Academic Program Description Form

University Name: Al Nahrain University

Faculty/Institute: College .of Science

Scientific Department: Physics

Academic or Professional Program Name: B.Sc in Physics

Final Certificate Name: B.Sc

Academic System: Semester

Description Preparation Date: 2025–2026

File Completion Date: 2025\11\3

Signature: Saael N - Abood

Head of Department Name:

Prof.Dr Saad Naji Abood

Date: 2025/11/

Signature:

Scientific Associate Name: Manaf Adnan Saleh

Date: 3/ 11/ 2025

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date:

Signature:

Ministry of Higher Education and Scientific Research
Republic of Iraq
Al-Nahrain University / College of Science
Dean's office

Approval of the Dean

Prof.-Dr. Asmaa H. Mohammad

1. Program Vision

The student's ability to understand and apply a variety of physical, and acquire the ability to explain and understand many of the physical processes.

2. Program Mission

Qualifying students practically and scientifically through an intensive scientific curriculum of teaching and learning methods and preparing the student in an academic way that is compatible with the necessities of scientific development. Preparing distinguished students in the field of scientific research who hold graduate studies.

3. Program Objectives

Increasing the efficiency of students and raising their level of knowledge so that they are qualified to work in various state departments so that they can be effective and distinguished elements in their fields of work and scientific research.

4. Program Accreditation

Does the program have program accreditation? And from which agency?

From the Association of Arab Universities

5. Other external influences

Is there a sponsor for the program?

Ministry of Higher Education and Scientific Research

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	2		100	

College Requirements	2		100	
Department Requirements	2		100	
Summer Training	–		–	
Other				

* ممكن ان تتضمن الملاحظات فيما اذا كان المقرر أساسي او اختياري .

7. Program Description

Credit Hours		Course Name	Course Code	Year/Level
practical	theoretical			B.Sc
	2	Electricity	PHY	الاولى
	2	Calculus	PHY	الاولى
	1	computer	PHY	الاولى
	2	Mechanics and properties of materials	PHY	الاولى
	2	General astronomy	PHY	الاولى
	1	Democracy and human rights	PHY	الاولى
2	2	Calculus II	PHY	الاولى
2	2	Mechanics and properties of materials II	PHY	الاولى
2	2	Programming fundamentals	PHY	الاولى
	2	Arabic language	PHY	الاولى
	2	Introduction of chemistry	PHY	الاولى
		Magnetism	PHY	الاولى
	2	Enghlish language	PHY	الاولى
	2	programming	PHY	الثانية
	2	Modern physics I	PHY	الثانية
	2	Analog electronics	PHY	الثانية
	2	Differential equation	PHY	الثانية
2	2	Analytical mechanics	PHY	الثانية
2	2	Heat and thermodynamic	PHY	الثانية
	2	جرائم نظام البعث	PHY	الثانية
	2	Thermodynamic and statical	PHY	الثانية
2	2	Modern physics II	PHY	الثانية
2	2	Linear algebra	PHY	الثانية
2	2	Sound and wave motion	PHY	الثانية
2	2	Analytical mechanicsII	PHY	الثانية
2	2	Enghlish language II	PHY	الثانية
	2	Arabic languageII	PHY	الثانية

8.Expected learning outcomes of the program

Knowledge	
Learning Outcomes 1	The student acquires the ability to explain and understand many of the biological processes in primary and graduate studies that serve the labor market and scientific research.
Skills	
Learning Outcomes 2	Preparing students who are scientifically empowered in the field of specialization and the labor market.
Learning Outcomes 3	Identifying the most important advanced scientific and research materials that serve the fields of communications and modern technology.
Ethics	
Learning Outcomes 4	Ability to apply principles of physics.
Learning Outcomes 5	The ability to solve scientific problems and find possible alternatives to those solutions.

9.Teaching and Learning Strategies

1. Solve various problems in different physics applications.
2. Giving homework to increase students' ability in problem-solving techniques.
3. Promote quick student response by asking conceptual questions during class.
4. Encouraging students in strategies to solve examples in class.
5. Encouraging students to publish research in graduate studies.
6. Encouraging students to use modern, advanced applications in the field of specialization.

10.Evaluation methods

1. Seminar.
2. Oral exams.

3. Quizzes.
4. Direct questions.
5. Homework.
6. Reports

11. Faculty

Faculty Members

Number of the teaching staff		Special Requirements/Skills (if applicable)		Specialization		Academic Rank	
lecture	staff			Special	General		
	1			فيزياء طبية	علوم الفيزياء	استاذ دكتور	أ.د.اسماء هادي محمد
	1			بصريات	علوم الفيزياء	استاذ دكتور	أ.د.سهى موسى خورشيد
	1			بصريات الكترون	علوم الفيزياء	استاذ دكتور	أ.د.عدي علي حسين
	1			صلبة	علوم الفيزياء	استاذ دكتور	أ.د.احمد عبد الرحمن
	1			فيزياء نظرية	علوم الفيزياء	استاذ دكتور	أ.د.سعد ناجي عبود
	1			صلبة	علوم الفيزياء	استاذ دكتور	أ.د.عماد خضير عباس
	1			معالجة صور رقمية	علوم الفيزياء	استاذ دكتور	أ.د.ليث عبد العزيز عباس
	1			بلازما	علوم الفيزياء	استاذ دكتور	أ.د.خالد عباس يحيى
	1			فلك	علوم الفيزياء	استاذ مساعد دكتور	أ.م.د.جزيل حسين
	1			بلازما	علوم الفيزياء	استاذ مساعد دكتور	أ.م.د.حسن ناصر
	1			صلبة	علوم الفيزياء	استاذ مساعد دكتور	أ.م.د.وسن علي موسى
	1			اشعاعية	علوم الفيزياء	استاذ مساعد دكتور	أ.م.د.مروة عبد المحسن
	1			احصائية	علوم الفيزياء	استاذ مساعد دكتور	أ.م.د ابراهيم عبدالمهدي
	1			بلازما	علوم الفيزياء	استاذ مساعد دكتور	ا.م.د.نيسان سعود
	1			صلبة	علوم الفيزياء	استاذ مساعد دكتور	ا.م.د سديم عباس
	1			نظرية	علوم الفيزياء	مدرس دكتور	م.د.احمد شاكر
	1			بصريات	علوم الفيزياء	استاذ مساعد	أ.م.نور محمد حسن
	1			نظرية	علوم الفيزياء	مدرس دكتور	م.د.عمر اياد

م.د.سلام اسماعيل	مدرس دكتور	علوم الفيزياء	فلك			1	
أ.م.د.زينب منذر	استاذ مساعد دكتور	علوم الفيزياء	الكترونيك			1	
أ.م.د.احمد صبيح	استاذ مساعد دكتور	علوم كيمياء	كيمياء			1	
م.د.فاطمة عبد الصاحب	مدرس دكتور	علوم رياضيات	رياضات			1	
م.عمر عدنان	مدرس	شريعة	شريعة			1	
م.د.منى صالح	مدرس دكتور	علوم رياضيات	رياضيات			1	
م.د.احمد نعمة	مدرس دكتور	اللغة عربية	اللغة العربية			1	
ا.م.ابتسام كامل	استاذ مساعد	علوم الرياضيات	رياضيات			1	
م.د.ايمان عبد الوهاب	مدرس دكتور	علوم رياضيات	رياضيات			1	
م.د.احمد ايوب	مدرس دكتور	علوم رياضيات	رياضيات			1	

Professional Development
Mentoring new faculty members
Assess teaching techniques and give the students surveys about those techniques.
Professional development of faculty members
Involve the new staff in teaching process and encourage them to develop the lecture with the supervision of the main lecturer.

12.Acceptance Criterion

(**Setting regulations related to enrollment in the college or institute, whether central admission or others**)

13.The most important sources of information about the program

دليل اتحاد الجامعات العربية "ضمان الجودة والاعتماد للبرامج الاكاديمية في كليات الجامعات العربية الامانه العام /عمان/الاردن/2022

14.Program Development Plan

Involve more high level books and upgrade the lectures each year.

Program Skills Outline																
Required program Learning outcomes																
Ethics				Skills				Knowledge				Basic or optional	Course Name	Course Code	Year/Level	
C4	C3	C2	C1	B4	B3	B2	B1	A4	A3	A2	A1					
								✔	✔	✔	✔	اساسى	Electricity	PHY	مرحلة اولى	
								✔	✔	✔	✔	اساسى	Calculus	PHY	مرحلة اولى	بكالوريوس
								✔	✔	✔	✔	اساسى	computer	PHY	مرحلة اولى	
								✔	✔	✔	✔	اساسى	Mechanics and properties of materials	PHY	مرحلة اولى	
								✔	✔	✔	✔	اختياري	General astronomy	PHY	مرحلة اولى	
								✔	✔	✔	✔	اختياري	Democracy and human rights	PHY	مرحلة اولى	
								✔	✔	✔	✔	اساسى	Calculus II	PHY	مرحلة اولى	
								✔	✔	✔	✔	اساسى	Mechanics and properties of materials II	PHY	مرحلة اولى	

								✔	✔	✔	✔	اساسى	Programming fundamentals	PHY	مرحلة اولى	
								✔	✔	✔	✔	اختياري	Arabic language	PHY	مرحلة اولى	
								✔	✔	✔	✔	اساسى	Introduction of chemistry	PHY	مرحلة اولى	
								✔	✔	✔	✔	اساسى	Magnetism	PHY	مرحلة اولى	
								✔	✔	✔	✔	اختياري	Enghlish language	PHY	مرحلة اولى	
								✔	✔	✔	✔	اساسى	programming	PHY	مرحلة ثانية	
								✔	✔	✔	✔	اساسي	Modern physics I	PHY	مرحلة ثانية	
								✔	✔	✔	✔	اساسي	Analog electronics	PHY	مرحلة ثانية	
								✔	✔	✔	✔	اساسي	Differential equation	PHY	مرحلة ثانية	
								✔	✔	✔	✔	اساسي	Analytical mechanics	PHY	مرحلة ثانية	
								✔	✔	✔	✔	اساسى	Heat and thermodynamic	PHY	مرحلة ثانية	
								✔	✔	✔	✔	اختياري	جرائم نظام البعث	PHY	مرحلة ثانية	
								✔	✔	✔	✔	اساسى	Thermodynamic and statical	PHY	مرحلة ثانية	
								✔	✔	✔	✔	اساسى	Modern physics II	PHY	مرحلة ثانية	

								✔	✔	✔	✔	اساسى	Linear algebra	PHY	مرحلة ثانية
								✔	✔	✔	✔	اساسى	Sound and wave motion	PHY	مرحلة ثانية
								✔	✔	✔	✔	اساسى	Analytical mechanicsII	PHY	مرحلة ثانية
								✔	✔	✔	✔	اختياري	Enghlish language II	PHY	مرحلة ثانية

- **يرجى وضع اشارة في المربعات المقابلة لمخرجات التعلم الفردية من البرنامج الخاضعة للتقييم**

الكورس الاول

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	COMPUTER I			**Module Delivery**	
Module Type	BASIC			☒**Theory** ☐**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	URCOM				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level		1	**Semester of Delivery**		1
Administering Department		physics	**College**	science	
Module Leader	Dr. Ahmed Shakir Mahmood		**e-mail**	Ahmad.mohmood@nahrainuniv.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Dr. Ahmed Shakir Mahmood Bilal Abdul Satar Rasha Shahir Badawi		**e-mail**	Ahmad.mohmood@nahrainuniv.edu.iq Bilal.AbdulSatar@nahrainuniv.edu.iq Rasha.shahir@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Review Committee Approval		01/09/2024	**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. To give a general description to the main parts of the computer. 2. To learn the fundamentals of the visual basic programming language. 3. Develop programming skills for the students to solve different kinds of physical and mathematical problems. 4. Knowing some of the basic commands for the visual basic programming language.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The students will learn a lot of information about the software and hardware for the computer and how one can use it for many applications in our life. 2. Develop the knowledge of the students for the aspect of programming logic and how one can use it to solve simple problems. 3. Understanding the basic commands and objects in the visual basic programming language. 4. The students should be able to write a different programming codes to solve basic mathematical and physical problems.		
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction to the hardware and software of the computer. The Visual Basic environment and creating the user interface by using the standard control tools. Some properties for the standard control tools. Visual Basic fundamentals, data declarations. Arithmetic operators. Commonly used library functions in Visual Basic. Working with controls and learning what mathematical logic means, then writing a program in visual basic programming language to solve any problem. The branching command. The Looping Command.		

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.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	15	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
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**	4	10% (10)	5, 10	LO #1, 2, 3 and 4
	Assignments	2	10% (10)	2, 12	LO # 2, 3 and 4
	Projects / Lab.	9 hr/1	10% (10)	Continuous	
	Report	6 hr/1	10% (10)	13	LO # 3 and 4
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-4
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to the hardware and software of the computer
Week 2	The Visual Basic environment and creating the user interface by using the standard control tools.
Week 3	Some properties for the standard control tools.

Week 4	Visual Basic fundamentals, data declarations.
Week 5	Arithmetic operators.
Week 6	Commonly used library functions in Visual Basic-I.
Week 7	Commonly used library functions in Visual Basic-II.
Week 8	Commonly used library functions in Visual Basic-III.
Week 9	Working with controls and learning what mathematical logic means, then writing a program in visual basic programming language to solve any problem.
Week 10	**Mid Exam**
Week 11	The branching command –I.
Week 12	The branching command –II.
Week 13	The Looping Command -I
Week 14	The Looping Command -II
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to the hardware and software of the computer
Week 2	Lab 2: The Visual Basic environment and creating the user interface by using the standard control tools.
Week 3	Lab 3: some properties for the standard control tools.
Week 4	Lab 4: Visual Basic fundamentals, data declarations.
Week 5	Lab 5: Arithmetic operators.
Week 6	Lab 6: Commonly used library functions in Visual Basic-I.
Week 7	Lab 7: Commonly used library functions in Visual Basic-II.
Week 8	Lab 8: Commonly used library functions in Visual Basic-III.
Week 9	Lab 9: Working with controls and learning what mathematical logic means, then writing a program in visual basic programming language to solve any problem.
Week 10	**Mid Exam**
Week 11	Lab 11: The branching command –I.
Week 12	Lab 12: The branching command –II.
Week 13	Lab 13: The Looping Command -I

Week 14	Lab 14: The Looping Command -II
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Microsoft Visual Basic 6.0 Step by Step" Microsoft Corporation (1999)	No
Recommended Texts	"Schaum's Outline of Theory and Problems of Programming with Visual Basic", by Byron S. Gottfried McGraw-Hill, NC. (2001)	No
Recommended Texts	Lectures Notes Dr. Ahmed Shakir Mahmood Yas (2023)	
Websites	https://learn.microsoft.com/en-us/previous-versions/visualstudio/visual-basic-6/visual-basic-6.0-documentation	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.



ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Sciences Physics Department	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**Calculus (I)**		**Module Delivery**
Module Type	**Core**		• ☐ **Theory** • ☒ **Lecture** • ☐ **Lab** • ☒ **Tutorial** • ☐ **Practical** • ☐ **Seminar**
Module Code	**CREQ1101**		
ECTS Credits	**4**		
SWL (hr/sem)	**100**		
Module Level		**Semester of Delivery**	1
Administering Department	Mathematics and Computer Applications	**College**	College of Sciences
Module Leader	Ibtisam Kamil Hanan	**e-mail**	ibtisam.kamil@nahrainuniv.edu.iq
Module Leader's Acad. Title	Asst. Prof.	**Module Leader's Qualification**	Ph.D.
Module Tutor	Ibtisam Kamil Hanan	**e-mail**	ibtisam.kamil@nahrainuniv.edu.iq
Peer Reviewer Name	me	**e-mail**	E-mail

Scientific Committee Approval Date	1/9/2024	**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**	The aim of this course is for student to gain proficiency in computations. In calculus, we use two main tools for analyzing and describing the behavior of functions: limits and derivatives. Students will use these tools to solve application problems in a variety of setting ranging from physics and chemistry to business and economics.
Module Learning Outcomes **مخرجات التعلم للمادة الدراسية**	1. To determine the solution set of inequalities involving absolute value, 2. To determine domain, range and operation of someone variable functions and the graphs. 3. To determine limit and continuity of one variable functions. 4. To determine derivate of one variable functions. 5. To determine the solution of problems involving the derivate of one variable function. 6. To determine inverse function and its derivative. 7. To learn about application of derivatives.
Indicative Contents **المحتويات الإرشادية**	1. Real number, inequalities, absolute value, Cartesian coordinate system, function and its graph, operation on function, trigonometry function. 2. Definition, theorems of limit, trigonometry function limit, limit on infinity, infinite limit, continuity function, 3. Definition and rule of derivate, derivate of trigonometry function, chain rule, higher order derivate, implicit derivate, related rate, basic concept of differential, 4. Maximum and minimum, monotonicity and concavity, graphing one variable function, mean value theorem for derivate. 7. Natural logarithm function, inverse function and its derivate, natural exponential function, general exponential function, general logarithm function, hyperbolic function and its inverse.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module will be presented to the students through a specified series of lectures, supported by problem solving practice carried out in interactive tutorials. These tutorials will be supported by practice and directed study outside the classroom. Formative assessment takes place throughout the module during tutorials and feedback is given during these tutorials.

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**	3.467
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	20% (20)	3, 8	LO #1, 2, and 3
	Assignments	2	10% (10)	6, 9	LO # 4 and 5
	Projects / Lab.	-	-	-	-
	Report	1	10% (10)	12	LO # 5 and 6
Summative assessment	**Midterm Exam**	1	10% (10)	7	LO # 1-5
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	The Rate of Change of Function: Coordinates, Increments and Distance, Slope of the straight line, Equations of straight lines, Circle, Equation of circle.
Week 2	Inequalities, Intervals, Absolute value, Properties of Absolute values.
Week 3	Functions and graphs: Odd function, Even function, Domain, Range, Composition function, Shift Formula, Axes intercept points, Symmetry, Asymptotes.
Week 4	Limits and continuity **:**Calculation Techniques of limits, One sided and two-sided limits.
Week 5	Limit at infinity, Oblique asymptote, Sandwich theorem, Continuous functions.
Week 6	The slope of the curve and derivatives: Formal differentiation, Rules of derivatives
Week 7	Mid Term Exam + Implicit differentiation, Second and higher order derivatives, Chain rule, Extended Chain rule.
Week 8	Parametric equations, Derivatives of the Parametric Equations, L'Hopital's rule (First Form), L'Hopital's rule (Stronger Form).
Week 9	Transcendental Functions: Properties and derivatives for Trigonometric functions.
Week 10	Properties and derivatives for Inverse of trigonometric functions.
Week 11	Properties and derivatives for Logarithmic, exponential functions and The exponent function a^x
Week 12	Properties and derivatives for (Hyperbolic functions and Inverse of Hyperbolic Functions)
Week 13	Applications of Derivatives: Curve sketching
Week 14	Roll's and mean value theorems, Velocity and acceleration.
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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 and Analytic Geometry by Thomas	Yes
Recommended Texts	Calculus with application brief version	No
Websites	www.mathhandbook.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.

