Sana'a University
Faculty of Engineering
Mechanical Engineering Department
Mechanical Engineering Program

28. Course Plan of Mechanics of Materials-I

I. Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Assoc. Prof. Dr. Khalil Al-Hatab	**Office Hours**					
Location& Telephone No.		SAT	SUN	MON	TUE	WED	THU
E-mail			10-12			12-2	

II. Course Identification and General Information:						
1.	Course Title:	Mechanics of Materials-I**.**				
2.	Course Number & Code:	ME131.				
3.	Credit Hours:	C.H				TOTAL CR. HRS.
		Th.	Seminar/Tu.	Pr	Tr.	
		2	2	2	-	4
4.	Study level/year at which this course is offered:	Second Year – Second Semester.				
5.	Pre –requisite (if any):	Dynamics & Materials Science and Engineering .				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered	Mechanical Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	System of Study:	Semesters.				
10.	Mode of delivery:	Lectures, Tutorials and Lab.				
11.	Location of teaching the course:	Mechanical Engineering Department.				

Head of Department
Asst. Prof. Dr. Adel Ahmed Al-Shakiri

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

III. Course Description:

This is an introductory course to the basic concepts   and   principles of Mechanics of Materials. It is an an attempt to provide sufficient knowledge to enable any component to be designed such that it will not fail within its service life. The course covers the following topics: stress and strain concepts, axial load, statically indeterminate axially loaded members, thermal stress, torsion, angle of twist, statically indeterminate torque-loaded members, bending, eccentric axial loading of beams, transverse shear, shear flow in build-up members, curved beams, stress and strain transformation and thin-walled pressure vessels.

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

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

1- Understand modern knowledge tools, analytical skills, software packages (i.e., solid work, MDSolids…etc) and graphical method in the elementary solutions to the problems in practical mechanics of materials.

2- Identify, formulate, analyses and solve engineering strength of materials problems subjected to static loadings.

3- Determine displacements, stresses in members due to axial, torsional, shear force, bending moments and pressure loads and design the machine elements

4- Evaluate the influence of various geometric and loading parameters in plane stress and plane strain problems.

5- Address and present a problem oriented in depth knowledge of the underlying concepts and methods behind mechanics of materials to design bars, beams, and circular shafts for allowable stresses and loads.

6- Compute and construct the shearing force and bending moment diagrams, Mohr's circle and illustrate stress variations over the cross-section of the members.

7- Design and conduct experiments of mechanics of materials, as well as analyze, interpret data and apply the experimental results for the services.
   Ability to share ideas and to communicate effectively with other both orally and in writing technical report.

V. Course Content:

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

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A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Week Due	Contact hours
1.	Concept of Stress.	− Course Overview and Introduction. − Equilibrium of Deformable Body. − Average Normal, Shear and Bearing Stresses. − Allowable Stress. − Factor of Safety. − General and Typical States of Stress.	1 st and 2 nd Weeks	4
2.	Concept of Strain.	− Displacements and Deformation. − Normal and Shear Strain. − Plane Strain. − Thermal Strain.	3 rd Week	2
3.	Mechanical Behavior of Materials.	− The Tension Test. − Hooke's Law. − Poisson's Ratio. − Unit Volume Change. − Generalized Hooke's Law in 2D.	4 th Week	2
4.	Axially Loaded Members.	− Elastic Deformation of Axially Loaded Members. − Principle of Superposition. − Statically Indeterminate. − Stress Concentration Factors.	5 th and 6 th Weeks	4
5.	Torsion Stress & Deformation.	− Torsional Shear Strain. − Torsional Formula. − Angle of Twist. − Statically Indeterminate. − Stress Concentration.	7th week	4
6.	Mid-Term Exam.	− The First 5 Chapters	8 th Week	2

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7.	Torsion Stress & Deformation.	− Torsional Shear Strain. − Torsional Formula. − Angle of Twist. − Statically Indeterminate. − Stress Concentration.	9 th Week	4
8.	Equilibrium of Beams.	− Transverse Loading and Type of Loads. − Shearing Force and Bending Moment Diagrams.	10 th Week	2
9.	Bending Theory.	− Bending Stress. − Stress Concentration. − Transverse Shear Stress. − Curved Beams.	11 th and 12th Weeks	4
10.	Stress and Strain Transformations.	− Plane Stress Transformations. − Principal & Maximum Shear Stresses. − Mohr's Circle. − Thin-Walled Cylinders. − Plane Strain Transformations. − Strain Measurements.	13 th and 14th Weeks	4
11.	Thin Wall Pressure Vessels.	− Cylindrical Vessels. − Spherical Vessels.	15 th Week	2
12.	Final Exam.	All the Chapters.	16 th Week	2
Number of Weeks /and Units Per Semester			**16**	**32**

B – Practical Aspect:			
Order	**Tasks/ Experiments**	**Week Due**	**Contact hours**
1.	Introduction.	1st , 2 nd Weeks	4
2.	Tensile Test.	3 rd Week	2
3.	Compression Test.	4 th Week	2

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4.	Torsional Test.	5 th Week	2
5.	Practical Mid-Term Exam.	6 th Week	2
6.	Bending Test.	7 th Week	2
7.	Impact Test.	8 th Week	2
8.	Creep Test.	9 th Week	2
9.	Thin-Wall Pressure Vessel Test.	10 th Week	2
10.	Strain Measurements Test.	11 th Week	2
11.	Practical Final Exam.	12 th Week	2
12.	Review	13th ,14th Weeks	**4**
Number of Weeks /and Units Per Semester		**14**	**28**

