

# MODULE DESCRIPTION – Mechanics of Materials I

## وصف المادة الدراسية – ميكانيك المواد I

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Mechanics of Materials I</b>		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	<b>CIER 210</b>		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	Semester of Delivery	
Administering Department	CIER	College	
Module Leader	Prof. Dr. Ibrahim Saleem Ibrahim + Dr. Ahmed Abdalhafedh Mustafa	e-mail	<a href="mailto:Ibrahim.S.Ibrahim@nahrainuniv.edu.iq">Ibrahim.S.Ibrahim@nahrainuniv.edu.iq</a> <a href="mailto:ahmed.a.mustafa@nahrainuniv.edu.iq">ahmed.a.mustafa@nahrainuniv.edu.iq</a>
Module Leader's Acad. Title	Professor + Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Prof. Dr. Ibrahim Saleem Ibrahim + Dr. Ahmed Abdalhafedh Mustafa	e-mail	<a href="mailto:Ibrahim.S.Ibrahim@nahrainuniv.edu.iq">Ibrahim.S.Ibrahim@nahrainuniv.edu.iq</a> <a href="mailto:ahmed.a.mustafa@nahrainuniv.edu.iq">ahmed.a.mustafa@nahrainuniv.edu.iq</a>
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>Graduation of civil engineers qualified to work in their various fields of specialization:</p> <ol style="list-style-type: none"><li>1. Providing the student with the necessary skills and mechanisms to deal with the latest developments in scientific and technical progress in their field of specialization.</li><li>2. Special care for outstanding students and enabling them to put forward their ideas.</li><li>3. Providing the student with high skill and the ability to solve problems and teamwork.</li><li>4. Instilling the spirit of diligence and perseverance and encouraging them to create and innovate.</li></ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>Module Learning Outcomes include the following:</p> <ol style="list-style-type: none"><li>1. Demonstrate an understanding of the concepts of stress and strain, and define all types of stresses.</li><li>2. Demonstrate an understanding of the relationships between loads, member forces and deformations and material stresses and strains in structural members under axial loading, flexural, and shear loadings.</li><li>3. Demonstrate an understanding of the mechanical properties of materials and the stress-strain relationships for homogenous, isotropic materials.</li><li>4. Demonstrate an understanding of the stress-strain behavior of ductile and brittle materials.</li><li>5. Demonstrate an understanding of the elastic deformation of axially loaded members, statically indeterminate axially loaded members and thermal stress.</li><li>6. Describe the methods for determining and drawing axial force diagram.</li><li>7. Describe the methods for determining and drawing shear force diagram.</li><li>8. Describe the methods for determining and drawing bending moment diagrams.</li><li>9. Demonstrate an understanding of the assumptions and theories of flexural formula.</li><li>10. Demonstrate an understanding of the assumptions and theories of shear formula.</li></ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>Indicative content includes the following:</p> <p>- <b>Stress and Strain</b> Equilibrium of a deformed body, stress, support reactions, internal resultant loading, average normal stress, average shear stress, allowable stress, stress in simple connections, deformation, strain, shear strain, and small strain analysis. [8 hrs]</p> <p>- <b>Mechanical Properties of Materials</b></p>

	<p>Tension and compression test, stress-strain diagram, stress-strain behavior of ductile and brittle materials, Hooke's Law, Modulus of Elasticity, Shear modulus, Poisson's ratio, Modulus of resilience, Modulus of toughness. [8 hrs]</p> <p><b>- Axial Load</b> Introduction, elastic deformation of axially loaded members, principle of superposition, statically indeterminate axially loaded members, force method of analysis for axially loaded members, and thermal stress. [8 hrs]</p> <p><b>- Axial Force, Shear Force and Bending Moment</b> Types of axial members, types of beams, types of load, structural systems, statically determinate and indeterminate beams, Sign Conventions, free body diagrams, axial force diagrams, shear force diagrams, bending moment diagrams, method of sections, method of differential equation of equilibrium, boundary condition of the supports, and Area or Summation Method. [16 hrs]</p> <p><b>- Bending Stress</b> Bending deformation of a straight member, the flexural formula, bending stresses, unsymmetrical bending, neutral axis, moment applied about principal axis, moment arbitrarily applied, and composite beams. [8 hrs]</p> <p><b>- Shear Stress</b> Shear in straight members, the shear formula, shear flow in built-up members, shear flow in thin walled members, Shear Center, and shear center for open thin-walled members. [8 hrs]</p> <p><b>- Solving additional problems.</b> [8 hrs]</p>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<ul style="list-style-type: none"> <li>• Introduce students to definition of mechanics of materials.</li> <li>• Self-regulated learning (i.e., planning, monitoring and evaluating one's own learning process in the classwork / Class team work).</li> <li>• Practice testing (short question answers and exams).</li> <li>• Self-explanation (i.e., explaining to oneself how new information is related to old information or explain steps taken when solving a problem or a task).</li> </ul>

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	63	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	4
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.4
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>125</b>		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 9	LO #1 - #6
	Assignments	3	10% (10)	2, 7, and 12	All
	Exam	1 hr	10% (10)	6	LO #1, #2, #3, #4 and #5
	Report	1	10% (10)	13	All
Summative assessment	Midterm Exam	2 hr	10% (10)	10	LO #1 - #8
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Stress and Strain
Week 2	Stress and Strain
Week 3	Mechanical Properties of Materials
Week 4	Mechanical Properties of Materials
Week 5	Axial Load
Week 6	Axial Load
Week 7	Axial Force , Shear Force and Bending Moment
Week 8	Axial Force , Shear Force and Bending Moment
Week 9	Axial Force , Shear Force and Bending Moment
Week 10	Axial Force , Shear Force and Bending Moment
Week 11	Bending Stress
Week 12	Bending Stress
Week 13	Shear Stress
Week 14	Shear Stress
Week 15	Solving Additional Problems
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1- Hearn, E. J., "Mechanics of Materials" Pergamon Press, Headington Hill Hall, Oxford OX 3 0 BW, UK, 1985.	Yes
Recommended Texts	1- Hibbeler, R.C., "Mechanics of materials", 9 <sup>th</sup> Edition, Person, Singapore, 2013.	Available online
Websites		
Others	1- Notebook prepared by the instructor of the course. 2- Collection of sheets of solved problems.	

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	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
<p><b>Note:</b> Marks 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.</p>				