	Ministry of Higher Education and Scientific Research - Iraq **Al-Naji University** **College of Engineering** **AI Engineering Department**	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Mechanics**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	AIA1204				
ECTS Credits	**6**				
SWL (hr/sem)	150				
Module Level		UGI	**Semester of Delivery**		2
Administering Department		AI Engineering	**College**	Engineering	
Module Leader	Yousif Qais Yousif		**e-mail**	yousif.qays@alnaji-uni.edu.iq	
Module Leader's Acad. Title		Assist. Lecturer	**Module Leader's Qualification**		MSc.
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**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	1. The objectives of the Engineering Mechanics course within the Department of Artificial Intelligence and Robotics Engineering are: 2. Integrating mechanical concepts with intelligent algorithms to enhance the performance of robotics. 3. Analyzing and designing robotic systems using the principles of statics and dynamics. 4. Understanding dynamic control and movement of robotic systems. 5. Developing intelligent systems that learn and adapt using mechanical principles. 6. Employing critical and analytical thinking to solve engineering problems related to robotics. **7. Achieving these objectives will enable students to develop intelligent robotic systems that meet future demands in the fields of engineering and artificial intelligence.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	LO1. Understanding Fundamental Concepts: Applying Newton's Laws and understanding the principles of statics and dynamics. LO2. Analyzing Mechanical Systems: Evaluating forces, moments, and the motion of bodies. LO3. Designing Robotic Systems: Creating and analyzing robotic systems using engineering principles. LO4. Critical Thinking and Problem-Solving: Improving problem-solving skills using mathematical methods. LO5. Practical Applications: Applying theoretical concepts to engineering projects.
Indicative Contents المحتويات الإرشادية	1. Key topics and expected completion time: 2. Introduction to Engineering Mechanics: 3. Definition and importance of engineering mechanics. 4. Newton’s fundamental laws. 5. Expected duration: One week. 6. Force Systems and Analysis: 7. Analysis of balanced and combined forces. 8. Free-body diagrams. 9. Expected duration: One week. 10. Static and Dynamic Equilibrium: 11. Conditions for equilibrium in static bodies. 12. Laws of dynamic motion. 13. Expected duration: Two weeks. 14. Centroids and Moment of Inertia: 15. Determining geometric and gravity centers. 16. Calculating and applying the moment of inertia. 17. Expected duration: Two weeks. 18. Energy and Work in Mechanical Systems: 19. Principles of energy and work. 20. Energy conservation and intelligent systems. 21. Expected duration: Two weeks. 22. Total estimated time to complete the key topics: Approximately 7–8 weeks.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Interactive Learning: Utilizing discussions and interactive questions. 2. Problem-Based Learning (PBL): Presenting real-world problems that require critical thinking. 3. Technology Utilization: Leveraging computer software and educational videos. 4. Inductive Reasoning and Practice: Applying theories to practical scenarios. 5. Continuous Feedback: Providing immediate and periodic feedback to students. Teaching: 1. Theoretical Lectures: Structuring the presentation of fundamental concepts. 2. Demonstrations: Employing visual aids and models. 3. Group Work: Encouraging collaborative efforts among students. 4. Evaluative Tests: Assessing student progress through quizzes and periodic evaluations. These strategies aim to enhance students' practical and theoretical understanding, fostering skills in the field of engineering mechanics.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
5Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	1	10% (10)	Continuous	All
	Home Work	1	10% (10)	Continuous	All
	CW	1	10% (10)	Continuous	All
	Report	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Lecture 1: Introduction to Engineering Mechanics - Statics** • Overview of engineering mechanics and its importance • Newton's Three Laws of Motion • Basic concepts: Force, Moment, Equilibrium
Week 2	**Lecture 2: Force Systems** • Analysis of Concurrent Force Systems • Free-body diagrams • Resultant forces and equilibrium conditions
Week 3	**Lecture 3: Distributed Forces and Centroids** • Centroids and center of gravity • Calculation of centroids for composite bodies • Applications to beam design
Week 4	**Lecture 4: Rigid Bodies - Equilibrium** • Conditions for equilibrium in two and three-dimensions • Friction forces • Analysis of structures and mechanisms • Equilibrium equations
Week 5	**Lecture 5: Structures - Analysis** • Types of structures: trusses, frames, and machines • Analysis of trusses using the method of joints and method of sections • Internal forces in beams: Shear force and bending moment diagrams
Week 6	**Lecture 6: Introduction to Dynamics** • Overview of dynamics and its importance • Differences between statics and dynamics • Basic concepts: Motion, Velocity, Acceleration
Week 7	**Lecture 7: Kinematics of Particles** • Rectilinear motion: equations of motion • Curvilinear motion: projectile motion

	Relative motion analysis
Week 8	**Lecture 8: Newton's Laws of Motion for Particles** • Application of Newton's laws to particle motion • Force and acceleration equations Examples and problem-solving
Week 9	**Lecture 9: Energy and Work Principles** • Work-energy theorem • Kinetic energy and potential energy • Conservation of energy
Week 10	**Lecture 10: Impulse and Momentum Principles** • Linear impulse and momentum • Conservation of linear momentum • Collisions and impact problems
Week 11	**Lecture 11 : Moment of Inertia in Dynamics** • Role of moment of inertia in rotational motion • Calculation and applications of moment of inertia in dynamic systems • Examples related to the motion of robotic components
Week 12	**Week 12: Impulse and Momentum Principles** • Linear impulse and momentum • Conservation of linear momentum • Collisions and impact problems
Week 13	**Week 13: Planar Kinematics of Rigid Bodies** • Rotational motion: angular velocity and angular acceleration • Relative motion analysis: translation and rotation • Examples and applications in robotics
Week 14	**Week 14: Review and Applications in Robotics (**statics) • Practical applications of statics in robotics • Problem-solving session and case studies • Review of key concepts and preparation for exams
Week 15	**Week 15: Review and Applications in Robotics (**dynamics) • Practical applications of dynamics in robotics • Problem-solving session and case studies • Review of key concepts and preparation for exams

Week 16	

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Engineering Mechanics: Statics and Dynamics by J.L. Meriam and L.G. Kraige Vector Mechanics for Engineers: Statics and Dynamics by Ferdinand P. Beer, E. Russell Johnston, and David F. Mazurek Engineering Mechanics: Dynamics by R.C. Hibbeler	

Recommended Texts	دورات مجانية من معهد ماساتشوستس للتكنولوجيا. MIT OpenCourseWare: تشمل مواد الميكانيك الهندس دروس مبسطة و رشوحات بالفيديو لمواضيع الميكانيك Khan Academy: الهندس. دورات ع رب الإن رينت تقدمها جامعات مرموقة تشمل مواضيع Coursera: الميكانيك الهندس.	
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.