials (Chapter 1 – Chapter 12)	a1, a2, a3, b1, b2	1-14	10
	Total			**10**

VIII.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.	2nd to 15th	15	10 %	a1, a2, a3, a4, b1, b2, c2,d1, d2.
2.	Course File and Presentation.	3rd to 14th	7.5	5 %	a1, a2, a4, b1,c1, c2, d1, d2.
3.	Attendance.	1st to 15th	7.5	5%	a1, a2, a3, a4, b1, b2, c2,d1, d2.
4.	Mid-Term Exam.	8th	15	10%	a1, a2, a3, a4, b1, b2, c2.
5.	Final Exam.	16th	105	70 %	a1, a2, a3, a4, b1, b2, c2.
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. Course notes and power point presentations
2. T. A. Philpot, 2017 "Mechanics of Materials: An Integrated Learning System", 4th Ed John Wiley & Sons, Inc.

2- Essential References.

1. W. Riley, L. Sturges, & D. Morris, 2008 "Mechanics of Materials", 6 th Ed, Publisher: W 2007.
2. A.C. Ugural, "Mechanics of Materials", 1st Ed, Wiley.
3. Mechanics of Materials, by R. C. Hibbeler, Pearson, Latest Edition

3- Electronic Materials and Web Sites *etc*.

http://web.mst.edu/~mecmovie/-1

	X.Course Policies:
.1	**Class Attendance:** - The students should have more than 75% of attendance according to rules and regulations of the faculty.
.2	**Tardy:** - The students should respect the timing of attending the lectures. They should attend within 15 minutes from starting of the lecture.
.3	**Exam Attendance/Punctuality:** - The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for mid-term exam and final 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:** - If any cheating occurred during the examination, the student is not allowed to continue and he has to face the examination committee for enquiries.
6.	**Plagiarism:** - If one student attends the exam on another behalf; he will be dismissed from the faculty according to the policy, rules and regulations of the university.
7.	**Other Policies:** - All the teaching materials should be kept out the examination hall and mobile phones are not allowed. - Mutual respect should be maintained between the student and his teacher and also among students. Failing in keeping this respect is subject to the policy, rules and regulations of the university.

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. Head of Mechatronics Engineering Department: Assoc. Prof. Dr. Abdul-Malik Momin.
	Deputy Rector for Academic Affairs Assoc. Prof. Dr. Ibrahim AlMutaa. Assoc. Prof. Dr. Ahmed Mujahed. Asst. Prof. Dr. Munaser Alsubari.

Head of the Department Assoc. Prof. Dr. Abdul-Malik Momin	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad	Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas

Template for Course Plan of Properties and Strength of Materials

I.Information about Faculty Member Responsible for the Course:								
Name of Faculty Member	Assoc. Prof. Dr. Khalil AL-Hatab.	**Office Hours**						
Location& Telephone No.	771 157 027.	**SAT**	**SUN**	**MON**	**TUE**	**WED**	**THU**
E-mail	alhatab22@yahoo.com.						

II.Course Identification and General Information:						
1.	Course Title:	Properties and Strength of Materials				
2.	Course Number & Code:	MT103.				
3.	Credit hours:	C.H				TOTAL CR. HRS
		Th.	Seminar	Pr	Tu.	
		2	-	-	2	3
4.	Study level/year at which this course is offered:	Second Year-First Semester.				
5.	Pre –requisite (if any):	Engineering Mechanics 1 (Statics).				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered	Mechatronics Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	System of Study:	Semesters.				
10.	Mode of delivery:	Lectures and Tutorials.				
11.	Location of teaching the course:	Mechatronics Engineering Department.				

Head of the Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
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III.Course Description:

This course presents the basic concepts, theory and principles of strength of materials as well as common mechanical properties of materials necessary for engineering design of various machine components. It concentrates on concepts of stress and strain, mechanical properties of materials, analysis of deformation, strain and stress that occurs in structural members under axial, torsion and bending loading conditions. This course also covers: shear and moment diagrams; stress and strain transformations; Mohr's circle; thin wall pressure vessels; combined stresses and static failure theories; and beam deflections.

IV.Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1.	Characterize knowledge and understanding the type of load/stress and the deformations/strain produced on the deformable bodies subjected to axial, torsion and bending loading.	A1
a2.	Describe basic principles of strength of materials and mechanical behaviour of materials in engineering applications and mechatronics design problems.	A2
a3.	Identify a working knowledge of stress and strain analysis of common mechanical systems and the ability to develop computer programs to calculate stress, strain, and their relations.	A3
a4.	Discuss the different types of engineering materials failures under static loads and their relevance on the solving of machine design problems.	A4
b1.	Explore solution to problems that involve the stress and strain analysis of linear elastic solids under tension, compression, torsion load.	B1
b2.	Categorize the body section under the which the force, torque or moment act and be aware of the influence of the stress concentration factors affecting the design.	B2
c1.	Apply computer programs necessary tests to check the validity of engineering materials.	C1
c2.	Apply computer programs for solving the shearing force and bending moment diagrams, Mohr's circle and illustrate stress variations over the cross-section of the members.	C2
d1.	Review ideas with others and apply quantitative reasoning skills to solve problems	D1
d2.	Examine effectively in written, oral and electronic forms.	D2