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	GENERAL ASTRONOMY	**Module Delivery**	
Module Type	CORE	☒**Theory** ☒**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☒**Seminar**	
Module Code	PHYS1105		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level x11	1	**Semester of Delivery**	1
Administering Department	Physics	**College**	Science
Module Leader	Dr. Jazeel Hussein Azeez	**e-mail**	jazeel.azeez@nahrainuniv.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**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. Learn the basics of astronomy and study the laws that govern this science. 2. Identifying astronomical phenomena, their physical interpretation, and terminology related to this science. 3. Recognize the physical properties of the near and far celestial bodies and learn about the laws governing them and their movement in the sky 4. Identifying the method of observing the various astronomical phenomena and trying to explain them in a correct scientific way through the laws that govern astronomy.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Enable students to obtain knowledge and understanding of the principles, scientific foundations, and theories of astronomy. 2. Enabling students to obtain an understanding of modern and advanced scientific topics in this field. 3. Enable the student to identify celestial bodies, including stars and interstellar matter, which contain gases and cosmic dust, as well as planets, meteorites, meteors and comets, as well as identify galaxies, which represent the basic structure of the universe. And try to explain the phenomena experienced by these objects. 4. Introducing the student to how to find and deal with the events that take place for celestial bodies and to determine their dimensions and speed, as well as dealing with their various phenomena.
Indicative Contents المحتويات الإرشادية	Whiteboard, LCD, and Data show.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Discussing the topics of the textbook and supporting references • Theoretical lectures including problem solving and discussion of homework • Asking students a set of thinking questions during the lectures for specific topics. • Giving students homework that requires finding self-solutions.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	45	**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	3.46
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

As

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20% (10)	5, 10	
	Assignments	2	10% (10)	2, 11	
	Projects / Lab.				
	Report	2	10% (10)	14	
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Week

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction
Week 2	celestial coordinates & Kepler's laws
Week 3	The sun and its layers
Week 4	Planets of the solar system(1 - 4)
Week 5	Planets of the solar system(5 - 8)
Week 6	Meteors, meteors and comets
Week 7	Mid exam
Week 8	interstellar medium & Star Formation
Week 9	Main sequence stars
Week 10	physical properties of stars-Part 1
Week 11	physical properties of stars-Part 2

Week 12	star evolution
Week 13	Galaxies and Clusters
Week 14	Report Discussion
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**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	Fundamental Astronomy 5th edition, H. Karttunen, Springer-Verlag Berlin Heidelberg 2007.	Electronic Version
Recommended Texts	فيزياء الجو والفضاء : الجزء الاول (علم الفلك) حميد مجول النعيمي وفياض النجم : وزارة التعليم العالي والبحث العلمي العراقية, 1981	No
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	ELECTRICITY AND MAGNETISM I	**Module Delivery**	
Module Type	CORE	☒**Theory** ☒**Lecture** ☒**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	PHYS1102		
ECTS Credits	8		
SWL (hr/sem)	220		
Module Level	1	**Semester of Delivery**	1
Administering Department	Physics	**College**	college of science
Module Leader	Dr. Wasan A. Al-Taa'y	**e-mail**	wassan.ali.mousa@nahrainuniv.edu.iq
Module Leader's Acad. Title	Assist Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	Dr. Wasan A. Al-Taa'y	**e-mail**	wassan.ali.mousa@nahrainuniv.edu.iq
Peer Reviewer Name	Dr. Wasan A. Al-Taa'y	**e-mail**	wassan.ali.mousa@nahrainuniv.edu.iq
Review Committee Approval	2025/10/5	**Version Number**	1.0
Lab administrators	م.م.حسين علي وهيب, م.م ميس عطاالله وحش,زهراء زهير,م.م حسين علي		

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- Understand electric charge and electric field. 2- Knowing the materials. 3- Identify the electric field of charges and electric field lines. 4- Identifying the forces, moments and electric potential energy. 5- Learn about Causs' law ,Ohm's Law, Coulomb's law. 6- Identify the electric flux and the enclosed charge. 7-Learn about the electrostatic field. 8-Identification of a point charge inside a spherical surface. 9 - Identify the resistance and capacitance.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Make the student able to: 1- Understand electric charge and electric field. 2- Knowing the composition of the material. 3- Know the types of matter. 4- Know the types of electric charge. 5- Learn about Coulomb's law. 6- Identify the electric field of charges and electric field lines. 7- Identifying the forces, moments and electric potential energy. 8- Learn about Causs' law. 9- Identify the electric flux and the enclosed charge. 10-Learn about the electrostatic field. 11-Identification of a point charge inside a spherical surface. 12- Learn about Ohm's Law. 13 - Identify the resistance and capacitance.		
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. electric charge and electric field, electric charge and structure of matter, types of matter, charge is conserved, charging by induction and friction,electric forces on uncharged objects, Coulomb's law, electric field, electric field on a point charge, electric field calculations, electric field lines, electric dipole, forces, moments and electric potential energy,Causs' law, electric flux and the enclosed charge, calculating electric flux, flux of a nonuniform electric field, point charge inside a spherical surface, the electrostatic field, Ohm's Law, resistance and capacitance, capacitor in series and parallel, inductive CCT, inductive resistance XL, capacitive reactance Xc		
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 and by oral, written exams andhomeworks.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	124	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	96	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	220		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20% (20)	2, 5, 10, 12	LO 1, 2,10 and 11
	Assignments	2	5%(5)	2, 12	
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	5% (5)	13	LO 5, 8, and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	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	electric charge, electric field, electric charge and structure of matter.
Week 2	types of matter, charge is conserved, charging by induction and friction
Week 3	electric forces on uncharged objects, Coulomb's law
Week 4	electric field, electric field on a point charge,
Week 5	electric field calculations, electric field lines,
Week 6	electric dipole, forces, moments and electric potential energy
Week 7	Causs' law, electric flux and the enclosed charge
Week 8	Mid exam
Week 9	calculating electric flux,
Week 10	flux of a nonuniform electric field ,

Week 11	point charge inside a spherical surface,
Week 12	the electrostatic field, Ohm's Law, resistance and capacitance,
Week 13	capacitor in series and parallel, inductive CCT,
Week 14	inductive resistance XL, capacitive reactance Xc
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Ohms law
Week 2	Lab 2: Ohmic and Non Ohmic materials
Week 3	Lab 3: Series and parallel of capacitor and energy
Week 4	Lab 4: Electrical resonance phenomenon
Week 5	Lab 5: Voltage difference for The resistance and capacitance
Week 6	Lab 6: Voltage and resistance for the battery
Week 7	Lab 7: parallel and series for resistance and equivalent resistance

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Edward M.Purcell, Electrisity and magnetism,3rd edition	yes
Recommended Texts	University physics with modern physics, 13th edition	Yes
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				
NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	MECHANICS AND PROPERTIES OF MATTER			**Module Delivery**	
Module Type	CORE			☒**Theory** ☒**Lecture** ☒**Lab** ☒**Tutorial** ☒**Practical** ☒**Seminar**	
Module Code	PHYS1101				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Physics Department		**College**	College of Science	
Module Leader	Dr. Ahmed A. Al-Tabbakh Zena Mofaq Wasan Khadier Zainab khalid		**e-mail**	ahmad.altabbak@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Omar Adnan		**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**	1.0	

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	1
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. Introducing students to the basic concepts related to static and moving systems. 2. Introducing the student to the methods of classifying mechanical systems, the laws related to them, and the life applications that simulate their theories. 3. Introducing the student to methods of mathematical solutions to problems related to static and moving mechanical systems.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Providing the student with sufficient experience to deal with kinetic systems according to the mathematical theories and laws compatible with them. 2. Enhancing the student's mental ability to analyze kinetic systems according to those theories to find the required solutions to the problems that the student may face during study and after graduation.		
Indicative Contents المحتويات الإرشادية	1. Introduction to vectors. 2. Equilibrium under the action of concurrent forces 3. Equilibrium under the action of coplanar forces 4. Uniformly accelerated motion. 5. Newton's Laws 6. Work, Energy and Power 7. Impulse and Momentum		
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies	1. Differentiated Instruction: Learning Stations: Differentiated instruction provides a way to meet the needs of all students. One useful strategy to differentiate teaching is learning stations. Learning Stations can be easily designed to enable students with diverse learning needs to learn at their own pace and level of readiness. Teachers can set up each station where students will be able to complete the same task, but at the level and style designed specifically for them. 2. Cooperative Learning: Cooperative learning gives students the opportunity to work with others and see different perspectives. Students learn more effectively when working together rather than separately, and it is also known to improve self-confidence in students. 3. Using technology in the classroom. Such as using multimedia		

	presentations, scientific films, and illustrative animations. 4. Inquiry-based learning to engage students in learning by asking probing, investigative, and exploratory questions.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	94	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	81	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	10min/12	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	1hr/12	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	20hr/1	10% (10)	Continuous	
	Report	20hr/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	**Introduction to vectors:** Scalar Quantity, Vector quantity, resultant, graphical addition of vectors, Parallelogram method, subtraction of vectors, trigonometric functions, components of a vector, unit vectors
Week 2	**Introduction to vectors:** Problem solving
Week 3	**Equilibrium under the action of concurrent forces:** Concurrent forces, an object in equilibrium, first condition in equilibrium, Problem solution method.

Week 4	**Equilibrium under the action of concurrent forces:** Problem solving
Week 5	**Equilibrium under the action of coplanar forces:** Torque or momentum, two conditions for equilibrium, center of gravity
Week 6	**Equilibrium under the action of coplanar forces:** Problem solving
Week 7	**Mid-term exam**
Week 8	**Uniformly accelerated motion:** Speed, velocity and acceleration. Uniformly accelerated motion on straight line, projectiles.
Week 9	**Uniformly accelerated motion:** Problem solving
Week 10	**Newton's Laws:** Mass, Force, External force. Newton first law, Newton second law, Newton third law. Law of universal gravitation. Weight. Types of forces.
Week 11	**Newton's Laws:** Problem solving
Week 12	**Work, Energy and Power:** Work, kinetic energy, gravitational potential energy, conservation of energy, Power, Kilowatt-hour
Week 13	**Work, Energy and Power:** Problem Solving
Week 14	**Impulse and Momentum:** Linear momentum, impulse causes change in momentum, conservation of linear momentum, collisions and explosions. Elastic collision, coefficient of restitution.
Week 15	**Mid-term Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Instructions to students, Basic personal needs and other requirements. Writing the account of an experiment, Introduction to graphical representation of experimental data, Errors, their determination and minimization, least square fitting. Units.
Week 2	Lab 2: Forces and Equilibrium
Week 3	Lab 3: Spiral Spring and Hooks Law
Week 4	Lab 4: Spiral Spring: Determination of force constant and effective mass of a spring.

Week 5	Lab 5: Spiral Spring: To deduce the acceleration of free fall from a combination of the static and dynamic experiments.
Week 6	Lab 6: Simple Pendulum and determination of gravitational acceleration (g).
Week 7	Lab 7: The Cantilever experiment
Week 8	Lab 8: The bifilar suspension: Variation of the period of oscilation with the distance between the vertical suspension threads.
Week 9	Lab 9: The bifilar suspension: Variation of Oscillation with length of the suspension threads.
Week 10	Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Theory and Problems of College Physics By Frederick Bueche and Eugene Hecht	Available
Recommended Texts	Fundamental of Physics by Halliday, Resnick and Walker	Available
Websites		

APPENDIX:

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
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E – Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	PROGRAMMING 3	**Module Delivery**	
Module Type	CORE		☐**Theory** ☒**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**
Module Code	PHYS2110		
ECTS Credits	8		
SWL (hr/sem)			

Module Level	Second	**Semester of Delivery**	First
Administering Department	Physics Department	**College**	College of Science
Module Leader	Dr. Omar Ayad	**e-mail**	omar.jalal@nahrainuniv.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Doctor
Module Tutor	Suhaib Qusay Abdullah Zeina Aliwi Abbas	**e-mail**	suhaib.qusay@nahrainuniv.edu.iq zeina.aliwi@nahrainuniv.edu.iq
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**Version Number**	

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Programming 4	**Semester**	Second
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. Teaching students the basics of the MATLAB language. 2. Teaching students to write advanced MATLAB programs. 3. Teaching the students to solve some physics problems using MATLAB.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Discussing the topics of the methodological book and auxiliary references 2. Theoretical lectures, including problem solving and discussion of homework 3. Asking students for a set of thinking questions during lectures on specific topics. 4. Giving students homework requires finding solutions on their own.		
Indicative Contents المحتويات الإرشادية	• Daily tests 10% • Monthly exams 80% • Homework assignments and student interaction in discussion sessions 10%		
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies	• Discussing the topics of the methodological book and auxiliary references • Theoretical lectures, including problem solving and discussion of homework • Asking students for a set of thinking questions during lectures on specific topics. • Giving students homework that requires finding solutions on their own.		

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	102	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	98	**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
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	0	10% (10)	Continuous	
	Report	0	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	Introduction
Week 2	MATLAB workspace
Week 3	Simple Mathematics
Week 4	About Variables
Week 5	Comment and Punctuation
Week 6	Complex Numbers
Week 7	Common Mathematical Functions
Week 8	Simple Array
Week 9	Array Construction
Week 10	Array Addressing
Week 11	Array Manipulation

Week 12	Sets of Linear Equations
Week 13	Relational Operators
Week 14	Logical Operators
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction
Week 2	Lab 2: MATLAB workspace
Week 3	Lab 3: Simple Mathematics
Week 4	Lab 4: About Variables
Week 5	Lab 5: Comment and Punctuation
Week 6	Lab 6: Simple Array
Week 7	Lab 7: Array Construction
Week 8	Lab 8: Array Manipulation
Week 9	Lab 9: Relational Operators
Week 10	Lab 10: Logical Operators

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	ESSENTIAL MATLAB (For Engineers and Scientists), 3rd edition (2007), Brian D. Hahan *and* Danial T. Valentine.	
Recommended Texts	Getting Started with MATLAB 7, The MathWorks (2007). MATLAB Primer (Seventh Edition 2005), Timothy A. Davies *and* Kermit Sigmon.	
Websites	www.mathwork.com	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	الفيزياء الحديثة1	**Module Delivery**	
Module Type	CORE	نظري + عملي	
Module Code	PHTS2107		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	**Semester of Delivery**	1
Administering Department	الفيزياء	**College**	HGUG,L
Module Leader	نيسان سعود عريبي	**e-mail**	nissan.oribi@nahrainuniv.edu.iq
Module Leader's Acad. Title	استاذ مساعد	**Module Leader's Qualification**	دكتوراه
Module Tutor	م. زينة موفق م.م رشا شاهر م.م سيبف محمد	**e-mail**	
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**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	-العمل على تطوير نوعية التعليم الجامعي الأساسي -إعداد الكوادر البشرية القادرة على التعامل مع البحث العلمي الأكاديمي -الأساليب والتطبيقات. إعداد الكوادر الكفؤة لتلبية احتياجات المؤسسات التعليمية -توفير الكوادر المؤهلة بما يلبي احتياجات البيئة المحيطة بالجامعة والتفاعل مع المجتمع وتقديم الخدمات العلمية المهنية .استشارات أخرى -تبادل الخبرات والكفاءات مع الكليات والجامعات البحثية المماثلة -إيصال الطالب إلى المستوى الذي يؤهله لمواصلة الدراسات العليا لمواصلة البحث والتطوير في مجال الفيزياء -يبتكر الطالب حلولاً وتفسيرات للظواهر الفيزيائية بشيء من الحداثة والإبداع -يتعرف الطالب على مفهوم الفيزياء العملية ويتكيف مع حل المشكلات يقوم الطالب بتصميم خطة لدراسة المفردات الفيزيائية بطريقة جديدة
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	.يبتكر الطالب حلولاً وتفسيرات للظواهر الفيزيائية بشيء من الحداثة والإبداع .يتعرف الطالب على مفهوم الفيزياء العملية ويتكيف مع حل المشكلات يقوم الطالب بتصميم خطة لدراسة المفردات الفيزيائية بطريقة جديدة تمكين الطلبة من تحليل الواقع من منظور مادي
Indicative Contents المحتويات الإرشادية	إدارة وقتهم بشكل فعال من أجل تلبية المواعيد النهائية كل أسبوعين لإكمال الواجبات المنزلية وتطوير استراتيجيات التأقلم المناسبة؛ العمل بشكل تعاوني واستخدام بعضهم البعض كمصدر للتعلم.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	تم تصميم استراتيجية التعلم والتدريس من أجل: تغطية المواد الأساسية والتقنيات التحليلية الضرورية بعناية في المحاضرات، وإظهار المفاهيم بأمثلة مناسبة (وحيثما أمكن عملية). السماح للطلاب بالوقت الكافي لممارسة التقنيات باستخدام عدد كبير من المشكلات التعليمية المختارة بعناية

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**75**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**5**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**50**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	5% (5)	1	4
	Assignments	2	5 % (5)	15	30
	Lab	2	15% (15)	15	30
	Tut.	1	5% (5)	15	15
Summative assessment	**Midterm Exam**	4	20% (20)	1	4
	Final Exam	3	50% (50)		
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**The Quantum Theory Of Light** Introduction to the atomic ,What is atomic physics and atomic structure , Atomic mass, Avogadro number.The nature of light and electromagnetic radiation, Thermal Radiation, Emission and Absorption of Radiation

Week 2	, Electron configuration , The electron orbital diagrams, Shell and subshell of orbital, Atomic mass unit and determination of e/m
Week 3	Atomic model,
Week 4	**Atomic spectra** Divination of the Atomic spectra , Absorption spectrum, emission spectrum , and X-ray
Week 5	quantum theory :blackbody radiation and plank radiation law Wien's distribution law, Rayleigh-Jeans' law, Home Work, Planck's Law of Radiation, Derivation Wien's law from Planck's law , Derivation of Rayleigh-Jeans' law from Planck's law, Derivation of Stefan's Law from the Planck Distribution, Photoelectric Effect,
Week 6	**Monthly Exam.**
Week 7	The Bohr Atom, Spectral Series, Bohr's Quantum Model of the Atom, Energy levels and spectra. Hydrogen atom spectrum
Week 8	Atomic excitation: The Franck–Hertz Experiment, Bohr's Correspondence Principle,
Week 9	Behr's solution of Hydrogen
Week 10	Elliptic orbital for Hydrogen atom Home work.
Week 11	Selection rule and spectral notation Hydrogen and sodium
Week 12	Zeeman effect
Week 13	**Atomic Structure** Orbital Magnetism and the Normal Zeeman Effect, The Spinning electron, the lande g factor
Week 14	The spin–orbit interaction and other magnetic effect, Exchange Symmetry and the Exclusion Principle, The Periodic Table.
Week 15	**Monthly Exam**

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي العملي	
	Material Covered
Week 1	**Inverse square law**
Week 2	Daily exam and discussion reports

Week 3	**Thermal radiation**
Week 4	Daily exam and discussion reports
Week 5	**Determination of Rydberg constant .**
Week 6	Daily exam and discussion reports
Week 7	**Calibration of a linear spectrum**
Week 8	Monthly exam.
Week 9	Frank-Hertz experiment
Week 10	Daily exam and discussion reports
Week 11	**Characteristic X-rays of copper and diffraction from**
Week 12	Daily exam and discussion reports
Week 13	Stefan Boltzmann's radiation law experiment
Week 14	Photoelectric effect experiment
Week 15	**Monthly Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. Modern Physics (V H Satheeshkumar) 2. Atomic Physics 1st and 2nd . 3. Modern Physics 3rd (Raymond A. Serway) 4. Models of the Atomic Nucleus 2nd (Norman D. Cook)	yes
Recommended Texts	1. Solid State Physics 1st (Yahya Nouri Al-Jamal) 2. Solid State Physics 2nd (Yahya Nouri Al-Jamal) **3.** Articles from internet about the subjects	yes
Websites	https://www.academia.edu/ https://www.researchgate.net/ https://scholar.google.com/	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
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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
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	MATHEMATICS 3 (DIFFERENTIAL EQUATIONS)			**Module Delivery**	
Module Type	CORE			☐**Theory** ☒**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code					
ECTS Credits	4				
SWL (hr/sem)	3				
Module Level		Second Year	**Semester of Delivery**		First
Administering Department		Mathematics	**College**		Sciences
Module Leader	Dr. Ahmed Ayyoub Yousif		**e-mail**		ahmed.ayyoub@nahrainuniv.edu.iq
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Dr. Ahmed Ayyoub Yousif		**e-mail**		ahmed.ayyoub@nahrainuniv.edu.iq
Peer Reviewer Name		Dr. Fadhel S. Fadhel	**e-mail**		fadhel.subhi@nahrainuniv.edu.iq
Review Committee Approval			**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. The student knows the Classifications of differential equations (ordinary and partial). 2. The student knows how to solve a differential equation (ordinary and partial) of first and higher order. 3. The student knows the applications of differential equation (ordinary and partial) in physics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The student will gain experience in dealing with any life problems that have been done using partial differential equations 2. Gaining experience in solving many physical problems, especially since most of them are represented by ordinary and partial differential equations.
Indicative Contents المحتويات الإرشادية	The indicative contents of differential equation divided into two part: First part is about ordinary differential equations which contents: - Introduction and classification of ordinary differential equations. - First Order Differential Equations. - Method of finding the solution of ordinary differential equations. - General Solution of Homogeneous Linear Differential Equations. - Linear Equations with Constant Coefficients. - Non-Homogeneous Equations with Constant Coefficients. Second part is about partial differential equations which contents: - Introduction to Partial Differential Equations. - Diffusion-Type Problems (Parabolic Equations). - Separation of Variables. - Transforming Nonhomogeneous BCs into Homogeneous Ones. - Transforming Hard Equations into Easier Ones. - Solving Nonhomogeneous PDEs (Eigenfunction Expansions). - The One-Dimensional Wave Equation (Hyperbolic Equations). - The Finite Vibrating String (Standing Waves). - First-Order Equations (Method of Characteristics). At last give some physical applications of differential equations.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Daily activity 2. Complete the duties

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	45	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	55	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.6
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	20% (20)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	0	0% (0.0)	-	
	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	Classification of ODE's, First Order Differential Equations
Week 2	Method of Finding the Solution of First Order Differential Equations [Method 1,2]
Week 3	Method 3,4
Week 4	Method 5,6,7
Week 5	Linear Differential Equations, General Solution of Homogeneous Equations
Week 6	Linear Equations with Constant Coefficients
Week 7	Non-Homogeneous Equations with Constant Coefficients (Method of Undetermined Coefficients, Inspection Method), Some Physical Applications.
Week 8	Introduction to Partial Differential Equations, Diffusion-Type Problems (Parabolic Equations)
Week 9	Separation of Variables
Week 10	Transforming Nonhomogeneous BCs into Homogeneous Ones

Week 11	Transforming Hard Equations into Easier Ones, Solving Nonhomogeneous PDEs (Eigenfunction Expansions)
Week 12	The One-Dimensional Wave Equation (Hyperbolic Equations)
Week 13	The Finite Vibrating String (Standing Waves)
Week 14	First-Order Equations (Method of Characteristics)
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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	- Elementary Differential Equations By Earl D. Rainville, Phillip E. Bedient, Richard E. Bedient. - Partial differential equations for scientists and engineers By Stanley J. Farlow.	yes
Recommended Texts	- Ordinary and Partial Differential Equations By M. D. Raisinghania	No
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	ANALYTICAL MECHANICS I			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	PHYS2104				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	1		**Semester of Delivery**	1	
Administering Department	physics		**College**	science	
Module Leader	Dr. Ahmed Shakir Mahmood		**e-mail**	Ahmad.mohmood@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Ahmed Shakir Mahmood		**e-mail**	Ahmad.mohmood@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Review Committee Approval	01/09/2025		**Version Number**	1.0	

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Newtonian Mechanics	**Semester**	I and II
Co-requisites module	Calculus, Differential Equations	**Semester**	I and II
Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
Module Aims أهداف المادة الدراسية	1. Teach the student the basics of Analytical Mechanics. 2. Teach the student to solve the problems that include calculus, vectors and other varieties of topics in physics. 3. Teach the student to solve some physical and geometrical problems. problems that include ordinary differential equations.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The students should learn a lot of information about the appropriate coordinate geometry of space and how one can choose the coordinates that simplify the physical problem. 2. Develop the knowledge and experiences of the students for different physics concepts and use new approaches to handle the problems that arise naturally in life. 3. The students should be able to solve different physical problems by using different mathematical methods.		
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction to vectors. Scalar and vector products, triple products and vector calculus. Tangential and normal components of acceleration vector. Position, velocity and acceleration vector in rectangular and plane polar coordinates. Position, velocity and acceleration vector in cylindrical and spherical coordinates. Newton's laws of motion, rectilinear motion under constant force. Forces that depend on position and the concepts of kinetic and potential energy. Forces that depend on velocity, fluid resistance, the terminal velocity and solving some problems.		

