

Academic Program Description Form

2026-2025

Faculty / Institute: College of Science

Scientific Department: Physics Department

Academic or Professional Program Name: B.Sc. in Science

Final Certificate Name: B.Sc. in Physics Department

Academic System: Semester (Courses)

Description Preparation Data: October – 2025 File Completion Data: 25-1 -2026



Signature:



Head of Department Name:

Dr. Alaa J. Mohammed

Data: 25/1/2026

Signature:

Scientific Association Name:

Dr. Salah Abdul Khuder Hassan

Data: 25/1/2026

The File is Checked by:

Department of Quality Assurance and University Performance

M.Sc. Saleh A. Lazam

Data: 25/1/2026



M. Kham

Approval of the Dean

Prof Dr. Khaula Kani Jassim

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Mechanics I		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 1101		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester of Delivery	
Administering Department	Alaa Jassim Mohammed	College	Colleg of science
Module Leader	Alaa Jassim Mohammed	e-mail	alaa.mohammed@mu.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Alaa Jassim Mohammed	e-mail	Physics.sci@mu.edu.iq
Peer Reviewer Name	comi	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. Comprehend the fundamentals of stress/strain analysis and apply them with confidence to the calculation of loads and deformations in simple structures 2. Recognize the relationships between commonly used material properties, and recall their value for typical materials used in mechanical engineering structures. 3. Analyses and examine a physical problem . 4. Develop free-body diagrams which form the basis of many formulations in mechanics, to separate more complex loaded structures into combinations of elemental sections 5. Critically evaluate and judge the validity of a method of analysis in a solid mechanics problem in terms of its assumptions and simplifications 6. develop an understanding of the fundamentals of engineering mechanics. 7. introduce the wide range of materials used in engineering and their fundamental, physical properties 8. develop problem solving skills in engineering mechanics through the application of concepts in statics and dynamics to real world problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the fundamental principles of mechanics: Students should be able to comprehend the basic principles of mechanics, such as Newton's laws of motion, conservation of momentum, and concepts related to forces, motion, and equilibrium. 2. Apply mathematical tools to solve mechanics problems: Students should be able to use mathematical techniques, such as algebra, trigonometry, calculus, and vector analysis, to solve problems related to mechanics. This includes analyzing motion, calculating forces, determining accelerations, and predicting the outcomes of mechanical systems. 3. Analyze and interpret physical systems: Students should develop the ability to analyze and interpret the behavior of physical systems in various scenarios. They should be able to identify and describe the forces acting on objects, analyze motion graphs, and apply appropriate mathematical models to predict the behavior of systems. 4. Apply principles to real-world situations: Students should be able to apply the principles and concepts of mechanics to real-world situations. This involves identifying and analyzing mechanical systems in practical contexts, such as engineering applications, vehicle dynamics, structural analysis, or fluid mechanics. 5. Develop problem-solving skills: Students should enhance their problem-solving skills by applying the principles of mechanics to solve complex problems. This includes breaking down complex problems into smaller components, applying appropriate mathematical models, and critically evaluating solutions for accuracy and feasibility. 6. Demonstrate experimental and analytical skills: Students should be able

	to design and conduct experiments related to mechanics, analyze experimental data, and draw conclusions based on their findings. This may involve using laboratory equipment, collecting and interpreting data, and applying statistical analysis methods. - Enhance critical thinking and analytical reasoning: Students should develop critical thinking skills to analyze and evaluate different approaches to problem-solving in mechanics. They should be able to assess the validity of arguments, make informed decisions, and apply logical reasoning to formulate solutions. - Communicate effectively: Students should be able to communicate their understanding of mechanics concepts, principles, and problem-solving techniques effectively. This includes writing clear and concise reports, explaining complex ideas in a coherent manner, and presenting findings or solutions orally.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A</u> 1. Kinematics: The study of motion without considering the causes of motion. Topics include displacement, velocity, acceleration, and their relationships. 8hr 2. Dynamics: The study of the causes of motion and the forces that affect it. Topics include Newton's laws of motion, force, mass, inertia, and equilibrium. 8hr 3. Forces: The concept of force and its various types, such as gravitational force, normal force, frictional force, tension, and elastic force. 7hr 4. Newton's Laws of Motion: The three fundamental laws that govern the motion of objects. They describe the relationship between forces, mass, and acceleration. 7hr 5. Momentum and Impulse: The concepts of momentum and impulse, which describe the motion of objects in terms of their mass and velocity. 7hr <u>Part B</u> 1. Work, Energy, and Power: The relationship between work, energy, and power, and their applications in mechanical systems. Topics include potential energy, kinetic energy, conservation of energy, and power calculations. 10hr 2. Circular Motion: The study of objects in circular motion and the forces acting on them. Topics include centripetal force, centrifugal force, and rotational motion. 10hr 3. Gravitation: The study of the force of gravity and its effects on objects. Topics include universal gravitation, orbital motion, and satellite motion. 9hr 4. Oscillations: The study of periodic motion, including simple harmonic motion. Topics include oscillating systems, pendulums, and resonance. 8hr

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

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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	3	10% (10)	4, 9,12	LO #1, 2, 3,7,8
	Assignments	3	10% (10)	5, 10, 13	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	14	LO # 5, 8
Summative assessment	Midterm Exam	1 hr	10% (10)	8	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 mechanisms: basic concepts, system of particles, fluid mechanics, statistical mechanics, heat and thermodynamics.
Week 2	Vectors
Week 3	Position, velocity and acceleration analysis of linkages
Week 4	Static and dynamic force analysis of mechanisms
Week 5	translational kinematics and dynamics work and energy
Week 6	system of particles, rotational kinematics and dynamics
Week 7	Mid-term Exam .
Week 8	equilibrium, gravitation oscillations, waves.
Week 9	Newton's laws, momentum and angular momentum methods
Week 10	Work and energy
Week 11	Dynamics of rigid bodies
Week 12	kinematics
Week 13	Euler's Laws
Week 14	angular momentum
Week 15	Work and energy methods for rigid bodies

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	أيجاد التعجيل الأرضي باستخدام بندول بسيط: Lab 1
Week 2	تحقيق قانون هوك وحساب قيمة التعجيل الأرضي باستخدام نابض محلزن: Lab 2
Week 3	معامل الاحتكاك الشروع والانزلاقي لقطعة منزلقة على لوح معدني: Lab 3
Week 4	تعيين عزم القصور الذاتي لعجلة محورية: Lab 4
Week 5	قوانين نيوتن في الحركة: Lab 5

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1. "Classical Mechanics" John R. Taylor (2005) 2. "Introduction to Classical Mechanics: With Problems and Solutions" by David Morin (2008) 3. "Classical Mechanics: The Theoretical Minimum" by Leonard Susskind & George Hrabovsky (2014)	Yes
Recommended Texts		No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Mechanics and Properties of Materials II		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 1214		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester of Delivery	2
Administering Department	Phy. Dep	College	College of Science
Module Leader	Alaa Jassim Mohammed	e-mail	alaa.mohammed@mu.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Curriculum Committee	e-mail	Physics.sci@mu.edu.iq
Peer Reviewer Name	-	e-mail	-
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Phys 1101	Semester	1
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1- Study of Fluid Behavior: Fluid mechanics aims to understand the behavior of fluids, including liquids and gases, under various conditions. It investigates how fluids flow, how they interact with their surroundings, and the forces that act on them. 2- Conservation Laws: Fluid mechanics aims to establish and apply fundamental principles, such as mass, momentum, and energy conservation, to fluid systems. These laws help in analyzing and predicting fluid flow patterns, pressure distributions, and other related phenomena. 3- Engineering Applications: One of the primary aims of fluid mechanics is to provide a foundation for engineering applications. It helps in designing and analyzing fluid-based systems, such as pumps, turbines, aircraft wings, pipes, and hydraulic systems, to ensure optimal performance, efficiency, and safety. 4- Fluid Dynamics: Fluid mechanics aims to explore the dynamics of fluid flow, including aspects like turbulence, laminar flow, boundary layers, and flow separation. Understanding these phenomena is crucial for various fields, including aerospace, automotive, civil, and environmental engineering.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding the fundamental concepts: Students should develop a solid understanding of the basic principles and concepts of fluid mechanics, including properties of fluids, fluid statics, and fluid dynamics. 2. Applying conservation laws: Students should be able to apply the principles of conservation of mass, momentum, and energy to fluid systems, and analyze and solve problems involving flow rates, forces, and energy transfers. 3. Analyzing fluid behavior: Students should learn how to analyze the behavior of fluids under different conditions, such as steady and unsteady flows, laminar and turbulent flows, and compressible and incompressible flows. 4. Calculating fluid forces: Students should be able to calculate fluid forces on submerged surfaces and understand the concepts of pressure distribution, buoyancy, and drag forces. 5. Solving flow problems: Students should develop problem-solving skills to analyze and solve fluid flow problems, including pipe flow, open channel flow, and flow through nozzles, diffusers, and pumps. 6. Understanding flow measurement techniques: Students should learn about various techniques used to measure flow rates, such as orifice meters, venture meters, and flow visualization methods. 7. Applying dimensional analysis: Students should understand the principles of dimensional analysis and be able to use it to develop dimensionless groups and perform similarity analysis. 8. Analyzing flow in pipes and channels: Students should learn about

	the characteristics of flow in pipes and channels, including friction losses, flow regimes, and hydraulic design considerations. 9. Studying boundary layer theory: Students should gain an understanding of boundary layer theory, including laminar and turbulent boundary layers, boundary layer separation, and the effects of boundary layers on flow over surfaces. 10. Real-world applications: Students should explore the practical applications of fluid mechanics in various fields, such as civil engineering, mechanical engineering, aerospace engineering, and environmental science.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A 1- Introduction to Fluid Mechanics: Definition and properties of fluids - Fluid statics and pressure Fluid forces and buoyancy. 12 hr 2- Fluid Kinematics: Description of fluid motion Eulerian and Lagrangian approaches Streamlines, streak lines, and path lines Velocity and acceleration fields. 12 hr 3- Fluid Dynamics: Conservation laws (mass, momentum, and energy) - Control volume analysis and Reynolds transport theorem Navies-Stokes equations and their simplifications Boundary layer theory and flow regimes. 13 hr Part B 1- Fluid Flow: Steady and unsteady flow ,Incompressible and compressible flow , Laminar and turbulent flow ,Viscous and in viscid flow. 10 hr 2- Flow Measurements: Pressure measurement techniques, Flow rate measurement (e.g., flow meters) , Velocity measurement (e.g., Pitot tubes, hot-wire anemometers). 10 hr 3- Pipe Flow: Flow in pipes and ducts, Conservation equations for pipe flow ,Friction losses and head loss calculations ,Pipe networks and system analysis. 10 hr 4- Open Channel Flow: Flow in open channels (e.g., rivers, canals) ,Manning's equation and uniform flow, Gradually varied and rapidly varied flow, Channel controls and hydraulic structures. 7 hr

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 type of simple experiments involving some sampling activities that are interesting to the students.
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Student Workload (SWL)			
الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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	3	10% (10)	5, 10, 12	LO #1, 2, 10
	Assignments	3	10% (10)	2, 9, 11	LO # 3, 4, 6 , 7, 8
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-8
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to fluid mechanics: Definition and scope, continuum hypothesis, classification of fluids

	Fluid properties: Density, viscosity,
Week 2	surface tension, compressibility Pressure and fluid statics: Pascal's law, hydrostatic pressure, manometers
Week 3	Fluid kinematics: Eulerian and Lagrangian descriptions, streamline, pathline, streakline, acceleration of fluid particles.
Week 4	Conservation laws: Mass conservation (continuity equation) Bernoulli's equation: Derivation and applications.
Week 5	Fluid dynamics: Euler's equation of motion, control volume analysis
Week 6	Conservation laws: Momentum conservation (Navier-Stokes equations).
Week 7	Mid-term Exam .
Week 8	Simplifications of the Navier-Stokes equations: In viscid flow, viscous flow, steady flow, and unsteady flow.
Week 9	Flow measurements: Flow rate measurement techniques (orifice, venturi, pitot tubes, etc.)
Week 10	Internal flow: Laminar and turbulent flow in pipes, pipe friction and losses
Week 11	Pipe networks: Series and parallel pipes, pipe sizing, pump selection
Week 12	Flow in open channels: Classification of open channels, energy principles, specific energy, critical flow, gradually varied flow
Week 13	Channel design and hydraulic structures: Channel cross-sections, slope, uniform flow, and non-uniform flow
Week 14	Compressible flow: Isentropic flow, Mach number, normal shock waves, oblique shock waves, expansion waves
Week 15	Applications of fluid mechanics: Aircraft aerodynamics, hydraulics, turbomachinery, environmental flows

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: قوانين نيوتن في الحركة
Week 2	Lab 2: قياس كثافة سائل باستخدام انبوبة اختبار مقلدة
Week 3	Lab 3: إيجاد الشد السطحي للماء باستخدام الانابيب الشعرية

Week 4	البندول المركب: Lab 4
Week 5	ايجاد معامل اللي و ثابت الصلادة لقضيب او سلك منتظم باستخدام معامل اللي: Lab 5
Week 6	معامل المرونة: Lab 6
Week 7	حساب سرعة الصوت: Lab 7

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1- "Fluid Mechanics" by Pijush K. Kundu, Ira M. Cohen, and David R. Dowling (2015). 2- "Computational Fluid Dynamics: Principles and Applications" by Jiri Blazek (2015). 3- "Introduction to Fluid Mechanics" by Yasuki Nakayama (2019)	Yes
Recommended Texts		No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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
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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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Electricity		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 1102		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester of Delivery	1
Administering Department	Phys.Dept	College	College of Science
Module Leader	Ahmed Almurshedi	e-mail	fhahmed2@mu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Curriculum Committee	e-mail	Physics.sci@mu.edu.iq
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	010/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents
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أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. To differentiate between conductors, insulators and semiconductor. 2. To understand the concept of electric charge. 3. To use Coulomb's law to solve problems about electric force electric field and electric potential. 4. To understand the meaning of dipole moments. 5. Use Gauss' law to different types of charge distributions in space. 6. Explain the physical basis of Ohm's law and use Ohm's law in solving problem. 7. To understand types of Kirshoff's current and voltage Laws and using it in the electric circuits. 8. To understand different types of capacitor and its application in the circuits. 9. To know concepts such as Electric Current, Current density, Resistance, Resistivity, Series and parallel combination of resistance. 10. To develop problem solving problem skills related to the electric force, electric field and electric potentials.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Learn the nature of electric charge, and how we know that electric charge is conserved. 2- Recognize how objects become electrically charged and how to use Coulomb's law to calculate the electric force between charges. 3- The distinction between electric force and electric field. 4- Learn how to calculate the electric field due to a collection of charges. 5- What is meant by electric flux, and how to calculate it. 6- How to use Gauss's law to calculate the electric field due to a symmetric charge distribution. 7- How to calculate the electric potential energy of a collection of charges. 8- How to use equipotential surfaces to visualize how the electric potential varies in space. 9- How to use electric potential to calculate the electric field. 10- The nature of capacitors, and how to calculate a quantity that measures their ability to store charge. 11- The meaning of electric current, and how charges are move in a conductor. 12- What is meant by the resistance, resistivity and conductivity of a substance.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Electric force</u> Electric Charge - Properties of electric charges, Conductors, Insulators and Semiconductor, Types of Charging and Coulomb's Low. [15 hrs] Electric Field - Electric Field of point charges, Charge Density, Electric Field

	due to charged Rod, The Electric Field of a Uniform Ring of Charge, The Electric Field of a Uniformly Charged Disk. [10 hrs] Electric Flux – The flux Examples Flux through a Cube, Electric flux through a disk, Gauss’s Law and its application to find the electric field, charged spherical shell, infinite line charge, non-conductor infinite plane. [10 hrs] Electric Potential - Electric Potential of a Point Charge, Electric Potential Due to a Spherical Shell, Electric Potential of a Uniformly Charged Sphere, Energy Relation in an electric field. [10 hrs] <u>Part B – Electric Circuit</u> Capacitors - Capacitors and Insulators, Parallel plate capacitor, cylindrical capacitor, spherical Capacitor. [10 hrs] Electric Current - Current density, Resistance, Resistivity, Series and parallel combination of resistance, Ohm’s law, solving Problems. [10 hrs] Kirshoff’s Low - Kirshoff’s current and voltage Laws and using it in the electric circuits. [10 hrs]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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	3	10% (10)	5, 10, 12	LO #1, 2, 10 and 12
	Assignments	3	10% (10)	2, , 7, 11,	LO # 3, 4, 6 and 12
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	10	LO # 5, 8 and 10
Summative assessment	Midterm Exam	1 hr	10% (10)	9	LO # 1-9
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Electric Charge - Properties of electric charges, Conductors, Insulators and Semiconductor, Types of Charging,
Week 2	Electric force, Coulomb's Law
Week 3	Electric Field of point charges, Charge Density, Electric Field due to charged Rod.
Week 4	The Electric Field of a Uniform Ring of Charge, The Electric Field of a Uniformly Charged Disk
Week 5	Electric Flux, The flux Examples Flux through a Cube, Electric flux through a disk
Week 6	Gauss's Law and its application to find the electric field, charged spherical shell, infinite line charge, non-conductor infinite plane
Week 7	Electrical potential, Electric Potential of a Point Charge, Electric Potential Due to a Spherical Shell.
Week 8	Electric Potential of a Uniformly Charged Sphere, Energy Relation in an electric field.
Week 9	Energy stored in charged system
Week 10	Capacitors - Capacitors and Insulators, Parallel plate capacitor, cylindrical capacitor, spherical Capacitor.
Week 11	Polarization
Week 12	Dielectric and Isolator Material
Week 13	Ohm's law Electric Current, AC currents, Current density

Week 14	Resistance, Resistivity, Series and parallel combination of resistance, Ohm's law
Week 15	Kirshoff's voltage and current law

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Ohm's law investigation (تحقيق قانون اوم)
Week 2	Lab 2: Electrical resonance (الرنين الكهربائي)
Week 3	Lab 3: Kirchhoff's laws for complex circuit analysis (قانونا كيرشوف لتحليل الدوائر المعقدة)
Week 4	Lab 4: The internal resistance of the voltmeter (المقاومة الداخلية للفولتمتر)
Week 5	Lab 5: The maximum power transfer theorem (القدرة العظمى للمولد)
Week 6	Lab 6: Capacitive Reactance (حساب الرادة السعوية)
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	- Fundamentals of Physics, Halliday & Resnicle, John Wiley, 2011 9th edition. - University Physics by Francis and others.	No
Recommended Texts	- الفيزياء العامة (ميكانيك – كهربائية ومغناطيسية) أ.د. فؤاد شاكر د. علي خلف - الكهربائية والمغناطيسية إبراهيم ناصر وآخرون	Yes
Websites	https://openstax.org/books/physics/pages/18-3-electric-field	

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Magnetism		Module Delivery	
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☒ Tutorial ☒ Practical ☐ Seminar	
Module Code	Phys 1215			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	1	Semester of Delivery		2
Administering Department	Physics. Dept.	College	College of science	
Module Leader	Ahmed Almurshedi		e-mail	fhahmed2@mu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Curriculum Committee	e-mail	Physics.sci@mu.edu.iq	
Scientific Committee Approval Date	10/06/2023	Version Number	1.0	

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Phys 1102	Semester	1
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	11. To understand the nature of magnetism and magnet. 12. To differentiate between electric field and magnetic field. 13. To understand the magnetic field and its different examples. 14. To understand the behavior of the motion of charged particle in uniform and nonuniform magnetic field. 15. To develop problem solving skills related to magnetism. 16. Application of Gauss' law for magnetism. 17. Study of Amperes law, lenz law and Maxwell equations. 18. To study the type of transformer and its applications. 19. To understand the inductance, self and mutual inductance. 20. To study the type of transformer and its applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The properties of magnets, and how magnets interact with each other. 2. The nature of the force that a moving charged particle experiences in a. a magnetic field. 3. How magnetic field lines are different from electric field lines. 4. How to analyze the motion of a charged particle in a magnetic field. 5. Some practical applications of magnetic fields in physics. 6. How to analyze magnetic forces on current-carrying conductors. 7. How current loops behave when placed in a magnetic field. 8. How to describe the magnetic field produced by an element of a 9. current-carrying conductor. 10. How to use Ampere's law to calculate the magnetic field of symmetric current distributions. 11. How Faraday's law relates the induced emf in a loop to the change in magnetic flux through the loop. 12. How to calculate the emf induced in a conductor moving through a magnetic field.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Magnetic Force, Magnetic field and Source of Magnetic Field</u> Introduction to Magnetism – Magnetic force, Magnetic field, Motion of a charged particle in a uniform magnetic field, Motion of a charged particle in a nonuniform magnetic field [10 hrs] Magnetic Field – Magnetic force on an electric current, Magnetic field produced by a closed current, Magnetic field of a rectilinear current (Biot-Savart Law),

