MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Mechanics/ Dynamics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 101**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level		1	**Semester of Delivery**		2
Administering Department		PM	**College**	TEMO	
Module Leader	Tariq Khalid		**e-mail**	tariqaikhalidi@ntu.edu.iq	
Module Leader's Acad. Title		Assist. Professor	**Module Leader's Qualification**		MASTER
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name		Dr. Ayman sabah	**e-mail**	aymansabah@ntu.edu.iq	
Scientific Committee Approval Date		June /01/2023	**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	
Module Objectives أهداف المادة الدراسية	Module Objectives for Engineering Mechanics/Dynamics: 1. Understand the fundamental concepts and principles of dynamics, including motion, forces, and acceleration. 2. Apply kinematic equations to analyze the motion of particles and rigid bodies in various scenarios. 3. Determine the relationship between forces, mass, and acceleration using Newton's laws of motion. 4. Apply the principles of work and energy to analyze and solve dynamic problems. 5. Analyze and calculate linear and angular momentum, and apply the principle of impulse and momentum to dynamic systems. 6. Understand and apply the principles of vibrations and oscillations in mechanical systems. 7. Apply principles of balancing rotating masses and vibrations to ensure smooth operation of machinery. 8. Analyze multi-degree of freedom systems and determine their natural frequencies and mode shapes. 9. Apply dynamic principles to real-world engineering problems and systems. 10. Develop critical thinking and problem-solving skills in the context of engineering dynamics. 11. Communicate effectively, both orally and in writing, to present and explain the analysis, results, and solutions of dynamic problems. By achieving these module objectives, students will gain a comprehensive understanding of the principles and applications of engineering dynamics. They will be able to analyze and solve problems related to motion, forces, and vibrations in mechanical systems, and apply their knowledge to real-world engineering scenarios. They will also develop skills in critical thinking, problem-solving, and effective communication, which are valuable in the field of engineering.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Module Learning Outcomes for Engineering Mechanics/Dynamics: 1. Demonstrate a thorough understanding of the fundamental concepts and principles of dynamics, including motion, forces, and acceleration. 2. Apply kinematic equations to analyze the motion of particles and rigid bodies in different scenarios and determine their velocities and accelerations. 3. Analyze and calculate the forces and moments acting on particles and rigid bodies in dynamic situations, considering the principles of equilibrium. 4. Apply Newton's laws of motion to determine the relationship between forces, mass, and acceleration, and solve dynamic problems using these principles.

	5. Utilize the principles of work and energy to analyze and solve dynamic problems, calculating mechanical work, kinetic energy, and potential energy. 6. Apply the principles of impulse and momentum to analyze the motion and collision of particles and rigid bodies, and solve related problems. 7. Understand the principles of vibrations and oscillations in mechanical systems, and analyze their behavior, natural frequencies, and damping effects. 8. Analyze three-dimensional motion of rigid bodies, applying Euler's equations of motion to determine their rotational and translational behavior. 9. Understand gyroscopic motion and its applications in stability and control systems, including precession and gyroscope stabilization. 10. Apply the principles of balancing rotating masses to minimize vibrations and ensure smooth operation of rotating machinery. 11. Analyze multi-degree of freedom systems, determine their natural frequencies and mode shapes, and understand their response to dynamic loading. 12. Apply the principles and techniques learned in dynamics to solve real-world engineering problems, such as analyzing the motion and forces in mechanical systems. 13. Demonstrate critical thinking and problem-solving skills by effectively applying dynamic principles to analyze and solve complex engineering problems. 14. Communicate effectively, both orally and in writing, to present and explain the analysis, results, and solutions of dynamics problems. By achieving these module learning outcomes, students will have a solid foundation in engineering dynamics, enabling them to analyze and solve problems related to motion, forces, vibrations, and stability in mechanical systems. They will develop critical thinking skills, problem-solving abilities, and effective communication skills, which are essential for success in the field of engineering dynamics.
Indicative Contents المحتويات الإرشادية	Indicative Contents for Engineering Mechanics/Dynamics: 1. Kinematics of Particles • Position, velocity, and acceleration • Rectilinear and curvilinear motion • Projectile motion • Tangential and normal components of acceleration 2. Kinetics of Particles • Newton's laws of motion • Force, mass, and acceleration • Application of Newton's laws to particles • Frictional forces • Applications of particle kinetics 3. Kinematics of Rigid Bodies

