MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**الفيزياءPhysics /**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CAIK100**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level			**Semester of Delivery**	2	
Administering Department	Cybersecurity Technical Engineering / قسم الأمن تقنيات هندسة السيبراني		**College**	Technical Engineering College of Computer and AI - Kirkuk / التقنية الكلية كركوك - الاصطناعي والذكاء للحاسوب الهندسية	
Module Leader	Dr. Academic Leader		**e-mail**	leader@ntu.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**		Ph.D. in Physics / Applied Physics
Module Tutor	Tutor Name		**e-mail**	tutor@ntu.edu.iq	
Peer Reviewer Name	Reviewer Name		**e-mail**	reviewer@ntu.edu.iq	
Scientific Committee Approval Date	01/09/2024		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	High School Physics & Mathematics / الفيزياء أساسيات والرياضيات	**Semester**	Prep
Co-requisites module	Digital Electronics (CYBT106) & Semiconductor Physics	**Semester**	2 & 3

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	This module aims to provide engineering students in Cybersecurity and Artificial Intelligence with fundamental principles of applied physics. It covers classical mechanics, wave motion and acoustics, electromagnetism, semiconductor physics, optics, laser fundamentals, and quantum physics principles essential for understanding electronic hardware, signal transmission, and modern computing hardware.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Understand fundamental laws of classical mechanics, vectors, motion, forces, work, and energy. Comprehend electric fields, electric potential, Gauss's law, capacitance, and DC circuit principles. Analyze magnetic fields, electromagnetic induction, Faraday's law, and Maxwell's equations. Understand wave mechanics, acoustics, wave superposition, interference, diffraction, and optical phenomena. Comprehend semiconductor physics, energy bands, p-n junction diode mechanics, and optoelectronic devices. Explain basic concepts of modern physics, photo-electric effect, wave-particle duality, and laser physics. Apply physical laws to model electronic hardware behavior and solve physical engineering problems.
Indicative Contents المحتويات الإرشادية	The module will cover the following key areas: Vectors & Motion Mechanics: Physical Quantities, Vector Operations, Kinematics, Newton's Laws of Motion, Work, and Energy Electrostatics: Electric Charge, Coulomb's Law, Electric Fields, Gauss's Law, and Electric Potential Capacitance & Dielectrics: Capacitors, Dielectric Materials, Energy Storage in Electric Fields, and DC Circuits Electromagnetism: Magnetic Fields, Lorentz Force, Biot-Savart Law, Ampere's Law, and Magnetic Properties of Matter Electromagnetic Induction: Faraday's Law, Lenz's Law, Inductance, Transformers, and Maxwell's Equations Wave Physics & Optics: Mechanical Waves, Sound Waves, Wave Interference, Diffraction, Polarization, and Electromagnetic Spectrum Semiconductor Physics: Energy Band Theory (Conductors, Insulators, Semiconductors), Intrinsic & Extrinsic Semiconductors, p-n Junction Mechanics Modern Physics & Quantum Concepts: Blackbody Radiation, Photoelectric Effect, Compton Effect, Wave-Particle Duality, and De Broglie Hypothesis Laser Physics & Optoelectronics: Stimulated Emission, Laser Principles, Fiber Optics Transmission Principles, and Photodiodes

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module will employ a combination of strategies including: Lectures: To present fundamental physical laws, mathematical derivations, and theoretical concepts. Interactive Demonstrations: Visual simulations of electromagnetic fields, wave propagation, and semiconductor energy bands. Problem-Solving Sessions: Guided problem sets on electric circuits, wave optics, vector mechanics, and magnetic forces. Tutorials & Group Work: Step-by-step problem analysis, unit conversions, and conceptual physics discussions. Mid-term and final exams: To evaluate theoretical comprehension, mathematical derivations, and physical problem-solving skills. Preparatory Week: To give students time to revise physical laws and clarify numerical problem-solving before final exams.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	5% (5)	5, 10	LO #1, 3 and 5
	Assignments	2	5% (5)	2, 12	LO #2, 4 and 6
	Projects / Lab.	1	10% (10)	Continuous	LO #7
	Report	1	10% (10)	13	LO #3, 5 and 7
Summative assessment	**Midterm Exam**	2 hr	20% (20)	8	LO #1 - 4
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Engineering Physics: Units, Measurements, Vectors, Kinematics & Newton's Laws.
Week 2	Work, Energy & Power: Work-Energy Theorem, Conservative Forces, Conservation of Energy.
Week 3	Electrostatics I: Electric Charge, Coulomb's Law, Electric Field Calculations, and Dipoles.
Week 4	Electrostatics II: Gauss's Law, Flux, Applications to Symmetrical Charge Distributions, Electric Potential.
Week 5	Capacitance & DC Circuits: Capacitors in Series/Parallel, Dielectrics, Ohm's Law, and Kirchhoff's Rules.
Week 6	Magnetromagnetism I: Magnetic Fields, Force on Moving Charges (Lorentz Force), Current-Carrying Conductors.
Week 7	Magnetromagnetism II: Biot-Savart Law, Ampere's Law, Magnetic Dipole Moment, Magnetic Materials.
Week 8	Mid-term Exam (الفصل منتصف اختبار) & Electromagnetic Induction: Faraday's Law, Lenz's Law, Inductance.
Week 9	Maxwell's Equations & Electromagnetic Waves: Displacement Current, Electromagnetic Spectrum, Wave Equation.
Week 10	Wave Motion & Acoustics: Mechanical Waves, Superposition Principle, Standing Waves, Sound Waves.
Week 11	Physical Optics: Wave Nature of Light, Interference, Young's Double-Slit Experiment, Thin Films.
Week 12	Diffraction & Polarization: Single-Slit Diffraction, Gratings, Polarization of Light, Brewster's Law.
Week 13	Semiconductor Physics I: Quantum Mechanics Basics, Energy Band Theory, Conductors, Insulators, Semiconductors.
Week 14	Semiconductor Physics II: Intrinsic & Extrinsic Semiconductors, Doping, Carrier Transport, p-n Junction Fundamentals.
Week 15	Modern Physics & Lasers: Photoelectric Effect, De Broglie Waves, Stimulated Emission, Laser Action Principles.
Week 16	Fiber Optics Basics, Optoelectronic Devices, Course Review & Final Examination (النهائي الاختبار).

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Tutorial 1: Vector Analysis & Kinematics Problem Solving Session.
Week 2	Tutorial 2: Electrostatics & Coulomb's Law Mathematical Exercises.
Week 3	Tutorial 3: Electric Field, Potential, and Capacitor Circuit Numerical Drills.
Week 4	Tutorial 4: Magnetic Force & Electromagnetic Induction Problem Solving.
Week 5	Tutorial 5: Wave Motion, Sound Waves, and Optical Interference Calculations.
Week 6	Tutorial 6: Semiconductor Carrier Concentration & Energy Band Problem Sets.
Week 7	Tutorial 7: Revision, Numerical Problem Assessment, Practical/Written Quiz, and Course Review.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Serway, R. A., & Jewett, J. W. (2018). "Physics for Scientists and Engineers with Modern Physics" (10th ed.). Cengage Learning.	Yes
Recommended Texts	Halliday, D., Resnick, R., & Walker, J. (2014). "Fundamentals of Physics" (10th ed.). Wiley.	Yes
Websites	Yes	

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.