	Magnetic field of a circular current, Magnetic field of moving charge. [10 hrs] Ampere's Law - Ampere's Law for the magnetic field, Examples on Ampere's Law, Magnetic Flux, Magnetic field strength, Magnetization, Magnetic susceptibility. [10 hrs] Faraday's Law - Faraday's Law, Lenz's Law, Faraday Henry Law. [5 hrs] Inductance - Self Inductance, Mutual Inductance, Inductance of a solenoid in terms of its geometry, Magnetic energy Stored by an inductor, Magnetic Energy Density Inside a Current Carrying Solenoid. [10 hrs] Revision and solving problems [5 hrs] <u>Part B – Circuits</u> DC circuits - A series combination of an inductor and a resistor connected to a dc source, A Charged capacitor connected to an inductor, Energy of an LC Circuit, Transformers. [10 hrs] AC circuits - Alternating Current Circuits, A Resistor Connected to an ac Source, A Capacitor Connected to an ac Source, An Inductor Connected to an ac Source, Series Combination of a Resistor, an Inductor and a Capacitor Connected to an ac Source, Resonant Frequency. [15 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	5

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	5
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	3	10% (10)	3, 5, 10	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	2, 9, 12	LO # 3, 4, 6, 7 and 12
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	8	LO # 1-8
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري	
	Material Covered
Week 1	Introduction to Magnetism, Magnet, Magnetic materials, magnetic field of earth
Week 2	Magnetic field, Magnetic force, Lorentz force
Week 3	Motion of a charged particle in a uniform magnetic field
Week 4	Motion of a charged particle in a nonuniform magnetic field
Week 5	Magnetic force on an electric current
Week 6	Magnetic field produced by a closed current
Week 7	Magnetic field of a rectilinear current (Biot-Savart Law)
Week 8	Magnetic field of a circular current, Magnetic field of moving charge
Week 9	Amperes Law for the magnetic field, Examples on Amperes Law
Week 10	Magnetic Flux, Magnetization, Magnetic susceptibility
Week 11	Faraday's Law, Lenz's Law, Faraday Henry Law

Week 12	Inductance, Self Inductance, Mutual Inductance
Week 13	DC circuit, A series combination of an inductor and a resistor connected to a dc source, A Charged capacitor connected to an inductor, Energy of an LC Circuit, Transformers
Week 14	AC circuit, Alternating Current Circuits, A Resistor Connected to an ac Source, A Capacitor Connected to an ac Source
Week 15	AC circuit, An Inductor Connected to an ac Source, Series Combination of a Resistor, an Inductor and a Capacitor Connected to an ac Source, Resonant Frequency

Delivery Plan (Weekly Lab. Syllabus) المناهج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Nonlinear relation between voltage and current (الشذوذ عن قانون اوم)
Week 2	Lab 2: Charge and discharge Capacitance an calculation of time constant (شحن وتفريغ متسعة وحساب ثابت الزمن لها)
Week 3	Lab 3: Wheatstone Bridge (قنطرة ونستون)
Week 4	Lab 4: Measuring the inductive impedance of coil in AC circuits (قياس الممانعة الحثية للملف في الدوائر المتناوبة)
Week 5	Lab 5: Inductive Reactance (الرادة الحثية)
Week 6	Lab 6: The internal resistance of Ammeter (المقاومة الداخلية للاميتر)
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1-Fundamentals of Physics, Halliday & Resnicle, John Wiley, 2011 9th edition. 2-University Physics by Francis and others.	No
Recommended Texts	1. الفيزياء العامة (ميكانيك - كهربائية ومغناطيسية) - أ.م.د. فؤاد شاكر د. علي خلف 2. الكهرباء والمغناطيسية - إبراهيم ناصر وآخرون	Yes
Websites	http://hyperphysics.phy-astr.gsu.edu/hbase/magnetic/magfie.html	

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	General chemistry		Module Delivery
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☒ Tutorial ☒ Practical ☐ Seminar
Module Code	COS 1203		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester of Delivery	2
Administering Department	Physics Dept	College	College of Science
Module Leader	Asstabraq Mohsin Yasir	e-mail	Asstabraq@mu.edu.iq
Module Leader's Acad. Title	Alaa J. Mohammed	Module Leader's Qualification	
Module Tutor	Name (if available)	e-mail	Physics.sci@mu.edu.iq
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	09/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1 - The student learns different Ways of Expressing Concentrations. 2 - The student learns methods of volumetric analysis and applications. 3 - The student should recognize the electronic distribution of atoms and periodic properties of elements in the periodic table. 4 - The student should learn about the different theories of the atomic Construction. 5. The student should identify the different types of chemical bonds. 6- The student learns the laws of gases and the different applications of these laws. 7 - The student learns the Nernst equation, measuring the cell potential, writing the cell and its symbol.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The study includes an introduction to analytical chemistry and types of chemical analysis. 2. The study also includes the structure of the atom and the periodic table of the elements - the electronic distribution of elements, the general properties of the periodic table, some periodic properties of the elements atoms: ionization energy, The general equation of gases - Boyle's law, real gas and ideal gas, electrical chemistry (oxidation and reduction, Niernst equation), galvanic cell, measuring the cell potential, writing the cell and its symbol.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. General introduction - its types, a historical overview , The Nature of Analytical Chemistry, The Role of Analytical Chemistry ,Quantitative Analytical Methods , Typical Quantitative Analysis,compare qualitative and quantitative analyses. Solutions and their classification according to the volume, quantity, and composition of solute particles, the behavior of Brønsted-Lowry acids and bases ,Apply an understanding of pH and pOH to characterize aqueous solutions and determine ion concentrations , equilibrium calculations for Brønsted-Lowry acid-base systems Some of the periodic properties of atoms of elements: Ionic energy, Electron Affinity, electronegativity and Chemical bonds and their types. Electrochemistry (oxidation and reduction , Nernst equation) galvanic cell, measuring the cell potential, writing the cell and its symbol.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 Analytical chemistry thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	3, 5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	9	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Analytical Chemistry, Different Methods of Chemical Analysis
Week 2	Different ways of Expressing Concentrations of solutions: Formality, Mollality, Molarity
Week 3	Different ways of Expressing Concentrations of solutions: Normality, percentages, Mole Fraction
Week 4	Quantitative volumetric analysis-General principle of volumetric titration
Week 5	Type of reaction in volumetric analysis , acid- base indicator
Week 6	1. Periodic table of elements - electronic distribution of elements 2. General properties of the periodic table
Week 7	Some of the periodic properties of atoms of elements: Ionic energy, Electron Affinity, electronegativity
Week 8	Chemical bonds and their types
Week 9	The four Quantum numbers
Week 10	Theories of Atomic construction
Week 11	The general equation for gases - Boyle's law
Week 12	Charles's law
Week 13	Avogadro's Law, real gas and ideal gas
Week 14	Electrochemistry (oxidation and reduction , Nernst equation)
Week 15	galvanic cell, measuring the cell potential, writing the cell and its symbol.

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	General laboratory guidelines, and techniques for dealing with glassware and chemicals
Week 2	Preparation of standard solution of sodium carbonate
Week 3	Preparation of standard solution of hydrochloric acid
Week 4	Preparation and standardization of 0.1 N HCl solution
Week 5	Preparation of approximatly 0.1 N NaOH solution and standardization of it with standard solution of hydrochloric acid
Week 6	Preparation and standardization of approximate 0.1 N acetic acid Solution with standard solution of sodium hydroxide
Week 7	Determination the percentage of acetic acid in vinegar

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1- D. A. Skoog and D. M. west ;“ <i>fundamentals of Analytical chemistry</i> ”, 4 th Ed. ,Saunders college publishing company, (1982). 2-Fallah Hassan, “ <i>The prinsible of thermodynamic</i> ”, 2 th Ed., Bairut,(2012). 3- M. N. AL-Zakoom ;“ <i>Introduction in Analytical Chemistry and Physical Chemistry</i> ”, University of Basrah , (1977) .	No
Recommended Texts	Muhi alddin AL-bakoosh; “ <i>Fundamentals of General chemistry</i> ”, 2 th Ed., Tripoli, (2003).	Yes
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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Astrophysics		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys1103		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester of Delivery	1
Administering Department	Physics. Dept	College	College of Science
Module Leader	Majed Kamil Qetheth	e-mail	Majed_kamil@mu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	M.Sc.
Module Tutor	Name (if available)	e-mail	Physics.sci@mu.edu.iq
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Learn the basics of astronomy and study the laws that govern this science. 2. Learn about astronomical phenomena and explain them physically, as well as the terminology of this science. 3. Identifying the physical properties of the nearby celestial bodies and identifying the laws that govern them in the sky. 4. Learn how to monitor different astronomical phenomena and try to interpret them in a correct scientific way through the laws that govern astronomy and space physics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Enabling students to obtain knowledge and understanding of the principles, scientific foundations and theories of astrophysics. 2. Enabling students to obtain an understanding of modern and advanced scientific topics in this section. 3. Enabling the student to identify the nature of celestial bodies, including stars and interstellar matter that contain gases and cosmic dust, as well as planets, meteorites, meteors and comets, as well as identifying galaxies that represent the basic structure of the universe, and trying to explain all the phenomena that these bodies go through. 4. Introducing the student to how to deal with the events that take place in celestial bodies, determining their dimensions and speeds, as well as dealing with their various phenomena..
Indicative Contents المحتويات الإرشادية	<u>Chapter One: Planetarium</u> Kepler's Laws, the first, second and third laws, astronomical terminology for the planetarium, coordinate systems of the planetarium, horizon system, equator system, zodiacal system, galactic system, astronomical seasons, astronomical units of measurement.[10 hrs] <u>Chapter Two: The Solar System</u> The sun, the physical properties of the sun, the layers of the sun, the surface phenomena of the sun, the moon, the physical properties of the moon.[5 hrs] <u>Chapter Three: Planets</u> Bode rule, small asteroids, the origin of the solar system, hypotheses to explain the origin of the solar system.[5 hrs] <u>Chapter four: The physical properties of stars</u> The star, the magnitudes of the stars, the luminosity of the stars, the relationship of the energy received from the star with its bolometric magnitude, Hertzsprung-Russell diagram, the life cycle of stars, white dwarfs, neutron stars, black stars.[10 hrs] <u>Chapter Five: Stellar Systems and Variables</u> Binary stars, measuring the mass of two stars in terms of the mass of the sun, types of binary stars, variable stars.[10 hrs] <u>Chapter Six: The Galaxy</u>

	Our Milky Way galaxy, galaxy motion, galactic mass calculator, nebulae. [5 hrs] Chapter Seven: Galaxies Types of galaxies, clusters of galaxies, active galaxies. [5 hrs] Chapter Eight: Quasars (quasi-stars) Expansion of the universe and redshift, theories of the emergence of the universe, Aristotle's cosmology, Olbers' paradox, Einstein-de Sitter's cosmology, the big bang theory, steady state theory, the future of the universe, life in the universe. [10 hrs]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Giving students specialized, theoretical and practical scientific skills. 2. Giving students the skills of thinking and analysis in both the theoretical and practical aspects. 3. Enable students to obtain theoretical experiences and develop learning skills in astrophysics. 4. Training students on the skills of arithmetic operations for calculating some astronomical and physical coefficients and parameters of astrophysics.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المناهج الاسبوعي النظري	
	Material Covered
Week 1	Introduction, Kepler's laws, Astronomic terms.
Week 2	Planetarium (Celestial Sphere): Planetarium coordinate systems.
Week 3	Stellar asteroids ,Zodiac and zodiacal circle.
Week 4	Astronomic units.
Week 5	Our solar system: Sun, the surface phenomena of the sun, the moon.
Week 6	Planets: physical properties of planets, meteors, meteorites and comets.
Week 7	Eclipses and eclipses, Bode's law.
Week 8	The physical properties of the stars: the Stellar Magnitude, Stellar luminosity.
Week 9	Hertz Sprank-Russell diagram.
Week 10	Neutron stars, Black holes.
Week 11	Stellar systems and variables stars, Star Clusters, Nebulae.
Week 12	Galaxies: Milky way, types of galaxies.
Week 13	Galaxy mass, Quasi stellar.
Week 14	The Expansion of the Universe.
Week 15	Theories of the beginning of the universe
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1- Fundamental Astronomy 5th ed, H.Karttunen et al, Springer, 2006	No
Recommended Texts	2- Astronomy - Principles and Practice 4th ed, A.Roy, D Clarke , Springer ,2000	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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Computer Science I		Module Delivery	
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	UOM 1104			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	1	Semester of Delivery		1
Administering Department	Physics . Dep.		College	College of science
Module Leader	Nawrass N. Ameen		e-mail	Nawrass@mu.edu.iq
Module Leader's Acad. Title	Assistant professor		Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	10/06/2023		Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	21. To develop problem solving skills and understanding of principles of computer science through the application of software. 22. To understand the purpose of using Microsoft word. 23. This course deals with the basic concept of Microsoft word. 24. To differentiate between the orders. 25. To perform steps of preparing project.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	9. Recognize how the computer device works. 10. List the various terms associated with computers. 11. Summarize what is meant by a Bit and Byte. 12. Describe RAM and ROM. 13. Define Hardware and software.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: <u>Computer science, software and hardware</u> UNIT – I Introduction to Computers Computer system: characteristics and capabilities. Computer Hardware and Software: Block Diagram of a Computer, Different Data Processing: Data, Data Processing System, Storing Data, Processing Data. Types of Computers: Analogue, Digital, Hybrid, General and Special Purpose Computers. Generation of Computers. Computer Systems: Micros, Minis & Main-frames. Limitations of Micro Computer. [9 hrs] UNIT –II Computer Peripherals Introduction to Input Devices: Categorizing Input Hardware, Keyboard, Direct Entry — Card Readers, Scanning Devices — O.M.R., Character Readers, Thumb Scanner, MICR, Smart Cards, Voice Input Devices, Pointing Devices — Mouse, Light Pen, Touch Screen. Computer Output: Output Fundamentals, Hardcopy Output Devices, Impact Printers, Non-Impact Printers, Plotters, Computer output Microfilm/Microfiche (COM) systems, Softcopy Output Devices, Cathode Ray Tube, Flat Screen Technologies, Projectors, Speakers. [9 hrs] UNIT – III Basic Components & Storage Central Processing Unit: The Microprocessor, control unit, A.L.U., Registers, Buses, Main Memory, Main Memory (RAM) for microcomputers, Read Only Memory (ROM). Storage Devices: Storage Fundamentals, Primary and Secondary Storage, Data Storage and Retrieval Methods — Sequential, Direct & Indexed Sequential, Tape Storage and Retrieval Methods Tape storage Devices, characteristics and limitations, Direct access Storage and Microcomputers – Hard Disks, Disk Cartridges, Direct Access Storage Devices for large Computer systems, Mass storage systems and Optical Disks, CD ROM. [9 hrs]

	UNIT – IV Computer Software & Languages System Software: System software Vs. Application Software, Types of System Software, Introduction and Types of Operating Systems. Boot Loader, Diagnostic Programs, BIOS, Utility Programs. Application Software: Microcomputer Software, Interacting with the System, Trends in PC software, Types of Application Software, Difference between Program and Packages. Computer Languages: Definition, Generations of computer languages, Types of Languages, Language Processors: Assembler, Interpreter, Compiler, Linker and Loader. Programming constructs, Algorithm & flowchart. [9 hrs] UNIT – V Introduction to MS DOS & Windows Introduction to DOS: History and versions of DOS. Fundamentals of DOS: Physical Structure of the Disk, Compatibility of drives, Disks & DOS versions, Preparing Disks for use, Device Names. Getting Started with DOS: Booting Process (DOS, Windows, Unix), System Files and Command.com, Internal DOS Files & Directories, Elementary External DOS Commands, Additional Commands. Microsoft Windows: Operating system-Definition & functions, basics of Windows. Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders. Control panel—display properties, adding and removing software and hardware, setting date and time, screen saver and appearance. Using windows [5 hrs] RL, RC and RLC circuits - Frequency response of RLC circuits, simple filter and band-pass circuits, resonance and Q-factor, use of Bode plots, use of differential equations and their solutions. Time response (natural and step responses). Introduction to second order circuits. Revision problem classes [4 hrs]		
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 type of simple experiments involving some sampling activities that are interesting to the students.		
Student Workload (SWL) الحمل الدراسي للطلاب			
Structured SWL (h/sem)	48	Structured SWL (h/w)	3
Unstructured SWL (h/sem)	52	Unstructured SWL (h/w)	3
Total SWL (h/sem)	100		

الحمل الدراسي الكلي للطلاب خلال الفصل	
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Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Lab Syllabus)	
المنهاج الاسبوعي المختبر	
	Material Covered
Week 1	UNIT – I Introduction to Computers
Week 2	How computer works
Week 3	computers contents
Week 4	UNIT – II Computer Peripherals
Week 5	Computer Output
Week 6	UNIT – III Basic Components & Storage
Week 7	Storage Devices
Week 8	UNIT – IV Computer Software & Languages
Week 9	Application Software: Microcomputer Software, Interacting with the System, Trends in PC software, Types of Application Software, Difference between Program and Packages.
Week 10	Application Software: Computer Languages: Definition, Generations of computer languages, Types of Languages, Language Processors: Assembler, Interpreter, Compiler, Linker and Loader. Programming constructs
Week 11	UNIT – V Introduction to MS DOS & Windows
Week 12	Microsoft Windows: Operating system-Definition & functions, basics of Windows. Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running

	applications, exploring computer, managing files and folders, copying and moving files and folders.
Week 13	Microsoft Windows: Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar
Week 14	Microsoft Windows: Running applications, exploring computer, managing files and folders, copying and moving files and folders.
Week 15	Microsoft Windows: Control panel—display properties, adding and removing software and hardware, setting date and time, screen saver and appearance. Using windows
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	أسس الحاسب الالى	Yes
Recommended Texts	كتاب علم الحاسوب، 2010	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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	اللغة العربية العامة		Module Delivery
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	UoB12345		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	1	Semester of Delivery	1
Administering Department	Physics. Dept.	College	College of science
Module Leader	Ali Jawad Obada	e-mail	ali.jawad.sci@edu.iq
Module Leader's Acad. Title		Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	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			
Module Aims أهداف المادة الدراسية	1. إعانة الطلاب على التعبير الصحيح، وضبط الأساليب وتفهم القرآن الكريم والوقوف على أسراره . 2. تعويد الطلاب على دقة الملاحظة والتمييز بين الخطأ والصواب فيما يسمعون ويقرؤون مما يساعدهم على فهم معاني الجمل والأساليب . 3. تمرين الطلاب على دقة التفكير والبحث العقلي الدقيق . 4. إكساب الطلاب قدرات نحوية تمكنهم من تقويم ألسنتهم عند القراءة . 5. تنمية الثروة اللغوية للطلاب وتزويدهم بكثير من الألفاظ والتراكيب بفضل ما يعرض عليهم من أمثلة وأساليب . 6. مساعدة الطلاب على فهم التراكيب المعقدة والأساليب الغامضة والتعرف على أسباب تعقيدها أو غموضها .		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	مخرجات تعلم اللغة العربية العامة: 1. التعرف إلى مستويات نظام اللغة العربية. 2. معرفة القواعد النحوية والصرفية. 3. وصف المناهج النقدية والظواهر الأدبية. 4. التعريف بأبرز المصنفات اللغوية والأدبية		
Indicative Contents المحتويات الإرشادية			
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies	• استراتيجيات الحوار... • إستراتيجية السرد القصصي... • التدريس باستخدام التكنولوجيا... • إستراتيجية إعداد المشاريع... • استراتيجيات تبادل الأدوار		
Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	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	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	نشأة اللغة
Week 2	قضايا قرآنية
Week 3	الاعطاء الشائعة
Week 4	عصور الأدب العربي
Week 5	الخط والإملاء
Week 6	امتحان شهر اول
Week 7	همزة الوصل والقطع
Week 8	الظاء والضاد
Week 9	تحليل نص شعري حديث
Week 10	قواعد كتابة الهمزة وسط الكلمة
Week 11	الألف المقصورة والممدودة
Week 12	امتحان شهر ثاني
Week 13	البلاغة العربية وعلومها
Week 14	علامات الترقيم
Week 15	مناقشة تقارير الطلبة
Week 16	الامتحان النهائي

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	الوجيز في قواعد الاملاء والانشاء /د.عبد الله أنس الطباع	Yes
Recommended Texts	جامع الدروس العربية/ مصطفى الغلاييني	No
Websites	الموسوعة الحرة ويكيبيديا	

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	حقوق الانسان والديمقراطية		Module Delivery
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	UoB12345		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	1	Semester of Delivery	2
Administering Department	Physics. Dept .	College	College of science
Module Leader	Samar abdullah	e-mail	samar.abdullah@mu.edu.iq
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	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