C – Tutorial Aspect:

Order	Units/Topics List	Week Due	Contact hours
1.	Concept of Stress.	1 st and 2 nd Weeks	4
2.	Concept of Strain.	3 rd Week	2
3.	Mechanical Behavior of Materials.	4 th Week	2
4.	Axially Loaded Members.	5 th and 6 th Weeks	4
5.	Torsion Stress & Deformation.	7th and 8 th Weeks	4
7.	Equilibrium of Beams.	9 th Week	2
8.	Bending Theory.	10 th and 11 th Weeks	4
9.	Stress and Strain Transformations.	12 th and 13 th Weeks	4
10.	Thin Wall Pressure Vessels.	14 th Week	2
Number of Weeks /and Units Per Semester		**14**	**28**

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VI. Teaching strategies of the course:

- Active Lectures,
- Laboratory based session
- Tutorials
- Software packages (i.e., SolidWorks, MDSolids …etc)
- Interactive class discussions
- Exercises and Homework
- Problem based learning,

VII. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Homework 1.	a1, a2, b1, b2, c1,d2	2nd	1.25
2.	Homework 2.	a1, a2, b1, b2, c1,d2	3rd	1.25
3.	Homework 3.	a1, a2, b1, b2, c1,d2	4th	1.25
4.	Homework 4.	a1, a2, a3, b1, b2, b3,b4, c1, c2, d2	5th	1.25
5.	Homework 5.	a1,a2,a3,b1,b2,b3,b4,c1,c2,c3,d1,d2	6th	1.25
6.	Homework 6.	a1, a2, a3, b1, b2, b3,b4, c1, c2, d2	7th	1.25
7.	Homework 7.	a1, a2, a3, b1, b2, b3,b4, c1, c2, d2	9th	1.25
8.	Homework 8.	a1, a2, a3, b1, b2, b3,b4, c1, c2, d2	10th	1.25
9.	Homework 9.	a1, a2, a3, b1, b2, b3,b4, c1, c2, d2	11th	1.25
10.	Homework 10.	a1, a2, a3, b1, b2, b3,b4, c1, c2, d2	12th	1.25
11.	Homework 11.	a1, a2, a3, b1, b2, b3,b4, c1, c2, d2	13th	1.25
12.	Homework 12.	a1, a2, a3, b1, b2, b3,b4, c1, c2, d2	14th	1.25
	Total			**15**

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

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes

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1.	Homework 1 to Homework 12.	2nd to 14th	15	7.5%	a1, a2, a3, b1, b2, b3,b4, c1, c2, d2
2.	Practical Report 6 to Practical Report 9.	3rd to 13th	15	7.5%	a1,b1,b2,c3,d1,d2
3.	Real Problem Presentation 1 to Real Problem Presentation 6.	5th to 11th	10	5%	a1,a2,a3,b1,b2,b3,b4,c1,c2,c3,d1,d2
4.	Quiz 1- Quiz 3.	4th ,7th,11th	10	5%	a1, a2, a3, b1, b2, b3,b4, c1, c2, d2
5.	Mid-Term Exam.	8th	20	10%	a1, a2, a3, b1, b2, b3,b4, c1, c2, d2
6.	Practical Mid-Term Exam.	6th	10	5%	a1,b1,b2,c3,d1,d2
7.	Practical Final Exam.	14th	20	10%	a1,b1,b2,c3,d1,d2
8.	Final Exam.	15th	100	50%	a1, a2, a3, b1, b2, b3,b4, c1, c2, d2
	Total		**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. Course notes and power point presentations
2. A.C. Ugural, 2008, "Mechanics of Materials", 1st ed, Wiley.

2- Essential References.

1. W. Riley, L. Sturges, & D. Morris, 2007 "Mechanics of Materials", 6th Ed, Wil
2. Huei-Huang Lee, "Mechanics of Materials Labs with SolidWorks simulation 2 SDC Publications.
3. T. A. Philpot, 2011, "Mechanics of Materials", 3rd ed., Wiley Publications.
4. R. C. Hibbeler, 2018, "Mechanics of Materials", 10th ed., Pearson.

3- Electronic Materials and Web Sites *etc*.

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

I.	Course Policies:
1	**Class Attendance:**

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

	- The student should be attending not less than 75% of total contact hours of the subject, otherwise he will not able to take exam and be considerd as an exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic.
2	**Tardy:** - For lateness in attending the class, the student will be initially notified. If he repeates late in attending class he will be considered absent.
3	**Exam Attendance/Punctuality:** - The student should attend the exam on time. He is permitted to attend the exam half one hour from exam beginning, after that he/she will not be permitted to take exam and he/she is considered absent in the exam.
4	**Assignments & Projects:** - In general one assignment is given after each chapter of a course. The student should submit the assignment on time, mostly one week after giving the assignment
5	**Cheating:** - For cheating in exam, the student is considered as failure. In case the cheating is repeated three times during study the student will be disengaged from the Faculty
6	**Plagiarism:** Plagiarism is the attending of the student the exam of a course instead of other student. If the examination committee proved a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Affair Council of the university.
7	**Other policies:** - The mobile phone is not allowable to be used during class lecture. It must be switched off, otherwise the student will be ordered to leave the lecture room. - The mobile phone is not allowed to be taken during the examination time. - Lecture notes and assignments may be given directly to students using soft or hard copy.

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