	General Motion: Work principle and potential energy function in three-dimensional motion. The Del operator. Conservative Forces and Force Fields. Motion of Charged Particle in Electric and Magnetic Field.
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.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	46	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	54	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.38
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**	4	10% (10)	5, 10	LO #1, 2 and 3
	Assignments	2	10% (10)	2, 12	LO # 1, 2 and 3
	Projects / Lab.	25	10% (10)	Continuous	
	Report	28	10% (10)	12	LO # 1,2 and 3
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	Introduction to vectors.
Week 2	Introduction to vectors.
Week 3	Scalar and vector products, triple products and vector calculus.
Week 4	Tangential and normal components of acceleration vector.
Week 5	Position, velocity and acceleration vector in rectangular and plane polar coordinates.
Week 6	Position, velocity and acceleration vector in cylindrical and spherical coordinates.
Week 7	Newton's laws of motion, rectilinear motion under a constant force.
Week 8	Forces that depend on position and the concepts of kinetic and potential energy.
Week 9	Forces that depend on velocity, fluid resistance, the terminal velocity and solve some problems.
Week 10	**Mid Exam**
Week 11	General Motion: Work principle and potential energy function in three-dimensional motion.
Week 12	The Del operator.
Week 13	Conservative Forces and Force Fields.
Week 14	Motion of Charged Particle in Electric and Magnetic Field
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	

Week 10	**Mid Exam**
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Analytical Mechanics" by Fowles & Cassidy, 7th Edition, (Thomson Brooks/Cole),2005.	No
Recommended Texts	"Analytical Mechanics Solutions to Problems in Classical Physics" by Ioan Merches, Daniel Radu · 2014.	No
Websites	MIT- Open Course YouTube https://www.youtube.com/channel/UCEBb1b_ L6zDS3xTUrIALZOw - MIT- Open Course https://ocw.mit.edu/	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.



ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	ANALOG ELECTRONICS			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☒**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	PHYS2108				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	second		**Semester of Delivery**	First	
Administering Department	Physics		**College**	Science	
Module Leader	Dr. Nada Abdul Hadi Kareem		**e-mail**	nada.abdulhadi@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D	
Module Tutor	Dr. Nada Abdulhadi Kareem Raghad saad Wesam mohammad Reem Yasser		**e-mail**	nada.abdulhadi@nahrainuniv.edu.iq Raghad.saad@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

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. To study electronics and immediately starts training in this specialty, thus providing motivation 2. Is concerned with the operation, characteristics, parameters, limitations and applications of electronic devices.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Enable students to understand how the JFET ,MOSFET and operational amplifier 2. Enable students to know the uses of each of the JFET ,MOSFET and operational amplifier 3. Enabling students to identify transistor bias methods and types of amplifiers 4. Enabling students to solve problems reducing the size of the electronic circuit 5. Enabling students to solve problems related to reducing the costs of electronic circuits		
Indicative Contents المحتويات الإرشادية	1. Common Emitter configuration 2. Common emitter Amplifier 3. JFET 4. Operational Amplifier 5. Operational Amplifier Applications		
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies	Learning analog electronics can be a challenging but rewarding journey if you take the following steps into consideration: 1. Start with basic Physics 2. Study basic components 3. Embrace a practical learning approach 4. Safety 5. Learn how to troubleshoot and learn from mistakes		

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	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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)	4, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	15% (15)	Continuous	
	Report	1	5%	11	
Summative assessment	**Midterm Exam**	2 hr	10% (15)	5,13	LO # 1-4, Lo#6-12
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Semiconductor Material Diode Characteristics
Week 2	Operation of Bipolar Transistor
Week 3	Common Emitter Configuration
Week 4	Voltage Divider Bias
Week 5	Dc operating point , AC equivalent circuit
Week 6	Common Emitter Amplifier& Frequency Response
Week 7	Exam
Week 8	JFET
Week 9	MOSFET

Week 10	Differential Amplifier
Week 11	Exam
Week 12	Op. Amp. Characteristics
Week 13	Op. Amp. As Comparator Op. Amp.Adder Op. Amp. Integrator
Week 14	Op. Amp. Differentiator
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction
Week 2	Lab 2: P-N Junction diode characteristics Junction ideality factor
Week 3	Lab 3: Com. emitter configuration
Week 4	Lab 4: Voltage divider biasing
Week 5	Lab 5: Common Emitter Amplifier
Week 6	Lab 6: JFET
Week 7	Lab 7:MOSFET
Week 8	Lab 8: Exam
Week 9	Lab 9: Differential Amplifier
Week 10	Lab 10: Operational amplifier principles
Week11	Lab 11: Operational amplifier as comparator
Week12	Lab 12: Operational amplifier as summing amplifier
Week13	Lab 13: Operational amplifier as differentiator and integrator
Week14	Lab 14: Review
Week15	Lab 15: Final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Electronic Devices, Thomas L. Floyd, 7th edition, Pearson Education international, 2005. • Electronic Devices, Tocci, 3rd edition, Charles E. Merrill Publishing Company, 1983. •	Yes
Recommended Texts	Electronic Devices, Thomas L. Floyd, 2nd edition, Merrill's International. • Microelectronics, Jacob Millman & Arivin Grabel, 2nd edition, McGraw-Hill Inc., 1987.	Yes
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C – Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	THERMODYNAMICS			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☒**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	PHYS2109				
ECTS Credits					
SWL (hr/sem)	125				
Module Level	second		**Semester of Delivery**	First	
Administering Department	Physics		**College**	Science	
Module Leader	Dr. Narjis Zamil Abdulzahra		**e-mail**		
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D	
Module Tutor	**Dr.Narjis Zamil Abdulzahra** **Halla Fadel** **Reem mzahem**		**e-mail**	narjis.zamil@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

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. Understand the fundamental concepts of energy, heat, work, and the laws of thermodynamics. 2. Analyze physical systems using the first and second laws of thermodynamics. 3. Apply thermodynamic principles to devices such as engines, pumps, and turbines. 4. Develop scientific thinking and mathematical analysis skills in thermal phenomena. 5. Enhance research and presentation skills through seminar preparation and delivery.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Theoretical lectures supported by visual media. 2. Classroom discussions and problem-solving exercises. 3. Scientific presentations (Seminars). 4. Use of computer simulations and thermal laboratory experiments.
Indicative Contents المحتويات الإرشادية	.1Basic concepts and definitions .2Energy, work, and heat .3The First Law of Thermodynamics (for closed and open systems(.4Properties of pure substances and the ideal gas law .5The Second Law of Thermodynamics and entropy .6Reversible and irreversible processes .7Thermodynamic cycles (Carnot, Rankine, Brayton, and refrigeration cycles(.8Practical applications of thermodynamics

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Learning thermodynamics can be challenging unless the following steps are considered: 1. Lectures Explanation of fundamental concepts and laws of energy, work, and heat. Use of PowerPoint presentations and visual aids to illustrate thermodynamic processes. 2. Problem-Solving Sessions Training students to apply mathematical laws and solve numerical problems step by step. Discussing different solution methods to strengthen critical understanding. 3. Group Discussions

	Encouraging students to exchange ideas and analyze real-world thermal phenomena. Promoting scientific communication and teamwork skills. 4. Laboratory and Simulation Experiments Conducting simple experiments to demonstrate the relationship between pressure, volume, and temperature. Using simulation software (such as Thermo-Calc or Engineering Equation Solver) to understand thermal processes. 5. Seminars and Student Presentations Assigning specific topics (e.g., thermodynamic laws or thermal cycles) to students. Presenting and discussing results in class to develop research and presentation skills. 6. Assignments and Scientific Reports Preparing scientific reports on real-life applications of thermodynamics (e.g., power plants or refrigeration systems). 7. Interactive Quizzes Conducting short quizzes after each unit to reinforce understanding and review key concepts.

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	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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)	4, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	15% (15)	Continuous	
	Report	1	5%	11	
Summative assessment	**Midterm Exam**	2 hr	10% (15)	5,13	LO # 1-4, Lo#6-12
	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 Thermodynamics
Week 2	System, Boundary, and Surroundings
Week 3	Thermodynamic Properties and State Variables
Week 4	Thermodynamic Processes (Isothermal, Isobaric, Isochoric)
Week 5	Work and Internal Energy
Week 6	First Law of Thermodynamics for Closed Systems
Week 7	First Law of Thermodynamics for Open Systems
Week 8	Midterm Review and Exam
Week 9	Entropy and Reversibility
Week 10	Second Law of Thermodynamics
Week 11	Carnot Cycle and Efficiency
Week 12	Rankine and Brayton Cycles
Week 13	Refrigeration and Heat Pump Cycles
Week 14	Thermodynamics in Real-Life Applications
Week 15	Final Review and Problem Analysis
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Experiment to Measure Specific Heat Capacity of a liquid by method of cooling
Week 2	Determination of the Coefficient of Apparent Cubic Expansivity of a Liquid by Mathiessen's Sinker Method
Week 3	The Specific Heat Capacity of Copper by Calendar Method
Week 4	Examination
Week 5	Coefficient of Linear Expansion of Copper
Week 6	Measurement of Thermal Conductivity by Lee's Disc Method
Week 7	Boltzmann Stefan
Week 8	Examination
Week 9	Poster work
Week 10	Review

Week11	Seminar
Week12	Ideal gas Law
Week13	Equation of state
Week14	Review
Week15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	المقرر الكتاب: Thermodynamics: An Engineering Approach, by Yunus A. Çengel & Michael A. Boles. .	Yes
Recommended Texts	الأساسية المراجع: • Fundamentals of Thermodynamics, by Richard E. Sonntag & Claus Borgnakke. • Fundamentals of Statistical and Thermal Physics, by F. Reif	Yes
Websites	الإلكترونية المراجع: • www.thermopedia.com • www.engineeringtoolbox.com	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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Fail Group	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded

(0 – 49)	**F** – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	SEMICONDUCTOR			**Module Delivery**	
Module Type	CORE			☐**Theory** ☒**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	PHYS3107				
ECTS Credits	3				
SWL (hr/sem)	3				
Module Level		Third stage	**Semester of Delivery**		First
Administering Department		Physics	**College**		Science
Module Leader	Dr.Nada Abdul Hadi Kareem		**e-mail**	nada.abdulhadi@nahrainuniv.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**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-Introducing students to the types of the materials in nature including semiconductors.** **2-Enable them to recognize the most important semiconductor materials and their properties.** **3-Familiarizing students with the main applications of semiconductors materials in industry in particular, and in life in general**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- **Lectures taught in person in halls as well as electronic lectures, Using the most important reliable and valuable scientific sources available.** **2- Using the most relevant research papers and journals related to semiconductor device fabrication.** **3- Introducing students to the key theories related to the subject matter, especially nanotechnology.** **4- Familiarizing students with the relationship between semiconductors and the industrial, medical, and technological job market in all its fields.**
Indicative Contents المحتويات الإرشادية	Guidance Contents on Semiconductors Part One: Introduction to Semiconductors • A general introduction to materials and their common types: conductors, insulators, and semiconductors, including a clear explanation of atomic structure. • A discussion of insulators, conductors, and semiconductors, and the differences between them. • A description of how current is generated in semiconductors. Part Two: Properties of Semiconductors • A description of the properties of p-type and n-type semiconductors. • An explanation of how a P–N junction diode is formed.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Daily Activity 2. Homework

Student Workload (SWL) الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	45	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	55	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.6
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	20% (20)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	0	0% (0.0)	-	
	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	**Energy Bands and Carrier Concentration in thermal equilibrium**
Week 2	**Doping of the semiconductor**
Week 3	**Charge carrier transport phenomena(drift or diffusion**
Week 4	**Generation and recombination process of charge carriers**
Week 5	**Continuity equation**
Week 6	**Thermal emission process and tunneling phenomenon**
Week 7	**Current in Semiconductor**
Week 8	**Electron and hole current**
Week 9	**Semiconductor N-type , P-type**
Week 10	**P-N junction**
Week 11	**Formation of Depletion Region**
Week 12	**Energy Diagram of the P-N junction and Depletion Region**
Week 13	**Transistors and their types**

Week 14	**Application of transistor**
Week 15	**Preparation week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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	- **3rd Edition Semiconductor Devices Physics and Technology S. M. SZE and M. K. LEE JOHN WILEY & SONS, INC.2010**	yes
Recommended Texts	- **Semiconductor Physics and Devices Basic Principles Third Edition Donald A. Neamen Univer.\ip of New Mexico**	No
Websites		

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	F – Fail	راسب	(0-44)	Considerable amount of work required

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MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	GEOMETRICAL OPTICS			**Module Delivery**	
Module Type	CORE			☒**Theory** ☒**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	PHYS3104				
ECTS Credits	8				
SWL (hr/sem)	200				
Module Level	1		**Semester of Delivery**	1	
Administering Department			**College**		
Module Leader	Dr.Suha M. Alawsi		**e-mail**	Suha.korsheed@nahrainuniv.edu.iq	
Module Leader's Acad. Title	lecturer		**Module Leader's Qualification**	Ph.D	
Module Tutor	Ruaa Tahseen Abdallah Ghufran Mohammed Jassam		**e-mail**	ghufran.muhammed@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**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. 1. The student learns about optical elements. 2. 2. The student learns how to work with lenses and mirrors. 3. 3. The student learns how to track the transmission of rays from lenses and mirrors. 4. 4. The student learns how to work with simple and complex optical systems. 5. 5. The student learns to calculate some optical measurements.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	. 1. Identify the lesson topic and outline its outline. 2. Practice reading the characteristics of visual elements and identifying their types. 3. Conduct some simple practical experiments and observe their results. 4. Practice analyzing the outputs of simple and complex visual systems. 5. Work effectively with groups.		
Indicative Contents المحتويات الإرشادية	The guiding content includes the following: This unit introduces the student to optical elements. [25 hours] Assemble optical elements into an optical system. [25 hours] Monitor a light beam within an optical system and calculate its properties. [25 hours] Calculate performance metrics for optical systems and analyze and interpret optical outputs.		

	[25 hours]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The semester lasts sixteen weeks, including exams. Approximately 102 hours are devoted to teaching students the theoretical and practical foundations of the course subject, including theoretical material, which comprises 45 hours of lectures (three hours per week) and practical material, which comprises 30 hours of practical material during the semester (two hours per week). Two hours are allocated for the midterm exam, three hours for quizzes that extend from the middle of the semester to the end of the semester, and 20 hours for seminars, homework, and the like.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	102	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	98	**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**
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	Introduction
Week 2	refraction
Week 3	Refraction law
Week 4	reflection
Week 5	Reflection law
Week 6	Lenses
Week 7	Thin lenses
Week 8	Thick lenses
Week 9	Mirror
Week 10	Prism
Week 11	Ray tracing
Week 12	Equation of ray tracing
Week 13	Aberrations
Week 14	Types of aberration
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Light path
Week 2	Lab 2: Snell's Law
Week 3	Lab 3: Mirror
Week 4	Lab 4: Lenses (1)
Week 5	Lab 5: Lenses (2)
Week 6	Lab 6: Refractive Index
Week 7	Lab 7: Glass Prism

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamental of Optics BASIC WAVEFRONT ABERRATION THEORY Auther: Katherine Creath	
Recommended Texts	INTRODUCTION OF OPTICS Auther: A. Foweles	
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.



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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	NUMERICAL ANALYSIS	**Module Delivery**	
Module Type	CORE		☐**Theory** ☒**Lecture** ☒**Lab** ☐**Tutorial** ☒**Practical** ☐**Seminar**
Module Code	PHYS3105		
ECTS Credits	8		
SWL (hr/sem)	3		

Module Level	Second	**Semester of Delivery**	First
Administering Department	Physics Department	**College**	College of Science
Module Leader	Dr. Omar Ayad	**e-mail**	omar.jalal@nahrainuniv.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	
Module Tutor	Bilal Abdulsattar Yousif Qusay Abdullah	**e-mail**	belal.alshekhly@nahrainuniv.edu.iq suhaib.qusay@nahrainuniv.edu.iq
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**Version Number**	

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Programming 3	**Semester**	First

Co-requisites module	Programming 4	Semester	Second
Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
Module Aims أهداف المادة الدراسية	1. Teaching students the basics of numerical analysis. 2. Teaching the student to write advanced programs in the MATLAB language, specifically for numerical methods. 3. Teaching the student to solve some physical and engineering problems using numerical analysis.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Discussing the topics of the methodological book and auxiliary references 2. Theoretical lectures including problem solving and discussion of homework 3. Asking students for a set of thinking questions during lectures on specific topics. 4. Giving students homework requires finding solutions on their own.		
Indicative Contents المحتويات الإرشادية	• Daily tests 10% • Monthly exams 80% • Homework assignments and student interaction in discussion sessions 10%		
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies	• Discussing the topics of the methodological book and auxiliary references • Theoretical lectures including problem solving and discussion of homework • Asking students for a set of thinking questions during lectures on specific topics. • Giving students homework that requires finding solutions on their own.		

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	102	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	98	**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**
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	Graphical method
Week 2	Bisection method
Week 3	Fixed Point method
Week 4	Newton-Raphsen method
Week 5	Gauss Elimination method
Week 6	Gauss-Seidal method
Week 7	Least Square Fitting
Week 8	Trapezoidal Rule

Week 9	Simpson's 1/3 method
Week 10	Simpson's 3/8 method
Week 11	Euler's method
Week 12	Runge-Kutta's method
Week 13	Solution of non-linear system (Newton's method**)**
Week 14	Solution of non-linear system (iteration method)
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Graphical method
Week 2	Lab 2: Incremental Search
Week 3	Lab 3: Bisection method
Week 4	Lab 4: Fixed Point method
Week 5	Lab 5: Newton-Raphson method
Week 6	Lab 6: Gauss Elimination method
Week 7	Lab 7: Gauss-Seidal method
Week 8	Lab 8: Least Square Fitting
Week 9	Lab 9: Trapezoidal Rule
Week 10	Lab 10: Simpson's 1/3 method
Week 11	Lab 11: Simpson's 3/8 method
Week 12	Lab 12: Euler's method
Week 13	Lab 13: Runge-Kutta's method
Week 14	Lab 14: Solution of non-linear system (Newton's method**)**
Week 15	Lab 15: Solution of non-linear system (iteration method)

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	ESSENTIAL MATLAB (For Engineers and Scientists), 3rd edition (2007), Brain D. Hahan *and* Danial T. Valentine.	**Available**
Recommended Texts	• Getting Started with MATLAB 7, The MathWorks (2007). • MATLAB Primer (Seventh Edition 2005), Timothy A. Davies *and* Kermit Sigmon	**Not available**
Websites	www.mathwork.com	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.