Module Aims أهداف المادة الدراسية	1- تعريف الطالب بالديمقراطية وحقوق الانسان والاسس الصحيحة لهما من اجل تشكيل وعي مناسب لهذا النظام السياسي المتطور 2- دراسة مفهوم الديمقراطية وحقوق الانسان من خلال معرفة اسسها واشكالها وعناصرها ومقوماتها مع دراسة اهم التجارب الديمقراطية في دول العالم
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- ان يكون الطالب ملما بمعرفة اسس النظام الديمقراطي - 2- أن يكون يمتلك الثقافة الجيدة للتمييز بين انواع الديمقراطيات 3- أن يمتلك معلومات جيدة حول الية الانتخابات في الدول الديمقراطية - 4- ان يكون الطالب على اطلاع بحقوق الانسان وحياته الاساسية
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	ب -الأهداف المهاراتية الخاصة بالمادة تقارير حول النظام الديمقراطية -1 ب مناقشات اثناء المحاضرة حول النظام الديمقراطي -2ب ب - 3- شرح اهم حقوق الانسان التي ينبغي ان يتمتع بها
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Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
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	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	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	مفهوم حقوق الانسان تعريف الحق
Week 2	حقوق الانسان في الاديان والشرائع السماوية حقوق الانسان في الاسلام
Week 3	الاعتراف الدولي بحقوق الانسان
Week 4	نشوء المنظمات غير الحكومية ودورها في ميادين حقوق الانسان اللجنة الدولية للصليب الاحمر منظمة العفو الدولية منظمة مراقبة حقوق الانسان المنظمة العربية لحقوق الانسان
Week 5	ديمقراطية الاحزاب – التداول السلمي والشرعي للسلطة
Week 6	المساواة السياسية – احترام مبدأ الاغلبية وجود دولة القانون
Week 7	انماط الديمقراطية – الديمقراطية المباشرة – الديمقراطية شبه المباشرة
Week 8	الديمقراطية النيابية – الديمقراطية التشاركية – الديمقراطية اللبرالية
Week 9	الديمقراطية التوافقية – ديمقراطية الاغلبية ديمقراطية الكثرة
Week 10	الديمقراطية التفويضية – الديمقراطية الاجتماعية الديمقراطية الصناعية – الديمقراطية التداولية
Week 11	فصل السلطات – السلطة التنفيذية

Week 12	السلطة التشريعية – السلطة القضائية
Week 13	— النظام الحزبي
Week 14	الديمقراطية في العراق – النظام الحزبي في العهد الملكي
Week 15	تطور الحياة النيابية – الملك
Week 16	— تأسيس الجمهورية وتوالي الانقلابات

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	كتاب الديمقراطية مفاهيم وتجارب للدكتور حسن لطيف الزبيدي والاستاذ نعمة محمد العبادي	Yes
Recommended Texts		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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Mathematics I		Module Delivery
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	COS 1101		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester of Delivery	1
Administering Department	Physics. Dept.	College	College of Science
Module Leader	Mousa Makey Khrajan	e-mail	E-mail; mmkrady@mu.edu.iq
Module Leader's Acad. Title	Assist.Prof.	Module Leader's Qualification	M.Sc.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims	Teach students the most important basic concepts, principles . laws. And

أهداف المادة الدراسية	scientific theories of the limits and continuous . The students has the scientific skills that enable him to perform their professional and business functions and others.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	14. To understand the applications of differentiations such as area and volume. 15. Enabling the student to obtain and understanding of modern and advanced scientific topics in this area. 16. Linking theoretical concepts with applied material through applied examples.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part 1:</u> Basics of functions (types of functions) with graph; Limits (definition with examples); continuity. 20 hr Part 2: Derivatives (definition with examples) ; Rules of derivatives; Chain rule with examples ; Implicit Differentiation ; Higher Order Derivatives. 20 hr Part 3; Differentiation Differentiation of Exponential and Logarithmic functions ; on of Trigonometric functions. 20 hr
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Giving students specialized theoretical and practical scientific skills , skills of thinking and analysis in both the theoretical and practical aspects. 2. Enable students to obtain theoretical experiences and develop learning skills in this area.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
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	3	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	2, 8, 12	LO # 3, 4, 6 and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	6	LO # 1-6
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المناهج الاسبوعي النظري	
	Material Covered
Week 1	Introduction
Week 2	Basics of functions (types of functions)
Week 3	Graph of functions
Week 4	Limits (definition with examples)
Week 5	Limits (theorems)
Week 6	Derivatives (definition with examples)
Week 7	Rules of derivatives
Week 8	Chain rule with examples
Week 9	Implicit Differentiation
Week 10	Higher Order Derivatives (Exampels)
Week 11	Differentiation of Exponential and Logarithmic functions
Week 12	Differentiation of Trigonometric functions and basic identities
Week 13	The Hyperbolic Functions
Week 14	The inverse of trigonometric and Hyperbolic Functions
Week 15	Increasing and decreasing functions and elementary curve sketching
Week 16	Increasing and decreasing functions and elementary curve sketching(examples)

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Calculus and Analytics Geometry; Thomas and Finney , ADDISON – WESLEY PUBLISHING COMP.	Yes
Recommended Texts	Calculus ; STANLEY I .GROSSMAN; ACADEMIC PRESS	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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Mathematics II		Module Delivery
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	COS 1212		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester of Delivery	2
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Mousa Makey Khrajan	e-mail	E-mail; mmkrady@mu.edu.iq
Module Leader's Acad. Title	Assist.Prof.	Module Leader's Qualification	M.Sc.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	COS 1101	Semester	1
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents
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أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Teach students the most important basic concepts, principles . laws. And scientific theories of the Integrals . The students has the scientific skills that enable him to solve more problems in application. integration
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	17. To understand the applications of differentiations such as area and volume. 18. Enabling the student to obtain and understanding of modern and advanced scientific topics in this area. 19. Linking theoretical concepts wi Improper integrals first kind th applied material through applied examples.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part 1: The definite and indefinite integral ; The fundamental theorem of calculus ; integration by substitution ; 10 hrs Part 2: Integration of Trigonometric functions ; The integration of Hyperbolic Functions; The integration of inverse trigonometric and Hyperbolic Functions ; The integration of Exponential and Logarithmic functions: 15 hrs Part 3 : (Techniques of application) Integration by part ; Integration by Partial Fractions(Linear factors)s ; Integration by Partial Fractions (Quadratic factors) ; Other substitution by Trigonometric function. 15 hrs Part 4 : Improper integral Improper integrals first kind ; Improper integrals second kind. 10 hrs Part 5 : Application of integral Work , Power, and Energy. 10 hrs
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Giving students specialized theoretical and practical scientific skills , skills of thinking and analysis in both the theoretical and practical aspects. 2. Enable students to obtain theoretical experiences and develop learning skills in this area.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
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	3	10% (10)	3, 5, 10	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	2, 8, 13	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	9	LO # 1-9
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	The definite integral
Week 2	The indefinite integral / The Fundamental Theorem of Calculus
Week 3	Integration by substitution
Week 4	The area between two curves with examples
Week 5	Work , Power, and Energy
Week 6	Integration of Trigonometric functions
Week 7	The integration of Hyperbolic Functions
Week 8	The integration of inverse trigonometric and Hyperbolic Functions
Week 9	The integration of Exponential and Logarithmic functions

Week 10	Techniques of application (By Parts)
Week 11	Integrals of Certain Trigonometric functions
Week 12	Integration by Partial Fractions(Linear factors)
Week 13	Integration by Partial Fractions (Quadratic factors)
Week 14	Other substitution by Trigonometric function
Week 15	Improper integrals first kind
Week 16	Improper integrals second kind

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Calculus and Analytics Geometry; Thomas and Finney , ADDISON – WESLEY PUBLISHING COMP.	Yes
Recommended Texts	Calculus ; STANLEY I .GROSSMAN; ACADEMIC PRESS	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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	English Language I		Module Delivery	
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	UOM1202			
ECTS Credits	3:00			
SWL (hr/sem)	75			
Module Level	1	Semester of Delivery		2
Administering Department	Type Dept. Code	College	College of Science	
Module Leader	Rasha A. Hussein		e-mail	rasha.lasereng@mu.edu.iq
Module Leader's Acad. Title	Assist Professor		Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	010/06/2023		Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents
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أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	26. To provide material for the students to learn pronunciation of the English sounds, to learn to read, write, and to know the fundamentals of English grammar and vocabulary; 27. To develop the students' reading skills to enable them to skim an adapted text for main idea, to scan an adapted text for specific information. 28. To develop the students' writing skills to enable them to respond to input applying information to a specified task, to select, to summarize information in essays. 29. To develop the students' listening skills to enable them to understand and apply specific information from the input. 30. To develop the students' speaking skills to enable them to use general and professional language.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students should be able to: 20. Distinguish between description and prescription in English grammar. 21. analyze and label sentence constituents accurately 22. parse any sentence 23. understand the role of grammar in effective communication 24. Develop a sound grasp of the nature and terminology of English grammar viewed as constituent structure. Students will gain skills in applying this descriptive framework to any text in English and understand the effect of grammar choices on style. 25. Develop students' ability to write, speak and communicate visually in appropriate English for the context.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Unit 1: Hello! am/ are/ is, my/your • This is ... How are you? • Good morning! What's this in English? • Plurals . 4hr Unit 2: Your world Countries • <i>he/she/ they, his/her</i> • Where's he from? <i>fantastic/ awful/ beautiful</i>. 4hr Unit 3: All about you Jobs • <i>am/are/ is</i> • Negatives and questions • Personal information • Social expressions (1). 4hr Unit 4: Family and friends <i>our/their</i> • Possessive 's • The family • <i>has/have</i>. 4hr Unit 5: The way I live Sports/ Food/ Drinks • <i>Present Simple - I/you/ we/they</i> • <i>a/ an</i> Languages and nationalities. 4hr Unit 6: Every day

	The time • Present Simple-he/she • <i>always/sometimes/never</i> Words that go together • 4hr Unit 7: My favorites Question words • <i>me/him/us/them</i> • <i>this/that</i> Adjectives • <i>Can I... ?</i> 4hr Unit 8: Where I live Rooms and furniture • <i>There is/ are</i> • Prepositions • Directions . 4hr Unit 9: Times past Saying years • <i>was/were born</i> • Past Simple - irregular verbs • <i>have/do/go</i> • When's your birthday? 4hr Unit 10: We had a great time Past Simple - regular and irregular • Questions and negatives • Sport and leisure • Going sightseeing. 4hr Unit 11: I can do that! <i>can/can't</i> • Adverbs • Adjective + noun • Everyday problems. 4hr Unit 12: Please and thank you I'd like - <i>some/any</i> • In a restaurant • Signs all around. 4hr Reading Comprehension Reading paragraphs Listening . 4hr
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The course is delivered face-to-face via one lecture each week. The lectures will provide a combination of lecture-style content and opportunities to participate in discussions and problem-solving tasks.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	3, 7, 10	LO #1, 2,5, 9 and 11
	Assignments	3	10% (10)	2, 6,12	LO # 3, 4, 6 and 13
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 ,9 and 10
Summative assessment	Midterm Exam	2 hr	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	Unit one
Week 2	Unit Two
Week 3	Unit Three
Week 4	Unit Four
Week 5	Unit Five
Week 6	Unit Six
Week 7	Mid-term Exam
Week 8	Unit Seven
Week 9	Unit Eight
Week 10	Unit Nine
Week 11	Unit Ten
Week 12	Unit Eleven
Week 13	Unit Twelve
Week 14	Listening 1
Week 15	Reading Comprehension
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	New Headway English Course- Pre-intermediate By: John and Liza. Oxford, 2007	Yes
Recommended Texts		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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	English Language II		Module Delivery
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	UOM 2316		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	2	Semester of Delivery	
Administering Department	Physics Dept.	College	College of Science
Module Leader	Rasha A. Hussein	e-mail	rasha.lasereng@mu.edu.iq
Module Leader's Acad. Title	Assist Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	UOM1202	Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	31. To provide material for the students to learn pronunciation of the English sounds, to learn to read, write, and to know the fundamentals of English grammar and vocabulary; 32. To develop the students' reading skills to enable them to skim an adapted text for main idea, to scan an adapted text for specific information. 33. To develop the students' writing skills to enable them to respond to input applying information to a specified task, to select, to summarize information in essays. 34. To develop the students' listening skills to enable them to understand and apply specific information from the input. 35. To develop the students' speaking skills to enable them to use general and professional language.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students should be able to: 26. Distinguish between description and prescription in English grammar. 27. analyze and label sentence constituents accurately 28. parse any sentence 29. understand the role of grammar in effective communication 30. Develop a sound grasp of the nature and terminology of English grammar viewed as constituent structure. Students will gain skills in applying this descriptive framework to any text in English and understand the effect of grammar choices on style. 31. Develop students' ability to write, speak and communicate visually in appropriate English for the context.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Unit one Reading: Getting to know Writing: Tenses : 4 hrs Unit Two Reading: The way we live Writing: Present tenses (simple, continuous) : 4 hrs Unit Three Reading: It all went wrong Writing: Past tenses (simple, continuous) : 4 hrs Unit Four Reading: Let's go shopping Writing: Quantity (much, more, some, any,...etc.) : 4 hrs Unit Five

	Reading: What do you want to do Writing: Verb patterns1 (want/hope, Future intentions) : 4 hrs Unit Six Reading: Tell me what's it like Writing: Comparative and superlative : 4 hrs Unit Seven Reading: Famous couples Writing: Present Perfect and Past Simple: 4 hrs Unit Eight Reading: Do's and don'ts Writing: Have, should, must: 4 hrs Unit Nine Reading: Going places Writing: Time and conditional clauses: 4 hrs Unit Ten Reading: Scared to death: 3 hrs Writing: Verb patterns 2 (manage to do, used to do, go walking): 4hrs Unit Eleven Reading: Things that Changed the world Writing: Passives : 3 hrs Unit Twelve Reading: Dreams and reality Writing: Second conditional : 3 hrs
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The course is delivered face-to-face via one lecture each week. The lectures will provide a combination of lecture-style content and opportunities to participate in discussions and problem-solving tasks.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	2, 5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	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	Unit one
Week 2	Unit Two
Week 3	Unit Three
Week 4	Unit Four
Week 5	Unit Five
Week 6	Unit Six
Week 7	Mid-term Exam
Week 8	Unit Seven
Week 9	Unit Eight

Week 10	Unit Nine
Week 11	Unit Ten
Week 12	Unit Eleven
Week 13	Unit Twelve
Week 14	Listening 1
Week 15	Listening 2
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	New headway intermediate student's book By: John and Liz Soars. Oxford	Yes
Recommended Texts		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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Sound and Wave Motion		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 24014		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	Semester of Delivery	4
Administering Department	Physics. Dept.	College	College of Science
Module Leader	Muwafaq Fadhil Jaddoa	e-mail	muwafaqfj@mu.edu.iq
Module Leader's Acad. Title	Assist. Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To study and understanding basic waves concepts. 2. Discussion of simple harmonic, damped, forced and coupled oscillators . 3. Behavior of transverse waves on a string, longitudinal waves in a gas and a solid, voltage and current waves on a transmission line. 4. Explain the difference between sound and hearing and Describe sound as a wave.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize the wave properties. 2. Understanding the simple harmonic motion and its applications. 3. Understanding the damped oscillation and its difference with forced oscillation. 4. To understand the sound and shock waves.
Indicative Contents المحتويات الإرشادية	<u>Part A - Simple Harmonic Motion</u> Periodic Motion, The Time Period, The Frequency, The Displacement, Restoring Force or Return Force, Simple Harmonic Motion (SHM), Velocity, Acceleration and Energy of a Simple Harmonic Oscillator, The Simple Pendulum, solved problems. [12 hrs] <u>Part B - Superposition Principle and Coupled Oscillations</u> Degrees of Freedom, Superposition Principle, Superposition Principle for Linear Inhomogeneous Equation, Superposition of Simple Harmonic Motions along a Straight Line, Superposition of Two Simple Harmonic Motions at Right Angles to Each Other, Solved Problems. [12 hrs] <u>Part C - The Damped Harmonic Oscillator</u> Damped Harmonic Motion, Damped LC Oscillations (LCR Circuit), Solved Problems.12 hrs

	<u>Part D - Forced Vibrations and Resonance</u> Forced Vibrations, Resonance, Quality Factor Q, Helmholtz Resonator, Solved Problems: 12 hrs <u>Part E – Travelling waves</u> The wave equation, travelling sinusoidal waves, sound waves, models describing sound, Speed of Sound in Various Media, sound intensity, Interference of Sound Waves, beats, Doppler effect, Shock Waves and Sonic Booms ; 12 hrs
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	6
Total SWL (h/sem)	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	2,6, 11	LO #, 2, 6, 10 and 11
	Assignments	3	10% (10)	2,8, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	8	LO # 1-8
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Simple Harmonic Motion, Periodic Motion, The Time Period, The Frequency, The Displacement, Restoring Force or Return Force
Week 2	Simple Harmonic Motion (SHM), Velocity, Acceleration and Energy of a Simple Harmonic Oscillator
Week 3	The Simple Pendulum, solved problems
Week 4	Degrees of Freedom, Superposition Principle
Week 5	Linearity and Superposition, Source Transformations, Thévenin and Norton Equivalents
Week 6	Superposition Principle for Linear Inhomogeneous Equation, Superposition of Simple Harmonic Motions along a Straight Line
Week 7	Superposition of Two Simple Harmonic Motions at Right Angles to Each Other, Solved Problems.
Week 8	Damped Harmonic Motion
Week 9	Damped LC Oscillations (LCR Circuit), Solved Problems
Week 10	Forced Vibrations, Resonance
Week 11	Quality Factor Q, Helmholtz Resonator, Solved Problems
Week 12	The wave equation, travelling sinusoidal waves, sound waves

Week 13	models describing sound, Speed of Sound in Various Media
Week 14	Interference of Sound Waves, beats, Doppler effect
Week 15	Shock Waves and Sonic Booms
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Waves and Oscillations, Walter Fox Smith, Oxford University Press 2010	No
Recommended Texts	Waves and Oscillations, R.N. Chaudhuri, New Age International (P) Ltd., Publishers 2010	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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Analytical Mechanics I		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 2308		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	3	Semester of Delivery	1
Administering Department	Physics. Dept.	College	College of science
Module Leader	Oday Salman Mahdi	e-mail	Oday.mahdi.sci@mu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	36. To develop problem solving skills and understanding of the theory of analytical mechanics. 37. To understand the motion of the body and particles. 38. This course deals with the basic concept of motion and acceleration. 39. This is the basic subject for all moving and velocity. 40. To understand speed velocity and accelerations Laws problems. 41. To perform analytical mechanic .
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	32. Recognize how body and particles moving. 33. List the various terms associated with velocity. 34. Summarize what is meant by a basic moving. 35. Discuss the reaction and involvement of body and particles. 36. Describe velocity, speed ,acceleration, displacement. 37. Define velocity, speed ,acceleration, displacement. 38. Identify the basic laws of moving. 39. Discuss the operations of analytical mechanics. 40. Discuss the various of moving. 41. Explain the aims of analytic mechanics. 42. Identify the classical mechanics and classical mechanics.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Definitions and rules of vectors – scalar and vector products, triple products, derivation of vectors. Position ,velocity, acceleration. [10 hrs] Velocity and acceleration in – plane polar, cylindrical and spherical coordinates . [10 hrs] Newton's law – rectilinear motion, linear momentum , the force as a function of position, variation of the gravity with height. [10 hrs] Harmonic motion – harmonic motion in one dimension , harmonic motion in tow dimension, harmonic motion in three dimension. [10 hrs] Revision problem classes [5 hrs]

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

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	2, 5, 10	LO #1, 2, 6, 10 and 11
	Assignments	3	10% (10)	3, 7, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المناهج الاسبوعي النظري	
	Material Covered
Week 1	Formal definitions and rules of vectors
Week 2	Scalar and vector products and their applications.
Week 3	Position , velocity and acceleration vectors
Week 4	velocity and acceleration in polar coordinates.
Week 5	velocity and acceleration in cylindrical coordinates.
Week 6	velocity and acceleration in spherical coordinates.
Week 7	Newtons law of motion
Week 8	Variation of gravity with height
Week 9	Harmonic motion in one dimension
Week 10	Harmonic motion in tow dimension
Week 11	Harmonic motion in three dimension
Week 12	Energy consideration for harmonic motion
Week 13	Damped harmonic motion
Week 14	Energy consideration for damped harmonic motion
Week 15	Forced harmonic motion
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Analytical mechanics ,grand r.fowles,third edition,1977	Yes
Recommended Texts	Instructors solutions manual analytical ,seven edition,fowels, 1977	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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Analytical Mechanics II		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 24112		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	1	Semester of Delivery	4
Administering Department	Physics. Dept.	College	College of science
Module Leader	Oday Salman Mahdi	e-mail	Oday.mahdi.sci@mu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Phys 2308	Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	42. To develop problem solving skills and understanding of the theory of analytical mechanics. 43. To understand the motion of the body and particles. 44. This course deals with the basic concept of motion and acceleration. 45. This is the basic subject for all moving and velocity. 46. To understand speed velocity and accelerations Laws problems. 47. To perform analytical mechanic .
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	43. Recognize how body and particles moving. 44. List the various terms associated with velocity. 45. Summarize what is meant by a basic moving. 46. Discuss the reaction and involvement of body and particles. 47. Describe velocity, speed ,acceleration, displacement. 48. Define velocity, speed ,acceleration, displacement. 49. Identify the basic laws of moving. 50. Discuss the operations of analytical mechanics. 51. Discuss the various of moving. 52. Explain the aims of analytic mechanics. 53. Identify the classical mechanics and classical mechanics.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Generalized coordinates , generalized velocity , general force, generalized momentum . [15 hrs] Lagrange's equation , applications of Lagrange's equation. [15 hrs] The Hamiltonian function. [10 hrs] Harmonic motion in Lagrange's equation. [15 hrs] Revision problem classes [5 hrs]
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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	2, 5, 10	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	2, 7, 12	LO # 3, 4, 6 and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	8	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	Generalized coordinate
Week 2	Generalized velocity
Week 3	Generalized momentum
Week 4	Lagrange's equation
Week 5	Lagrange's function
Week 6	Simple pendulum in Lagrange equation
Week 7	changing length of Simple pendulum in Lagrange equation
Week 8	changing weight of Simple pendulum in Lagrange equation
Week 9	Harmonic motion in Lagrange equation
Week 10	Harmonic motion in tow variation in Lagrange equation
Week 11	Lagrange and classical mechanics

