Module Information
معلومات المادة الدراسية

Module Title	STRENGTH AND PROPERTIES OF MATERIALS	**Module Delivery**	
Module Type	BASIC	✓ **Theory** ✓ **Lecture** ✓ **Tutorial** ✓ ✓	
Module Code	UOMU0101033		
ECTS Credits	4		
SWL (hr/sem)	100		

Module Level	UGII	**Semester of Delivery**	3
Administering Department	BME	**College**	College of Engineering
Module Leader	Dr. Ali Kamil Kareem	**e-mail**	ali.kamil.kareem@uomus.edu.iq
Module Leader's Acad. Title	lecturer	**Module Leader's Qualification**	Ph.D
Module Tutor	Dr. Ali Kamil Kareem	**e-mail**	ali.kamil.kareem@uomus.edu.iq
Peer Reviewer Name		**e-mail**	
Review Committee Approval	27/09/2024	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Engineering Mechanics	**Semester**	One
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	Strength of materials is a branch of applied mechanics that deals with the behavior of solid bodies subjected to various types of loading. The aims of this subject are: 1- Recognize different types of loads that affects solid bodies include axially-loaded bars, shafts, beams, and columns. 2- Identify the simple stresses in beams which include axile stress, shear stress produces by direct force and bearing stress. 3- Discuss the effects of applying a torsional loading to a shaft or tube have a circular or noncircular cross section. 4- Determine the external forces and stresses by statically indeterminate methods. 5- Define power transmission by shaft subjected to torque. 6- Identify thin-walled pressure vessels including cylindrical and spherical shapes 7- Identify vessel subjected to fluid pressure 8- Learn how to draw bending and shear force diagrams that distributed along with beam's axle. 9- Explain the thermal stresses in beams that exposed to thermal effect beside the mechanical stresses. 10- Concepts of stress, strain and deflection. Factor of safety.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	A thorough understanding of the fundamentals of this subject is of vital importance because many of the formulas and rules of design cited in engineering codes are based upon the principles of this subject. After completing this module, a student will be able to:

	1. Recognize different types of loads and stresses that affect loaded beams. 2. Find external forces and stresses in beams that statically indeterminate since the equilibrium equation(s) are not sufficient. 3. Understand the stress distribution within the beam due to torsion load and identify the angle of twist of this beam having circular or noncircular section. 4. Use the statically indeterminate methods to find the reactions, stresses and deflections in beams subjected to torsional or axil loads. 5. Power Transmission in Beams Subjected to Torques. 6. Identify Thermal Stresses in Beams 7. Draw the Shear Force and Bending Moment Distributed Along the Beams. 8. Stress and deformation calculations for cases of axially loaded rods
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Concepts of stress, strain and deflection. Factor of safety. Mechanical properties of materials. Stress and deformation calculations for cases of axially loaded rods (15 hours) . torsion of circular shafts, beam bending and combined loading. Horizontal shear connectors in built-up beams. Area moment of inertia. Parallelaxis theorem. Introduction to beam design. Stress concentration (20 hours) . Stress transformation and principal stress calculation by Mohr's circle. Statically indeterminate analysis. Elastic buckling of columns (15 hours)
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some practical tests. Encourage students to solve some selected homework from refences to practice solving engineering problems using stresses analysis route.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	56	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	40	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	96 + 4 hours (Final exam) = 100 hours/sem		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Lab.	2 hr.	10% (10)	Continuous	
	Report	0	10% (0)	13	LO # 5, 8 and 10

Summative assessment	**Midterm Exam**	2 hr.	10% (20)	7	LO # 1-7
	Final Exam	3hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Concepts of stress, strain and deflection, Factor of safety
Week 2	Stress and deformation calculations for axially loaded rods and thermal stress
Week 3	Torsion of circular shafts.
Week 4	Beam bending and combined loading,
Week 5	Horizontal shear connectors in built-up beams. Area moment of inertia.
Week 6	Statically indeterminate of Reactions, Deflections and Stresses.
Week 7	Parallel-axis theorem. Introduction to beam design. Stress concentration
Week 8	**Midterm Exam**
Week 9	Stress transformation and principal stress calculation by Mohr's circle.
Week 10	Statically indeterminate analysis. Elastic buckling of columns.
Week 11	Engineering Materials: Classification of engineering materials, Ferrous Metals, Non-Ferrous Metals
Week 12	Engineering Materials: Destructive and non-destructive tests
Week 13	Physical and chemical properties of materials
Week 14	Mechanical load and tests: Tension, Hardness, Fatigue, Impact, Creep.
Week 15	Mechanical properties of materials.
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	MECHANICS OF MATERIALS, Eighth Edition, R. C. HIBBELER Engineering Materials, Michael F. Ashby and David R. H. Jones	Yes
Recommended Texts	Mechanics of Materials, Singer Mechanics of Materials, Gere Mechanics of Materials, Hearn	No

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors

	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.