	Ministry of Higher Education and Scientific Research - Iraq University of Diyala College of Engineering Department of Materials Engineering	

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**ENGINEERING MECHANICS/ STATIC AND DYNAMIC**			**Module Delivery**	
Module Type	CORE			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MATE 105				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	1		**Semester (s) offered**	2	
Administering Department	All Departments		**College**	College of Engineering	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval	13/06/2023		**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, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	The aim of this course is: To familiarize students with analyzing mechanical bodies in static and motion states by understanding the theories and laws specific to mechanical systems. Introducing students to this curriculum is a supplementary component of engineering mechanics, serving as a gateway to materials engineering. To equip students with the necessary knowledge to enable them to achieve optimal design for engineering shapes and materials capable of withstanding loads and environmental conditions.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• State the fundamental principles used in the study of mechanics. Define the magnitude and directions of forces and moments and identify associated scalar and vector products. • Draw free-body diagrams for two- and three-dimensional force systems. Solve problems using the equations of static equilibrium. • Compute the moment of a force about a specified point or line. Replace a system of forces with an equivalent simplified system. • Analyze the forces and couples acting on a variety of objects. Determine unknown forces and couples acting on objects in equilibrium. • Analyze simple trusses using the method of joints or the method of sections. • Determine the location of the centroid and the center of mass for a system of discrete particles and for objects of arbitrary shape. • Analyze structures with a distributed load. Calculate moments of inertia for various shapes. Apply the parallel axis theorem to compute moments of inertia. • Solve problems involving the equilibrium of rigid bodies subjected to systems of loads. • Analyze the friction force and normal force for the different contact masses and bodies		
Indicative Contents المحتويات الإرشادية	Part 1: Static Introduction to mechanic Resultant of forces Moments and couples Equilibrium in Two and Three Dimensions (Introduction, System Isolation the Free-Body Diagram, Equilibrium Conditions Friction Centroid and moment of inertia Part 2: Dynamic		

	Introduction to dynamic Rectilinear motion and kinetic of rectilinear motion. curvilinear motion and kinetic of curvilinear motion motion of projectile space motion and kinetic of space motion.
Course Description	The basic theory of engineering mechanics, using calculus, involves the description of forces, moments, and couples acting on stationary engineering structures; equilibrium in two and three dimensions; free body diagrams; friction; centroids; centers of gravity; and moments of inertia. In addition to rectilinear motion and kinetic of rectilinear motion, curvilinear motion and kinetic of curvilinear motion, the motion of a projectile, space motion and kinetic of space motion.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Begin in Engineering Mechanics, then employ a range of teaching strategies to ensure first-year engineering students fully grasp the various mechanical concepts. Instructional methods include interactive lectures, where core mechanical principles are explained in detail, and practical problem-solving sessions to provide hands-on learning experiences. Collaborative group work encourages peer-to-peer learning and reinforces understanding through shared insights. Regular formative assessments will be conducted to monitor students' understanding of the material, and feedback will be promptly given to guide their learning process. Instructors will maintain office hours for personalized support, and online resources will be available to supplement classroom instruction. Emphasis will be placed on relating mechanical concepts to real-world engineering applications to make the learning experience more relevant and engaging. These strategies aim to develop students' critical thinking skills, enhance their problem-solving abilities, and prepare them for advanced engineering studies.

Student Workload (SWL) الحمل الدراسي للطالب				
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** **80** **In class tests** **8** **Seminars** **5**		93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** **30** **Preparation for tests** **27**		57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8

Homework **12**			
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	5% (5)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments	6	20% (20)	2, 4, 6, 8, 10, 12	LO # 1, 2, 3, 4, 5 and 6
	Seminars	2	5% (5)	Continuous	
Summative assessment	**Midterm Exam**	2	20% (10)	7	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to the basic quantities and idealizations of mechanics, statement of Newton's Laws of Motion and Gravitation, and the principles for applying the SI system of units. The standard procedures for performing numerical calculations, a general guide for solving problems
Week 2	Force vectors: show how to add forces and resolve them into components using the Parallelogram Law. Express force and position in Cartesian vector form and explain how to determine the vector's magnitude and direction. Introduce the dot product to use it to find the angle between two vectors or the projection of one vector onto another.
Week 3	Equilibrium of particles: To introduce the concept of the free-body diagram for a particle. To show how to solve particle equilibrium problems using the equations of equilibrium
Week 4	Force system resultants: To discuss the concept of the moment of a force and show how to calculate it in two and three dimensions. To provide a method for finding the moment of a force about a specified axis. To define the moment of a couple. To show how to find the resultant effect of a nonconcurrent force system. To indicate how to reduce a simple distributed loading to a resultant force acting at a specified location
Week 5	Equilibrium of rigid body: To develop the equations of equilibrium for a rigid body. To introduce the concept of the free-body diagram for a rigid body. To show how to solve rigid-body equilibrium problems using the equations of equilibrium
Week 6	Friction: To introduce the concept of dry friction and show how to analyze the equilibrium of rigid bodies subjected to this force. To present specific applications of frictional force analysis on wedges, screws, belts, and bearings. To investigate the concept of rolling resistance.

Week 7	Center of Gravity and Centroid: To discuss the concept of the center of gravity, the center of mass, and the centroid. To show how to determine the location of the center of gravity and centroid for a body of arbitrary shape and one composed of composite parts. to use the theorems of Pappus and Guldinus for finding the surface area and volume of a body having axial symmetry. To present a method for finding the resultant of a generally distributed loading and to show how it applies to finding the resultant force of a pressure loading caused by a fluid
Week 8	Introduction, Rectilinear Kinematics: Continuous Motion, Rectilinear Kinematics: Erratic Motion, General Curvilinear Motion,
Week 9	Curvilinear Motion: Rectangular Components, Motion of a Projectile, Curvilinear Motion: Normal and Tangential Components
Week 10	Curvilinear Motion: Cylindrical Components
Week 11	Absolute Dependent Motion Analysis of Two Particles
Week 12	Relative-Motion of Two Particles Using Translating Axes
Week 13	Kinetics of a Particle: Force and Acceleration, Newton's Second Law of Motion.
Week 14	The Equation of Motion, the Equation of Motion for a System of Particles,
Week 15	Equations of Motion: Rectangular Coordinates, Equations of Motion: Normal and Tangential Coordinates, Equations of Motion: Cylindrical Coordinates, Central-Force Motion and Space Mechanics
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Engineering Mechanics: Static & Dynamic by R.C. Hibbeler, 14th edition, Pearson Publishing.	Yes
Recommended Texts		-
Websites		

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 is 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.