Week 12	Lagrange in polar coordinates
Week 13	Lagrange in cylindrical coordinates
Week 14	Hamiltonian equation
Week 15	Application on Hamiltonian equation
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Analytical mechanics ,grand r.fowles,third edition,1977	Yes
Recommended Texts	Instructors solutions manual analytical ,seven edition,fowels, 1977	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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Advanced Calculus I		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar
Module Code	Math211		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	1	Semester of Delivery	1
Administering Department	Mathematics	College	Science
Module Leader	Yaseen Merzah Hemza	e-mail	yaseenmerzah@mu.edu
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Math101	Semester	1
Co-requisites module	Math102	Semester	2

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	48. Students learn the concept of functions with multiple variables and their partial derivatives and their applications and repeated integrals and their applications. 49. This course deals with the basic concept of calculus II. 50. This is the basic subject for all functions with multiple variables.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	54. The student should have sufficient knowledge about functions with multiple variables and repeated integrals. 55. Everything the student can be transformed from one form to another equivalent to the original form. 56. Summarize the topic is supported by detailed examples. 57. Questions and answers, discussion and daily exams. 58. Assign the student to solve daily questions and ask new questions and discuss with the students. 59. Daily discussion and exams.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. (Vector Field) حقل المتجهات (Space Coordinates) , (Cartesian coordinates) , (Cylindrical coordinates) , (Polar coordinates). (Spherical coordinates) (Vectors and distance in space) (The scalar product), (dot product of two vectors) The vector product (cross product of two vectors) (Equation of lines, Line segments and plane) . (Product of three vectors or more) 2. (Functions of Several Variables) الدوال متعددة المتغيرات (Functions of two or more variables) دوال لمتغيرين أو أكثر (Limit and continuity) النهاية والاستمرارية (Chain rules) المشتقات الجزئية (Partial derivatives) قاعدة السلسلة ، (Non-independent variables) المتغيرات غير المستقلة (Directional derivatives and (Gradients) والمشتقات الاتجاهية ومستوي المماس ، tangent planes) (Higher order partial derivatives) المشتقات الجزئية من الرتب العليا (Maxima) Minima and saddle points ، (القيم العظمى ، القيم الصغرى والنقاط السرجية) (Lagrange multipliers) مضاعفات لاجرانج (Double integrals over rectangular regions) التكاملات الثنائية على مناطق رباعية الشكل (Double integrals for bounded nonrectangular region) ، (Volumes) ، (Area) المساحة (Volume) ، (Volume) الحجم

	- Physical applications) تطبيقات فيزيائية (Center of mass), (First and second moments) - عزم القصور الذاتي مركز الكتلة ، (Moments of inertia) ، (Changing to polar coordinates) , التغير إلى الإحداثيات القطبية (Triple integrals over rectangular and nonrectangular regions) التكاملات الثلاثية على مناطق رباعية وغير رباعية الأشكال . (Triple integrals in cylindrical and spherical coordinates) التكاملات الثلاثية باستخدام مساحة السطح (Surfaces area) , الإحداثيات الأسطوانية والكروية
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	77	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	123	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.5
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 (مخرجات التعلم ذات الصلة)
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative	Midterm Exam	2 hr	10% (10)	7	LO # 1-7

assessment	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction - (Vector Field) حقل المتجهات
Week 2	(Space Coordinates) , (Cartesian coordinates) , (Cylindrical coordinates) , (Polar coordinates) , (Spherical coordinates) , انواع الاحداثيات (Vectors and distance in space)
Week 3	(The scalar product) (dot product) of two vectors) The vector product (cross product) of two vectors) (Equation of lines, Line segments and plane) .(Product of three vectors or more)
Week 4	(Functions of Several Variables) الدوال متعددة المتغيرات , (Functions of two or more variables)
Week 5	(Limit and continuity) (Chain rules) , (Partial derivatives) قاعدة السلسلة , (Limit and continuity) الغاية والاستمرارية
Week 6	(Chain rules) , (Partial derivatives) قاعدة السلسلة , المشتقات الجزئية
Week 7	(Directional derivatives and tangent planes) (Gradients) والمشتقات الاتجاهية ومستوي المماس , (Directional derivatives and tangent planes)
Week 8	(Higher order partial derivatives) المشتقات الجزئية من الرتب العليا
Week 9	(Maxima , Minima and saddle points) (القيم العظمى , القيم الصغرى والنقاط السرجية)
Week 10	(Lagrange multipliers) مضاعفات لاجرانج
Week 11	(Double integrals over rectangular regions) , (Volumes) , (Double integrals for bounded nonrectangular region) , (Volume) , (Area) المساحة , (Double integrals over rectangular regions) , (Volumes) , (Double integrals for bounded nonrectangular region) , (Volume) , (Area) المساحة , (Double integrals over rectangular regions) , (Volumes) , (Double integrals for bounded nonrectangular region) , (Volume) , (Area) المساحة
Week 12	(Physical applications) (Center of mass), (First and second moments) , (Moments of inertia) , (Physical applications) تطبيقات فيزيائية , (Center of mass), (First and second moments) مركز الكتلة , عزم القصور الذاتي (Moments of inertia)
Week 13	(Changing to polar coordinates) (Triple integrals over rectangular and nonrectangular regions) . التكميلات الثلاثية على مناطق رباعية وغير رباعية الاشكال (Changing to polar coordinates) , (Triple integrals over rectangular and nonrectangular regions) . التكميلات الثلاثية على مناطق رباعية وغير رباعية الاشكال
Week 14	(Triple integrals in cylindrical and spherical coordinates) مساحه السطوح (Surfaces area) , والكروية (Triple integrals in cylindrical and spherical coordinates) مساحه السطوح (Surfaces area) , والكروية
Week 15	Preparatory week before the final Exam
Week 16	

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Calculus Stanley – Grossman	Yes
Recommended Texts	Calculus and analytic Geometry – thomas	yes
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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Analog Electronics		Module Delivery	
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	Phys 2309			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	2	Semester of Delivery		3
Administering Department	Physics. Dept. Code	College	College of Science	
Module Leader	Hassan M. Jaber Al-Ta'ii		e-mail	Domez973@yahoo.com
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.	
Module Tutor	Name (if available)	e-mail	E-mail	
Peer Reviewer Name	Name	e-mail	E-mail	
Scientific Committee Approval Date	10/06/2023	Version Number	1.0	

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The purpose of the course is to introduce and teach students the following: 1. The fundamental principles of electronics and devices, beginning with semiconductor materials and prototyping semiconductor-based electronic devices and their applications. 2. Afterward, communication systems and digital electronics technologies are discussed and analyzed.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Students are expected to learn and understand: 60. The basic principles of electronics. 61. Fundamental components of electronics. 62. Electronics devices and applications. 63. Analog electronics systems and applications. 64. Digital electronics systems and applications.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. ❖ Current divider, Voltage Divider, (KVL), The Structure of Semiconductor Materials, The Energy-Band Levels, Classification of Materials (Conductors, Semiconductors, Insulators) Conduction in Semiconductor, Intrinsic and Extrinsic Semiconductors, Extrinsic Semiconductors, N-Type, Semi-conductors, P-Type Semiconductors, Analysis of Drift and Diffusion Currents ; 6 hrs ❖ Fabrication of a Semiconductor P-N Junction Diode, Diodes, Diode Applied Bias Current-Voltage (I-V) response in F.B. and R.B.Static and Dynamic Resistance, DC load line for a diode, Temperature Effects on P-N Junction, Junction capacitances; 6 hrs ❖ Diode equivalent circuits, Ideal Diode Models, Zener diodes, Applications of Diode, Series Diode, Configurations with DC Inputs, Parallel Diode, Configurations with DC Inputs, (Rectifier), Half-wave rectifier, Full-wave rectifier, Filter circuits Filter circuits, Capacitor- input filter, Regulated power supply, CLIPPERS (Diode limiting), CLAMPERS, Voltage Multipliers ❖ Zener Diodes, Varactor diodes (variable-capacitance diodes), Optical Diodes, Light Emitting Diode (LED), The Photodiode/ Solar Cells; 6 hrs ❖ Other types of Diodes, Current Regulator Diode, The Schottky Diode (hot-carrier diode), The PIN Diode, The step-recovery diode (SRD), The Tunnel Diode, Laser Diode; 6 hrs Part B - Analogue Electronics ❖ Bipolar Junction Transistor (BJT), Construction of BJT and Operation, BJT Characteristics and Parameters, Transistor Amplifying Action, Transistor

	Switching; 6 hrs ❖ Transistor Configurations, Common Emitter Configuration (CEC), Common Base Configuration (CBC), Common Collector Configuration (CCC), Base Bias Collector to Base Bias, Voltage Divider Bias ; 6 hrs ❖ Junction Field Effect transistor (JFET), Types of FET, Biasing of the JFET, Characteristics of JFETs, JFET Operating Characteristics, FET as a Voltage-Controlled Resistor ; 6 hrs ❖ N-Channel JFET Operation, MOSFETs, JFET (n-channel) Biasing Circuits, The Potential (Voltage) Divider Bias ; 6 hrs ❖ BJT Amplifier, Multistage Amplifiers, Gain in Decibels, Band Width of an Amplifier, Single stage CE Amplifier, Capacitor Coupled two stage CE Amplifier ; 6 hrs ❖ Feedback Amplifier, Operational Amplifiers (Op-Amp), Op-Amp Input Modes and Parameters, Negative Feedback, Noninverting Amplifier. ; 6 hrs ❖ Comparators, Nonzero-Level Detection, Comparator Applications, Summing Amplifier, Integrators, The Op-Amp Differentiator ; 6 hrs
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module will be taught in such a way that students will be compelled to participate in the exercises and their critical thought skills will be refined and expanded through participation. Classes and interactive tutorials will be used in order to reach this goal, as well as considering the types of simple experiments involving sampling activities that the learners might find interesting as well. The module will also include group activities, which will encourage collaboration and the exchange of ideas. This will help to create an engaging learning experience for the students and will also help them to develop their communication skills.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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	3	10% (10)	3,6, 10	LO #1, 3, 9 and 10
	Assignments	3	10% (10)	2, 7, 12	LO # 3, 4, 6 and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	8	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Current divider, Voltage Divider, (KVL), The Structure of Semiconductor Materials, The Energy-Band Levels, Classification of Materials (Conductors, Semiconductors, Insulators) Conduction in Semiconductor, Intrinsic and Extrinsic Semiconductors
Week 2	Extrinsic Semiconductors, N-Type, Semi-conductors, P-Type Semiconductors, Analysis of Drift and Diffusion Currents
Week 3	Fabrication of a Semiconductor P-N Junction Diode, Diodes, Diode Applied Bias Current-Voltage (I-V) response in F.B. and R.B.Static and Dynamic Resistance, DC load line for a diode, Temperature Effects on P-N Junction, Junction capacitances
Week 4	Diode equivalent circuits, Ideal Diode Models, Zener diodes, Applications of Diode, Series Diode, Configurations with DC Inputs, Parallel Diode, Configurations with DC Inputs, (Rectifier), Half-wave rectifier, Full-wave rectifier, Filter circuits
Week 5	Filter circuits, Capacitor- input filter, Regulated power supply, CLIPPERS (Diode limiting), CLAMPERS, Voltage Multipliers
Week 6	Zener Diodes, Varactor diodes (variable-capacitance diodes), Optical Diodes, Light Emitting Diode (LED), The Photodiode/ Solar Cells
Week 7	Other types of Diodes, Current Regulator Diode, The Schottky Diode (hot-carrier diode), The PIN Diode, The step-recovery diode (SRD), The Tunnel Diode, Laser Diode
Week 8	Bipolar Junction Transistor (BJT), Construction of BJT and Operation, BJT Characteristics and Parameters, Transistor Amplifying Action, Transistor Switching
Week 9	Transistor Configurations, Common Emitter Configuration (CEC), Common Base Configuration (CBC), Common Collector Configuration (CCC), Base Bias Collector to Base Bias, Voltage Divider Bias
Week 10	Junction Field Effect transistor (JFET), Types of FET, Biasing of the JFET, Characteristics of JFETs, JFET Operating Characteristics, FET as a Voltage-Controlled Resistor
Week 11	N-Channel JFET Operation, MOSFETs, JFET (n-channel) Biasing Circuits, The Potential (Voltage) Divider Bias
Week 12	BJT Amplifier, Multistage Amplifiers, Gain in Decibels, Band Width of an Amplifier, Single stage CE Amplifier, Capacitor Coupled two stage CE Amplifier
Week 13	Feedback Amplifier, Operational Amplifiers (Op-Amp), Op-Amp Input Modes and Parameters, Negative Feedback, Noninverting Amplifier.
Week 14	Comparators, Nonzero-Level Detection, Comparator Applications, Summing Amplifier, Integrators, The Op-Amp Differentiator
Week 15	Comparators, Nonzero-Level Detection, Comparator Applications, Summing Amplifier, Integrators, The Op-Amp Differentiator
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المناهج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: (V – I) Characteristics of P-N Junction Diodes
Week 2	Lab 2: Half-Wave Rectifier
Week 3	Lab 3: Center-Tapped Full-Wave Rectifier
Week 4	Lab 4: Full-Wave Bridge Rectifier (FWBR)
Week 5	Lab 5: Zener Diode
Week 6	Lab 6: Diode as a voltage multiplier
Week 7	Lab 7: Study the properties of the light emitting diode (LED)
Week 8	Lab 8: Study the properties of Transistor emitter
Week 9	Lab 9: Study the properties of the common emitter transistor
Week 10	Lab 10: Study the properties of the common Base transistor

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	A Textbook of Electrical Technology, B.L. Theraja, A.K. Theraja, 1st, 1999	Yes
Recommended Texts	1- Schaums outline series theory and problems of electric circuits, 2nd, Josef A. Edminister, 1983. 2-Electronics Physics - Subhi Al Rawii - Mosul University 1974	Yes
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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Digital Electronics		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 24113		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	Semester of Delivery	4
Administering Department	Physics. Dept.	College	College of science
Module Leader	Hassan M. Jaber Al-Ta'ii	e-mail	Domez973@yahoo.com
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Phys 2309	Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	51. To develop problem-solving skills and an understanding of circuit theory through the application of techniques. 52. To understand the voltage, current, and power generated by a circuit. 53. This course deals with the basic concept of electrical circuits. 54. This is the basic subject of all electrical and electronic circuits. 55. To understand Kirchhoff's current and voltage laws problems. 56. To perform mesh and nodal analyses.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	65. Recognize how electricity works in electrical circuits. 66. List the various terms associated with electrical circuits. 67. Summarize what a basic electric circuit is. 68. Discuss atom reactions and involvement in electric circuits. 69. Describe electrical power, charge, and current. 70. Define Ohm's law. 71. Identify the basic circuit elements and their applications. 72. Discuss the operations of sinusoids and phasors in an electric circuit. 73. Discuss the various properties of resistors, capacitors, and inductors. 74. Explain the two Kirchhoff's laws used in circuit analysis. 75. Identify the capacitor and inductor phasor relationship with respect to voltage and current.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. ❖ Introductory Digital Concepts, Number Systems, Subtraction and addition for different system: 20 hrs ❖ Logic gates, design the logic circuit : 15 hrs ❖ Boolean algebra, Boolean expressions; 15 hrs ❖ KARNAUGH MAP MINIMIZATION: 15 hrs ❖ COMBINATIONAL LOGIC ANALYSIS; 10 hrs

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module is designed to encourage students to participate in the exercises, while simultaneously improving and expanding their critical thinking abilities. The exercises are designed to challenge and stimulate students, allowing them to become more confident in their abilities. Through these activities, students will be able to better apply their critical thinking skills to real-world situations. Classes, interactive tutorials, and simple experiments involving sampling activities that are interesting to students will be used to accomplish this goal. These activities will also help students develop effective problem-solving skills and creativity and they will be able to gain insights into their own potential and how to use it to their advantage.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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	3	10% (10)	2, 6, 10	LO #1, 2, 5,10 and 11
	Assignments	3	10% (10)	3, ,7, 12	LO # 3, 4, 6, 10 and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	8	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introductory Digital Concepts
Week 2	Number Systems
Week 3	Number Systems
Week 4	Subtraction and addition for different system
Week 5	Logic gates, design the logiccircuit
Week 6	Logic gates, design the logiccircuit
Week 7	Logic gates, design the logiccircuit
Week 8	Boolean algebra, Boolean expressions
Week 9	Boolean algebra, Boolean expressions

Week 10	Boolean algebra, Boolean expressions
Week 11	KARNAUGH MAP MINIMIZATION
Week 12	KARNAUGH MAP MINIMIZATION
Week 13	KARNAUGH MAP MINIMIZATION
Week 14	COMBINATIONAL LOGIC ANALYSIS
Week 15	COMBINATIONAL LOGIC ANALYSIS
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المناهج الأسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: AND Logic Gate
Week 2	Lab 2: OR Logic Gate
Week 3	Lab 3: NOT Logic Gate
Week 4	Lab 4: NAND Logic Gate
Week 5	Lab 5: NOR Logic Gate
Week 6	Lab 6: XNOR Logic Gate
Week 7	Lab 7: XOR Logic Gate
	Lab 8: De Morgan Theory
	Lab 9: Half adder
	Lab 10 : Full adder

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Digital fundamental (T. Floyd ,9 th ed. ,2006)	Yes
Recommended Texts	Principle Digital Electronics	yes
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Modern Physics I		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 2306		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	Semester of Delivery	3
Administering Department	Physics. Dept. Code	College	College of Science
Module Leader	Qahtan Adnan Abdulqader		e-mail: Qahtan.adnan@mu.edu.lq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Qahtan Adnan Abdulqader		e-mail: Qahtan.adnan@mu.edu.lq
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	57. To develop problem solving skills and understanding of atomic mechanisms through the application of techniques. 58. To understand development of atomic structure of materials. Basics of solid state physics and nuclear physics. 59. This course deals with the basic concept of quantum mechanics of atom. 60. Dealing with different atomic spectra.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	76. Recognize the basic components of atom. 77. List the various terms associated with quantum numbers. 78. Summarize what is meant by a basic atomic transitions. 79. Discuss the reaction and involvement of electrons in its orbitals.. 80. Study spin angular momentum by stern-garlic experiment . 81. The effects of different strength of electric and magnetic fields on electrons. 82. Knowing the basic terminology of quantum mechanics.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Fundamentals : 10 hrs Atomic models as historical review. 10 hrs Rutherford scattering experiment and Rutherford atomic model. 10 hrs Boher model of atom. and hydrogen atomic spectra. 10 hrs Quantization of atomic energy levels and orbital angular momentum. 10 hrs Pauli exclusion principle, Zeeman and Stark effects. 10 hrs

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 type of simple ideas and equations involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	3, 9, 12	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	5, 8, 11	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	9	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction – Historical review to atomic physics and it's important to other sciences.
Week 2	Thomson atomic model and discovery of electron. Measurement of (e/m).
Week 3	Rutherford experiment of scattering of alpha particles. Atomic Rutherford model.
Week 4	Failure of classical models and postulates of Boher model.
Week 5	Hydrogen atomic spectra as view of Boher model.
Week 6	Review of atomic models. Solving problems and discussion.
Week 7	Mid-term Exam .Principle quantum numbers and spin quantum number.