- Rotation and angular displacement
- Angular velocity and acceleration
- Fixed axis rotation
- General plane motion

4. Kinetics of Rigid Bodies
   - Moment of inertia
   - Parallel-axis theorem
   - Angular momentum and torque
   - Equations of motion for rigid bodies
   - Applications of rigid body kinetics
5. Work and Energy
   - Work done by a force
   - Kinetic energy and potential energy
   - Principle of work and energy
   - Power and efficiency
   - Conservative and non-conservative forces
6. Impulse and Momentum
   - Linear momentum and impulse
   - Conservation of linear momentum
   - Impulse-momentum principle
   - Impact and collision
   - Applications of momentum
7. Vibrations and Oscillations
   - Free and forced vibrations
   - Single degree of freedom systems
   - Damping and damping ratios
   - Natural frequency and resonance
   - Vibration isolation and control

Note: The indicative contents provided above give an overview of the topics typically covered in an Engineering Mechanics/Dynamics course. The actual contents may vary depending on the specific curriculum and academic institution.

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 types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**200**		

Module Evaluation تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	5	15% (15)	2,4,9,11 and 13	LO #1, #3 ,#8,#9 and #10,
	Assignments	6	15% (15)	3,5,7,8,10a nd 15	LO #2, #4, #5, #7, #9 , and #11
	Projects / Lab.				
	Report	1	10% (10)	15	LO #6, #12,#13 and #14
Summative assessment	Midterm Exam	2hr	10% (10)	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	Introduction to Engineering Mechanics/Dynamics • Overview of Engineering Mechanics/Dynamics • Fundamental concepts and principles • Unit conversions
Week 2	• Kinematics of Particles • Position, velocity, and acceleration
Week 3	Rectilinear motion
Week 4	Curvilinear motion
Week 5	Tangential and normal components of acceleration
Week 6	Projectile motion
Week 7	• Kinetics of Particles • Newton's laws of motion • Force, mass, and acceleration
Week 8	Application of Newton's laws to particles
Week 9	• Frictional forces • Applications of particle kinetics
Week 10	• Kinetics of Rigid Bodies • Moment of inertia

Week 11	• Work and Energy • Work done by a force
Week 12	• Kinetic energy and potential energy • Principle of work and energy
Week 13	• Impulse and Momentum • Linear momentum and impulse • Conservation of linear momentum • Impulse-momentum principle • Impact and collision • Applications of momentum
Week 14	Vibrations • Free and forced vibrations • Single degree of freedom systems •
Week 15	• Damping and damping ratios • Natural frequency and resonance • Vibration isolation and control

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	ENGINEERING MECHANICS, STATICS AND DYNAMICS TWELFTH EDITION R. C. HIBBELER	yes
Recommended Texts	Theory and Problems of Engineering Mechanics Statics and Dynamics/ Fifth Edition, Shaum's Outline	No
Websites		

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

Note: 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.

Code	Course/Module Title	ECTS	Semester
PM 101	Engineering Mechanics/ Dynamics	8	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	3	93	107

Dynamics is a branch of Engineering Mechanics that focuses on the study of objects in motion and the forces that cause that motion. It builds upon the principles of statics and expands them to analyze the behavior of objects subjected to acceleration, velocity, and displacement. This field is concerned with understanding and predicting the motion of particles and rigid bodies, as well as the forces and energy associated with their motion.

The primary goal of Engineering Mechanics/Dynamics is to provide engineers with a comprehensive understanding of how objects move and interact under the influence of forces and moments. By studying dynamics, engineers can design and analyze systems such as machines, vehicles, and structures to ensure their optimal performance, efficiency, and safety.

In this subject, students explore various topics, including the kinematics and kinetics of particles and rigid bodies. Kinematics deals with the description of motion, focusing on concepts such as displacement, velocity, and acceleration. Kinetics, on the other hand, focuses on the forces and torques acting on objects, leading to their motion.