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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Molecular physics			**Module Delivery**	
Module Type	CORE			☒**Theory** ☒**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	PHYS3108				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	1		**Semester of Delivery**	1	
Administering Department			**College**		
Module Leader	Nissan soud oribi		**e-mail**	nissan.oribi@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Asst. Prof.		**Module Leader's Qualification**	Ph.D	
Module Tutor	None		**e-mail**	none	
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**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. 1. The student learns about molecule theory 2. 2. The student learns how to work with spectroscopy . 3. 3. The student learns how to track the transmission of rays from energy levels 4. 4. The student learns how to work with simple and complex molecular systems. 5. 5. The student learns to calculate some molecular measurements.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	. 1. Identify the lesson topic and outline its outline. 2. Practice reading the characteristics of visual elements and identifying their types. 4. Practice analyzing the outputs of simple and complex molecular systems. 5. Work effectively with groups.
Indicative Contents المحتويات الإرشادية	• Understand the concepts in science of molecule physics and spectrum [10 hours] • Linking a theoretical concept with the application [10 hours] *Giving the student the opportunity to solve all the equation in molecule physics [10 hours]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The semester lasts sixteen weeks, including exams. Approximately 102 hours are devoted to teaching students the theoretical and practical foundations of the course subject, including theoretical material, which comprises 30 hours of lectures (three hours per week) material,. Two hours are allocated for the midterm exam, three hours for quizzes that extend from the middle of the semester.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	15% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	15% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.				
	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	Introduction of molecular physics
Week 2	Classification of molecule
Week 3	Atomic and molecule spectra
Week 4	Rotation of molecule-diatomic rigid molecule
Week 5	Rotation of molecule-diatomic non rigid molecule
Week 6	Population of Rotation levels
Week 7	Rotational spectrumof liner polyatomic molecule
Week 8	Vibrational energy
Week 9	Harmonic vibration of diatomic
Week 10	AnHarmonic vibration of diatomic

Week 11	"Morse potential"
Week 12	Examples
Week 13	Vibration-Rotation of molecule
Week 14	Electronic energy and spectra
Week 15	Raman spectra
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered **NO Lab.**
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	Fundamental of molecule spectroscopy By :w.s.struve	
Recommended Texts	الفيزياء الجزيئة د.عصام احمد محمود , د.خالد عبدالله	
Websites	All related international lectures and researches were dependent	

APPENDIX:

GRADING SCHEME

مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	QUANTUM MECHANICS 1			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	PHYS3102				
ECTS Credits	5				
SWL (hr/sem)	60				
Module Level	Three		**Semester of Delivery**		
Administering Department	Physics		**College**	Science	
Module Leader	Dr. Ibrahim A. Sadiq		**e-mail**	Ibrahim.sadiq@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Calculus, Complex Analysis, ODE and Mechanics	**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	• To know the origins of the Quantum Mechanics **(QM)** • To realize the basic concepts and principles of **QM.** • To have the ability to understand the applications of **QM.** • To have skills necessary to solve problems concerning QM and its applications**.** • The student is able to study advanced programs in QM. • The student is also able to understand other physics programs that requires the knowledge and skills QM program provides**.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• To know the origins of the Quantum Mechanics **(QM)** • To realize the basic concepts and principles of **QM.** • To have the ability to understand the applications of **QM.** • To have skills necessary to solve problems concerning QM and its applications**.** • The student is able to study advanced programs in QM. The student is also able to understand other physics programs that requires knowledge and skills QM program provides**.**
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Classroom Attendance • Exercises and solved problems. • Home Assessments (Solving problems and Reports) • Quizzes • Seminar

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

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes		15% (15)		
	Assignments		5% (5)		
	Seminar	2	10%(10)		
	Report	1	10% (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	The Origins of QM and the Historic Developments of QM
Week 2	Basic Concepts and Principles of QM: The wave packet and Heisenberg Uncertainty Principle
Week 3	The Basic Postulates of QM and Schrodinger Equation (TDSE)
Week 4	Applications of TISE (Cases of Unbounded System):THE FREE PARTICLE
Week 5	The Step Potential
Week 6	The Potential Barrier
Week 7	Review 1: Seminar 1 (Cases of Bounded System): The 1D Box Potential
Week 8	The 1D Box Potential
Week 9	The 1D Box Potential
Week 10	The 3D Box Potential
Week 11	The Harmonic Oscillator
Week 12	The Harmonic Oscillator
Week 13	The Ladder Operators
Week 14	Operators Algebra and Commutation Relations
Week 15	Review: Saminar
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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	1. Fundamentals of Quantum Mechanics, Ajit Kumar, Cambridge University Press. First published 2018. 2. Introduction to Quantum Mechanics, A. C. Phillips Department, John Wiley & Sons Ltd, 2003. 3. Quantum Mechanics Concepts and Applications Second Edition, Nouredine Zettili, John Wiley & Sons, Ltd. 2009. 4. Introduction to Quantum Mechanics Second Edition, David J. Griffiths, Pearson Education. Inc. 2005	
Recommended Texts	1. Introduction to Quantum Mechanics by Dicke and Wittke 2. An Introdution to Theory of Quantum Mechanics and Applications by Amnon Yariv 3. Solved Problems in Quantum Mechanics (Schaum's Outlines Series)	
Websites		

APPENDIX:

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
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	LASER PHYSICS		**Module Delivery**		
Module Type	CORE		☒**Theory** ☒**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**		
Module Code	PHYS3103				
ECTS Credits	8				
SWL (hr/sem)	200				
Module Level	1		**Semester of Delivery**	1	
Administering Department			**College**		
Module Leader	Dr.wildan M. Awad		**e-mail**	wildan.awad@nahrainuniv.edu.iq	
Module Leader's Acad. Title	lecturer		**Module Leader's Qualification**	Ph.D	
Module Tutor	Zena Kamil Zahraa Salman Zainab Hazim		**e-mail**	none	
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**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. To develop problem solving skills and understanding the basics of laser theory 2. To understand the laser device elements and laser beam generation processes 3. This course deals with the basic concept of laser active medium and pumping source 4. To understand the basic principles for all laser types 5.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. List the various terms associated with laser device and laser generation 2. Recognize the laser device basic components . 3. Identify each component like active medium, pumping source and resonator 4. Discuss the involvement of the active medium in laser wavelength. 5. Define the resonator and explain the operations and property of the different type of the resonators 6. Identify the basic pumping source and their property. 7. Discuss the various types of pumping source and there properties 8.study the laser beam output properties and .		
Indicative Contents المحتويات الإرشادية	indicative content includes the following Part A – Nature of Light Electromagnetic Waves black body radiation Boltzmann Distribution Refractive Index , Polarization, Light Intensity ,absorption and emission Atomic Energy Levels Molecules Energy Levels [10 hrs]		

	Part B –Basic Principle of Laser – Einstein Coefficients — Population Inversion –stimulated and spontaneous emission– Threshold Condition —[10 hrs] Optical pumping methods Optical Resonators types – Condition for light amplification. [15 hrs] Part c – Line Shape Function– Q switching– mode-locked Laser Modes–Three level and four level systems[15 hrs]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to helping students to understand and understand the principle of laser devices and how to benefit from them in various applications through practical lessons and encouraging them to establish simplified classroom activities and events to clarify the mechanism of laser work

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	102	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	98	**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**
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	Introduction, Black Body Radiation, Boltzmann Distribution
Week 2	Absorption , Spontaneous Emission, Stimulated Emission
Week 3	Forbidden and Allowed Transitions
Week 4	Rate of Stimulated Emission and Absorption
Week 5	Gain Coefficient, Absorption Cross Section
Week 6	Einstein's Calculations
Week 7	Idea of Maser and Laser
Week 8	Laser of Principles
Week 9	Laser active medium
Week 10	Gain Coefficient and Threshold Condition
Week 11	Pumping Plan and Methods
Week 12	Types of Optical Resonators Resonator Optical of Stability
Week 13	Resonator Mods Quality Factor
Week 14	Continuous Wave (CW) and Pulsed Operation
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Laser directionality
Week 2	Lab 2: Monochromatic
Week 3	Lab 3: range measurement
Week 4	Lab 4: thickness measurement by laser
Week 5	Lab 5: Laser light polarization
Week 6	Lab 6: slit thickness measurement

Week 7	Lab 7: Gauss's distribution

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamental of laser physics (2007)	
Recommended Texts	Principles of laser	
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.



ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	SUSTAINABLE ENERGY			**Module Delivery**	
Module Type	CORE			☒**Theory** ☒**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☒**Seminar**	
Module Code	PHYS3106				
ECTS Credits	8				
SWL (hr/sem)	100				
Module Level			**Semester of Delivery**	2	
Administering Department	PHYSICS		**College**	Science	
Module Leader	Assist. Prof. Ahmed Kadhim		**e-mail**	AHMED.KADHIM@NAHRAINUNIV.EDU.IQ	
Module Leader's Acad. Title	Assis. Professor		**Module Leader's Qualification**	Master	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**	1	

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	• **Teaching students the basics of sustainable Energy.** • **Teaching the student to deal with new scientific understanding of the renewable energy** • **Teaching the student to find out why to deal with new sources of energy and its problems**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Discussing the topics of the methodological book and auxiliary references • Theoretical lectures including problem solving and discussion of homework • Asking students for a set of thinking questions during lectures on specific topics. • Giving students homework that requires finding solutions on their own.
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	102	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	98	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.5
Total SWL (h/sem)	200		

الحمل الدراسي الكلي للطالب خلال الفصل	

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	Total Energy Usage
Week 2	what is Energy?
Week 3	Energy Resources
Week 4	Calculation of Wind Energy and Power
Week 5	Applications of Renewable Energies
Week 6	Mid-term exam
Week 7	Photovoltaic
Week 8	Solar Radiation
Week 9	Solar Power
Week 10	Atmosphere Influence on Solar Radiation
Week 11	Resource Identification
Week 12	Geothermal Resources
Week 13	Geothermal Power Technology
Week 14	Mid-Term Exam
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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	Sustainable Energy TEXTBOOK	
Recommended Texts	Renewable Energy	
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	F – Fail	راسب	(0-44)	Considerable amount of work required
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ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**Materials Physics/I**		**Module Delivery**
Module Type	**Core**		• ☒ **Theory** • ☒ **Lecture** • ☐ **Lab** • ☐ **Tutorial** • ☐ **Practical** • ☐ **Seminar**
Module Code	**PHYS3101**		
ECTS Credits	**2**		
SWL (hr/sem)	**60**		
Module Level	3	**Semester of Delivery**	2
Administering Department	PHY	**College**	College of Science
Module Leader	Dr. Sadeem Abbas Fadhil	**e-mail**	sadeemfadhil@yahoo.com
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	E-mail
Scientific Committee Approval Date	10/4/2025	**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. Understanding Physical Properties: Enabling students to understand the physical properties of different materials, such as density, hardness, and elasticity. 2. Applying Theoretical Concepts: Connecting theoretical concepts in physics to practical applications in everyday life and industry. 3. Developing Analytical Skills: Enhancing analytical and critical thinking skills through the study of material behavior under various conditions. 4. Encouraging Innovation: Inspiring students to innovate in the design and application of materials, supporting research and development in fields like engineering and materials science. 5. Understanding Chemical and Physical Changes: Studying how changes in environmental conditions affect the properties of materials. 6. Interacting with Technology: Enhancing students' understanding of how modern technology is used in the study and application of materials science.
Module Learning Outcomes **مخرجات التعلم للمادة الدراسية**	**1. Knowledge and Understanding** **2. Explain the relationship between the atomic structure of matter and material properties.** **3. Describe the main classes of materials (metals, ceramics, polymers, semiconductors, composites) and their characteristic properties.** **4. Interpret crystal structures, unit cells, and the significance of crystallographic directions and planes.** **5. Explain the role of imperfections (point, line, and surface defects) in determining material behavior.** **6. Describe basic mechanical, thermal, electrical, magnetic, and optical properties of materials in relation to their internal structure.** **7. Explain fundamental phase diagrams, diffusion processes, and phase transformations.** **8. Recognize how materials are selected and applied in physics and engineering contexts.** **9. Intellectual Skills** **10. Analyze and predict the effect of atomic bonding and microstructure on macroscopic properties.** **11. Apply basic principles of thermodynamics and kinetics to materials behavior.**

	12. **Interpret experimental data (e.g., X-ray diffraction, stress-strain curves) to deduce material properties.**
Indicative Contents **المحتويات الإرشادية**	**1. Introduction to Materials Science** • Historical development and importance of materials in science and technology. • Classification of materials: metals, ceramics, polymers, semiconductors, composites. • Structure–property–processing–performance relationship. **2. Atomic Structure and Bonding** • Review of atomic structure. • Primary and secondary types of bonding (ionic, covalent, metallic, van der Waals, hydrogen bonding). • Influence of bonding on physical properties. **3. Crystal Structure of Solids** • Unit cells, crystal systems, Bravais lattices. • Common crystal structures (FCC, BCC, HCP, diamond, etc.). • Miller indices for planes and directions. • X-ray diffraction and determination of crystal structure. **4. Imperfections in Solids** • Point defects (vacancies, interstitials, substitutional defects). • Dislocations (edge, screw, mixed). • Grain boundaries and surface defects. • Effect of defects on material properties. **5. Diffusion in Solids** • Fick's laws of diffusion. • Diffusion mechanisms (vacancy and interstitial). • Applications of diffusion in materials (e.g., doping semiconductors, carburization). **6. Mechanical Properties of Materials** • Stress–strain relationships. • Elastic deformation, plastic deformation, hardness. • Toughness, ductility, resilience, fatigue, creep, fracture. • Strengthening mechanisms. **7. Phase Diagrams and Phase Transformations** • Basic concepts of phases and microstructures. • Binary phase diagrams (eutectic, eutectoid). • Lever rule. • Nucleation and growth, solidification processes. **8. Thermal Properties of Materials** • Heat capacity, thermal expansion, and thermal conductivity. • Thermal stresses and thermal shock. **9. Electrical, Magnetic, and Optical Properties** • Conductors, semiconductors, and insulators.

	• Band theory basics. • Magnetic properties (diamagnetism, paramagnetism, ferromagnetism). • Optical properties (transparency, absorption, reflection). **10. Classes of Materials and Applications** • Metals and alloys. • Ceramics and glasses. • Polymers. • Composites. • Emerging functional materials (smart materials, nanomaterials, superconductors).

Learning and Teaching Strategies **استراتيجيات التعلم والتعليم**	
Strategies	1. **Lectures** • Deliver core theoretical concepts with visual aids (PowerPoint, animations, models of crystal structures). • Integrate real-world applications (e.g., materials in electronics, superconductors, nanomaterials). 2. **Tutorials / Problem-Solving Sessions** • Small-group sessions focused on solving numerical and conceptual problems (e.g., calculating Miller indices, diffusion coefficients, or analyzing stress–strain data). • Encourage peer discussion and collaborative learning. 3. **Case Studies and Applications** • Explore practical scenarios like material failure analysis, materials selection for engineering/physics applications, or the role of superconductors in modern technology. 4. **Use of Digital and Multimedia Resources** • Simulation software for crystal structures, phase diagrams, and materials properties. • Online videos/virtual labs to complement experimental limitations. 5. **Interactive Teaching** • Classroom discussions, Q&A, and group brainstorming on material-related challenges. • Incorporation of quizzes or clicker questions to check understanding during lectures. 6. **Project-Based Learning (Optional, if time permits)**

	• Mini-projects where students investigate a specific material (e.g., graphene, shape-memory alloys, superconductors) and present findings.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) **الحمل الدراسي المنتظم للطالب خلال الفصل**	30	**Structured SWL (h/w)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	2
Unstructured SWL (h/sem) **الحمل الدراسي غير المنتظم للطالب خلال الفصل**	30	**Unstructured SWL (h/w)** **الحمل الدراسي غير المنتظم للطالب أسبوعيا**	2
Total SWL (h/sem) **الحمل الدراسي الكلي للطالب خلال الفصل**	60		

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, 3and 6
	Assignments	1	10% (10)	2, 12	LO # 3, 4, 5 and 6
	Projects / Lab.		10% (10)	Continuous	
	Report	1	10% (10)		LO # 4, 5 and 6
Summative assessment	**Midterm Exam**	1hr	10% (10)	10	LO # 1-6
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction
Week 2	Atomic Bonding of Materials

Week 3	Forces and energy between atoms
Week 4	Structure of Solids
Week 5	Crystal Defects
Week 6	Crystal lattice systems
Week 7	Mechanical Properties of Materials
Week 8	Mid-term exam1
Week 9	Electrical Properties of Materials
Week 10	Thermal Properties of Materials
Week 11	Magnetic Properties of Materials
Week 12	Optical Properties of Materials
Week 13	Mid-term exam2
Week 14	Materials applications
Week 15	Discussing Projects
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	- Fundamentals of Materials Science and Engineering: An Integrated Approach By: WILLIAM D. CALLISTER, JR.	No

	& DAVID G. RETHWISCH, 2015 John Wiley & Sons, Inc.	
Recommended Texts	- Introduction to Solid State Physics, by Kittel 2005	No
Websites	MIT lectures about materials	

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.

الكورس الثاني

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Sciences Physics Department	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**Calculus (II)**		**Module Delivery**
Module Type	**Core**		• ☒ **Theory** • ☐ **Lecture** • ☐ **Lab** • ☒ **Tutorial** • ☐ **Practical** • ☐ **Seminar**
Module Code	**CREQ1201**		
ECTS Credits	**4**		
SWL (hr/sem)	**100**		
Module Level		**Semester of Delivery**	2
Administering Department	Mathematics and Computer Applications	**College**	College of Sciences
Module Leader	Ibtisam Kamil Hanan	**e-mail**	ibtisam.kamil@nahrainuniv.edu.iq
Module Leader's Acad. Title	Asst. Prof.	**Module Leader's Qualification**	Ph.D.
Module Tutor	Haneen Abdulkareem	**e-mail**	haneen.abdulkareem@nahrainuniv.edu.iq
Peer Reviewer Name	me	**e-mail**	E-mail
Scientific Committee Approval Date	02/01/2026	**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**	The aim of this course is to introduce the concept of integration, study various techniques of integration, test improper integrals for convergence and illustrate some applications of integration. Student will gain proficiency to use integration to solve real world problems such as area and volumes problems.
Module Learning Outcomes **مخرجات التعلم للمادة الدراسية**	After completing the course, students have the ability 1. To determine proper integral of one variable functions. 2. To determine integral involving the fundamental theorem of Calculus and method of substitution. 3. To determine the solution of problems involving the integral of one variable function. 4. To compute integral involving transcendental functions. 5. To compute integral with advanced integration techniques. 6. To demonstrate ability to think critically by recognizing patterns and determining and using appropriate techniques for solving a variety of integration problems. 7. To solve indeterminate forms and improper integral problems. 8. To calculate the length of a plane curve and solving area and volume application problems. 9. To demonstrate an intuitive and computational understanding for integral applications by solving a variety of problems from physics, engineering and mathematics.
Indicative Contents **المحتويات الإرشادية**	1. Proper integral, Fundamental Theorem of Calculus, basic rules of integration. 2. Methods of integrations, method of substitution, partial integration method, trigonometry integral and integral of rational function with partial fraction. 3. Improper integrals.

	4. Application of Definite Integrals, Area, solid revolution volume and Arc length.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module will be presented to the students through a specified series of lectures, supported by problem solving practice carried out in interactive tutorials. These tutorials will be supported by practice and directed study outside the classroom. Formative assessment takes place throughout the module during tutorials and feedback is given during these tutorials.

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**	3.467
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)	3, 8	LO #1, 2, and 4
	Assignments	2	10% (10)	6, 9	LO # 3 and 6
	Seminar	1	10% (10)	7	-
	Report	1	10% (10)	12	LO # 5, 7 and 8
Summative assessment	**Midterm Exam**	1	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	Indefinite integrals, Definite integrals, The fundamental theorems of integrals, Basic Integration Formulas.
Week 2	Integration by substitution
Week 3	Integration of certain powers of trigonometric and hyperbolic functions
Week 4	Integrals involving trigonometric substitutions, Integrals involving hyperbolic substation.
Week 5	Integrals involving quadratic substation
Week 6	Integration by parts
Week 7	Integration of Rational Functions
Week 8	Integration of Irrational Functions
Week 9	Integration of Rational Functions of Trigonometric
Week 10	Mid-Term Exam + Improper integrals: Definition of improper integral and examples
Week 11	Application of Definite Integrals: Area under the curve
Week 12	Area between two curves, Volume of solid of revolution: Disk (washer) method
Week 13	Volume of solid of revolution: shell method
Week 14	Arc length, Area of surface of revolution
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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 and Analytic Geometry by Thomas	Yes
Recommended Texts	Calculus with application brief version	No
Websites	www.mathhandbook.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.