Week 8	Continue Principle quantum numbers and spin quantum number.
Week 9	Quantization of energy atomic levels and orbital angular momentum.
Week 10	Stern- Gerlach experiment.
Week 11	Total angular momentum, L-S coupling.
Week 12	Pauli exclusion principles and Hund rule.
Week 13	Normal and anomalous Zeeman effects.
Week 14	Concept of wave function and operator.
Week 15	Time independent Schrodinger equation.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	دراسة الاشعة السينية يدوياً: Lab 1
Week 2	الظاهرة الكهروضوئية – الجزء الاول: Lab 2
Week 3	دراسة الطيف الذري لذرة الهيدروجين: Lab 3
Week 4	تعيين الشحنة النوعية للالكترونات بثبوت التيار: Lab 4
Week 5	استخدام انيوبة ثومسون لدراسة الانحراف المغناطيسي على الالكترونات: Lab 5
Week 6	طيف ذرة الصوديوم: Lab 6
Week 7	حيود الالكترونات: Lab 7
Week 8	التفريغ الكهربائي: Lab 8

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Introduction to atomic and nuclear physics: 5 edition. Henny semat. 1973 By Champ mann and Hall.	Yes
Recommended Texts	Atomic Physics and Quantum Mechanics. UCAL by: H. Hakan/springer 1986.	No
Websites	https://en.wikipedia.org/wiki/Quantum_mechanics	

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Modern PhysicsII		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 24110		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	Semester of Delivery	4
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Qahtan Adnan Abdulqader		e-mail
Qahtan.adnan@mu.edu.lq			
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Qahtan Adnan Abdulqader		e-mail
Qahtan.adnan@mu.edu.lq			
Peer Reviewer Name	Qahtan Adnan Abdulqader	e-mail	Qahtan.adnan@mu.edu.lq
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Phys 2306	Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	61. To develop problem solving skills and understanding of the new phenomenon like black body radiation and relativity. 62. To understand development of the concept of the duality behavior of electrons and photons. 63. This course deals with the basic concept of quantum mechanics of radiation. 64. Studying the experiments that explicates these behaviors. 65. Understanding the constancy of speed of light and frame of reference.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	83. Recognize the basic concepts of special relativity. 84. Understanding the meaning of different inertial frame of reference and how make transformation in physical quantities. 85. Discuss the relation between the speed of a body moving with high speed and other physical parameters like mass, length, time....etc. 86. Using the concept of black body radiation to develop the quantum optics. 87. Explaining the glow curve of black body . 88. To understanding the the emission of photoelectrons , work function of material. 89. The methods of light interaction with atom.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Fundamentals: 10 hr Relativity and ether concept before Einstein as historical review; 10 hrs Morley-Michelson experiment of ether movement;10 hrs Deal with different transformation in physical laws ; 10 hrs Quantization of black body radiation by Planck with contrary with wen and Reilig models.10 hrs Studying the interaction of light as a particle with atom.10 hr
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 type of simple ideas and equations involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125
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Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	4, 7, 11	LO #1, 2, 5, 10 and 11
	Assignments	3	10% (10)	3, 6, 12	LO # 3, 4, 6, 7 and 10
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	9	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 – Historical review to Concepts of special relativity and it's relation to other sciences.
Week 2	Einstein's Two Postulates.
Week 3	Lorentz Transformation Equations.
Week 4	Transformation of time, length and velocities
Week 5	Relativistic momentum.
Week 6	Black body radiation failure of classical physics. Solving problems and discussion.
Week 7	Mid-term Exam . Black body radiation failure of classical physics.
Week 8	Plank energy distribution.
Week 9	Dual nature of mater and radiation and related phenomena.
Week 10	Dual nature of mater and radiation and related phenomena.
Week 11	Davison and Grammar experiment diffraction of electrons.
Week 12	Interaction of radiation with matter.
Week 13	Compton elastic and inelastic scattering..
Week 14	Pair production. Discussion by solving examples.
Week 15	X-rays diffraction.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الأسبوعي للمختبر	
	Material Covered
Week 1	دراسة الاشعة السينية الكترونياً: Lab 1
Week 2	الظاهرة الكهروضوئية – الجزء الثاني والثالث: Lab 2
Week 3	دراسة الطيف الذري لذرة لنظام يحتوي على الكترونين في الغلاف الخارجي كمثال (الزئبق): Lab 3
Week 4	تعيين الشحنة النوعية للالكترون بثبوت الفولتية: Lab 4
Week 5	استخدام انبوبة ثومسون لدراسة الانحراف الكهربائي على الالكترونات: Lab 5
Week 6	طيف ذرة الكاديوم وحساب المسافة بين خطي الكاديوم: Lab 6
Week 7	الانبعاث الأيوني الحراري: Lab 7

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Introduction to atomic and nuclear physics: 5 edition. Hennyry semat. 1973 By Champ mann and Hall.	Yes
Recommended Texts	Modern Physics, 4th edition, by: Kineth s. Karny .Wiley.	No
Websites	https://www.nature.com :	

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Heat and Thermodynamic		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 2307		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester of Delivery	
Administering Department	Physics. Dept.	College	College of science
Module Leader	Hadey K. Mohamad	e-mail	hadey.mohamad@mu.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Hadey K. Mohamad	e-mail	hadey.mohamad@mu.edu.iq
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	66. To develop problem solving skills and understanding of Thermodynamics through the application of techniques. 67. To understand isothermal, isobaric, isochoric and adiabatic processes. 68. This course deals with the basic concept of thermodynamics. 69. This is the basic subject for all thermodynamic processes. 70. To understand the equations of state for ideal and real gases, respectively. 71. To perform transformation of thermal energy to work.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	90. Recognize how the thermodynamic processes happen. 91. List the various cycles associated with thermodynamic processes. 92. Summarize what is meant by a reversible cycle. 93. Discuss the reaction and thermodynamic processes in reversible cycles. 94. Define the equation of state. 95. Define the first law of thermodynamics and its applications. 96. Define the second law of thermodynamics and its applications. 97. Discuss the throttling process of gases. 98. Discuss the Enthalpy. 99. Explain the Entropy in thermodynamics.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Thermodynamics Laws and Thermodynamic processes</u> Zeroth Law of Thermodynamics, Gas laws, Ideal gases and Real gases, Mechanism of heat transfer, Applications of first Law of Thermodynamics on Thermodynamic Processes. [20 hrs] <u>Part B – Transformation of thermal energy to work</u> Reversible processes, Carnot cycle, Otto cycle, [20 hrs] <u>Part C – Second Law of Thermodynamics</u> Entropy, Applications of second law of Thermodynamics on Isolated systems, Applications of second law of Thermodynamics on non-Isolated systems, Free energy function [20 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The interactive teaching and learning strategies. The strategies aim to promote critical and reflective thinking, research and evaluation skills that will help students to take positive action to protect, enhance and advocate for their own and other's health, wellbeing and safety. Students use personal and social capability to work collaboratively with others in learning activities, to appreciate their own strengths and abilities and those of their peers and develop a range of interpersonal skills such as communication, negotiation, team work, leadership and an appreciation of diverse perspectives.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	5, 9, 11	LO #1, 2, 3, 7 and 10
	Assignments	3	10% (10)	4, 6, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	9	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري	
	Material Covered
Week 1	Fundamental Concepts, Heat and Temperature
Week 2	Zeroth Law of Thermodynamics, Gas laws
Week 3	Ideal gases and Real gases, Mechanism of heat transfer
Week 4	Heat capacity of matter, First law of Thermodynamics
Week 5	Applications of first Law of Thermodynamics on Thermodynamic Processes
Week 6	Polytropic Processes
Week 7	State Equations of gases
Week 8	Transformation of thermal energy to work
Week 9	Throttling process of gases
Week 10	Enthalpy
Week 11	Entropy
Week 12	Second Law of Thermodynamics
Week 13	Applications of second law of Thermodynamics on Isolated systems
Week 14	Applications of second law of Thermodynamics on non-Isolated systems
Week 15	Free energy function

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: The electric equivalent heat
Week 2	قياس السعة الحرارية النوعية بطريقة الخلط
Week 3	تعيين نقطة الانصهار
Week 4	قانون نيوتن في التبريد
Week 5	تحويل الطاقة الكهربائية الى طاقة حرارية
Week 6	ايجاد معامل التمدد الحراري

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. الترمودايناميك د. أمجد عبد الرزاق كرجيه	Yes
Recommended Texts	2. مبادئ الترمودايناميك د. فلاح حسن حسين جامعة بابل 2012	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Thermodynamic and Statistical		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 24111		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	Semester of Delivery	4
Administering Department	Physics. Dept.	College	College of Science
Module Leader	Hadey K. Mohamad		e-mail: hadey.mohamad@mu.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Phys 2307	Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	72. To develop problem solving skills and understanding of discrete and continuous probabilities through the application of techniques. 73. To understand binomial distribution, deviation and dispersion from a given problem. 74. This course deals with the basic concept of statistical physics. 75. This is the basic subject for all statistical distributions. 76. To understand Maxwell-Boltzmann distribution and classical distribution function problems. 77. To perform Bose-Einstein statistics, Fermi-Dirac statistics, and their applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	100. Recognize how binomial distribution works in statistical equilibrium. 101. Describe Discrete and continuous probabilities. 102. List the various terms associated with probability theory. 103. Summarize what is meant by deviation or dispersion. 104. Discuss Energy Levels, Macrostates and Microstates. 105. Define the phase space. 106. Identify Maxwell-Boltzmann statistics and its applications. 107. Identify Bose-Einstein statistics and its applications. 108. Identify Fermi-Dirac statistics and its applications. 109. Discuss the various functions of Thermodynamics.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A - Statistical definitions and Binomial distribution</u> Discrete and continuous probabilities, problems, deviation, dispersion, binomial distribution law. [15 hrs] <u>Part B – Maxwell-Boltzmann Statistics and Its applications</u> -Maxwell-Boltzmann distribution, classical distribution function, Helmholtz free energy, internal energy, Entropy [15 hrs] <u>Part C – Bose-Einstein Statistics</u> - Bose-Einstein distribution, and Evaluation of Bose-Einstein distribution function, applications [15 hrs] <u>Part D – Fermi-Dirac Statistics</u> - Fermi-Dirac distribution, Evaluation of Fermi function, applications [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The interactive teaching and learning strategies. The strategies aim to promote critical and reflective thinking, research and evaluation skills that will help students to take positive action to protect, enhance and advocate for their own and other's health, wellbeing and safety. Students use personal and social capability to work collaboratively with others in learning activities, to appreciate their own strengths and abilities and those of their peers and develop a range of interpersonal skills such as communication, negotiation, team work, leadership and an appreciation of diverse perspectives.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	5,9, 11	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	3, 7,12	LO # 3, 6, 10and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	9	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	Statistical definitions	
Week 2	Statistical equilibrium	
Week 3	Binomial distribution	
Week 4	Deviation, Dispersion	
Week 5	Energy Levels, Macrostates and Microstates	
Week 6	Maxwell-Boltzmann Statistics, Classical distribution function	
Week 7	Phase Space	
Week 8	Applications of Maxwell-Boltzmann Statistics, Derivation of properties of ideal gas	
Week 9	Molecular velocities distribution, Derivation of barometric equation	
Week 10	Specific heat capacity of diatomic gases	
Week 11	Bose-Einstein statistics, Bose-Einstein distribution function	
Week 12	Applications of Bose-Einstein statistics, Photonic gas	
Week 13	Wien displacement law, Fermi-Dirac statistics	
Week 14	Fermi-Dirac distribution function	
Week 15	Applications of Fermi-Dirac statistics, Electron gas	
Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	النظرية الحركية للغازات والميكانيك الإحصائي تأليف: فياض عبد اللطيف د. عبد الحميد علي العبد	Yes
Recommended Texts	Statistical Physics Tony Guenault Lancaster Un., UK. 1995	No

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Mathematics III		Module Delivery
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	COS 2314		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	Semester of Delivery	3
Administering Department	Physics. Dept.	College	College of science
Module Leader	Muwafaq Fadhil Jaddoa	e-mail	muwafaqfj@mu.edu.iq
Module Leader's Acad. Title	Assist. Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	COS 1212	Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	5. To provide a modern introduction to calculus. 6. To understand Functions of two or more variables are studied from verbal, numerical, visual, and algebraic points of view. 7. This course deals with the basic concept Double and triple integrals and how are used to compute probabilities, surface areas, and volumes. 8. To understand Types of sequences and series and methods to solve their problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	5. The material on derivatives is covered in part A in order to give students more time to get used to the idea of a derivative as a function. 6. Functions of two or more variables are studied from verbal, numerical, visual, and algebraic points of view. 7. The area problem, volume, and the distance problem serve to motivate the definite integral. 8. The convergence tests have intuitive justifications (see page 759) as well as formal proofs. Numerical estimates of sums of series are based on which test was used to prove convergence.
	<u>Part A – Partial Derivatives</u> Functions of Several Variables, Domains and Ranges, Functions of Two Variables, Functions of Three Variables, Exercises, Partial Derivatives of a Function of Two Variables, Second-Order Partial Derivatives, The Mixed Derivative Theorem, Partial Derivatives of Still Higher Order, Exercises, The Chain Rule. [15 hrs] <u>Part B- Multiple Integrals</u> Double and Iterated Integrals over Rectangles, Double Integrals, Double Integrals as Volumes, Fubini's Theorem for Calculating Double Integrals, Evaluating Iterated Integrals, Evaluating Double Integrals over Rectangles, Double Integrals over Bounded, Nonrectangular Regions, Finding Limits of Integration, Properties of Double Integrals, Area by Double Integration, Exercises. [15 hrs] <u>Part C- Triple Integrals in Rectangular Coordinates:</u> Triple Integrals, Finding Limits of Integration in the Order $dz\ dy\ dx$, <i>Average Value of a Function in Space</i>, Exercises, <i>Masses and First Moments, Moments of Inertia</i>. [15 hrs] <u>Part D – Infinite Sequences and Series</u> Sequences, Representing Sequences, Convergence and Divergence, Calculating Limits of Sequences, Infinite Series, Geometric Series, The nth-Term Test for a Divergent

	Series, Combining Series, Exercises, alternating Series. Power Series and Convergence, The Radius of Convergence of a Power Series. [15 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
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	3	10% (10)	3, 6, 10	LO #1, 2, 6, 10 and 11
	Assignments	3	10% (10)	2, ,7, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	9	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	Functions of Several Variables, Domains and Ranges, Functions of Two Variables, Functions of Three Variables, Exercises
Week 2	Partial Derivatives of a Function of Two Variables, Second-Order Partial Derivatives, The Mixed Derivative Theorem, Partial Derivatives of Still Higher Order, Exercises, The Chain Rule.
Week 3	Double and Iterated Integrals over Rectangles, Double Integrals, Double Integrals as Volumes, Fubini's Theorem for Calculating Double Integrals
Week 4	Evaluating Double Integrals over Rectangles, Double Integrals over Bounded
Week 5	Nonrectangular Regions, Finding Limits of Integration
Week 6	Properties of Double Integrals, Area by Double Integration, Exercises.
Week 7	Triple Integrals, Finding Limits of Integration in the Order $dz\ dy\ dx$,
Week 8	Average Value of a Function in Space, Exercises
Week 9	Masses and First Moments, Moments of Inertia.
Week 10	Central Dark Spot in Newton's Rings, Localized Fringes, Theory of Newton's Rings: Radius of the Bright and Dark Rings, Determination of the Wavelength of Light a Plano-Convex Lens
Week 11	Sequences, Representing Sequences, Convergence and Divergence
Week 12	Calculating Limits of Sequences, Infinite Series,
Week 13	Geometric Series, The n th-Term Test for a Divergent Series, Combining Series,
Week 14	Alternating Series. Power Series and Convergence
Week 15	The Radius of Convergence of a Power Series
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	CALCULAS, George B. Thomas, Pearson Education, Inc, 2014	Yes
Recommended Texts	CALCULAS, James Stewart, Cengage Learning, 2012	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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

حاسبات 11 computer

Module Information				
معلومات المادة الدراسية				
Module Title	Computer Science II		Module Delivery	
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	UOM 2415			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	2	Semester of Delivery		4
Administering Department	physics	College	Science	
Module Leader	Saleh .A Lazam		e-mail	sala@mu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Msc.	
Module Tutor	-		e-mail	-
Peer Reviewer Name	-		e-mail	--
Scientific Committee Approval Date	10/06/2023	Version Number	1.0	

Relation with other Modules				
العلاقة مع المواد الدراسية الأخرى				
Prerequisite module	UOM 1104		Semester	first
Co-requisites module	None		Semester	-

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	this module aims to equip the learner with the ability to thoughtfully apply computational tools when solving real-physics problems. This module aims to impart to the learner fundamental skills in Microsoft Excel for dealing with large amounts of data, and the ability to critically self-evaluate the way they apply these skills. They will learn to identify problems and design solutions, while also developing a critical awareness of the merits and limits of their methods, thereby empowering them to make better-informed decisions and to reason effectively in a variety of contexts .Microsoft Excel enables users to format, organize and calculate data in a spreadsheet. By organizing data using software like Excel, data analysts and other users can make information easier to view as data is added or changed. Excel contains a large number of boxes called cells that are ordered in rows and columns. Data is placed in these cells.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• At the end of the module, learners will be able to: • Enter data in worksheets and navigating worksheets • Use formulas and functions to get data summaries using formula libraries • Enhance worksheets by formatting cells and worksheets • Create theme based chart to give a visual feel of data • Edit worksheets in preparation for printing with page setup • Get data from external sources • Use filters and grouping to organise and summarise data
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Principles of Spreadsheets After completing this module, the learner will be able to demonstrate an understanding of the principles of spreadsheets. Define spreadsheet in terms of its purpose and use Name examples of spreadsheet programs Provide examples of spreadsheets that can be produced using a spreadsheet application Explain the benefits of using a spreadsheet application for producing and working with spreadsheets Identify and describe the properties of a spreadsheet in terms of its purpose and use Work within organizational standards and procedures with MS Excel Module 2: Getting Started with Excel If you are new to Excel and spreadsheets in general, the vast array of features and controls can seem quite daunting. However, once we cover the workings of a spreadsheet and how to deal with the basics, you will be well on your way to becoming an expert in Excel. Open Microsoft Excel: Identify the elements of the Excel interface .Create a basic worksheet § Navigation options.Save and close spreadsheets and excel .Use the help system in Microsoft Excel Module 3: Performing Calculations: One of the most powerful features in Excel is the ability to perform real-time calculations on data within workbooks. Using these powerful features allows you to save time and reduce errors when trying to calculate complex and simple equations.Create formulas in a worksheet . Demonstrate practices to ensure the integrity of the data Module 4: Modifying a worksheet: One of the most basic and common tasks that you will complete using Excel is modifying the contents of your worksheets. This topic covers various tools that you can use to work with the data in your worksheets in the most efficient ways possible. Manipulate data. Insert, manipulate, and delete cells, columns, and rows Search for and replace data. Module 5: Formatting a Worksheet: Excel contains many of the text formatting tools that you

might be familiar with from other Microsoft Office applications. In this topic, we will learn about a variety of different font options, as well as how to use the Format Painter, the mini toolbar, and more. Modify fonts. Add borders and colors to cells. Apply number formats Align cell contents .Apply cell styles.

Module 6: Check and print the spreadsheet: It is often the case that printouts of your workbook (or parts of your workbook) will be required for one purpose or another. In this topic, we will explore how to check for spelling and grammar and use the printing functionality in Excel. Check spelling and grammar in spreadsheet. Define the basic page layout for a workbook. Refine the page layout and apply print options

Module 7: Customizing the Excel Environment: In this lesson, you will begin examining how to customize Microsoft Excel 2016 to suit your specific needs. Customize general, language, formula, proofing, and saving options. Use Excel's version control features. Customize the ribbon and the Quick Access toolbar. Customize the functionality of Excel by enabling add-ins Customize advanced and Trust Center options

Module 8: Solve a problem using a Spreadsheet

After completing this module, the learner will be able to prepare and produce a spreadsheet to provide a solution to a given problem. Ensure that the spreadsheet produced addresses the given problem. Work with MS Excel .Adjust settings to customise the view and preferences of the spreadsheet

Module 9: Creating Advanced Calculations. In this lesson the learner will learn how to create advanced calculations, working with Range Names, formulas and functions. Apply range names. Use MS Excel to apply formulae to provide alternative solutions to the given problem .Insert Functions in a Worksheet

Module 10 : Organizing Worksheet Data with Tables

Tables allow you to use Excel's powerful organizational capabilities without modifying the data itself. Create and modify tables. Use subtotal features and database functions

Module 11: Visualizing Data with Charts . While pure data can be analyzed by those familiar with this data and the tools that Excel provides, sometimes you need graphical assistance to help interpret it. Create charts .Modify and format existing charts .Create a trend line Create advanced charts

Module 12: Inserting Graphics: While the default appearance of your worksheets can be quite plain, Excel offers you access to a variety of graphical objects that you can use to enhance their visual appeal. Insert and modify graphical objects .Layer and group graphic objects Incorporate SmartArt into your workbooks

Module 13: Apply formatting and special effects You can help improve the readability of a worksheet by applying different types of formatting. Use MS Excel to apply formatting and special effects applicable to the given problem Manage themes. Utilize International Symbols

Module 14: Auditing Worksheets. In this lesson you will learn how to evaluate formulas, troubleshoot invalid data and work with the trace cells feature. Use MS Excel to evaluate a spreadsheet to comply with the given problem Trace cells . Troubleshoot invalid data and formula errors. Watch and evaluate formulas .Create Scenarios. Perform a What-If Analysis

Module 15: Working with Multiple Worksheets. After completing this module, the learner will be able to work with multiple worksheets to suit the solution to the given problem. Format worksheet tabs. Manage worksheets. Manage the view of worksheets and workbooks Work with Page Breaks. Printing Large Worksheets)

Module 16 : Enhancing Workbooks Your workbooks can be customized in a number of different ways. In this topic you will learn how to customise in more ways. Customize workbooks Create and use templates Protect files

Module 17: Automating Worksheet Functionality This section looks at speeding up repetitive tasks such as adding automatic worksheet functionality to spreadsheet

Module 18: Analysing and Presenting Data This section looks at analysing data and presenting data in an easy to understand manner.