V.Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1.	Concept of Stress.	– Course overview and introduction. – Equilibrium of deformable body. – Average normal and shear stresses and bearing stress. – Allowable stress & factor of safety. – General and typical states of stress.	1	2
2.	Concept of Srain.	– Displacements and deformation. – Normal and shear strain. – Plane strain. – Thermal strain.	2	2
3.	Mechanical Behaviour of Materials.	– The tension test. – Hooke's law. – Poisson's ratio. – Unit volume change. – Generalized Hooke's law in 2D.	3	2
4.	Axially Loaded Members.	– Elastic deformation of axially loaded members. – Principle of superposition – Statically indeterminate. – Stress concentration factors.	4,5	4
5.	Torsion.	– Torsional shear strain. – Torsional formula. – Angle of twist. – Stress concentration.	6,7	4
6.	Mid-Term Exam.	- All the 5 chapters.	8	2
7.	Equilibrium of Beams.	– Transverse loading and type of loads. – Shear and moment in beams. – Methods for constructing S. F. & M. Diagrams: • Summation method • Graphical method. • Discontinuity functions.	9	2
8.	Bending Theory.	– Flexural strains. – Analysis of bending stresses in beams. – Stress concentration	10	2

		– Bending due to an eccentric axial load.		
9.	Shear Stress in Beams.	– The shear stress formula. – The first moment of area. – Shear stresses in beams of: • Rectangular cross section • Circular cross section – Shear stresses in webs of flanged beams.	11	2
10.	Stress Transformations.	– Plane stress transformations. – Principal & maximum shear stresses. – Mohr's circle.	12	2
11.	Strain Transformations.	– Plane strain transformations. – Strain measurements. – Generalized hooks' law.	13	2
12.	Combined Loading & Failure Theories.	– Combined axial and torsional loads. – General combined loadings. – Theories of failure.	14	2
13.	Beam Deflections.	– Moment–curvature relationship. – The differential equation of the elastic curve – Determining deflections by: • The method of integration. • The discontinuity functions. • The method of superposition.	15	2
14.	Final Exam.	All the chapters.	16	2
Number of Weeks /and Units Per Semester			**16**	**32**

B - Tutorial Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes
1.	Concept of Stress.	1	2	a1, a2, a3,b1, b2,d1.
2.	Concept of Srain.	2	2	a1, b1, b2,d1.
3.	Mechanical Behaviour of Materials.	3	2	a2, a3, a4, b1, b2, d1, d2.
4.	Axially Loaded Members.	4,5	4	a1, a2, a3,a4, b1, b2,c2,d1.
5.	Torsion.	6,7	4	a1, a2, a3,a4, b1, b2, c2,d1.
6.	Equilibrium of Beams.	8	2	a3, b1, b2, c2, d1.

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7.	Bending Theory.	9	2	a1, a2, a3, a4, b1, b2, c2,d1.
8.	Shear Stress in Beams.	10	2	a1, a2, a3, a4, b1, b2, c2, d1.
9.	Stress Transformations.	11	2	a1, a2, a3,a4, b1, b2,c2, d1.
10.	Strain Transformations.	12	2	a1, a2, a3,a4, b1, b2, c2, d1.
11.	Combined Loading & Failure Theories.	13	2	a1, a2, a3, a4, b1, b2,c2, d1.
12.	Beam Deflections.	14	2	a1, a2, a4,b1, b2,c1, c2, d1.
Number of Weeks /and Units Per Semester		**14**	**28**	

VI.Teaching strategies of the course:

The teaching strategies of the course are as follows:

- Active lectures.
- Tutorials.
- Interactive class discussions.
- Exercises and home works.
- Directed self- study.
- Case studies.

VII.Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Tutorials (Chapter 1 – Chapter 12)	a1, a2, a3, b1, b2	1-14	10
Total				**10**

VIII.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.	2nd to 15th	15	10 %	a1, a2, a3, a4, b1, b2, c2,d1, d2.

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Rector of Sana'a University
Prof. Dr. Al-Qassim Mohammed Abbas

2.	Course File and Presentation	3rd to 14th	7.5	5 %	a1, a2, a4, b1,c1, c2, d1, d2.
3.	Attendance.	1st to 15th	7.5	5%	a1, a2, a3, a4, b1, b2, c2,d1, d2.
4.	Mid-Term Exam.	8th	15	10%	a1, a2, a3, a4, b1, b2, c2.
5.	Final Exam.	16th	105	70 %	a1, a2, a3, a4, b1, b2, c2.
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. Course notes and power point presentations
2. T. A. Philpot, 2017 "Mechanics of Materials: An Integrated Learning System", 4th Ed John Wiley & Sons, Inc.

2- Essential References.

1. W. Riley, L. Sturges, & D. Morris, 2008 "Mechanics of Materials", 6 thEd, Publ Wiley, 2007.
2. A.C. Ugural, "Mechanics of Materials", 1st Ed, Wiley.
3. Mechanics of Materials, by R. C. Hibbeler, Pearson, Latest Edition

3- Electronic Materials and Web Sites *etc*.

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X.Course Policies:

Unless otherwise stated, the normal course administration policies and rules of the Faculty of Engineering apply. For the policy, see: ----------

.1	**Class Attendance:** - The students should have more than 75% of attendance according to rules and regulations of the faculty.
.2	**Tardy:** - The students should respect the timing of attending the lectures. They should attend within 15 minutes from starting of the lecture.
.3	**Exam Attendance/Punctuality:** - The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for mid-term exam and final 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:** - If any cheating occurred during the examination, the student is not allowed to continue and he has to face the examination committee for enquiries.
6.	**Plagiarism:** - If one student attends the exam on another behalf; he will be dismissed from the faculty according to the policy, rules and regulations of the university.
7.	**Other policies:** - All the teaching materials should be kept out the examination hall and mobile phones are not allowed. - Mutual respect should be maintained between the student and his teacher and also among students. Failing in keeping this respect is subject to the policy, rules and regulations of the university.

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