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	MAGNETISM	**Module Delivery**	
Module Type	CORE	☒**Theory** ☒**Lecture** ☒**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	PHYS122		
ECTS Credits	7		
SWL (hr/sem)	220		
Module Level	1	**Semester of Delivery**	2
Administering Department	PHYS	**College**	college of science
Module Leader	Dr. Wasan A. Al-Taa'y	**e-mail**	Wassan.ali.mousa@nahrainuniv.edu.iq
Module Leader's Acad. Title	Assist Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	Zahraa Serhan	**e-mail**	zehraa.salman@nahrainuniv.edu.iq
Peer Reviewer Name	Zahraa Serhan	**e-mail**	zehraa.salman@nahrainuniv.edu.iq
Review Committee Approval	2026/1/2	**Version Number**	1.0
Lab administrators	م.م.حسين علي وهيب,م.م.ميس عطاالله,م.م.هالة فاضل		

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. Understand the magnetic field and electromagnetic. 2. Understand the torque in a uniform magnetic field. 3. Know the sources of magnetic field. 4. Know the classification and kinds of magnetic materials. 5. Identify the magnetic and electric motive forces. 6. Learn about the Farady's Law, Lorent'z Law and Ohm's Law for magnetic CCT. 7. Identify the self and mutual inductance. 8. Understand the energy stored in inductor. 9. Identify the exponential functions. 10. Understand the magnetic field intensity.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the magnetic field. 2. Understand the torque in a uniform magnetic field. 3. Know the sources of magnetic field. 4. Know the classification of magnetic materials. 5. Understand the electromagnetism. 6. Identify the magnetic motive force. 7. Understand the characterization of magnetic and electromagnetic. 8. Know the kinds of magnetic materials. 9. Learn about the Farady's Law and Lorent'z Law. 10. Identify the self and mutual inductance. 11. Understand the energy stored in inductor. 12. Understand the R-C and R-L time constants. 13. Identify the exponential functions. 14. Understand the magnetic field intensity. 15. Understand the Reluctance. 16. Learn about Ohm's Law for magnetic CCT.

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. magnetic field, torque in a uniform magnetic field, sources of magnetic field, electromagnetism, the magnetic motive force, characterization of magnetic and electromagnetic, magnetic unite, classification of magnetic materials, kinds of magnetic materials, Farady's Law and Lorent'z Law, self and mutual inductance, energy stored in inductor, R-C and R-L time constants, exponential functions, magnetic field intensity, Reluctance, Ohm's Law for magnetic CCT, Reluctance in series and parallel.

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 and by oral, written exams and homeworks.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	82	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	205		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	2, 5, 10, 12	
	Assignments	2	10%(10)	2, 11	
	Projects / Lab.	1	15% (15)	Continuous	
	Seminar	1	5% (5)	13	
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	
	Final Exam	2hr	50% (50)	16	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Magnetic field, torque in a uniform magnetic field.
Week 2	sources of the magnetic field,
Week 3	classification of magnetic materials, electromagnetism
Week 4	Magnetic unite, magnetic and electromagnetic,
Week 5	magnetic materials, Farady's Law
Week 6	Lorent'z Law, induced e.m.f,,
Week 7	inductance R-C and R-L, , R-C time constants ,
Week 8	Mid exam
Week 9	R-L time constants, energy stored in inductor
Week 10	exponential functions
Week 11	magnetic field intensity, electric field, permeability.
Week 12	magnetic CCT, Reluctance
Week 13	Ohm's Law for magnetic CCT
Week 14	Reluctance in series and parallel.
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Ohms law
Week 2	Lab 2: lenz's law
Week 3	Lab 3: Faradays law
Week 4	Lab 4: time constant of R-C circuit
Week 5	Lab 5: maximum power transfer
Week 6	Lab 6: voltage of cell
Week 7	Lab 7: parallel and series for resistance and equivalent resistance

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fudamentals of magnetism , Mario reis	yes
Recommended Texts	Magnetism and magnetic materials	no
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	English Language	**Module Delivery**	
Module Type	BASIC		☒**Theory** ☐**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**
Module Code			
ECTS Credits	2		
SWL (hr/sem)	50		

Module Level	1	**Semester of Delivery**	2
Administering Department	Department of Physics	**College**	Science
Module Leader	Lecturer Israa Namh Abdula	**e-mail**	Israa.asultani@nahrainuniv.edu.iq
Module Leader's Acad. Title	Assist. Lecturer	**Module Leader's Qualification**	M.A.
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval		**Version Number**	

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. Developing Basic Communication Skills: - Enable students to express themselves effectively in everyday situations. - Focus on building a foundation in speaking and listening. 2. Enhancing Reading Comprehension: - Improve students' ability to understand and interpret written texts. - Introduce strategies for effective reading comprehension. 3. Strengthening Writing Proficiency: - Develop students' writing skills across different genres (e.g., essays, emails, reports). - Emphasize grammar, sentence structure, and vocabulary usage. 4. Expanding Vocabulary: - Introduce new words and phrases to broaden students' vocabulary. - Provide strategies for effective vocabulary acquisition and retention. 5. Grammar Mastery: - Ensure a solid grasp of essential grammar rules and structures. - Focus on practical application in spoken and written communication. 6. Listening Skills Development: - Improve students' ability to comprehend spoken English in various contexts. - Provide exposure to different accents and speaking speeds. 7. Critical Thinking through Discussions: - Encourage students to engage in discussions to develop critical thinking skills. - Promote the use of evidence and persuasive language in discussions. 8. Effective Presentation Skills: - Equip students with the skills to deliver clear and engaging presentations. - Focus on aspects such as organization, delivery, and visual aids.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Students will demonstrate the ability to initiate and sustain simple conversations in English. 2. Students will be able to ask and respond to basic questions related to personal information, daily activities, and immediate surroundings. 3. Students will exhibit improved reading comprehension by accurately summarizing and analyzing information from a variety of texts. 4. Students will produce well-organized written compositions with a clear introduction, body, and conclusion. 5. Students will apply correct grammar and sentence structures in spoken and written communication.

	6. Students will demonstrate improved listening comprehension across a range of accents and contexts 7. Students will actively participate in discussions, expressing and defending their opinions. 8. Students will deliver clear and organized presentations using appropriate language and visuals.
Indicative Contents المحتويات الإرشادية	Basic Communication Skills: • Greetings and introductions • Describing daily routines • Asking and answering simple questions Reading Comprehension: • Short stories and simple narratives • Comprehension exercises with questions Writing Proficiency: • Sentence structure and formation • Paragraph writing Vocabulary Expansion: • Everyday vocabulary • Academic vocabulary Listening Skills Development: • Listening to dialogues and conversations • Podcasts and audio materials
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Emphasize interactive and communicative activities to engage students actively in the learning process • Design tasks that require students to use English to accomplish specific goals, fostering language use in context. • Recognize and accommodate diverse learning styles and paces within the classroom. • Incorporate authentic materials like newspaper articles, blogs, or videos to expose students to real-life language use. • Implement ongoing formative assessments, such as quizzes, peer evaluations, and class discussions, to gauge student progress. • Provide constructive feedback on both spoken and written language, and encourage students to reflect on their learning experiences • Adapt lesson plans based on the evolving needs and interests of the students, allowing for flexibility in the teaching approach.

Student Workload (SWL) الحمل الدراسي للطالب			
SSWL (Structured SWL (h/sem)) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	18	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	1	10% (10)	5, 10	LO #1, 3, 5 and 8
	Assignments	1	10% (10)	4, 12	LO # 2, 4, 5 and 6
	presentation	1	10% (10)	3-14	
	Report	1	10% (10)	11	LO #4
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1, 3, 7, and 8
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to the course, syllabus, and expectations.
Week 2	Unit One of the textbook “Hello”: Basic greetings and practice activities. Basic grammar
Week 3	Writing skills: the basics of writing a paragraph
Week 4	Unit Two of the textbook “Your World”: Vocabulary related to daily routines and countries’ names. Present simple tense for daily activities. Describing things using adjectives.
Week 5	Unit Three of the textbook “All About You”: Vocabulary related to professions, questions and negatives, and Social expressions.
Week 6	Unit Four of the textbook “Family and Friends”: Possessive Adjectives, Possessive (‘s), and (Adjective+noun) • Reading and Speaking. • Role-playing on-campus scenarios.

Week 7	Mid-term
Week 8	Unit Five of the textbook "The Way I Live": Uses of definite and indefinite articles, Adjectives + nouns. - Languages and Nationalities
Week 9	Unit Six of the textbook "Every day": Adverbs of frequency used with present simple tense. - Vocabulary related to travel and transportation. - Asking for and giving directions. - Role-playing travel scenarios.
Week 10	Unit Seven of the textbook "My Favourites": Reading and writing a postcard and an e-mail to a friend. Adjectives and their opposites.
Week 11	Unit Eight of the textbook "Where I live": Introduction to prepositions (prepositions of place and time)
Week 12	-Writing and talking about personal interests. -Group activity: planning a class event based on shared interests.
Week 13	Vocabulary related to health and daily activities. Expressions for discussing health. Role-playing doctor-patient scenarios.
Week 14	Listening Skill: Listening to a podcast, and class discussions
Week 15	**Preparatory Week for the final exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"New Headway Plus - Beginner", John and Liz Soars, 2014.	Yes
Recommended Texts		
Websites	www.youtube.com (short videos+ chosen movies)	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	PROGRAMMING FUNDAMENTALS	**Module Delivery**	
Module Type	BASIC		☒**Theory** ☐**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**
Module Code	UREQ120		
ECTS Credits	3		
SWL (hr/sem)	75		

Module Level	1	**Semester of Delivery**	2
Administering Department	Physics	**College**	Science
Module Leader	Dr. Ahmed Shakir Mahmood	**e-mail**	Ahmad.mohmood@nahrainuniv.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor	Dr. Ahmed Shakir Mahmood, Bilal Abdul Satar Rasha Shahir Badawi	**e-mail**	Ahmad.mohmood@nahrainuniv.edu.iq Bilal.AbdulSatar@nahrainuniv.edu.iq Rasha.shahir@nahrainuniv.edu.iq
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	28/01/2026	**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. Develop programming skills for the students to solve different kinds of physical and mathematical problems. 2. Using new commands and controls. 3. Introduction to numeric analysis and computer graphics commands.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The students should learn many different physical and mathematical applications. 2. Development of the knowledge of the students for the aspect of the programming logic and how one can use it to solve complicated problems. 3. The students should be able to write a different programming code to solve basic mathematical and physical problems.		
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Looping Commands (For-next, Do – Loop). • Advanced applications I. • Advanced applications II. • Two-dimensional array and introduction to matrices (read and write matrix elements). • Mathematical operations on matrices (adding and subtracting matrices) I. • Mathematical operations on matrices (matrices multiplication) II. • Mathematical operations on matrices (Inverse matrix) III. • Subroutine and function definition I. • Subroutine and function definition II. • Sequential file (input and output). • Some numerical analysis methods (Differentiation) I. • Some numerical analysis methods (Integration) II. • Some computer graphics command.		

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.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	15	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
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**	4	10% (10)	5, 11	LO #1, 2 and 3
	Assignments	2	15% (15)	6, 12	LO # 2 and 3
	Projects / Lab.	9 hr/1	15% (15)	Continuous	
	Report	-	0	13	LO #1,2 and 3
Summative assessment	**Midterm Exam**	2 hr	10% (10)	10	LO # 1-3
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Looping Commands (For-next, Do – Loop).
Week 2	Advanced applications I.
Week 3	Advanced applications II.
Week 4	Two-dimensional array and introduction to matrices (read and write matrix elements).

Week 5	Mathematical operations on matrices (adding and subtracting matrices) I.
Week 6	Mathematical operations on matrices (matrices multiplication) II.
Week 7	Mathematical operations on matrices (Inverse matrix) III.
Week 8	Subroutine and function definition I.
Week 9	Subroutine and function definition II.
Week 10	**Mid Exam**
Week 11	Sequential file (input and output).
Week 12	Some numerical analysis methods (Differentiation) I.
Week 13	Some numerical analysis methods (Integration) II.
Week 14	Some computer graphics command.
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Looping Commands (For-next, Do – Loop).
Week 2	Lab 2: Advanced applications I.
Week 3	Lab 3: Advanced applications II.
Week 4	Lab 4: Two-dimensional array and introduction to matrices (read and write matrix elements).
Week 5	Lab 5: Mathematical operations on matrices (adding and subtracting matrices) I.
Week 6	Lab 6: Mathematical operations on matrices (matrices multiplication) II.
Week 7	Lab 7: Mathematical operations on matrices (Inverse matrix) III.
Week 8	Lab 8: Subroutine and function definition I.
Week 9	Lab 9: Subroutine and function definition II.
Week 10	**Mid Exam**
Week 11	Lab 11: Sequential file (input and output).
Week 12	Lab 12: Some numerical analysis methods (Differentiation) I.
Week 13	Lab 13: Some numerical analysis method (Integration) II.
Week 14	Lab 14: some computer graphics command.
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Microsoft Visual Basic 6.0 Step by Step" Microsoft Corporation (1999)	No
Recommended Texts	"Schaum's Outline of Theory and Problems of Programming with Visual Basic", by Byron S. Gottfried McGraw-Hill, NC. (2001)	No
Recommended Texts	Lectures Notes Dr. Ahmed Shakir Mahmood Yas (2023)	
Websites	https://learn.microsoft.com/en-us/previous-versions/visualstudio/visual-basic-6/visual-basic-6.0-documentation	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
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	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	MECHANICS AND PROPERTIES OF MATTER			**Module Delivery**	
Module Type	CORE			☒**Theory** ☒**Lecture** ☒**Lab** ☒**Tutorial** ☒**Practical** ☒**Seminar**	
Module Code	PHY-121				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level		1	**Semester of Delivery**		1
Administering Department		Physics Department	**College**	College of Science	
Module Leader	Dr. Ahmed A. Al-Tabbakh		**e-mail**	ahmad.altabbak@nahrainuniv.edu.iq	
Module Leader's Acad. Title		Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor	Essam M. Rasheed		**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	PHY-111	**Semester**	1

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. Introducing students to the basic concepts related to static and moving systems. 2. Introducing the student to the methods of classifying mechanical systems, the laws related to them, and the life applications that simulate their theories. 3. Introducing the student to methods of mathematical solutions to problems related to static and moving mechanical systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Providing the student with sufficient experience to deal with kinetic systems according to the mathematical theories and laws compatible with them. 2. Enhancing the student's mental ability to analyze kinetic systems according to those theories to find the required solutions to the problems that the student may face during study and after graduation.
Indicative Contents المحتويات الإرشادية	1. Angular Motion 2. Rigid body rotation 3. Simple harmonic motion 4. Density and elasticity 5. Fluids at rest 6. Fluids in motion 7. Thermal expansion

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1. Differentiated Instruction: Learning Stations: Differentiated instruction provides a way to meet the needs of all students. One useful strategy to differentiate teaching is learning stations. Learning Stations can be easily designed to enable students with diverse learning needs to learn at their own pace and level of readiness. Teachers can set up each station where students will be able to complete the same task, but at the level and style designed specifically for them. 2. Cooperative Learning: Cooperative learning gives students the opportunity to work with others and see different perspectives. Students learn more effectively when working together rather than separately, and it is also known to improve self-confidence in students. 3. Using technology in the classroom. Such as using multimedia presentations, scientific films, and illustrative animations. 4. Inquiry-based learning to engage students in learning by asking probing, investigative, and exploratory questions.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	94	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	81	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	10min/12	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	1hr/12	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	20hr/1	10% (10)	Continuous	
	Report	20hr/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	**Angular motion:** Angular displacement, angular velocity, angular acceleration, Relations between angular and tangential quantities. Centripetal force and centripetal acceleration.
Week 2	**Angular motion:** Problem solving
Week 3	**Rigid body rotation:** Torque, moment of inertia, torque and angular acceleration. Kinetic energy of rotation, rotation and translation. Angular momentum and angular impulse.
Week 4	**Rigid body rotation:** Problem solving
Week 5	**Simple harmonic motion:** Period, frequency, graph of vibratory motion. Displacement and restoring force. Hookean system, energy interchange, speed and acceleration of simple harmonic motion. Reference circle, simple pendulum.

Week 6	**Simple harmonic motion:** Problem solving
Week 7	**Mid-term exam**
Week 8	**Density and elasticity:** Mass density, specific gravity, elasticity, stress and strain, elastic limit. Young Modulus, Bulk modulus, shear modulus.
Week 9	**Density and elasticity:** Problem solving
Week 10	**Fluid at rest:** Average pressure, standard atmospheric pressure, hydrostatic pressure, Pascal principle, Archimedes principle
Week 11	**Fluid at rest:** problem solving
Week 12	**Fluids in motion:** Fluid flow or discharge, equation of continuity, shear rate, viscosity, Poiseuille's law, work done by a piston, work done by a pressure, Bernoulli's equation, Torricelli's theorem, Reynolds number.
Week 13	**Fluids in motion:** Problem solving
Week 14	**Thermal Expansion:** Temperature and scales, linear expansion of solids, area expansion, volume expansion.
Week 15	**Mid-term Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Instructions to students, Basic personal needs and other requirements. Writing the account of an experiment, Introduction to graphical representation of experimental data, Errors, their determination and minimization, least square fitting. Units.
Week 2	Lab 2: Moment of inertia of a flywheel (Maxwell Wheel)
Week 3	Lab 3: Measurement of a Young Modulus of a wire
Week 4	Lab 4: Exam
Week 5	Lab 5: The behavior of a wire under tension
Week 6	Lab 6: Flow of water through capillary tube.
Week 7	Lab 7: Fall of a body through a viscous medium.
Week 8	Lab 8: Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Theory and Problems of College Physics By Frederick Bueche and Eugene Hecht	Available
Recommended Texts	Fundamental of Physics by Halliday, Resnick and Walker	Available
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.



ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	اللغة العربية			**Module Delivery**	
Module Type	CORE			☐**Theory** ⁎**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code					
ECTS Credits	2				
SWL (hr/sem)					
Module Level	UGx11		**Semester of Delivery**		
Administering Department			**College**	College of science	
Module Leader	Omar adnan		**e-mail**	omar.adnan@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assistant professor		**Module Leader's Qualification**	MSC	
Module Tutor			**e-mail**		

Peer Reviewer Name		**e-mail**	
Review Committee Approval	1/2026	**Version Number**	

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. تغطية اساسيات اللغة العربية 2. معرفة اقسام اللغة العربية 3. تطوير مهارات القراءة والكتابة والاستماع 4. تنمية الثقافة اللغوية بفهم اللغة العربية بلغة ذات تاريخ وثقافة 5. تعلم مهارات الحديث والتحدث للتواصل بفعالية مع الاخرين		

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	المعرفة والفهم حيث يجب ان يكون الخريج قادر على معرفة وفهم مايأتي: 1. القدرة على التحدث والكتابة باللغة العربية بطلاقة وبمستوى متقدم 2. فهم الثقافة العربية والتقاليد والقيم 3. قدرة الطالب على المشاركة في المجتمعات والندوات سواء في المجال الاكاديمي او المهني او الاجتماعي 4. قدرة الطالب على قراءة وتحليل النصوص الادبية والاكاديمية باللغة العربية ليسهل عليهم اجراء البحوث وكتابة الاوراق البحثية بشكل مناسب 5. الاستعداد للحياة المهنية من خلال قدرة الطالب على استخدام اللغة العربية بالترجمة والتعليم والعلاقات العامة او اي مجال اخر يتطلب التواصل باللغة العربية
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. اسلوب المحاضرات والتطبيق بالامثلة 2. نظام الواجبات البيتية والسمنار

Student Workload (SWL)

الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	102	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	98	**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

As		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./ Seminar	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

Week	Material Covered

Week 1	مدخل الكلام ومايتألف منه
Week 2	اقسام الكلمة وعلامات كل قسم
Week 3	انواع الجملة وعلامات الاعراب
Week 4	المبني والمعرب
Week 5	المبتدأ والخبر وانواع الخبر وتقديمه
Week 6	اختبار ١٠
Week 7	قصيدة للشاعر ابي الطيب المتنبي
Week 8	النواسخ (كان واخواتها)
Week 9	إن واخواتها
Week 10	تكملة الموضوع السابق
Week 11	علامات التنقيط مع رسم الهمزة
Week 12	اختبار ١٥
Week 13	العدد
Week 14	التوابع (صفة-العطف-التوكيد-البدل)
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**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	شرح ابن عقيل	
Recommended Texts	الادب الجاهلي/شوقي ضيف البيان والتبين/الجاحظ	
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors

	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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CHMODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**General Chemistry**		**Module Delivery**
Module Type	**Core**		• ☒ **Theory** • ☒ **Lecture** • ☒ **Lab** • ☐ **Tutorial** • ☐ **Practical** • ☐ **Seminar**
Module Code	**CHM1103**		
ECTS Credits			
SWL (hr/sem)			
Module Level		**Semester of Delivery**	1
Administering Department	Type Dept. Code	**College**	Type College Code
Module Leader	Dr. Atheel Alwash	**e-mail**	atheelalwash@nahrainuniv.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	me	**e-mail**	E-mail
Scientific Committee Approval Date	02/01/2026	**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**	The primary objective of this course is to acquire basic concepts, principles, and techniques of modern chemistry including a mix of (analytical chemistry and basic of organic chemistry) that would empower students with an investigative mind set and the abilities to solve diverse problems in an efficient and quantitative way that conveys the importance of accuracy and precision of the analytical results. On successful completion of this course, students will be able: 1. To develop an understanding of the range and uses of analytical methods in chemistry. 2. To establish an appreciation of the role of chemistry in quantitative analysis 3. To develop an understanding of the broad role of the chemist in measurement and problem solving for analytical tasks. 4. To provide an understanding of chemical methods employed for elemental and compound analysis. 5. To provide experience in some scientific methods employed in analytical chemistry. 6. To develop some understanding of the professional and safety responsibilities residing in working on chemical analysis. 7. To understand some basic of organic chemistry such structure and properties of alcohol, alkane alkene …
Module Learning Outcomes **مخرجات التعلم للمادة الدراسية**	After attending this course in General Chemistry, **t**he students have to be able to develop a basic knowledge of main principles of general chemistry as follows

	▪ To understand qualitative and quantitative properties of solutions, understanding all kinds of analytical concentrations. ▪ To describe and explain chemical equilibriums of acid base reactions ▪ To know basic definitions, properties and nomenclature of alkan, alkenes, alcohol etc. ▪ Understanding the principles of gravimetric and specrochemical methods ▪ Understanding the acid/base reactions and titration methods Effectively teach practical science through the context of analytical chemistry Design problem solving activities to challenge student understanding of analytical chemistry Understanding the safe handling of chemicals and the principles apparatus and unit operation in analytical chemistry
Indicative Contents **المحتويات الإرشادية**	

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 presented during the class, home works and quizzes. Furthermore, encourage the student participation in panel discussion.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) **الحمل الدراسي المنتظم للطالب خلال الفصل**	102	**Structured SWL (h/w)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	7
Unstructured SWL (h/sem) **الحمل الدراسي غير المنتظم للطالب خلال الفصل**	98	**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**
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
Summative assessment	**Midterm Exam**	2 hr	30% (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	Chemicals, Apparatus, and Unit Operations of Analytical Chemistry
Week 2	Structure of atom
Week 3	Concentrations of solutions: molarity, normality, part per million and percentage
Week 4	
Week 5	Acid and base, Bronsted-Lowery definition
Week 6	PH
Week 7	Valence and oxidation number
Week 8	Chemical bonds

Week 9	Mid exam
Week 10	Reaction equilibrium
Week 11	Solubility equilibrium
Week 12	Titration
Week 13	
Week 14	Final exam
Week 15	Review and open discussion with the students
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) **المنهاج الاسبوعي للمختبر**	
	Material Covered
Week 1	Lab 1: Safety rules and Laboratory equipments
Week 2	Lab 2: PH and indicators
Week 3	Lab 3: Acid base titration
Week 4	Lab 4: Preparation of sodium hydroxide
Week 5	Lab 5: Effect of concentration on reaction rate
Week 6	Lab 6: Preparation and reaction of barium peroxide
Week 7	Lab 7: Calculation the percentage of water in hydrated salt

Learning and Teaching Resources **مصادر التعلم والتدريس**		
	Text	**Available in the Library?**
Required Texts	1. Fundamental of analytical chemistry: Nine edition, Skoog	Yes
Recommended Texts	Fundamentals of chemistry: Fourth Edition, David E. Goldberg	No
Websites	Different wabsites	

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.

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	THERMODYNAMICS & STATISTICAL PHYSICS			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code					
ECTS Credits	4				
SWL (hr/sem)	45				
Module Level	2nd		**Semester of Delivery**	2nd	
Administering Department	PHYSICS		**College**	Science	
Module Leader	Ibrahim A. Sadiq		**e-mail**	ibrahim.sadiq@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Doctor	
Module Tutor	Zainab Hazim		**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

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 teach students how to use statistical methods and mechanics to evaluate thermodynamic properties. 2. To teach how to predicts macroscopic properties form microscopic properties.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To understand the utility of statistical physics and when it should be used. 2. To realize the important role statistical physics 3. To realize that statistical physics is the theoretical extension of thermodynamics.
Indicative Contents المحتويات الإرشادية	The ideal gas equation , the kinetic theory, the classical heat capacity, diffusion, viscosity, heat conduction, Maxwell-Boltzmann statistics, Fermi-Dirac Statistics, Bose-Einstein statistics
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Classroom Lectures and Discussion • Class Assignments / tutorial • Home Assignments • Quizzes and Exams

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	45	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	55	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
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**	10	15% (15 M)		
	Assignments	5	10% (10 M)		
	Projects / Lab./ Seminar	0	10% (10 M)		
	Reports	3	5% (5 M)		
Summative assessment	**Midterm Exam**	2 hr	10% (10)	9	ALL PREVIOUS
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**INTRODUCTON: Thermodynamics Vs. Statistical Physics**
Week 2	**THE KINETIC THEORY OF GASES**
Week 3	**DEGREES OF FREEDOM CONCEPT AND EQUIPQRTION OF ENERGY PRINCIPLE**
Week 4	**THE CLASSICAL THEORY OF SPECIFIC HEAT CAPACITY**
Week 5	**MAXWELL DISTRIBUTION OF MOLECULAR VELOCITIES**
Week 6	**MAXWELL DISTRIBUTION OF MOLECULAR VELOCITIES**
Week 7	**TRANSPORT PHENOMENON: DIFFUSION, VISCOCITY AND HEAT CONDUCTION**
Week 8	**TRANSPORT PHENOMENON: DIFFUSION, VISCOCITY AND HEAT CONDUCTION**
Week 9	**STATISTICAL MECHANICS**
Week 10	**THERMODYNAMIC PROBABILITY**
Week 11	**MAXWELL- BOLTZMANN STATISTICS**
Week 12	**BOSE-EINSTEIN STATISTICS**
Week 13	**FREMI-DIRAC STATISTICS**
Week 14	**Entropy and Thermodynamic Probability**
Week 15	**APPLICATIONS OF MAXWELL- BOLTZMANN STATISTICS**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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	Thermodynamics, Kinetic Theory of Gases and Statistical Mechanics by (Sears Watson)	
Recommended Texts	Introduction to statistical Physics by Kerson Huang	
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	MATHEMATICS 4 (LINEAR ALGEBRA)			**Module Delivery**	
Module Type	CORE			☐**Theory** ☒**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**CRDIFEQU**				
ECTS Credits	4				
SWL (hr/sem)	3				
Module Level		Second Year	**Semester of Delivery**		Second
Administering Department		Mathematics	**College**		Sciences
Module Leader	Dr. Ahmed Ayyoub Yousif		**e-mail**		ahmed.ayyoub@nahrainuniv.edu.iq
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Dr. Ahmed Ayyoub Yousif		**e-mail**		ahmed.ayyoub@nahrainuniv.edu.iq
Peer Reviewer Name		Dr. Fadhel S. Fadhel	**e-mail**		fadhel.subhi@nahrainuniv.edu.iq
Review Committee Approval			**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. The student knows about linear system and matrices. 2. The student knows how to find Operations on the Matrices (Matrix Addition, Matrix Multiplication, Scalar Multiplication, The Transpose of a Matrix, The Inversion of a Matrix and Determinants) 3. The student knows about Vectors and Vector space. 4. The student knows about Eigenvalue and Eigenvectors.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The student will gain experience in dealing with any life problems that have been done using linear algebra. 2. Gaining experience in solving many physical problems, especially since most of them are represented by linear system and how to find the solution of them.
Indicative Contents المحتويات الإرشادية	The indicative contents of linear algebra divided into three parts: First part is about Linear Equations and Matrices which contents: - Linear Systems - Matrices - Operations on the Matrices - Matrix Addition - Matrix Multiplication - Scalar Multiplication - The Transpose of a Matrix - The Inversion of a Matrix. - Determinants. Second part is about Vectors and Vector space which contents: - Vector in plane - n- vector - Cross product in R^3 - Linear independent - Orthonormal bases in R^n The last part is Eigenvalue and Eigenvectors.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Daily activity 2. Complete the duties

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	45	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	55	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.6
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	15% (15)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab./Seminar	0	10% (10)	-	
	Report	1	5% (5)	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	**Linear Equations and Matrices and Linear Systems**
Week 2	**Matrices, Operations on the Matrices, Matrix Addition.**
Week 3	**Matrix Multiplication, Scalar Multiplication, The Transpose of a Matrix**
Week 4	**The Inversion of a Matrix**
Week 5	**Determinants**
Week 6	**Vectors and Vector space**
Week 7	**Vector in plane**
Week 8	**n- vector**
Week 9	**Cross product in R^3**
Week 10	**Linear independent**
Week 11	**Orthonormal bases in R^n**

Week 12	**Eigenvalue and Eigenvectors**
Week 13	**Diagonalization of symmetric Matrices**
Week 14	**Some real-life application of linear algebra**
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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	– **Introductory Linear Algebra with Applications By Bernard Kolman**	yes
Recommended Texts	– **INTRODUCTION TO LINEAR ALGEBRA WITH APPLICATIONS By Jim DeFranza and Dan Gagliardi.**	No
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	PROGRAMMING 4			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	PHYS2208				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level	Second		**Semester of Delivery**	Second	
Administering Department	Physics Department		**College**	College of Science	
Module Leader	Dr. Omar Ayad		**e-mail**	omar.jalal@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Doctor	
Module Tutor	• Suhaib Qusay Abdullah • Bilal Abdulsattar Yousif		**e-mail**	• suhaib.qusay@nahrainuniv.edu.iq • belal.alshekhly@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Programming 3	**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	1. Teaching students the basics of the MATLAB language. 2. Teaching students to write advanced MATLAB programs. 3. Teaching the student to solve some physics problems using the MATLAB language.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Discussing the topics of the methodological book and auxiliary references 2. Theoretical lectures including problem solving and discussion of homework 3. Asking students for a set of thinking questions during lectures on specific topics. 4. Giving students homework requires finding solutions on their own.		
Indicative Contents المحتويات الإرشادية	• Daily tests 10% • Monthly exams 80% • Homework assignments and student interaction in discussion sessions 10%		
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies			

• Discussing the topics of the methodological book and auxiliary references
• Theoretical lectures including problem solving and discussion of homework
• Asking students for a set of thinking questions during lectures on specific topics.
• Giving students homework that requires finding solutions on their own.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	49	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	26	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.8
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	3	15% (15)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	0	15% (15)	Continuous	
	Report	0	0	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	Control flow
Week 2	Script M-files
Week 3	Functions M-files
Week 4	Selected Examples I
Week 5	Selected Examples II
Week 6	Two-Dimensional Graphics
Week 7	Three-Dimensional Graphics
Week 8	Text
Week 9	Import and export data I
Week 10	Import and export data II

Week 11	Definition of Artificial Intelligence (AI)
Week 12	History of Artificial Intelligence
Week 13	Application of Artificial Intelligence
Week 14	Search engines using Artificial Intelligence
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Control flow
Week 2	Lab 2: Script M-files
Week 3	Lab 3: Functions M-files
Week 4	Lab 4: Selected Examples I
Week 5	Lab 5: Selected Examples II
Week 6	Lab 6: Two-Dimensional Graphics
Week 7	Lab 7: Three-Dimensional Graphics
Week 8	Lab 8: Text
Week 9	Lab 9: Import and export data
Week 10	Lab 10: Search engines using Artificial Intelligence

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	✓ ESSENTIAL MATLAB (For Engineers and Scientists), 3rd edition (2007), Brain D. Hahan *and* Danial T. Valentine. ✓ Structure and Strategies for Complex Problems Solving, 6thedition. Boston: Addison-Wesly Pearson Education.	

Recommended Texts	✓ Getting Started with MATLAB 7, The MathWorks (2007). ✓ MATLAB Primer (Seventh Edition 2005), Timothy A. Davies *and* Kermit Sigmon. ✓ Artificial Intelligence: Foundation of Computational Agents, 2nd edition, Cambridge University Press.	
Websites	www.mathwork.com	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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العاملين في المختبر:

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	ENGLISH LANGUAGE/II	**Module Delivery**	
Module Type	UREQ		☒**Theory** ☒**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**
Module Code			
ECTS Credits	2		
SWL (hr/sem)	30		
Module Level	2	**Semester of Delivery**	2
Administering Department	Physics	**College**	Sciences
Module Leader	Dr. Sadeem Abbas Fadhil	**e-mail**	sadeemfadhil@yahoo.com
Module Leader's Acad. Title	Assist. Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**Version Number**	

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. Develop Academic Reading Skills 2. Enhance Academic Writing Skills 3. Improve Listening and Note-Taking Skills 4. Expand Scientific Vocabulary 5. Foster Critical Thinking and Analysis 6. Prepare for International Communication 7. Gain the Ability to paraphrase and get rid of plagiarism. 8. Learning the techniques of writing reports and short papers.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1. Academic Reading Skills** **2. Academic Writing Skills** **3. Listening and Note-Taking Skills.** **4. Speaking and Presentation Skills** **5. Scientific Vocabulary Development** **6. Critical Thinking and Analysis** **7. Collaborative Learning.** **8. International Communication Skills.**
Indicative Contents المحتويات الإرشادية	1- Academic reading and writing. 2- Listening and note-taking. 3- Speaking and presentation skills. 4- Scientific vocabulary development. 5- Critical thinking and analysis. 6- Collaborative learning and teamwork. 7- International communication and networking.

	8- Research and referencing skills. 9- Problem-solving and application. Interdisciplinary communication. 10- Grammar and language accuracy.

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 lecture, while at the same time refining and expanding their critical thinking skills in English language. This will be achieved through classes, interactive tutorials and by considering type of simple assignments involving some paraphrasing activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	30	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	60		

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	1	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	-	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	Auxiliary verbs
Week 2	Auxiliary verbs exercises
Week 3	Present states and actions active and passive forms
Week 4	Present states and actions active and passive forms exercises.
Week 5	Past states and actions active and passive numbers
Week 6	Past states and actions active and passive numbers exercises.
Week 7	The modal verbs (1) Requests and offers
Week 8	The modal verbs (1) Requests and offers exercises
Week 9	Future forms: travelling around
Week 10	Mid-term exam
Week 11	Future forms: travelling around
Week 12	Future forms: travelling around exercises
Week 13	Likes and dislikes
Week 14	Likes and dislikes exercises
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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	- New Headway English course, Intermediate student's book, second edition.Liz & John Soars, Oxford University Press. - New Headway English course, Intermediate workbook, second edition. Liz & John Soars, Oxford University Press.	No
Recommended Texts	- British Council test books	No
Websites	https://www.oxfordonlineenglish.com/home-mobile	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	MODERN PHYSICS			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code					
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level	2nd		**Semester of Delivery**	2nd	
Administering Department	PHYSICS		**College**	Science	
Module Leader	NOOR M. HASSAN		**e-mail**	noor.mohamed@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	MASTER	
Module Tutor	NOOR M. HASSAN		**e-mail**	noor.mohamed@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

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 provide students the knowledge about the origins of Modern Physics 2. To enable students to realize the meaning of the concepts and their applications. 3. To provide the students with the necessary skills to solve the problems concerning Modern Physics and its applications 4. To qualify the students to study advanced programs, materials and topics in physics that concerns modern physics
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Historic Origins of Modern Physics 2. Most prominent Scientific Experiments and topics related to modern physics 3. The atomic nature of matter 4. The atomic nature of electromagnetic radiation 5. The Matter Waves
Indicative Contents المحتويات الإرشادية	Electromagnetic radiation spectrum, Black-Body Radiation, Stephan-Boltzmann law, Rayliegh- Jeans law, Wein Displacement law, Wave Particle Duality of Light, Photoelectric Effect, X-rays, Compton Effect, Gamma rays, Pair Production, Cosmic Rays, Radiation Momentum and Radiation Pressure, de Broglie Hypothesis and Matter waves, Schrodinger Equation.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Classroom Lectures and Discussion • Class Assignments / tutorial • Home Assignments • Quizzes and Exams

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	45	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
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	10	15% (15 M)		
	Assignments	5	10% (10 M)		
	Projects / Lab./Seminar	0	10% (10 M)		
	Reports	3	5% (5 M)		
Summative assessment	Midterm Exam	2 hr	10% (10)	9	ALL PREVIOUS
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Electromagnetic Radiation and Its Spectrum
Week 2	Black-Body Radiation
Week 3	Laws of Stephan-Boltzmann, Rayliegh- Jeans and Wein Displacement
Week 4	Wave Particle Duality of Light
Week 5	Photoelectric Effect
Week 6	X-rays
Week 7	X-rays
Week 8	X-rays
Week 9	Compton Effect
Week 10	Gamma rays and Pair Production
Week 11	Cosmic Rays
Week 12	Radiation Momentum and Radiation Pressure
Week 13	de Broglie Hypothesis and Matter waves
Week 14	Schrodinger Equation
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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	Modern Physics by Kenneth Krane	
Recommended Texts	Fundamentals of Physics by (Halliday and Resnick) University Physics by (Sears, Zemanski and Young) Modern Physics by Arthur Beiser	
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	DIGITAL ELECTRONICS	**Module Delivery**	
Module Type	CORE		☒**Theory** ☐**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**
Module Code	PHYS2208		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	second	**Semester of Delivery**	Second
Administering Department	Physics	**College**	Science
Module Leader	Dr. Nada abdul Hadi Karem	**e-mail**	nada.abdulhadi@nahrainuniv.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D
Module Tutor	Dr. Nada Abdul Hdi Kreem Assi. Lect. Ahmad kadem Lect. Zainab Khalid	**e-mail**	nada.abdulhadi@nahrainuniv.edu.iq Ahmed.kadhim@nahrainuniv.edu.iq Zainab2.khalid@univercity.edu.iq
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**Version Number**	

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	The aim of the course is to introduce and provide basic idea about binary system, digital logic gates, arithmetic operations, the principles of combinational and sequential digital logic design.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Distinguish between analog and digital representations. 2. Describe the operation of and construct the truth tables for the AND, NAND,OR,and NOR gates, and the NOT (INVERTER) circuit. 3. Appreciate the potential of Boolean algebra to simplify complex logic circuits. 4. Use DeMorgan's theorems to simplify logic expressions. 5. Construct and analyze the operation of a latch flip-flop made from NAND or NOR gates. 6. Describe the difference between synchronous and asynchronous systems. 7. Understand the operation of edge-triggered flip-flops. 8. Employ flip-flops as frequency-division and counting circuits.
Indicative Contents المحتويات الإرشادية	1. AND, NAND, OR and NOR gates 2. Boolean algebra 3. DeMorgan's theorems 4. Karnaugh Map Method 5. Flip-flop 6. synchronous and asynchronous systems.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Learning analog electronics can be a challenging but rewarding journey if you take the following steps into consideration: 1. Start with basic Physics 2. Study basic components 3. Embrace a practical learning approach 4. Safety 5. Learn how to troubleshoot and learn from mistakes

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem)	60	**Structured SWL (h/w)**	4

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	40	**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	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	4, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	15% (15)	Continuous	
	Report	1	5%	11	
Summative assessment	**Midterm Exam**	2 hr	10% (15)	5,13	LO # 1-4, Lo#6-12
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Digital Circuits/Logic Circuits
Week 2	Boolean Constants and Variables , Truth Tables , Operation with OR, ANd and Not Gats
Week 3	Describing Logic Circuits Algebraically , Evaluating Logic-Circuit Outputs , Implementing Circuits from Boolean Expressions , NOR Gates and NAND Gates
Week 4	Boolean Theorems - DeMorgan's Theorems
Week 5	Sum-of-Products Form , Simplifying Logic Circuits
Week 6	Exam
Week 7	Karnaugh Map Method
Week 8	Exclusive-OR and Exclusive-NOR Circuityy?.l
Week 9	Clocked S-R Flip-Flop , Clocked J-K Flip-Flop, Clocked D Flip-Flo
Week 10	ARITHMETIC CIRCuit
Week 11	Asynchronous (Ripple) Counter

Week 12	Exam
Week 13	Synchronous (Parallel) Counters
Week 14	Multiplexe
Week 15	**Preparatory Week**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction
Week 2	Lab 2: Logic operation (AND, OR,NAND and NOT)
Week 3	Lab 3: Logic combination
Week 4	Lab 4: Simplification of combinational logical circuits (Karnaugh map) part I
Week 5	Lab 5: Simplification of combinational logical circuits (Karnaugh map) part II
Week 6	Lab 6: Binary Addition Half Adder
Week 7	Lab 7: Full Adder
Week 8	Lab 8:
Week 9	Lab 9: R-S Flip Flop
Week 10	Lab 10: J-K Flip Flop
Week11	Lab 11: Multiplexer
Week12	Lab 12: 4 Bit ASynchronous counter
Week13	Lab 13: Synchronous up and down counter
Week14	Lab 14: Review
Week15	Lab 15: Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Digital Systems Principles and Applications • Ronald J.Tocci 2007	Yes

Recommended Texts	DIGITAL PRINCIPLES A D APPLICATIONS Donald P Leach, 2011	Yes
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Sound and Waves motion**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code					
ECTS Credits	4				
SWL (hr/sem)	**100**				
Module Level	2nd		**Semester of Delivery**	2	
Administering Department			**College**		
Module Leader	Dr.nissan soud oribi		**e-mail**	Nissan.oribi@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Ass. Prof.		**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			**Version Number**	1.0	
				د.ولدان+د.سجى قيس+م.م.سيف محمد	

Relation with other Modules العلاقة مع المواد الدراسية الاخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الارشادية	
Module Aims أهداف المادة الدراسية	1. The course aims to provide 2nd stage students with basic knowledge of waves and sound. 2.To understand that everything related to waves and understand the concepts such as types of waves ,Simple harmonic motion, position ,velocity ,acceleration and energy and its applications. 3. To enable students to access the science of waves by understanding how to analysis sound waves and how to deal with laws, equations, illustrations and other data. 4. Enabling the student to be able to analyze, devise and draw conclusions. theory through the application of techniques 5. Follow-up of scientific development through the Internet and keeping pace with scientific development by setting up experiments synchronized with theoretical topics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Learning the basic concepts of waves and the properties of substances using property tables or property relations. 2. Understanding the different types of waves, position ,velocity,acceleration and energy . 3. Understanding the Superposition principle, damped harmonic oscillation and Forced vibration (force oscillation) 4. Defining Resonance ,Sound,and Doppler effect 5. Performing Sound and its characteristics 6. Analyzing some basic applications of sound and waves in forensic science fields.