	Module 19: Import and Export Data This section looks at importing and exporting data to and from Excel. Module 20: Managing Large Workbooks After completing this module, the learner will be able to consolidate, link and sort data within spreadsheets.
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Select an Exercise or Problem and Copy Entirely It Into an Excel Worksheet This avoids lost time with students inputting data, facilitates focusing on creating a solution, and provides a template for students to learn how to develop a practical approach to solve problems. I use Box cloud storage to save and share files with my students. Be sure to synchronize your Box folders to your computer, so any changes you make to the files are automatically updated in the link you provide your students. Second Spend Extra Time in Class With Quick Tips and Techniques for Using Excel Keep it simple, in my introduction classes my students only have to be able to add, subtract, divide, multiply, copy, paste, save, and use absolute references. My class structure is flipped, so I form groups for students to solve in-class assignments. This allows students to help each other and frees me to walk around and work with groups and individual students. Spend Brief Periods of Class Time on Time on How to Use Excel in the In-Class Assignments There are short presentation in data show. I set up my in-class activities with the key data already input so students can focus on using Excel to work out the solution and we spend the majority of class time discussing what the answer means. Most often, a student is not required to enter any numbers in the in-class assignment, manipulate data.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	
	Assignments				
	Projects / Lab.	1	30% (10)	Continuous	
	Report				
Summative assessment	Midterm Exam	2 hr	10% (10)	10	
	Final Exam	2hr	50% (50)	16	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Lab. Syllabus)		
المنهاج الاسبوعي للمختبر		
	Material Covered	
Week 1	Lab 1: Learn Basic Excel operations and functions	
Week 2	Lab 2: Excel Basics introduction	
Week 3	Lab 3: Excel Basic operations and functions (mathematical)	
Week 4	Lab 4: Excel Basic operations functions (filtering, lookup, etc.)	
Week 5	Lab 5: Excel Charts 1	
Week 6	Lab 6: Excel Charts 2	
Week 7	Lab 7: equations in Excel	
Week 8	Lab 8: functions in Excel	
Week 9	Lab 9: logic in Excel	
Week 10	Lab 10: logical functions	
Week 11	Lab 11 : practice logical functions	
Week 12	Lab 12: large datasets	
Week 13	Lab 13: data tables	
Week 14	Lab 14 : problem solving	
Week 15	Lab 15 : Excel review	
Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?

Required Texts	https://www.sgul.ac.uk/about/our-professional-services/information-services/library/documents/training-manuals/Excel-Fundamentals-Manual.pdf	Yes/online
Recommended Texts	https://adminfinance.umw.edu/tess/files/2013/06/Excel-Manual1.pdf	Yes/ online
Websites	https://www.trainingconnection.com/resources/excel.php	

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	English Language III		Module Delivery
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	UOM 3517		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	3	Semester of Delivery	
Administering Department	Physics. Dept.	College	College of science
Module Leader	Firas Faeq K. Hussain	e-mail	firas.f@mu.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	---	e-mail	---
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	UOM 2316	Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The student will gain knowledge on how to communicate ideas clearly and appropriately in academic English, both orally and in writing. A strong command of the English language can help you get good grades and will be very helpful in your future profession. Students will focus on the following areas: 1. Students will be able to use language effectively in a variety of contexts, including informal emails, academic essays, and research papers. 2. Students will be able to read and understand a variety of texts, including academic articles, news articles, and literary works. 3. Students will be able to use critical thinking skills to analyze and evaluate texts. 4. Students will be able to write clear and concise arguments. 5. Students will be able to communicate effectively in both oral and written forms.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students will be able to: 1. Write an informal email that is clear, concise, and error-free. 2. Read and understand an academic article and identify the main points of the argument. 3. Analyze a news article and identify the author's point of view. 4. Write a research paper that is well-organized, supported by evidence, and free of errors. 5. Give an oral presentation that is clear, concise, and engaging.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Introduction to English language, Language for writing (an informal email), Reading (Reading methods) [5 hrs] Language for writing (synonyms and antonyms), Reading (A musical cure, A new Vaccine) [5 hrs] Language for writing (skimming and scanning), Reading (antonyms from prefixes) [5 hrs] Language for writing (meaning of from content), Reading (identify reading message) [5hrs] Revision problem classes [5 hrs]

	Part B – Language for writing (avoiding repetition), Reading (purpose and audience). [10 hrs] Language for writing (suffixes and prefixes), Reading (making notes, interpreting meaning). [5 hrs] Language for writing (noun/verb+ preposition, using numbers), Reading (using original sources). [5 hrs] Language for writing (adding extra information, organizing ideas), Reading (discussion). [5 hrs] Revision problem classes [3 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Active learning: Active learning is a type of learning where students are actively engaged in the learning process. This can be done through activities such as group work, discussion, and hands-on activities. • Differentiation: Differentiation is a teaching strategy that allows you to meet the individual needs of your students. This can be done by providing different levels of difficulty for assignments, offering choices, and using a variety of teaching methods. • Scaffolding: Scaffolding is a teaching strategy that provides support for students as they learn new material. This can be done by providing hints, providing examples, and breaking down tasks into smaller steps. • Feedback: Feedback is essential for student learning. It can be provided through written comments, oral feedback, or peer feedback. • Assessment: Assessment is used to measure student learning. It can be used to inform instruction, provide feedback to students, and make decisions about student progress.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
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	3	10% (10)	2, 5, 10	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	2, 7, 12	LO # 3, 4, 6 ,7 and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	8	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	Language for writing (an informal email)
Week 2	Reading (Reading methods)
Week 3	Language for writing (synonyms and antonyms)
Week 4	Reading (A musical cure, A new Vaccine)
Week 5	Language for writing (skimming and scanning)
Week 6	Reading (antonyms from prefixes)
Week 7	Language for writing (meaning of from content)
Week 8	Reading (identify reading message)
Week 9	Language for writing (avoiding repetition)

Week 10	Reading (purpose and audience)
Week 11	Language for writing (suffixes and prefixes)
Week 12	Reading (making notes, interpreting meaning)
Week 13	Language for writing (noun/verb+ preposition, using numbers)
Week 14	Reading (using original sources)
Week 15	Language for writing (adding extra information, organizing ideas)
Week 16	Preparatory week before the 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	Principles of laser Copyright Year: 2010	Yes
Recommended Texts	Laser Fundamentals Copyright Year: 2004	No
Websites	https://link.springer.com/book/10.1007/3-540-12305-9	

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.				

Module

Code	Course/Module Title	ECTS	Semester
UOM 3517	English Language III	3	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	27
Description			
This section includes a description of the module, 100-150 words			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Laser Physics II		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 36120		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level		3	
Administering Department		Physics. Dept.	College
Module Leader		Firas Faeq K. Hussain	e-mail
Module Leader's Acad. Title		Professor	Module Leader's Qualification
Module Tutor		---	e-mail
Peer Reviewer Name		---	e-mail
Scientific Committee Approval Date		10/06/2023	Version Number
			1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Phys 35016		Semester
Co-requisites module			Semester

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Aim of this module is to provide students with a comprehensive understanding of the physics of lasers. This includes: 78. To provide students with a comprehensive understanding laser classification. 79. To enable the student to take a comprehensive look about different types of lasers 80. Understand the different types of laser applications. 81. to provide a thorough grounding in laser hazard knowledge 82. As well as developing the conceptual framework the course also aims to give a sound perspective of laser safety
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The student will have acquired: 110. Comprehensive knowledge about laser classification. 111. A conceptual understanding of such important aspects, including of recent developments, concerning: solid-state lasers (including ruby and Nd-YAG) laser, Gas lasers (including He-Ne and CO₂), Chemical lasers, semiconductor lasers, and other types of lasers (including fiber and FEL lasers). 112. An ability to understand different types of laser applications includes: industrial, medical, military, and scientific research applications. 113. A thorough grounding in the principles of laser hazards. 114. Describe the laser safety factors and how they effect on human organs.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Classifications of Laser Introduction- types of classifications, comparison between laser and traditional light by properties. Different Classifications– classification according to active medium, classification according to emission duration, classification according to laser output. [10 hrs] Laser Classes – class1, class2, aclass3a, class3b, class4. [5 hrs] Part B – Types of Laser Solid-State Laser- ruby laser, pumping method, energy levels, applications, Nd-YAG laser, properties of YAG crystal, pumping method, applications. [5 hrs] Gas Laser- groups of gas lasers, He-Ne laser, active medium, pumping method,

	energy levels, applications, CO₂ laser, characteristics, pumping method, cooling technique, applications. [5hrs] chemical Laser- historical background, HF laser, pumping method, energy levels, applications. [5 hrs] Semiconductor Laser- general introduction to semiconductor technology, principle recombination radiation, diode laser, theory of operation, types of diode lasers, optical system, applications. [5 hrs] Revision problem classes [5 hrs] Part C – Laser Applications Industrial applications- types of industrial applications, Accurate measurements, Straight line marking or plan of reference, Marking a reference plane for construction, Material processing, Cutting, Welding, Laser Welding Process, active medium. [10 hrs] Medical applications- types of medical applications, lasers in medical surgery, Advantages of Laser Surgery, Lasers in ophthalmology, Lasers in Diagnostic Medicine. [5 hrs] Other types of laser applications- military application, daily applications, scientific research applications. [5 hrs] Part C – Laser hazards and safety Laser Safety– Maximum Permissible Exposure, Nominal Hazard Zone, Biological Effects, Skin effects. [10 hrs] Laser Hazards Factors– Non-Beam Hazards and Controls, Electrical Hazards, Fire Hazards, Explosion Hazards, Collateral radiation. [5 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Laser physics is a complex and challenging subject, so it is important to use a variety of learning and teaching strategies to help students learn the material. Some effective strategies include: Lectures: Lectures can be a good way to introduce students to the basic

	concepts of laser physics. However, it is important to keep lectures engaging and interactive, and to provide students with opportunities to ask questions. - Group work: Group work can help students to learn from each other and to develop their problem-solving skills. Group projects can be used to give students the opportunity to apply their knowledge to real-world problems. - Assessment: Assessment is an important part of any learning process. It is important to assess students' understanding of the material on a regular basis, and to provide feedback to help them improve their learning. Assessment can be done through quizzes, exams, and other methods.
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Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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	3	10% (10)	2, 5, 10	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	2, 5, 12	LO # 3, 4, 6 ,9and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	8	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Types of laser output (C.W and pulses)
Week 2	Laser Types and classifications
Week 3	Sold-state lasers (ruby and Nd-YAG lasers).
Week 4	Gas laser (CO ₂ and He-Ne lasers).
Week 5	Chemical lasers (HF and OI lasers).
Week 6	Semiconductor lasers (Diode lasers).
Week 7	Laser Diode.
Week 8	Other types of lasers (Fiber and FEL lasers).
Week 9	Laser Applications, Industrial Applications.
Week 10	Medical Applications.
Week 11	Military applications.
Week 12	Daily applications.
Week 13	Laser safety
Week 14	Estimation of safety factors
Week 15	Hazard sources.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	تجربة زاوية الانفراج لشعاع الليزر.
Week 2	تجربة دراسة وتحقيق ظاهرة الاستقطاب الخطي.
Week 3	تجربة دراسة ظاهرتي الاستقطاب الدائري والبيضوي.
Week 4	تجربة دراسة ظاهرة الحيود وإيجاد الطول الموجي لشعاع الليزر.

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Principles of laser Copyright Year: 2010	Yes
Recommended Texts	Laser Fundamentals Copyright Year: 2004	No
Websites	https://link.springer.com/book/10.1007/3-540-12305-9	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
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	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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Laser Physics I		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 35016		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester of Delivery	5
Administering Department	Physics Dept.	College	College of science
Module Leader	Firas Faeq K. Hussain	e-mail	firas.f@mu.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	---	e-mail	---
Peer Reviewer Name	---	e-mail	---
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents
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أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Aim of this module is to give fundamental understanding of Laser Physics by covering the following details 83. To provide students with a comprehensive understanding of the physics of lasers. 84. To enable students to apply the principles of laser physics to a variety of real-world applications. 85. Understand how light interacts with atoms in excited states, and how this can lead to stimulated emission and lasing. 86. To develop students about the physical theories regarding energy levels. 87. Absorption and Emission of light, Einstein Relations, Population inversion, Gain coefficient. 88. Theoretically design simple laser resonators. 89. Laser beam properties, Line width, Divergence, coherence, Brightness, Focusing properties of laser
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completion of this course, students will be able to: 115. Apply the above to calculations on practical laser systems, such as evaluating gain coefficients, threshold conditions, mode spacings and pulse lengths in mode locked systems. 116. Explain the special properties of laser radiation compared to more conventional sources. 117. Describe both qualitatively and quantitatively the propagation of gaussian laser beams and their focusing, and calculate, from basic principles, what laser power is needed to cut and ablate in various applications. 118. A thorough grounding in the principles and design of laser resonators, particularly stable cavities. - An ability to analyze quantitatively and design such cavities by using matrix techniques. 119. Describe both qualitatively and quantitatively the behavior of lasers with intra-cavity devices (mode lockers, Q-switches etc.) and the production of short, high intensity pulses.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Laser Idea Introduction- The electromagnetic spectrum, wave description, historical preview, [10 hrs] Lasing process – Bohr model of atoms, energy state (levels), Two, three, and four laser schemes, photons and energy diagram, absorption of electromagnetic radiation, Boltzmann distribution equation, population at thermodynamic equilibrium, population inversion. [10 hrs]

	Pumping – optical pumping, pumping process, types of pumping. [5 hrs] Processes between photons and atoms- stimulated emission, Einstein coefficients, absorption, spontaneous, stimulated emission, [10 hrs] Revision problem classes [5 hrs] Part B – Laser System Active medium- types of active medium. [5 hrs] Optical Resonator- gain coefficient, threshold gain coefficient, resonator configurations, plane-parallel resonator, concentric resonator, confocal resonator, stable resonators, unstable resonators, stability condition. [15 hrs] Properties Laser Radiation– monochromaticity, meaning of one color, directionality, divergence angle, spot size measurement, power density, coherence, spatial coherence, temporal coherence, brightness. [10 hrs] Laser Modes – Types of laser modes, longitudinal modes, transverse modes. [5 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Laser physics is a complex and challenging subject, so it is important to use a variety of learning and teaching strategies to help students learn the material. Some effective strategies include: • Lectures: Lectures can be a good way to introduce students to the basic concepts of laser physics. However, it is important to keep lectures engaging and interactive, and to provide students with opportunities to ask questions. • Group work: Group work can help students to learn from each other and to develop their problem-solving skills. Group projects can be used to give students the opportunity to apply their knowledge to real-world problems. • Assessment: Assessment is an important part of any learning process. It is important to assess students' understanding of the material on a regular basis, and to provide feedback to help them improve their learning. Assessment can be done through quizzes, exams, and other methods.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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	3	10% (10)	3, 5, 10	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	2,7, 12	LO # 3, 4, 6 and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	9	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Historical review
Week 2	Bohr model of atoms
Week 3	Spontaneous and stimulated emission
Week 4	Laser idea
Week 5	Energy states (levels),
Week 6	Two, three, and four laser schemes
Week 7	Properties of laser beam
Week 8	Black body theory
Week 9	Einstein thermodynamic theory

Week 10	Stevan-Boltzman theory
Week 11	Threshold gain coefficient
Week 12	Pumping processes
Week 13	Laser resonators
Week 14	Laser modes
Week 15	Types of laser modes
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المناهج الاسبوعي للمختبر	
	Material Covered
Week 1	تجربة ظاهرة النقاوة الطيفية لشعاع الليزر.
Week 2	تجربة دراسة ظاهرة الاتجاهية لشعاع الليزر.
Week 3	تجربة دراسة ظاهرة السطوع لشعاع الليزر.
Week 4	تجربة تعيين قدرة شعاع الليزر

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Principles of laser Copyright Year: 2010	Yes
Recommended Texts	Laser Fundamentals Copyright Year: 2004	No
Websites	https://link.springer.com/book/10.1007/3-540-12305-9	

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Scientific Research methods		Module Delivery
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	COS 3506		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	3	Semester of Delivery	
Administering Department	Physics. Dept.	College	College of science
Module Leader	Rasha A. Hussein	e-mail	rasha.lasereng@mu.edu.iq
Module Leader's Acad. Title	Assist Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. تعريف الطالب بأهداف العلم و افتراضات الطريقة العلمية 2. تعريف الطالب بمنهجية البحث و تعلم اساليب البحث العلمي 3. تعريف الطالب بطبيعة النشاط البحثي و شروط البحث العلمي و مبادئ التفكير العلمي
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. أن يعرف المتعلم المصطلحات المستخدمة في. المنهج العلمي 2. أن يفهم المتعلم المقصود. مناهج البحث العملي 3. أن يعرف ويفهم المتعلم البحث العلمي و مصادر الحصول على المعلومات 4. أن يعرف ويفهم المتعلم الوصول الى النتائج العلمية 5. ان يتعرف المتعلم مهارة التعامل مع الابحاث السابقة والدراسات و وضع الفروض.
Indicative Contents المحتويات الإرشادية	أولاً: مبادئ البحث العلمي , ويشمل: 6 ساعات • المراد بالبحث العلمي ، وأهدافه . • أهمية البحث العلمي ، وأثره في تأهيل طالب العلم. • خصائص البحث العلمي . • أنواع البحث العلمي ، والتميز بينها . • مفهوم الاشراف العلمي • أخلاقيات البحث العلمي. • صفات الباحث ، وآدابه ثانياً: مناهج البحث العلمي , ويشمل: 6 ساعات • التعريف بمنهج البحث العلمي. • تصنيف مناهج البحث العلمي باعتباريات متعددة، والتعريف بكل منهج. • أهمية تحديد منهج البحث العلمي المناسب. • الأسس التي يبنى عليها اختيار منهج البحث العلمي ثالثاً : اعداد فكرة البحث العلمي، ويشمل: 6 ساعات • كيفية الوصول إلى الأفكار البحثية. • تحديد الفكرة البحثية. • اختيار الموضوع. • عنوان البحث. • مراجعة الدراسات السابقة ومصادر البحث رابعاً: صياغة خطة البحث , ويشمل: 10 ساعات • اختيار موضوع البحث

	• صياغة عنوان البحث. • الإعلان عن موضوع البحث. • إبراز أهمية البحث والأسباب الداعية لاختياره. • تحديد أهداف البحث. • صياغة الفروض والتساؤلات البحثية • بيان المنهج العلمي المتبع في البحث. • اختيار أدوات البحث. • المقارنة بالدراسات السابقة لبيان ما أضافه البحث. • الإشارة إلى أهم مصادر البحث خامساً : أدوات البحث العلمي – الاستبانه 2 ساعة
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Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	المحاضرة التفاعلية، الحوار والمناقشة، العصف الذهني، حل المشكلات، المحاكاة والعروض العملية، المهام والتكليف، Cooperative Learning التعلم التعاوني، تبادل الخبرات بين الزملاء Exchange experience

Student Workload (SWL)			
الحمل الدراسي للطالب			
Structured SWL (h/sem)	33	Structured SWL (h/w)	2
الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعياً	
Unstructured SWL (h/sem)	42	Unstructured SWL (h/w)	3
الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعياً	
Total SWL (h/sem)	75		
الحمل الدراسي الكلي للطالب خلال الفصل			

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative	Quizzes	3	10% (10)	2,5, 10	LO #3, 6, 7 and 10

assessment	Assignments	3	10% (10)	3, 8, 12	LO # 3, 4, 6 , 10and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	8	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	مفاهيم عامة
Week 2	مبادئ البحث العلمي (1)
Week 3	مبادئ البحث العلمي (2)
Week 4	مناهج البحث العلمي
Week 5	إعداد فكرة البحث العلمي
Week 6	صياغة خطة البحث (1)
Week 7	صياغة خطة البحث (2)
Week 8	Mid-term Exam
Week 9	أدوات البحث العلمي
Week 10	قواعد جمع المادة العلمية
Week 11	قواعد صياغة البحث (1)
Week 12	قواعد صياغة البحث (2)
Week 13	قواعد التعليق والتهميش والتوثيق
Week 14	المصادر والمراجع ، وطريقة ترتيبها وفهرستها
Week 15	Preparatory week before the Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts		No
Recommended Texts	د.د. محمد سرحان علي المحمودي 2019 مناهج البحث العلمي	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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Thin film		Module Delivery
Module Type	E		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 3501		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	3	Semester of Delivery	5
Administering Department	Physics. Dept. Code	College	College of Science
Module Leader	Akeel Shaker Tuhaiwer	e-mail	Akeel.Almusawi@mu.edu.iq
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	Master
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	90. The study of the properties of matter in the form of thin films has aroused the attention of physicists since the second half of the seventeenth century. 91. Many theoretical studies have been conducted in this field. 92. Then the study of the practical side developed at the beginning of the nineteenth century when semiconductors entered into practical application.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	120. Thin films have industrial and technical importance, as they are included in most electronic applications if they are used in magnetic memory devices, integrated circuits, transistors, rectifiers, and digital calculators. 121. Detectors, solar cells, and gas sensors. In addition to these multiple applications, thin films have been used in optical applications, as they have been used in reproduction and photographic devices, and as optical filters to benefit from them in the manufacturing industry. 122. Photocells, reflective mirrors and anti-reflection.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Details include studying the history of thin films, knowing their types, methods of measuring their thickness, optical and structural properties, 26 hrs studying physical and chemical deposition processes, and various applications of thin films. 26 hrs
Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	Thin films are the most advanced technology in the manufacture of microelectronics and contribute significantly to the study of semiconductors (semiconductors). They are characterized by their small size, low costs, starting preparation and controlling the physical and chemical space.

Student Workload (SWL)			
الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	2, 5, 10	LO #1, 2, 6, and 10
	Assignments	3	10% (10)	2, 7, 12	LO # 3, 4, 6 and 11
	Projects /	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	9	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, History of Thin Films
Week 2	Types of thin films and their field of use, Thin-film interference
Week 3	Measure the thickness of thin films
Week 4	Optical properties of semiconductors
Week 5	Thin film applications, optical coatings. Optical Coatings, Photovoltaic, Semiconductor, Photo Electrochemical Cells (PEC), Photo Electrochemical Cells (PEC),
Week 6	Optoelectronics, Flat Panel Displays, Data Storage, Super Capacitor, Gas Sensors
Week 7	Thin film deposition processes, physical methods, Physical Vapor Deposition (PVD), Evaporation
Week 8	Technology Sputtering method, Ion plating
Week 9	Pulsed Laser Deposition Method
Week 10	chemical methods, Chemical Vapor Deposition, Chemical bath (immersion) deposition (precipitation by chemical reactions)
Week 11	Arrested Precipitation Technique, Anodic oxidation, Cathodic Deposition
Week 12	Thin-film characterization techniques, Optical Absorption, X- Ray Diffraction (XRD) Technique
Week 13	Study Raman Spectral
Week 14	Scanning Electron Microscopy (SEM), Energy Dispersive Analysis by X-Rays Measurement (EDS)

Week 15	Transport Properties, Atomic Force Microscopy (AFM)
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts		Yes
Recommended Texts	1. Thin Film Phenomena (K.L.Chopra) 2. Thin Film Deposition & Vacuum Technology by: stefen canon 3. 3. University Physics (Frederick Bosch)	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Physical Optics		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 36119		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester of Delivery	6
Administering Department	Physics. Dept.	College	College of science
Module Leader	Muwafaq Fadhil Jaddoa	e-mail	muwafaqfj@mu.edu.iq
Module Leader's Acad. Title	Assist. Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Phys 35015	Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	9. To develop problem solving skills and understanding of wave optics. 10. To understand light nature, waves superposition, light interference, diffraction and polarization. 11. This course deals with the basic concept of wave nature and propagation of light. 12. This is the basic subject for all interference experiments. 13. To understand Types of light diffraction and its applications. 14. To understand polarization of light and the polarizers and their types.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	9. Recognize how light behave as a particle and as a wave. 10. List the various theories of light nature in last centuries. 11. Summarize what is meant by waves in physics. 12. Discuss the properties and superposition of waves as an electromagnetic waves. 13. Describe the interference of light. 14. Explain Young's double slit experiment. 15. Identify the conditions of bright and dark fringes. 16. Discuss thin film interference and its types. 17. Explain the diffraction and its problems. 10- Explain the polarization of light and Its types and the problems and applications of polarization.
	<u>Part A – Waves</u> Travelling waves, Mathematics of waves, Amplitude, wavelength, frequency, wave equation, superposition of waves. [7 hrs] <u>Part B- Interference of light</u> Wave front, Types of wave front, Huygens Principle, constructive interference, destructive interference, Condition for interference of light, classification of interference, Young's double slit interference, Geometrical Solution, Analytical

	Solution, the intensity distribution of the light, Fresnel's Biprism, The Michelson Interferometer, Applications, The Fizeau Interferometer, Fabry-Perot Interferometer, Applications. [20 hrs] <u>Part C-Interference in Thin Films:</u> Division of Amplitude, Production of Colours in Thin Films, Interference from an Air Wedge, Newton's Rings -- A Variable Air Wedge, Calculation of Path Difference, Conditions for Constructive and Destructive Interferences, Circular Fringes, Central Dark Spot in Newton's Rings, Localized Fringes, Theory of Newton's Rings: Radius of the Bright and Dark Rings, Determination of the Wavelength of Light, Determination of the Radius Curvature of a Plano-Convex Lens, Determination of the Refractive Index of Transparent Liquid, Why the Diameter of the Newton's Rings Decreases if Liquid Medium is Taken in the Optical System . [20 hrs] <u>Part D – Diffraction of light</u> Diffraction theory, Fresnel diffraction, Fraunhofer diffraction, Difference between Interference and Diffraction, Diffraction from a Single Slit, . [8 hrs] <u>Part E – Polarization of Light</u> Introduction, Types of Polarization, Polarizers and polarizing beam splitters, Birefringence or Double refraction, Partially polarized light, Nicol Prism, Polarization of Light by Reflection, Polarization Based Scattering, Wave plates, Compensators, Fiber Loop Retarder. [20 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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	3	10% (10)	3, 5, 10	LO #1, 2, 5, 10 and 11
	Assignments	3	10% (10)	2, 7, 12	LO # 3, 4, 7 and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Waves, Travelling waves, Mathematics of waves
Week 2	Waves Amplitude, wavelength, frequency, wave equation, superposition of waves
Week 3	Interference of light, Wave front, Types of wave front, Huygens Principle, constructive interference, destructive interference, Condition for interference of light
Week 4	classification of interference, Young's double slit interference, Geometrical Solution
Week 5	Analytical Solution, the intensity distribution of the light, Fresnel's Biprism
Week 6	The Michelson, Interferometer, Applications
Week 7	The Fizeau Interferometer, Fabry-Perot Interferometer, Applications.
Week 8	Interference in Thin Films: Division of Amplitude, Production of Colours in Thin Films, Interference

	from an Air Wedge,
Week 9	Newton's Rings, A Variable Air Wedge, Calculation of Path Difference, Conditions for Constructive and Destructive Interferences, Circular Fringes
Week 10	Central Dark Spot in Newton's Rings, Localized Fringes, Theory of Newton's Rings: Radius of the Bright and Dark Rings, Determination of the Wavelength of Light a Plano-Convex Lens
Week 11	Determination of the Refractive Index of Transparent Liquid, Why the Diameter of the Newton's Rings Decreases if Liquid Medium is Taken in the Optical System
Week 12	Diffraction theory, Fresnel diffraction, Fraunhofer diffraction, Difference between Interference and Diffraction
Week 13	Diffraction from a Single Slit
Week 14	Introduction, Types of Polarization, Polarizers and polarizing beam splitters, Birefringence or Double refraction, Partially polarized light, Nicol Prism
Week 15	Polarization of Light by Reflection , Polarization Based Scattering, Wave plates, Compensators, Fiber Loop Retarder.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	تجربة حلقات نيوتن
Week 2	تجربة تحقيق قانون كوشي.
Week 3	تجربة قانون بروستر.
Week 4	تجربة دراسة ظاهرة الحيود وتعيين نمط وشدة الانتشار من الشق المفرد.
Week 5	تجربة دراسة ظاهرة الحيود وتعيين نمط وزاوية الحيود من الفتحة الدائرية.
Week 6	تجربة دراسة ظاهرة التداخل وتعيين نمط الانتشار من سلك مفرد.
Week 7	تجربة تعيين معاملات الامتصاص الضوئي للمواد البصرية.
Week 8	تجربة تعيين ظواهر الانعكاسية والنفاذية والامتصاصية للمواد البصرية.
Week 9	تجربة تحقيق قانون مالس في الاستقطاب.
Week 10	تجربة تعيين سمك الدوارق الزجاجية بطريقة بصرية.

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Fundamentals of Optics, Francis Arthur Jenkins and Harvy E. White, McGraw-Hill Education	Yes
Recommended Texts		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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Geometrical Optics		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 35015		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level		3	
Administering Department		Type Dept. Code	College
Module Leader		Rasha A. Hussein	e-mail
Module Leader's Acad. Title		Assist Professor	Module Leader's Qualification
Module Tutor		Name (if available)	e-mail
Peer Reviewer Name		Name	e-mail
Scientific Committee Approval Date		10/06/2023	Version Number
			1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	93. Enable students to understand the principle of operation of the main optical instruments. 94. Make use of these principles and their applications in everyday life. 95. The main skills that the course aims to transmit are:- be able to use the fundamental physical laws of geometric optics to understand the reflection and refraction of light and its possible applications in optical technologies.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completion of this course, students should understand the physical principles underlying geometrical optics, especially the relationship between rays, wavefronts and electromagnetic waves. They should understand how light propagates through “most” optical systems. So by the end of the course, they should be able to: 1. Distinguish between light rays and light waves. 2. State the law of reflection and show with appropriate drawings how it applies to light rays at plane and spherical surfaces. 3. State Snell’s law of refraction and show with appropriate drawings how it applies to light rays at plane and spherical surfaces. 4. Define index of refraction and give typical values for glass, water, and air. 5. Calculate the critical angle of incidence for the interface between two optical media and describe the process of total internal reflection. 6. Describe how total internal reflection can be used to redirect light in prisms and trap light in fibers. 7. Describe dispersion of light and show how a prism disperses white light. 8. Calculate the minimum angle of deviation for a prism and show how this angle can be used to determine the refractive index of a prism material. 9. Describe what is meant by Gaussian or paraxial optics. 10. Describe the relationship between collimated light and the focal points of convex and concave mirrors. 11. Use ray-tracing techniques to locate the images formed by plane and spherical mirrors. 12. Use the mirror equations to determine location, size, orientation, and nature of images formed with spherical mirrors. 13. Distinguish between a thin lens and a thick lens. 14. Describe the shapes of three typical converging (positive) thin lenses and three typical diverging (negative) thin lenses. 15. Describe the f-number and numerical aperture for a lens and explain how they control image brightness. 16. Use ray-tracing techniques to locate images formed by thin lenses. 17. Describe the relationship between collimated light and the focal points of a thin lens. 18. Use the lens maker’s equation to determine the focal length of a thin lens. 19. Use the thin-lens equations to determine location, size, orientation, and nature of the images formed by simple lenses.
Indicative Contents	Indicative content includes the following.

The reflection of light:

- transparent, translucent and opaque materials
- specular and diffusive reflection
- Reflection on flat mirrors
- Law of refraction starting from the Huygens principle
- Law of refraction starting from the optical beam
- Fermat's principle
- real and virtual images
- reflection of point sources and extended sources; 9 hrs

Reflection on spherical mirrors:

- equations of the spherical mirror
- spherical aberration (stigmatic, achromatic, orthoscopic optical system)
- Equation of the mirror in Gauss optics
- Reflections on mirrors of extended bodies: magnification
- Convex mirror and concave mirror
- Real and virtual images; 9 hrs

Refraction on a flat surface:

- Snell's law
- Construction by refracted wave front using the Huygens principle
- Construction by refracted optical beam
- Fermat's principle for refraction
- Flat diopter
- Refraction of a spherical wave on a flat diopter
- Refraction of an optical beam on a flat diopter
- Image of a body extended over a flat diopter: transverse magnification; 9 hrs

Optical Prism:

- Optical prism
- Prismatic deviation angle
- Angle of minimum deviation
- Optical dispersion
- Abbe number
- Prismatic power
- Applications of optical dispersion
- Limit angle, total reflection
- Applications of total reflection; 8 hrs

Spherical diopter:

- Conventions for the spherical diopter
- Refraction on a spherical surface
- Equation of the spherical diopter in Gauss optics
- focal points and focal distances

	-focal plane -Refractive power of the diopter -Refraction of extended sources -Transverse magnification -Angular magnification; 8 hrs Thin lenses: -Refraction through a thin lens -Points and planes -Nodal Points and Optical Center -Lens maker's formula -Gaussian equation of thin lenses -Newtonian equation of thin lenses -Transverse magnification -Longitudinal magnification; 8 hrs Thick lenses: -Focal distance -Effective power and nominal power -Frontal power -Analytical research of the principal planes -Power of a thick lens immersed in heterogeneous transparent media -Magnification; 8 hrs Combination of lenses -Effective power -Frontal power -Method of successive lenses -Method of principal planes -Convergence and divergence of a thin lens system; 8 hrs Optical aberrations: -Aberrations to the third order -Spherical aberration of a diopter -Spherical aberration of a thin lens -Astigmatism -Chromatic aberration; 8 hrs
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The course is divided into lectures trying to stimulate students' response and interest. The student is encouraged to develop a "curiosity-driven" approach to this discipline. The exam includes a written test where in some questions the student's knowledge of the theory and his/her ability to solve simple exercises are explored. At the student's discretion, the writing can be supplemented by an oral interview. The purpose of the interview is to verify the degree of understanding and mastery of the topics requested by the teacher.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	5
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	3	10% (10)	3, 5, 10	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	2, 7, 12	LO # 3, 4, 7 and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Light nature, Laws of geometrical optics (transmission law, Reflection law, Refraction law)
Week 2	Fermat's principle, optical path, critical angle
Week 3	Total internal reflection, principle of reversibility
Week 4	Refraction by prism, minimum deviation, thin prism, color dispersion, images formed by paraxial rays
Week 5	Spherical surfaces, focal points, focal lengths, image formation, virtual images, conjugate points and planes,
Week 6	Convention of signs, magnification, derivation of the Gaussian formula
Week 7	Mid-term Exam
Week 8	Thin Lenses, image formation, conjugate points and planes, the oblique-ray method, image formation at concave and convex lenses
Week 9	Lateral magnification, lens makers' formula, the power of a thin lens, thin lenses in contact, derivation of the lens formula
Week 10	Mirrors, focal point and focal length, mirror formulas, power of mirrors, spherical aberration, astigmatism, thick mirrors, thick-mirror formulas
Week 11	Optical instruments, the human eye
Week 12	Simple harmonic motion, the theory of simple harmonic motion
Week 13	Cameras and photographic objectives, speed of lenses, meniscus lenses, symmetrical lenses, telephoto lenses
Week 14	Wave equations
Week 15	The superposition of waves, addition of waves
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	تجربة معامل انكسار مادة الموشور
Week 2	تعيين قدرتي التفريق والتحليل للموشور
Week 3	تجربة معامل الانكسار بطريقة الأبعاد الحقيقية والظاهرية
Week 4	تجربة تحقيق قوانين الانعكاس
Week 5	تجربة تحقيق قانون سنيل في الانكسار
Week 6	تجربة البعد البؤري للعدسات اللامّة والمفرقة
Week 7	تجربة تعيين أنصاف تكور العدسات المختلفة
Week 8	تجربة البعد البؤري للمرايا المحدبة والمقعرة
Week 9	دراسة ظاهرة الاستجابة الطيفية للخلايا الشمسية
Week 10	تجربة تحقيق قانون التوزيع العكسي للفوتونات الضوئية باستعمال الخلايا الكهروضوئية
Week 11	تجربة تحقيق ظاهرة الانعكاس الداخلي الكلي وتحديد الزوايا الحرجة للمواد البصرية
Week 12	تجربة تعيين سرعة الضوء في الأوساط المختلف

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	F. A. Jenkins and H. E. White, Fundamentals of Optics	No
Recommended Texts	Eugene Hecht, Optics (fourth edition)	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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Numerical analysis		Module Delivery
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	COS 3607		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester of Delivery	
Administering Department	Physics. Dept.	College	College of science
Module Leader	Thill Akeel Kadhum Almusawi	e-mail	thillakeel@mu.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. The objectives of studying this module are to make the students familiarise with the ways of solving complicated mathematical problems numerically. 2. To help you become familiar with MATLAB and other convenient numerical software such as Microsoft Excel and with simple programming. 3. Obtaining numerical solutions to problems of mathematics. 4. Describing and understanding of the several errors and approximation in numerical methods. 5. The understanding of several available Solutions of Equations in One Variable. 6. The explaining and understanding of the several available methods to Solve the simultaneous equations. 7. The studying of Curve Fitting and Interpolation.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Describe how errors arise in computations. 2. Solve simple non-linear equations by root-finding techniques. 3. Calculate the interpolating polynomial through discrete data points. 4. Derive and use quadrature formulae based on integration of polynomial interpolates. 5. Write down suitable numerical schemes for solving first order ordinary differential equations. 6. Solve linear systems of algebraic equations using Gaussian elimination. 7. Implement numerical algorithms computationally and interpret the results of programs. 8. understand some of the practical issues associated with mathematical programming.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction to numerical analysis, detection of errors and identification of their sources and analysis, errors resulting from arithmetic operations, 25 hrs calculating initial approximations to the roots of equations, half-interval method, false position method, Newton-Raphson method, solutions to ordinary differential equations, 25 hrs Taylor method, Euler method, Euler method Developed (initialization and correction method), Range-Kota method, Trapezoidal method. 25 hrs

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main objective of this paper is to propose a didactic framework for teaching numerical analysis in higher education. After describing the structure of the framework, several applications of inquiry-based learning in teaching numerical analysis and optimization are provided to illustrate the potential of the proposed framework. The framework is based of two pillars, each characterized by the use of a particular cognitive tool: Algorithm for presenting a list of steps to follow in order to solve a problem and MATLAB software for computer programming. Introducing these cognitive tools to the design of the proposed didactic framework provides considerable potential of knowledge consolidation with reference to solving complex numerical problems using efficient algorithms.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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	3	10% (10)	3, 5, 10	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	2, 7, 12	LO # 3, 4, 6 and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	3 hr	10% (10)	9	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to numerical analysis.
Week 2	Types of errors, Round off errors, Truncations errors, initial errors.
Week 3	Solution of nonlinear equations,
Week 4	Bisection method.
Week 5	False position method.
Week 6	Newton– Raphson method.
Week 7	The secant method.
Week 8	Solution of differential equations,
Week 9	Explicit Euler's differential equation.
Week 10	Modified Euler's Differential equation.
Week 11	Runge – Kutta method.
Week 12	Numerical Integration.
Week 13	Rectangular method.
Week 14	Trapezium method.
Week 15	Simpson's method.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Drawing of linear functions by MATLAB.
Week 2	Lab 2: Drawing of Trigonometric Functions by MATLAB.
Week 3	Lab 3: Find the roots of equations by MATLAB.
Week 4	Lab 4: Algorithm a program of bisection method by MATLAB
Week 5	Lab 5: Algorithm a program of false position method by MATLAB
Week 6	Lab 6: Algorithm a program of Newton-Raphson method by MATLAB
Week 7	Lab 7: Algorithm a program of Newton-Raphson method by MATLAB

Week 7	Lab 8: Solving the differential equation by MATLAB.
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Learning and Teaching Resources				
مصادر التعلم والتدريس				
	Text			Available in the Library?
Required Texts	Introduction to Numerical analysis مقدمة في التحليل العددي تأليف: د. علي محمد سيفي و د. ابتسام كمال الدين			Yes
Recommended Texts	Numerical analysis التحليل العددي تأليف: د. أبو بكر احمد			Yes
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
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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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Mathematics IV		Module Delivery
Module Type	B		☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar
Module Code	COS 3515		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester of Delivery	5
Administering Department	physics	College	Science
Module Leader	Mousa Makey	e-mail	mmkrady@mu.edu.iq
Module Leader's Acad. Title	Assit. Prof.	Module Leader's Qualification	Ms.C.
Module Tutor	Mousa Makey	e-mail	
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	COS 2314	Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	96. Students learn the concept of The Basic principles of ordinary differential equations and its applications. 97. This course deals with the basic concept of Solution of special kind of ordinary differential equations with variable coefficients. 98. This is the basic subject for Power series to solve ordinary differential equations .
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	123. The student should have sufficient knowledge about ordinary differential equations and its applications. 124. Everything the student can be transformed from one form to another equivalent to the original form. 125. Summarize the topic is supported by detailed examples. 126. Questions and answers, discussion and daily exams. 127. Assign the student to solve daily questions and ask new questions and discuss with the students. 128. Daily discussion and exams.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • The Basic principles of ordinary differential equations; 15 hrs • 1st – order ordinary differential equations; 15 hrs • Nth -order ordinary differential equations ; 15 hrs • Solution of special kind of ordinary differential equations with variable coefficients ; 15 hrs

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
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 (مخرجات التعلم ذات الصلة)
Formative assessment	Quizzes	3	10% (10)	3, 5, 10	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	2, 7, 12	LO # 3, 4, 6 and 10
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	8	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	The Basic principles of ordinary differential equations
Week 2	Definition of ordinary differential equations ,the order and degree of ordinary differential equations , linear and non - linear ordinary differential equation(classification).
Week 3	the solution of ordinary differential equation, the general and special solution of ordinary differential equation.
Week 4	The first order ordinary differential equation and methods of solution, the standard forms of first order ordinary differential equation, classification of ordinary differential equation,

Week 5	separable first order ordinary differential equation
Week 6	homogeneous differential equation with examples
Week 7	,Exact differential equation with examples
Week 8	Linear differential equations and non Linear differential equations
Week 9	Equations Reducible to Linear form(Bernoulli Equation)
Week 10	Linear differential equations of second order with constant coefficients
Week 11	Linear independence and dependence with examples, Wronskian's Determinant
Week 12	Homogeneous equations with constant coefficients
Week 13	Complex roots
Week 14	The nonhomogeneous problems
Week 15	General method of finding the particular integral of any function $f(x)$
Week 16	Application various examples (Mechanical vibrations, forced vibrations ,and electrical networks)