Indicative Contents المحتويات الارشادية	Providing the student with general information about: - Identifying the science of waves and its importance in understanding the various branches of physics such as sound - Being able to understand and interpret the various wave phenomena and solve their practical problems - Identifying vibrations, their types, interference, and analysis, as well as the types of waves and their equations - Their propagation in different media - The basic concepts of sound and knowing the conditions of its emission and transmission - Making a comparison between simple harmonic motion and uniform circular motion - Deriving the general equations of simple harmonic motion - Identifying applications in forensic science - Understanding the superposition of waves in media - Understanding the interference of sound waves of equal amplitude and frequency, whether they are equal or different in phase - Understanding the phenomena of reflection and diffraction in sound - Identifying ultrasonic waves and their most important applications

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy in delivering this course is to encourage students to participate in analysis of waves sound problem solving, while simultaneously improving and expanding their critical thinking skills through training in the correct way of thinking to solve complex problems. This is achieved through classes and practical experiments matched with theoretical studies and by thinking about the type of scientific experiments that include some applications of sound waves laws that are of interest to studentsin forensic science field.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
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	36	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.1
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**	4	10% (10)	2,6,10,12	LO #1, 2, 5 and 6
	Assignments	5	10% (10)	2,,4,6, 8,10	LO # 1, 3, 5 and 6
	Projects / Lab.	1	15% (15)	Continuous	
	Seminae	1	5% (5)	13	LO # 1-6
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction of wave ,types of waves Properties of wave
Week 2	Simple harmonic motion,position ,velocity ,acceleration and energy
Week 3	Examples in forensic science
Week 4	Superposition principle
Week 5	Interference, diffraction and standing waves
Week 6	The damped harmonic oscillation
Week 7	Midterm exam
Week 8	damped harmonic oscillation
Week 9	Damping scale. examples
Week 10	Forced vibration (force oscillation)
Week 11	Resonance and its application
Week 12	Sound and its characteristics
Week 13	Sound and its characteristics
Week 14	Doppler effect ,examples
Week 15	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:Optical determination of velocity of sound in liquid
Week 2	Lab 2: The velocity of sound by mean of resonance tube closed at one end
Week 3	Lab 3: Melde's experiment
Week 4	Lab 4: The bottle resonator
Week 5	Lab 5: Capacitor decay constant
Week 6	Lab 6: The decrement of decay oscillation is defined as ratio of successive maxima
Week 7	Lab 7:Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Vibration and wave By : W.W.Norton and company	Yes
Recommended Texts	Wave phenomena By: Akira Hirose	No
Websites	All books and global sites in the internet	

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.

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	اللغة العربية			**Module Delivery**	
Module Type	BASIC			☐**Theory** ⁎**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code					
ECTS Credits	2				
SWL (hr/sem)					
Module Level		UGx11	**Semester of Delivery**		
Administering Department			**College**	College of science	
Module Leader	Omar adnan		**e-mail**	omar.adnan@nahrainuniv.edu.iq	
Module Leader's Acad. Title		Assistant professor	**Module Leader's Qualification**		Ph.D
Module Tutor			**e-mail**		

Peer Reviewer Name		**e-mail**	
Review Committee Approval	1/2026	**Version Number**	

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. تغطية اساسيات اللغة العربية 2. معرفة اقسام اللغة العربية 3. تطوير مهارات القراءة والكتابة والاستماع 4. تنمية الثقافة اللغوية بفهم اللغة العربية بلغة ذات تاريخ وثقافة 5. تعلم مهارات الحديث والتحدث للتواصل بفعالية مع الاخرين		

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	المعرفة والفهم حيث يجب ان يكون الخريج قادر على معرفة وفهم مايأتي: 1. القدرة على التحدث والكتابة باللغة العربية بطلاقة وبمستوى متقدم 2. فهم الثقافة العربية والتقاليد والقيم 3. قدرة الطالب على المشاركة في المجتمعات والندوات سواء في المجال الاكاديمي او المهني او الاجتماعي 4. قدرة الطالب على قراءة وتحليل النصوص الادبية والاكاديمية باللغة العربية ليسهل عليهم اجراء البحوث وكتابة الاوراق البحثية بشكل مناسب 5. الاستعداد للحياة المهنية من خلال قدرة الطالب على استخدام اللغة العربية بالترجمة والتعليم والعلاقات العامة او اي مجال اخر يتطلب التواصل باللغة العربية
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. اسلوب المحاضرات والتطبيق بالامثلة 2. نظام الواجبات البيتية والسمنار

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	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation
تقييم المادة الدراسية

As		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./Seminar	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

Week	Material Covered

Week 1	نصائح تساعد على الكتابة (كيف اكتب)
Week 2	مواضيع للكتابة(قوتنا في وحدتنا)
Week 3	مواضيع للكتابة (بر الوالدين)
Week 4	مواضيع للكتابة (منهج الاعتدال)
Week 5	مواضيع للكتابة (فن التعامل مع الاخرين)
Week 6	اختبار ١٠
Week 7	اللغة العربيةوعلومها
Week 8	مهارات التواصل بين الناس
Week 9	الامام علي رضي الله عنه (الاصدقاء)
Week 10	الامام علي رضي الله عنه (النفس تبكي)
Week 11	الفعل
Week 12	اختبار ١٥
Week 13	الفاعل ونائب الفاعل
Week 14	الاخطاء الاملائية الشائعة
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**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	شرح ابن عقيل	
Recommended Texts	الادب الجاهلي/شوقي ضيف البيان والتبين/الجاحظ	
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	ANALYTICAL MECHANICS II			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☒**Seminar**	
Module Code					
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Physics		**College**	Science	
Module Leader	Dr. Ahmed Shakir Mahmood		**e-mail**	Ahmad.mohmood@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Ahmed Shakir Mahmood		**e-mail**	Ahmad.mohmood@nahrainuniv.edu.iq	
Peer Reviewer Name	None		**e-mail**	None	
Review Committee Approval	15/01/2025		**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. Teach the student the bases of Analytical Mechanics. 2. Teach the student solve the problems that includes calculus, vectors and other varieties of topics in physics. 3. Teach the student to solve some of the physical and geometrical problems that include ordinary differential equations.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The students should learn many different physical and mathematical applications. 2. Develop the knowledge of the students for the aspect of physical logic and how one can use it to solve complicated problems. 3. The students should be able to use physics principles and 1. gather them in such a way to solve different physical problems.		
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: Introduction: general principles to particle motion in three-dimensional. Work principle and potential energy function in three-dimensional motion. The dell operator. Conservative forces and fore fields. Problems and solutions. Problems and solutions. Motion of charged particles in electric and magnetic field. Lagrange's Equation of motion and Lagrange's function for conservative system. Some applications of Lagrange's equations. Problems and solutions. The Hamiltonian function and Hamilton's equation. Problems and solutions.		
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.		

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	36	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.4
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**	10 min/5	10% (10)	5, 11	LO #1, 2, 3 and 4
	Assignments	1 hr/4	10% (10)	6, 12	LO # 2, 3 and 4
	Projects / Lab.	15 hr/1	10% (10)	Continuous	
	Report	15 hr/1	10% (10)	13	LO # 3 and 4
Summative assessment	**Midterm Exam**	2 hr	10% (10)	10	LO # 1-4
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction: general principles to particle motion in three-dimensional.
Week 2	Work principle and potential energy function in three- dimensional motion
Week 3	The Del operator.
Week 4	Conservative Forces and Force Fields.
Week 5	Problems and solutions.
Week 6	Problems and solutions.
Week 7	Motion of Charged Particle in Electric and Magnetic Field.
Week 8	**Mid exam.**
Week 9	Generalized forces, momentum and velocities. Action Integral Lagrange's Equation of motion and Lagrange's function for conservative system.

Week 10	Some Applications of Lagrange's Equations.
Week 11	Problems and solutions.
Week 12	The Hamiltonian Function and Hamilton's Equation.
Week 13	Problems and solutions.
Week 14	Problems and solutions.
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	
Week 16	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Analytical Mechanics" by Fowles & Cassidy, 7th Edition, (Thomson Brooks/Cole),2005.	No
Recommended Texts	"Analytical Mechanics Solutions to Problems in Classical Physics" by Ioan Merches, Daniel Radu · 2014	No
Recommended Texts	Lectures Notes Dr. Ahmed Shakir Mahmood Yas (2023)	
Websites	https://ocw.mit.edu/search/?d=Physics&q=Analytical%20Mechanics&s=department_course_numbers.sort_coursenum	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.



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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	THEORY OF RELATIVITY			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☐**HomeWork** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code					
ECTS Credits	4				
SWL (hr/sem)	30				
Module Level	Third		**Semester of Delivery**	Second	
Administering Department	Physics		**College**	College of Science	
Module Leader	Prof. Dr. Laith A. Al Ani		**e-mail**	Email: laithalani2003@nahrainuniv.edu.iq Laithalani2003@gmail.com	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph. D.	
Module Tutor	/		**e-mail**	/	
Peer Reviewer Name	/		**e-mail**	/	
Review Committee Approval	/		**Version Number**	/	

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	• Classical Mechanics: Special Relativity directly challenges and replaces the Galilean relativity taught in classical mechanics. It	**First year**	

	shows the limitations of Newtonian mechanics at high speeds and redefines the laws of momentum and energy.		
Co-requisites module	• **Waves & Optics:** The constant speed of light postulate resolves historical conflicts about the "medium" for light (luminiferous ether). It provides the correct framework for understanding the propagation of light and electromagnetic waves in vacuum.	**Second year**	

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

Module Aims أهداف المادة الدراسية	1. Understand the foundational principles of special relativity. 2. Derive and apply key equations like Lorentz transformations. 3. Exploring physical phenomena such as time dilation, length contraction, and relativistic energy. 4. Gain confidence in solving problems and understanding real-world applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. **Master Newtonian & Galilean Mechanics** Understand inertial/non-inertial frames, Galilean relativity, transformations, and fictitious forces. 2. **Grasp the Crisis Leading to Relativity** Learn how Maxwell's equations and the Michelson–Morley experiment (failed ether detection) challenged classical mechanics. 3. **Comprehend Einstein's Postulates & Consequences** Internalize the invariance of light speed and relativity of simultaneity, leading to time dilation and length contraction. 4. **Derive & Apply Relativistic Formulas** Use Lorentz transformations to derive time dilation, length contraction, and explain paradoxes. 5. **Understand Relativistic Momentum & Energy** Learn how momentum is redefined via the Lorentz factor, and how mass-energy equivalence unifies conservation laws. 6. **Apply Concepts to Modern Physics** Use spacetime diagrams/light cones to visualize causality, and apply

	relativity to particle accelerators, cosmic rays, and nuclear processes. 7. **Recognize Course Structure & Assessment** Understand how exams, problem sets, and projects evaluate comprehension of classical-to-relativistic physics progression.
Indicative Contents المحتويات الإرشادية	**1. The Crisis in Classical Physics** • **Galilean Relativity and Transformations** – Inertial frames, Galilean invariance • **Electromagnetism and the Ether Problem** – Maxwell's equations, the luminiferous ether hypothesis • **The Michelson–Morley Experiment** – Setup, null result, implications • **Einstein's Postulates** – Principle of relativity and constancy of light speed **2. Kinematic Consequences of Special Relativity** • **Relativity of Simultaneity** – Events simultaneous in one frame, not in another • **Time Dilation** – Moving clocks run slow; derivation using light clocks • **Length Contraction** – Moving objects contract in direction of motion • **Experimental Verification** – Muon decay, atomic clocks, particle accelerators **3. The Lorentz Transformation** • **Derivation from Postulates** – Replacing Galilean transformations • **Spacetime Diagrams** – Visualizing events, worldlines, light cones • **Invariant Interval** – Spacetime separation • **Relativistic Velocity Addition** – Velocities no longer add simply **4. Relativistic Dynamics** • **Relativistic Momentum** – Redefinition with Lorentz factor, conservation • **Relativistic Energy** – Mass-energy equivalence, rest energy • **Relativistic Kinetic Energy** – Relation to classical limit • **Energy–Momentum Relation** **5. Paradoxes and Conceptual Challenges** • **Twin Paradox** – Resolution using asymmetry and acceleration • **Ladder/Barn Paradox** – Role of simultaneity in length contraction • **Bell's Spaceship Paradox** – Tension in accelerating objects • **Causality and Temporal Order** – Protected by light cones
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lecture-based learning. • Technology-based learning. • Group learning. • Individual learning

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

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)		
	Assignments	2	10% (10)		
	Home Work	5	10% (10)		
	Report	1	10% (10)		
Summative assessment	**Midterm Exam**	2 hr	10% (10)		
	Final Exam	2hr	50% (50)		
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Special Relativity Syllabus Structure
Week 2	1. Concept of Reference Frames 2. The Law of Inertia (Newton's First Law
Week 3	1. Galilean and Newtonian Laws 2. Distinction Between Inertial and Non-Inertial Reference Frames 3. Assumptions of Galilean Relativity
Week 4	1. Concept of the "Luminiferous ether 2. Maxwell's Equations and the Conflict 3. The Michelson-Morley Experiment 4. How the Experiment Led to Special Relativity
Week 5	1. What is Simultaneity?

	2. The Terms Absolute and Relative 3. Transition to Relativity: Einstein's Two Postulates of Special Relativity 4. What is the Importance of Relativity? 5. Light Cones in a 3D Diagram and Their Justifications
Week 6	Mid Exam 1
Week 7	1. Main Effects of Einstein's Theories 2. Time Dilation 3. What is a Light Clock 4. The Light Clock Thought Experiment 5. Derivation of Time Dilation 6. The Twin Paradox
Week 8	1. Concept of Length Contraction 2. Definition of Length Contraction 3. Derivation of Length Contraction 4. What is the Ladder Paradox
Week 9	1. Limitations of Newtonian Momentum 2. Relativistic Momentum: 3. Derivation of Relativistic Momentum
Week 10	1. Relativistic Energy and Mass-Energy Equivalence 2. Relativistic Kinetic Energy 3. Derivation of Relativistic Energy 4. Energy-Momentum Relation
Week 11	1. Applications of Relativistic Momentum and Energy • Particle Accelerators: • Relativistic Collisions: • Astrophysical Phenomena 2. Problem-Solving and Thought Experiments
Week 12	Mid Exam 2
Week 13	1. Relativistic Doppler Effect 2. Applications in astronomy and cosmology 3. Exercises on the relativistic Doppler effect
Week 14	1. Comprehensive Review of Key Concepts and Equations 2. Group discussions on advanced problems 3. Question and Answer Session
Week 15	1. Introduction to general relativity (basic concepts)**.** **2.** Discussion of gravitational time dilation and curvature of spacetime **3.** Theoretical implications: Twin paradox and faster-than-light travel.

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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	*1) Spacetime Physics: Introduction to Special Relativity by Edwin F. Taylor and John Archibald Wheeler) 1992).* ISBN 13: 9780716723271: Publisher: W. H. Freeman, *2) Introduction to Special Relativity by Robert Resnick (1991)* ISBN: 978-0-471-71725-6: Publisher: Wiley	
Recommended Texts	*1) Special Relativity by A.P. French (1968)*	
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	LASER PHYSICS2			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code					
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	3		**Semester of Delivery**	2	
Administering Department			**College**		
Module Leader	Dr. Wildan M. Awad		**e-mail**	wildan.awad@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assistant professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	None		**e-mail**	none	
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**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-Developing the ability to distinguish between different types of lasers. 2. Understanding the properties of each type of laser and how it is generated. 3. Developing students' ability to connect different types of lasers with their applications. 4. Understanding how to manipulate a laser beam and change its properties.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. A detailed explanation of the properties of a laser beam. 2. Introducing the student to the mood looking and q switching techniques 3. Learning how to differentiate between pulsed and continuous lasers and the properties of each. 4. Explaining how to calculate pulse intensity, beam energy, and pulse repetition rate. 5. A detailed explanation of laser types and their characteristics. 6. Familiarizing students with the importance and applications of each type.
Indicative Contents المحتويات الإرشادية	indicative content includes the following: Part A -definition of laser output, pulsed laser, c-w laser, laser output criteria, [15 hrs] Part B – -laser beam property, directionality and how to calculate laser divergence angle, brightness, monochromaticity, [10 hrs] Part c –The types of lasers, how to generate each type, the general property of each type and its application [20 hrs]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy used in presenting this unit is to help students become able to know and distinguish each type of laser, identify the properties of each type and how to use them in various applications through theoretical lectures and encouraging them to organize simplified classroom activities and events to explain the types of lasers.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	102	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	98	**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
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	properties of a laser beam
Week 2	Natural line broadening
Week 3	Q switching
Week 4	quality factor switching methods
Week 5	mode looking
Week 6	Methods of mode looking
Week 7	Laser types
Week 8	Solid state laser
Week 9	Gas laser
Week 10	Liquid laser
Week 11	Semiconductor laser

Week 12	Laser scientific application
Week 13	The most important uses of Lasers in our lives
Week 14	Laser safety
Week 15	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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	**An, Kyungwon. Fundamentals of laser physics. 2023.**	
Recommended Texts	**Svelto, Orazio, and David C. Hanna. Principles of lasers. Vol. 1. New York: Springer, 2010.**	
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** – Excellent	امتياز	90 - 100	Outstanding Performance
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	F – Fail	راسب	(0-44)	Considerable amount of work required

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MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	QUANTUM MECHANICS 2	**Module Delivery**	
Module Type	CORE		☒**Theory** ☒**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☒**Seminar**
Module Code			
ECTS Credits	5		
SWL (hr/sem)	60		
Module Level	Third Year	**Semester of Delivery**	Seconed
Administering Department	Physics	**College**	Science
Module Leader	Ibrahim A. Sadiq	**e-mail**	ibrahim.sadiq@nahrainuniv. edu.iq
Module Leader's Acad. Title	Assist. Prof.	**Module Leader's Qualification**	PhD
Module Tutor	Ghufran M. Jassam	**e-mail**	ghufran.muhammed@nahrainuniv.edu.iq
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**Version Number**	

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Mechanics, Calculus, Complex Analysis, ODE, PDE, Wave Motion and linear Algebra	**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 students will gain additional knowledge beyond the first semester's quantum mechanics curriculum. 2. The students will develop their understanding of the fundamental concepts of quantum mechanics and some of their applications acquired in the first semester. 3. The students will acquire the ability to understand applications of quantum mechanics and the skill to solve problems related to those applications, as outlined in the second semester's topics. 4. The students will be prepared to study advanced chapters in quantum mechanics and other courses that require the concepts and skills gained from studying quantum mechanics.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To enable the student to consolidate their knowledge of key topics in quantum mechanics. 2. To enable the student to complete the mathematical skills required by the topics covered in the second semester. 3. To enable the student to understand the methods and techniques necessary for solving problems related to quantum mechanics and its applications. 4. To enable the student to skillfully use the methods and techniques necessary for solving problems related to quantum mechanics. 5. To enhance mathematical skills in calculus, special functions, and matrices.		
Indicative Contents المحتويات الإرشادية			
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies	- Classroom - Video lectures and online lectures (as an alternative to the university classroom) - Solved examples to enhance understanding - Discussion during lectures - Assigning homework to students.		