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Introduction to Differential Equations Jeffrey R. Chasnov / 2009	Yes
Recommended Texts	طرق حل المعادلات التفاضلية/خالد احمد السامرائي و يحيى عبد سعيد	Yes
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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Medical Physics		Module Delivery
Module Type	E		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 3602		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	3	Semester of Delivery	6
Administering Department	Physics. Dept.	College	College of science
Module Leader	Ahmed Almurshedi	e-mail	fhahmed2@mu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. To define an introduction to medical physics. 2. To explain the effect of forces on and in the body such as static, dynamic and friction. 3. To understand the method of heat loss and gain in the body 4. To understand the different types of pressure in the human body. 5. To differentiate between difference sources of Electricity in the body. 6. To have an idea of the bio potentials recorded from the vody such as ECG. 7. To have an idea about physics of ear (sound) and physics of eye (vision). 8. To understand of uses of electromagnetic radiation in the diagnosis and treatment. 9. To learn various topics in medical physics such as x-ray & nuclear medicine .. etc. 10. To understand the anatomical coordinate system of the body and relate it to the x,y,z coordinates.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	129. Apply expert theoretical knowledge and an integrated understanding across all areas of medical physics. 130. Knowledge on working principle of internal organs of human body. 131. Have an idea on wide range of medical instruments used in the diagnosis and its physics working principle. 132. Knowledge of the normal structure and function of the body and its major organ systems with emphasis on content applicable to clinical diagnostic imaging and/or radiation oncology. 133. Knowledge of radiation and radioactivity, its properties, units of measure, dosimetry measurement concepts and methods. 134. Knowledge of the radiation safety practices and procedures including the determination of radiation shielding requirements. 135. Learn how different external physical factors such as ionizing radiation, electrical and magnetic fields and thermal effects influence biological

	systems. 136. Learn the basic concept of image-based medical diagnostics, radiation physics, radiation technology, radiation therapy for cancer.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Terminology and Measurements – definition of medical physics, scope of medical physics, coordinate system, units in medical physics. [3 hrs] Force - Force on and in the body, static and dynamic force, frictional force, normal walking. [3 hrs] Energy – Energy, Work and Power of the Body, Metabolic rate, Glucose, food energy met and calories. [3 hrs] Heat - Heat and cold in medicine, heat lost from body, method of heat transfer, conduction, evaporation, perspiration. [3 hrs] Pressure in the body – Blood pressure, how to measure BP pressure inside the skull, eye pressure. [3 hrs] Bio Potentials - Electricity in human body, Electrocardiogram, electroencephalogram, electromyogram, electrooculogram, electroratinogram. [3 hrs] Physics of hearing and ear – sound wave, audible sound, function of ear, anatomy of ear, hearing aids. [3 hrs] Physics of eye and vision – anatomy of eye, refractive index of eye, glaucoma, trachoma, near and far sighted vision, astigmatism. [3 hrs] x-ray in medicine – generation of x-ray, used of x-ray in diagnosis, stale picture x-ray, CT scan, Angography, contious picture x-ray. [3 hrs] Nuclear medicine – radioactivity, use of radio active isotope in cancer treatment, gamma Knife, Positron emission tomography (PET). [3 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
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	3	10% (10)	2, 5, 10	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	2, 6, 12	LO # 3, 4, 6 and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	9	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المناهج الاسبوعي النظري	
	Material Covered
Week 1	Terminology and Measurements
Week 2	Force on and in the body
Week 3	Energy, Work and Power of the Body
Week 4	Heat and cold in medicine
Week 5	Pressure in the body
Week 6	Physics of cardiovascular system
Week 7	Electricity in human body
Week 8	Bio Potentials
Week 9	Sound in medicine
Week 10	Physics of hearing and ear
Week 11	Physics of eye and vision
Week 12	Light and UV in medicine
Week 13	x-ray in medicine
Week 14	Radiation in physics
Week 15	Nuclear medicine
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Medical Physics by John R. Cameron, International Publication.	No
Recommended Texts	Elements of Biophysics Randall 1998	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	Quantum Mechanics I		Module Delivery	
Module Type	تترك للقسم يقوم بكتابتها		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	Phys 35017			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	3	Semester of Delivery	5	

Administering Department	Physics. Dept.	College	College of science
Module Leader	Hadey K. Mohamad	e-mail	hadey.mohamad@mu.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	99. To develop problem solving skills and understanding of Quantum theory through the application of techniques. 100. To understand the wave function, linear operator and Schrödinger equation from given applications. 101. This course deals with the basic concepts of the Quantum theory. 102. To understand the simple harmonic oscillator problem. 103. To perform Reflection and Transmission Coefficients.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	137. Recognize how the linear operator works on the wave function. 138. Recognize how the wave function becomes an Eigen or not one, so one may evaluate the Eigen value and Eigen function, respectively. 139. Summarize what is meant by an admissible wave function, and Hermitian operator. 140. Solve the time-independent Schrödinger wave equation in one-

	dimensional case. 141. Solve the time-independent Schrödinger wave equation in two-dimensional case. 142. Solve the time-independent Schrödinger wave equation in three-dimensional case. 143. Study the important applications in solving the time-independent Schrödinger wave equation in one-dimensional case. 144. solve the time-independent Schrödinger wave equation for the simple harmonic oscillator problem. 145. Obtain the wave functions of the simple harmonic oscillator for all energy levels.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Linear operator</u> Definition of linear operator, Formulation of the linear operator, Evaluation of the Eigen values and Eigen functions, Commutative operators, Hermitian operators [15 hrs] <u>Part B – Schrödinger equation and its applications</u> Formulation of Schrödinger equation in one, two, and 3-dimensional cases, Free particle, particle in a box, step potential problem, Transmission and Reflection Coefficients [15 hrs] <u>Part C – Linear Harmonic Oscillator Problem</u> Schrödinger Equation Solution of Harmonic Oscillator Model, Calculation of Wave Functions for Harmonic Oscillator Model [15 hrs] <u>Part D – Bloch Theorem</u> Bloch function, Bloch electrons, Kronig-Penny model[15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The interactive teaching and learning strategies. The strategies aim to promote critical and reflective thinking, research and evaluation skills that will help students to take positive action to protect, enhance and advocate for their own and other's health, wellbeing and safety. Students use personal and social capability to work collaboratively with others in learning activities, to appreciate their own strengths and abilities and those of their peers and develop a range of interpersonal skills such as communication, negotiation, team work, leadership and an appreciation of

	diverse perspectives.
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Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	2, 6, 11	LO #1, 2, 6 and 10
	Assignments	3	10% (10)	2, 7, 12	LO # 3, 4, 6 ,7and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	10	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	Wave-Particle Property: Duality Property

Week 2	Wave function and Probability Density
Week 3	Operators and Eigenvalues Equation
Week 4	Hermitian Operators, Expectation Values
Week 5	Uncertainty Relations, Applications
Week 6	Schrödinger Wave Equation
Week 7	Formulation of Schrödinger Equation in one, two and 3-dimensional Cases
Week 8	Applications, Free Particle
Week 9	Particle in a Box(Infinite Potential Box)
Week 10	Step potential problem
Week 11	Transmission and Reflection Coefficients
Week 12	Linear Harmonic Oscillator Problem
Week 13	Schrödinger Equation Solution of Harmonic Oscillator Model
Week 14	Calculation of Wave Functions for Harmonic Oscillator Model
Week 15	Bloch Theorem

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Quantum Mechanics, Davydov, 2 nd Edition 1976	No
Recommended Texts	أساسيات ميكانيك الكم د.سالم الشماع د.أمجد عبد الرزاق كرجيه جامعة الموصل 1988	Yes
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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	Quantum Mechanics II	Module Delivery
Module Type	C	☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 36121	
ECTS Credits	5	
SWL (hr/sem)	125	

Module Level	3	Semester of Delivery	6
Administering Department	Physics Dept.	College	College of science
Module Leader	Hadey K. Mohamad	e-mail	hadey.mohamad@mu.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	10/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Phys 35017	Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	104. To develop problem solving skills and understanding of Quantum theory through the application of techniques. 105. To understand the orbital angular momenta operators and time-dependent Schrödinger equation from given applications. 106. This course deals with advanced concepts of the Quantum theory. 107. To understand the Schrödinger equation of Hydrogen atom. 108. To perform some of approximate methods in Quantum Mechanics.
Module Learning Outcomes مخرجات التعلم للمادة	146. Recognize how the orbital angular momenta operators work on the wave function. 147. Solve the time-dependent Schrödinger wave equation. 148. Study the given applications in solving the time-dependent Schrödinger wave equation.

الدراسية	149. solve the time-independent Schrödinger wave equation for the Hydrogen atom. 150. Evaluate the radial wave function of the electron in Hydrogen atom. 151. Evaluate the spherical harmonic function of the electron in Hydrogen atom. 152. Evaluate the total wave function of the electron in Hydrogen atom. 153. Evaluate the approximated wave function and the approximated energy value of the electron in Hydrogen atom.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – orbital angular momenta operators</u> Definition of orbital angular momenta operators, Commutative operators, time-dependent Schrödinger equation, [20 hrs] <u>Part B – The Schrödinger equation of Hydrogen atom</u> Schrödinger Equation Solutions in terms of Spherical Coordinates, Radial Schrödinger Equation of H. Atom, Spherical Harmonics, Applications, [20 hrs] <u>Part C – approximate methods in Quantum Mechanics</u> Approximate Methods, Variational Method, Perturbation Method in Solving Schrödinger Wave Equation, Solved Problems [20 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The interactive teaching and learning strategies. The strategies aim to promote critical and reflective thinking, research and evaluation skills that will help students to take positive action to protect, enhance and advocate for their own and other's health, wellbeing and safety. Students use personal and social capability to work collaboratively with others in learning activities, to appreciate their own strengths and abilities and those of their peers and develop a range of interpersonal skills such as communication, negotiation, team work, leadership and an appreciation of diverse perspectives.

Student Workload (SWL)

الحمل الدراسي للطلاب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	3, 5, 10	LO #1, 2, 9 and 11
	Assignments	3	10% (10)	2, 8, 12	LO # 3, 4, 6 and 10
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	10	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	Time-Dependent Schrödinger Equation
Week 2	Ehrenfest Theorem,
Week 3	Applications
Week 4	Angular Momentum Operators in terms of Cartesian Coordinates
Week 5	Commutation Relations of Angular Momentum Operators,
Week 6	Orbital Angular Momentum Operators in terms of Spherical Coordinates
Week 7	Dirac Representation, Applications
Week 8	Spherical Symmetry of Systems, Hydrogen Atom

Week 9	Schrödinger Equation Solutions in terms of Spherical Coordinates
Week 10	Radial Schrödinger Equation of H. Atom
Week 11	Spherical Harmonics, Applications
Week 12	Evaluation of total wave functions for H. atom, Applications
Week 13	Approximate Methods, Variational Method
Week 14	Perturbation Method in Solving Schrödinger Wave Equation
Week 15	Solved Problems

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Quantum Mechanics, Davydov, 2 nd Edition 1976	No
Recommended Texts	أساسيات ميكانيك الكم د. سالم الشماع د. أمجد عبد الرزاق كرجيه جامعة الموصل 1988	Yes
Websites		

Grading Scheme				
مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
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	C - Good	جيد	70 - 79	Sound work with notable errors
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	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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Materials Science		Module Delivery
Module Type	C		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	Phys 36022		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	3	Semester of Delivery	6
Administering Department	Physics. Dept.	College	College of science
Module Leader	Akeel Shaker Tuhaiwer	e-mail	Akeel.Almusawi@mu.edu.iq
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	Master
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	109. To predict and control material properties through an understanding of atomic, molecular, crystalline, and microscopic structures of engineering materials. 110. To ensure that the right materials are available at the right time and in the right quantities, to support the production process and meet customer demand. 111.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	154. The development of many modern technology systems, such as nuclear power plants, fast jet planes and spacecraft, 155. As well as computer and communication systems of all kinds, it led to a feeling of the importance of basic manufacturing materials as a primary choice for any manufacturing or engineering development, in addition to searching for new materials and alternatives to the materials currently used. 156. The optimal use of materials can only be achieved through a deep understanding of their mechanical, physical and chemical properties, their crystal structures and their influence on surrounding factors. 157. Remember and understand the meaning of materials science. 158. Description of crystal planes by Miller evidence. 159. Definition and comparison between amorphous and crystalline matter. 160. Crystal structure of some simple crystals.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Materials science, classification of materials, crystal structure, crystal structure, crystal symmetry, unit cell, crystal systems, Miller coefficients, plastic materials, composite materials, ceramic materials, magnetic materials,; 25 hsr structural properties of materials, optical properties of materials, mechanical properties of materials, electrical properties of materials; 20 hrs

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching students the most important basic concepts, principles, laws and scientific

	theories of materials science so that the student has the scientific skills that enable him to perform his professional, practical and other tasks.
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Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	2, 5, 10	LO #1, 2, 5, 10 and 11
	Assignments	3	10% (10)	2, 8, 12	LO # 3, 4, 6, 8 and 11
	Projects /	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	8	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري	
	Material Covered
Week 1	Introduction, classification of materials, concepts of classification of materials, metallic materials, non-metallic materials
Week 2	Crystal structure of materials, types of atomic bonds, crystallization of materials, structure

	of crystals, crystal levels
Week 3	Extended regularity and limited regularity, crystalline state, basis vectors, crystal lattice
Week 4	Elements of symmetry in crystals
Week 5	Unit cell, primary and non-primary cells, reticulum variables of the unit cell
Week 6	The seven crystal systems
Week 7	Miller's indices, Miller's indices for crystal planes, Miller's indices for the hexagonal family
Week 8	Types of plastics, polymerization reactions, types of polymer chains, physical properties of thermoplastics, manufacturing of plastics, types of thermoplastics
Week 9	Classification of composite materials, reinforcement systems of composite materials, reinforcing materials, properties of components of composite materials, mechanical properties of composite materials, manufacturing of composite materials
Week 10	Types of ceramics, crystal structure of ceramic materials, manufacturing processes, heat treatment, mechanical properties of ceramics, physical, electrical and chemical properties
Week 11	Types of magnetic materials, their characteristics and properties
Week 12	Explain the structural properties of materials
Week 13	Absorption, reflectivity and some other optical properties
Week 14	Characteristics and mechanical properties of materials
Week 15	Electrical properties of materials in general
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Solid State Physics Part One , by Dr. Moayad Gabriel Youssef Solid State Physics Part Two , by Dr. Moayad Gabriel Youssef	Yes
Recommended Texts	Fundamentals of Materials Engineering, by Dr. Issa Masoud Baghani Solid State Physics Part One , by Dr. Yousry Mustafa Solid State Physics Part Two , by Dr. Yousry Mustafa	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Electrical Circuits		Module Delivery	
Module Type	تترك للقسم يقوم بكتابتها		☒Theory ☒Lecture ☒Lab ☐Tutorial ☐Practical ☐Seminar	
Module Code	تترك للقسم يقوم بكتابتها			
ECTS Credits	تترك للقسم يقوم بكتابتها			
SWL (hr/sem)	تترك للقسم يقوم بكتابتها			
Module Level	3	Semester of Delivery	1	

Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Rasha A. Hussein	e-mail	rasha.lasereng@mu.edu.iq
Module Leader's Acad. Title	Assist Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	تترك للقسم يقوم بكتابتها	Semester	
Co-requisites module	تترك للقسم يقوم بكتابتها	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	112. Enable students to understand the principle of operation of the main optical instruments. 113. Make use of these principles and their applications in everyday life. 114. The main skills that the course aims to transmit are:- be able to use the fundamental physical laws of geometric optics to understand the reflection and refraction of light and its possible applications in optical technologies.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completion of this course, students should understand the physical principles underlying geometrical optics, especially the relationship between rays, wavefronts and electromagnetic waves. They should understand how light propagates through "most" optical systems. So by the end of the course, they should be able to: 1. Distinguish between light rays and light waves. 2. State the law of reflection and show with appropriate drawings how it applies to light rays at plane and spherical surfaces. 3. State Snell's law of refraction and show with appropriate drawings how it applies to light rays at plane and spherical surfaces. 4. Define index of refraction and give typical values for glass, water, and air. 5. Calculate the critical angle of incidence for the interface between two optical

	media and describe the process of total internal reflection. 6. Describe how total internal reflection can be used to redirect light in prisms and trap light in fibers. 7. Describe dispersion of light and show how a prism disperses white light. 8. Calculate the minimum angle of deviation for a prism and show how this angle can be used to determine the refractive index of a prism material. 9. Describe what is meant by Gaussian or paraxial optics. 10. Describe the relationship between collimated light and the focal points of convex and concave mirrors. 11. Use ray-tracing techniques to locate the images formed by plane and spherical mirrors. 12. Use the mirror equations to determine location, size, orientation, and nature of images formed with spherical mirrors. 13. Distinguish between a thin lens and a thick lens. 14. Describe the shapes of three typical converging (positive) thin lenses and three typical diverging (negative) thin lenses. 15. Describe the f-number and numerical aperture for a lens and explain how they control image brightness. 16. Use ray-tracing techniques to locate images formed by thin lenses. 17. Describe the relationship between collimated light and the focal points of a thin lens. 18. Use the lens maker's equation to determine the focal length of a thin lens. 19. Use the thin-lens equations to determine location, size, orientation, and nature of the images formed by simple lenses.
Indicative Contents المحتويات الإرشادية	<i>Indicative content includes the following.</i> The reflection of light: -transparent, translucent and opaque materials -specular and diffusive reflection -Reflection on flat mirrors -Law of refraction starting from the Huygens principle -Law of refraction starting from the optical beam -Fermat's principle -real and virtual images -reflection of point sources and extended sources Reflection on spherical mirrors: -equations of the spherical mirror -spherical aberration (stigmatic, achromatic, orthoscopic optical system) -Equation of the mirror in Gauss optics -Reflections on mirrors of extended bodies: magnification -Convex mirror and concave mirror -Real and virtual images Refraction on a flat surface: -Snell's law

	-Construction by refracted wave front using the Huygens principle -Construction by refracted optical beam -Fermat's principle for refraction -Flat diopter -Refraction of a spherical wave on a flat diopter -Refraction of an optical beam on a flat diopter -Image of a body extended over a flat diopter: transverse magnification Optical Prism: -Optical prism -Prismatic deviation angle -Angle of minimum deviation -Optical dispersion -Abbe number -Prismatic power -Applications of optical dispersion -Limit angle, total reflection -Applications of total reflection Spherical diopter: -Conventions for the spherical diopter -Refraction on a spherical surface -Equation of the spherical diopter in Gauss optics -focal points and focal distances -focal plane -Refractive power of the diopter -Refraction of extended sources -Transverse magnification -Angular magnification Thin lenses: -Refraction through a thin lens -Points and planes -Nodal Points and Optical Center -Lens maker's formula -Gaussian equation of thin lenses -Newtonian equation of thin lenses -Transverse magnification -Longitudinal magnification Thick lenses: -Focal distance -Effective power and nominal power -Frontal power
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	-Analytical research of the principal planes -Power of a thick lens immersed in heterogeneous transparent media -Magnification Combination of lenses -Effective power -Frontal power -Method of successive lenses -Method of principal planes -Convergence and divergence of a thin lens system Optical aberrations: -Aberrations to the third order -Spherical aberration of a diopter -Spherical aberration of a thin lens -Astigmatism -Chromatic aberration
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The course is divided into lectures trying to stimulate students' response and interest. The student is encouraged to develop a "curiosity-driven" approach to this discipline. The exam includes a written test where in some questions the student's knowledge of the theory and his/her ability to solve simple exercises are explored. At the student's discretion, the writing can be supplemented by an oral interview. The purpose of the interview is to verify the degree of understanding and mastery of the topics requested by the teacher.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	ترك للقسم يقوم بكتابتها	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	ترك للقسم يقوم بكتابتها

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	ترك للقسم يقوم بكتابتها	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	ترك للقسم يقوم بكتابتها
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	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Light nature, Laws of geometrical optics (transmission law, Reflection law, Refraction law)
Week 2	Fermat's principle, optical path, critical angle
Week 3	Total internal reflection, principle of reversibility
Week 4	Refraction by prism, minimum deviation, thin prism, color dispersion, images formed by paraxial rays
Week 5	Spherical surfaces, focal points, focal lengths, image formation, virtual images, conjugate points and planes,
Week 6	Convention of signs, magnification, derivation of the Gaussian formula
Week 7	Mid-term Exam
Week 8	Thin Lenses, image formation, conjugate points and planes, the oblique-ray method, image formation at concave and convex lenses
Week 9	Lateral magnification, lens makers' formula, the power of a thin lens, thin lenses in contact, derivation of the lens formula

Week 10	Mirrors, focal point and focal length, mirror formulas, power of mirrors, spherical aberration, astigmatism, thick mirrors, thick-mirror formulas
Week 11	Optical instruments, the human eye
Week 12	Simple harmonic motion, the theory of simple harmonic motion
Week 13	Cameras and photographic objectives, speed of lenses, meniscus lenses, symmetrical lenses, telephoto lenses
Week 14	Wave equations
Week 15	The superposition of waves, addition of waves
Week 16	Preparatory week before the 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	F. A. Jenkins and H. E. White, Fundamentals of Optics	No
Recommended Texts	Eugene Hecht, Optics (fourth edition)	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
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	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
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	F – Fail	راسب	(0-44)	Considerable amount of work required
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Module

Code	Course/Module Title	ECTS	Semester
	Academic English		
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
Description			
Geometric optics is the study of light in its simplest form by treating light as rays. Light rays travel in straight lines until they encounter an interface (such as a mirror or a lens) where they may be redirected by reflection and refraction. This course describes the physical principles that determine how rays behave at various interfaces. These principles are then used to model simple optical systems with varying degrees of fidelity. Natural optical phenomena (rainbows, mirages, total-internal reflection, etc.) and classic optical systems (prisms, telescopes, cameras, etc.) will be analyzed throughout the course. Linear systems will be introduced to analyze more complex optical systems.			