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
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 r	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	**The Hydrogen Atom**
Week 2	**The Hydrogen Atom**
Week 3	**Operators and Commutation**
Week 4	**The Angular Momentum in Cartesian Coordinates**
Week 5	**The Angular Momentum in Spherical Coordinates**
Week 6	**Dirac Notation of QM**
Week 7	**Dirac Notation of QM**
Week 8	**Matrix Representation of Kets and Bras**
Week 9	**Matrix Representation of Operators**
Week 10	**The Spin and Pauli Matrices**
Week 11	The Angular momentum and the spin
Week 12	**Time-independent Perturbation**
Week 13	**Time-dependent Perturbation**
Week 14	**Variational Method**
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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	1. **Fundamentals of Quantum Mechanics by Ajit Kumar** 2. **Introduction To Quantum Mechanics by Griffiths (3.rd Edition).** 3. **Concepts and Applications by Nouredine Zettili (2nd Editon).**	
Recommended Texts	1. **Introduction to Quantum mechanics by A.C. Philips.** 2. **Introduction to Quantum Mechanics by Dicke and Wittke** 3. **An Introdution to Theory of Quantum Mechanics and Applications by Amnon Yariv.**	
Websites		
	-	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A – Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C – Good	جيد	70 - 79	Sound work with notable errors
	D – Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E – Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.



ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**Materials Physics/II**	**Module Delivery**	
Module Type	CORE	☒**Theory** ☒**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code			
ECTS Credits	2		
SWL (hr/sem)	30		
Module Level	3	**Semester of Delivery**	2
Administering Department	Physics	**College**	Sciences
Module Leader	Dr. Sadeem Abbas Fadhil	**e-mail**	sadeemfadhil@yahoo.com
Module Leader's Acad. Title	Assist Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**Version Number**	

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. **Understanding Physical Properties**: Enabling students to understand the physical properties of different materials, such as density, hardness, and elasticity of metals, polymers, ceramics, and composite materials. 2. **Applying Theoretical Concepts**: Connecting theoretical concepts in physics to practical applications in everyday life and industry. 3. **Developing Analytical Skills**: Enhancing analytical and critical thinking skills through the study of material behavior under various conditions. 4. **Encouraging Innovation**: Inspiring students to innovate in the design and application of materials, supporting research and development in fields like engineering and materials science. 5. **Understanding Chemical and Physical Changes**: Studying how changes in environmental conditions affect the properties of materials. 6. **Interacting with Technology**: Enhancing students' understanding of how modern technology is used in the study and application of materials science.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**Module 1: Mechanics & Strengthening** • **Material Properties:** Introduction to basic behaviors. • **Dislocations:** Role of atomic defects in metal deformation. • **Slip Systems:** How atoms move along specific crystal planes. • **Strengthening:** Methods like cold working, alloying, and grain refinement. **Module 2: Failure Mechanisms** • **Fracture:** Differences between ductile and brittle failure. • **Fatigue:** Material exhaustion due to cyclic (repeated) stress and S-N curves. • **Creep:** Long-term deformation caused by high temperatures and constant load. **Module 3: Phase Diagrams** • **Phases:** Identifying Unary (1-component) and Binary (2-component) systems. • **Phase Diagrams:** Using charts to predict material states at specific temperatures. **Module 4: Material Categories** • **Ferrous Alloys:** Iron-based metals (Steels, Cast Irons).

	• **Non-Ferrous Alloys:** Non-iron metals (Aluminum, Copper, Titanium). • **Ceramics:** Properties of non-metallic, inorganic solids. • **Polymers:** Structure of plastics and molecular chains. • **Composites:** Combining different materials for enhanced performance. **Module 5: Evaluation** • **Assessment:** Mid-term exam, oral/written exams, and report discussions. • **Final:** Comprehensive final exam preparation.
Indicative Contents المحتويات الإرشادية	**1. Mechanical Fundamentals & Microstructure** • **Material Classification:** Overview of metals, ceramics, polymers, and composites. • **Dislocation Theory:** Edge and screw dislocations; their role in plastic deformation. • **Slip Systems:** Crystallographic planes and directions; Schmid's Law. • **Strengthening Strategies:** Grain size reduction, solid-solution hardening, and strain hardening. **2. Material Failure & Reliability** • **Fracture Mechanics:** Mechanisms of ductile vs. brittle fracture; crack propagation. • **Fatigue:** Behavior under cyclic loading; interpretation of **S-N curves** and fatigue limit. • **Creep:** Time-dependent deformation; influence of high temperature and constant stress. **3. Phase Equilibria** • **Phase Diagrams:** Solubility limits and phases; Unary and Binary systems. • **Interpretation:** Using the Lever Rule and Tie-line method to determine phase compositions. • **Iron-Carbon System:** Fundamentals of steel and cast iron microstructures. **4. Engineering Material Groups**

	• **Metal Alloys:** * **Ferrous:** Low-carbon, medium-carbon, and stainless steels. ○ **Non-Ferrous:** Aluminum, Copper, Magnesium, and Titanium applications. • **Ceramics:** Atomic bonding, crystal structures, and mechanical brittleness. • **Polymers:** Molecular weight, chain configurations, and thermoplastic/thermoset behavior. • **Composites:** Matrix and reinforcement phases; fiber-reinforced and structural composites. **5. Assessment & Application** • **Technical Reporting:** Analysis and discussion of material selection reports. • **Evaluation:** Mastery of theory through oral examinations and structured written exams.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**I. Teaching Strategies** • **Deductive Lecturing:** Systematic delivery of theoretical principles, beginning with atomic-scale structures (dislocations) and progressing to macroscopic behaviors (failure and processing). • **Case-Based Instruction:** Utilization of historical engineering failures to contextualize the significance of fracture mechanics, fatigue, and creep in structural integrity. • **Graphic Modeling:** Real-time construction of phase diagrams and S-N curves to demonstrate the relationship between thermodynamic equilibrium and mechanical endurance. • **Scaffolded Instruction:** Transitioning from guided problem-solving (Lever Rule calculations) to independent material selection and technical analysis. • **Formative Assessment:** Continuous evaluation through oral questioning and report discussions to identify and correct conceptual misconceptions before summative exams. **II. Learning Strategies (Student Engagement)**

	• **Technical Synthesis:** Developing the ability to link the "Materials Science Tetrahedron": Processing, Structure, Properties, and Performance. • **Collaborative Technical Reporting:** Engagement in peer-reviewed report writing to simulate professional engineering documentation and material selection processes. • **Quantitative Practice:** Mastery of mathematical models, including Schmid□s Law for slip systems and the Lever Rule for phase weight fractions. • **Active Visualization:** Mental and physical mapping of 3D crystallographic planes and directions to understand anisotropic material properties. • **Critical Inquiry:** Participation in structured oral defenses of technical reports to enhance communication and professional justification skills. **III. Strategic Summary** The course employs an **integrated approach** combining traditional whiteboard instruction for mathematical derivation with applied discussions for engineering context. This ensures that students move beyond rote memorization of material types toward a functional understanding of material behavior under service conditions.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	30	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	60		

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	1	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	-	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	Properties of materials
Week 2	Dislocations
Week 3	Mechanisms of Strengthening in Metals
Week 4	Failure: simple fracture
Week 5	Fatigue
Week 6	Mid exam 1
Week 7	Creep
Week 8	Phase diagrams
Week 9	Applications and processing of metal alloys: Ferrous alloys
Week 10	Non-Ferrous alloys
Week 11	Structures and
Week 12	Properties of Ceramics
Week 13	Polymer Structures
Week 14	Composites
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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	- Fundamentals of Materials Science and Engineering: An Integrated Approach By: WILLIAM D. CALLISTER, JR. & DAVID G. RETHWISCH, 2015 John Wiley & Sons, Inc.	No
Recommended Texts	- Introduction to Solid State Physics, by Kittel 2005	No
Websites	MIT lectures about materials	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	PHYSICAL OPTICS	**Module Delivery**	
Module Type	CORE	☒**Theory** ☒**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code			
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	**Semester of Delivery**	1
Administering Department		**College**	
Module Leader	Dr.Suha M. Alawsi	**e-mail**	Suha.korsheed@nahrainuniv.edu.iq
Module Leader's Acad. Title	lecturer	**Module Leader's Qualification**	Ph.D
Module Tutor	None	**e-mail**	None
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**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. To develop problem solving skills and understanding the basics of optical theory 2. To understand the optical device elements and experiment of physical optics 3. This course deals with the basic concept of physical optical such as diffraction, interference, and polarization .
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	.
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	102	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	98	**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
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	Introduction
Week 2	LIGHT WAVES AND PHYSICAL OPTICS
Week 3	Physics of waves and wave motion
Week 4	The mathematics of sinusoidal waveforms
Week 5	Diffraction
Week 6	Plane diffraction grating
Week 7	Polarization
Week 8	Linear polarization
Week 9	Elliptical polarization
Week 10	Cylindrical polarization
Week 11	Interference
Week 12	Constrictive interference
Week 13	Distractive interference
Week 14	Young"s experiments
Week 15	Selected Examples
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: polarimeter
Week 2	Lab 2: diffraction by single slit
Week 3	Lab 3: determination of the fine wire by interference frings measurment
Week 4	Lab 4: diffraction grating
Week 5	Lab 5: polarization by quarter wave plates
Week 6	Lab 6: faraday effect (effect of magnatic field on intensity)
Week 7	Lab 7:faraday effect (effect of magnatic field on the polarization angle)

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamental of optics (2012)	
Recommended Texts	Principles of physical optics	
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group	**A -** Excellent	امتياز	90 – 100	Outstanding Performance

(50 - 100)	**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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title		**Module Delivery**	
Module Type	CORE	☒**Theory** ☒**Lecture** ☐**Lab** ☒**Tutorial** ☒**Practical** ☒**Seminar**	
Module Code			
ECTS Credits	8		
SWL (hr/sem)	2		
Module Level		**Semester of Delivery**	
Administering Department	Physics	**College**	Science
Module Leader	Iman A. Hussain	**e-mail**	Iman.a.hussain@nahrainuniv.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Dr
Module Tutor	Batool imkhilif asher	**e-mail**	Batool.imkhilif@nahrainuniv.edu.iq
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**Version Number**	

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	Learning the complex integration, the improper integrals, finding the poles of function, use the infinite series to represent the analytic functions and study the conformal mapping.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	This module is concerned with complex functions, that is functions which are both defined for and assume complex values. Their theory follows a quite different development from that of real functions, is remarkable in its directness and elegance, and leads to many useful applications. Topics covered will include: Complex numbers. Domains and simple connectivity. Cauchy-Riemann equations. Integration and Cauchy's theorem. Singularities and residues. Applications.
Indicative Contents المحتويات الإرشادية	It is to help the student discover his abilities and academic potential, help him design a plan that is unique to him, meet his requirements for editing requirements, and help him overcome any difficulties that could determine his successful path.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	the strategies used by a faculty member to develop student learning. It can be defined as a set of general rules and broad lines that concern the means of achieving the desired goals of teaching. It refers to the methods and plans followed by the faculty member to reach learning goals.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	102	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	98	**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
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	Basic concepts
Week 2	Limit in complex functions
Week 3	Continuity, differential in complex functions
Week 4	Cauchy integral equations
Week 5	Cauchy integral equations in polar form
Week 6	Analytic functions
Week 7	Analytic equations in polar form
Week 8	Log functions and Exponential functions
Week 9	Triangle functions
Week 10	harmonic functions
Week 11	Integral
Week 12	Linear integral
Week 13	Resedu theorem

Week 14	Sequences, series
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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	Complex variables and applications Ruel v. Churchill	yes
Recommended Texts		
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	Physical Spectra	**Module Delivery**	
Module Type	CORE	☒**Theory** ☐**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code			
ECTS Credits			
SWL (hr/sem)	125		
Module Level	Third Stage (UG)	**Semester of Delivery**	second
Administering Department	Physics	**College**	Science
Module Leader	Dr. Narjis Zamil Abdulzahra	**e-mail**	
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D
Module Tutor	**Dr.Narjis Zamil Abdulzahra**	**e-mail**	narjis.zamil@nahrainuniv.edu.iq
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**Version Number**	

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**	• Understand the fundamental principles of electromagnetic radiation interaction with matter. • Analyze molecular energy levels including rotational, vibrational, and electronic states. • Apply spectroscopic techniques to determine molecular structures such as bond lengths and angles. • Develop scientific thinking and mathematical analysis skills in spectroscopy phenomena.
Module Learning Outcomes **مخرجات التعلم للمادة الدراسية**	• Explain molecular bonding and interactions. • Analyze rotational and vibrational spectra. • Apply quantum models to molecular behavior. • Interpret experimental molecular data.
Indicative Contents **المحتويات الإرشادية**	1. **Introduction to Spectroscopy:** Nature of radiation, spectral regions, and line width. 2. **Rotational Spectroscopy:** Rigid and non-rigid rotor models, selection rules, and isotope effects. 3. **Vibrational Spectroscopy:** Harmonic and anharmonic oscillators, PQR branches, and centrifugal distortion. 4. **Raman Spectroscopy:** Classical and quantum theories of Raman effect, Stokes and Anti-Stokes lines. 5. **Electronic Spectroscopy:** Electronic transitions, Franck-Condon principle, and molecular decay processes.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	• Lectures with visual presentations • Problem-solving sessions • Laboratory experiments and simulations • Student seminars and reports

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	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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)	4, 12	LO # 3, 4, 6 and 7
	Projects / Lab.			Continuous	
	Report	1	10%	11	
Summative assessment	**Midterm Exam**	2 hr	20% (15)	5,13	LO # 1-4, Lo#6-12
	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 Electromagnetic Radiation
Week 2	Interaction of Radiation with Matter & Line Width
Week 3	Pure Rotational Spectra: Rigid Rotor Model
Week 4	Non-Rigid Rotor & Isotopic Substitution Effect
Week 5	Rotational Selection Rules & Intensities
Week 6	Vibrational Spectra: Simple Harmonic Oscillator

Week 7	Anharmonic Oscillator & Dissociation Energy
Week 8	**Midterm Review and Exam (مراجعة وامتحان نصف الفصل)**
Week 9	Vibration-Rotation Spectra of Diatomic Molecules
Week 10	P, Q, and R Branches in Infrared Spectra
Week 11	Classical and Quantum Theory of Raman Effect
Week 12	Pure Rotational and Vibrational Raman Spectra
Week 13	Electronic Spectroscopy: Transitions and Energy Levels
Week 14	Franck-Condon Principle and Selection Rules
Week 15	Molecular Decay: Fluorescence and Phosphorescence
Week 16	**Final Exam (الامتحان النهائي)**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	•المراجع الأساسية هيرتزبرغ، الأطياف الجزيئية والبنية الجزيئية.	Yes
Recommended Texts	• Banwell & McCash, Fundamentals of Molecular Spectroscopy. • Atkins & Friedman, Molecular Quantum Mechanics.	Yes

Websites	المراجع الإلكترونية: 1) تحميل كتاب الفيزياء الذرية والجزيئية PDF كامل Atomic and Molecular Physics — كتاب شامل يصلح لطلاب المرحلة الجامعية (يتضمن أطياف الجزيئات، ميكانيك الكم التطبيقي على الذرات والجزيئات). https://www.physics-pdf.com/2019/02/Atomic-and-Molecular-Physics-pdf.html

APPENDIX:

GRADING SCHEME **مخطط الدرجات**				
Group	**Grade**	**التقدير**	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	**امتياز**	90 - 100	Outstanding Performance
	B - Very Good	**جيد جدا**	80 - 89	Above average with some errors
	C –Good	**جيد**	70 - 79	Sound work with notable errors
	D - Satisfactory	**متوسط**	60 - 69	Fair but with major shortcomings
	E - Sufficient	**مقبول**	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	**مقبول بقرار**	(45-49)	More work required but credit awarded
	F – Fail	**راسب**	(0-44)	Considerable amount of work required
Note:				

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	ETHICS	**Module Delivery**	
Module Type	BASIC	☒**Theory** ☐**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code			
ECTS Credits	1		
SWL (hr/sem)	15		
Module Level	1	**Semester of Delivery**	1
Administering Department	Physics	**College**	Science
Module Leader	Dr. Jazeel Hussein Azeez	**e-mail**	jazeel.azeez@nahrainuniv.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**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. Enable students to understand the fundamental principles and values of scientific research ethics.** **2. Distinguish between ethical scientific practices and research misconduct (plagiarism, fabrication, falsification).** **3. Understand the professional responsibilities of a physicist regarding data accuracy, laboratory safety, and environmental impact.** **4. Develop skills in proper citation, authorship, and publication ethics.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1. Knowledge & Understanding** • **Define Research Integrity: clearly define what constitutes scientific misconduct (Fabrication, Falsification, and Plagiarism) and distinguish it from honest error.** • **Understand Ethical Frameworks: Explain the fundamental principles guiding ethical research, including the researcher's value system, conflict of interest, and the structure of ethical research protocols.** • **Regulations & Rights: Demonstrate knowledge of intellectual property rights (IPR) and the standards for data ownership and sharing.** **2. Intellectual & Cognitive Skills** • **Critical Analysis: Analyze real-world case studies and scenarios to identify ethical dilemmas and propose appropriate solutions or preventative measures.** • **Evaluation of Relationships: Evaluate the ethical dynamics of professional relationships, including mentorship, collaboration, and peer review.** • **Impact Assessment: Assess the social and environmental implications of scientific research decisions.** **3. Practical & Professional Skills** • **Ethical Data Management: Apply best practices for data measurement, collection, and storage to ensure reproducibility and prevent manipulation.** • **Proper Citation: Demonstrate the ability to cite sources correctly to respect intellectual property and avoid plagiarism.** • **Responsible Authorship: Distinguish between ethical and unethical authorship practices (e.g., avoiding "ghost" or "gift" authorship) when publishing research.** **4. Values & Attitudes**

	• **Professional Responsibility: Develop a personal commitment to the researcher's value system, prioritizing honesty and accountability over pressure to publish.** • **Conflict Management: Recognize and disclose potential conflicts of interest (financial, personal, or professional) transparency.**
Indicative Contents المحتويات الإرشادية	• **Concept of Research Ethics** • **Principles of Scientific Integrity** • **Plagiarism and Its Forms** • **Ethics of Scientific Publishing** • **Intellectual Property Rights** • **Ethics of Research Involving Humans and Animals**

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	• **Lectures:** Direct instruction on ethical concepts and codes of conduct. • **Case Studies:** Analyzing real-world examples of ethical failures and scientific disasters to understand consequences. • **Discussions:** Open dialogue on hypothetical scenarios relevant to physics research.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	15	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	15	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	30		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	1 hr	20% (10)	5, 10	
	Assignments	1 hr	10% (10)	2, 11	
	Projects / Lab.				
	Report	1 hr	10% (10)	14	
Summative assessment	**Midterm Exam**	1 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	Introduction to Scientific Research & Ethics
Week 2	The Researcher's Value System
Week 3	Research Misconduct (Part 1)
Week 4	Research Misconduct (Part 2)
Week 5	Ethics of Data & Measurement
Week 6	Citation & Intellectual Property
Week 7	Structure of Ethical Research
Week 8	Publication Ethics & Authorship
Week 9	1st Midterm exam
Week 10	Professional Relationships
Week 11	Conflict of Interest
Week 12	Social & Environmental Responsibility
Week 13	Mid-term exam2
Week 14	Case studies discussions
Week 15	Scenario Discussions
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج 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	نبيل عبد الرزاق جاسم، قواعد وأخلاقيات ممارسة مهنة الهندسة، الطبعة الأولى، دار ومكتبة البصائر للطباعة والنشر والتوزيع، بيروت، 2013.	No
Recommended Texts	**Resnik, D. B., "What is Ethics in Research & Why is it Important?", National Institute of Environmental Health Sciences (NIEHS).**	No
Websites	Online resources on Academic Integrity and COPE (Committee on Publication Ethics) guidelines.	

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