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

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Thermodynamic			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☒**Lab** ☒**Tutorial** ☒**Practical** ☒**Seminar**	
Module Code	MPHY2103				
ECTS Credits	8				
SWL (hr/sem)	200				
Module Level	2		**Semester of Delivery**	1	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Saif Mohsin Nassrullah		**e-mail**	saif.muhsin@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor	Zahraa malik mosa		**e-mail**	zahraa.Malik@nahrainuniv.edu.iq	
Module Reviewer	Zainab Salam Khaleefah		**e-mail**	zainab.salam@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. Teaching the student the principles of thermodynamics. 2. Identify the main laws related to the science of heat and work. 3. Learn about real-life practical applications of thermodynamics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The student can distinguish between states of matter in addition to the difference between a real gas and an ideal gas. 2. The student can understand the laws of thermodynamics and the mechanism of their application. 3. The student can explain the mechanism between movement and heat and their effects 4. The student can explain the physical difference between heat and cooling. 5. Students' ability to apply what has been calculated theoretically in a practical way in the future.
Indicative Contents المحتويات الإرشادية	- Important terms, Reversible and Irreversible processes, Ideal Gas. [15 hrs.] - Heat Transformation, 1st Law of thermodynamics, The State Equation. [15 hrs.] - Adiabatic Processes, Specific Heat Capacity, Specific Heat Capacity in Adiabatic Processes. [20 hrs.] - 2nd Thermodynamics Law and Carnot Cycle Thermal Machines and Refrigerators. [15 hrs.]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	- Discussing the topics of the curriculum book 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 student's homework that requires finding self-solutions.

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	6.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	106	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	7.1
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**	1	10% (10)	Continuous	All
	Online Assignments	1	5% (5)	Continuous	All
	Lab	1	15% (15)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	14	LO # 1-13
	Final Exam	4hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Important terms.
Week 2	Reversible and Irreversible processes.
Week 3	Ideal Gas.
Week 4	Exercises.
Week 5	Heat Transformation.
Week 6	1st Law of thermodynamics.
Week 7	The State Equation.
Week 8	Adiabatic Processes.
Week 9	Specific Heat Capacity.
Week 10	Specific Heat Capacity in Adiabatic Processes.

Week 11	Work and Heat Relationship.
Week 12	2nd Thermodynamics Law.
Week 13	Carnot Cycle Thermal Machines and Refrigerators.
Week 14	Mid Exam
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-2	Lab 1: Determination of the coefficient of apparent cubic expansivity of a liquid by Mathieson's sinker method
Week 3-4	Lab 2: Entropy of system
Week 5-6	Lab 3: measurement of thermal conductivity by lees disc method
Week 7-8	Lab 4: experiment to measure specific heat capacity of a liquid by method of cooling
Week 9-10	Lab 5: the specific heat capacity of copper by calendar method
Week 11-12	Lab 6: experiment to measure specific heat capacity of a metal by method of mixtures
Week 13	Lab 7: coefficient of linear expansion of copper
Week 14	Mid Exam
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Francis Weston Sears, Thermodynamics, The Kinetic Theory of Gases, and Statistical Mechanics , 2rd edition, 1953	YES
Recommended Texts	Heat and Thermodynamics, Mark W. Zemansky, McGraw Hill, 1968	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.

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 Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Ba'ath Regime Crimes			**Module Delivery**	
Module Type	BASIC			☐**Theory** ☒**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	URBRC				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	2		**Semester of Delivery**	1	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Omar Adnan Khamas		**e-mail**	omar.adnan@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Module Reviewer			**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. Introducing students to concepts and definitions related to the crimes of the Ba'ath regime committed during its rule in Iraq. 2. To acquaint university students with the reality of life for decades that Iraq lived during the rule of the Baath regime in Iraq. 3. Increasing students' awareness of the facts without being influenced by any media censorship regarding the crimes of the Ba'ath regime in Iraq. The subject of the crimes of the Ba'ath regime in Iraq is important and essential for students, as it familiarizes them with the events, circumstances, and violations that Iraq experienced under Ba'ath rule from 1968 to 2003. The subject clarifies for students the impact of the Ba'ath regime's behaviors on Iraqi society
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The student should recognize the seriousness of crimes in general 2. The student should understand the extent of the injustice of the previous regime. 3. The student should comprehend the scope of criminal acts and their legal consequences.
Indicative Contents المحتويات الإرشادية	Awareness of students regarding the study of crimes throughout history, in Islamic law, and the legal aspects in detail, along with their consequences
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Fundamentally: Discussion and mutual dialogue between the instructor and the students. 2. Continuous presentation of documentaries to enhance understanding. 3. Preparation of concise working papers from selected groups on a weekly basis.

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	2.2
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	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	1	10% (10)	Continuous	All
	Online Assignments	1	10% (10)	Continuous	All
	Onsite Assignments	1	10% (10)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	5	LO # 1-4
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	General and foundational introduction to the topic: Crimes of the Ba'ath Regime according to the Iraqi High Tribunal Law of 2005.
Week 2	Psychological and social crimes and their effects, along with the most prominent violations of the Ba'ath regime in Iraq.
Week 3	The Ba'ath regime's stance on religion.
Week 4	Locations of prisons and detention under the Ba'ath regime.
Week 5	Mid Exam
Week 6	Environmental crimes of the Ba'ath regime in Iraq.
Week 7	Drying of the marshlands.
Week 8	Crimes of mass graves.
Week 9	Discussion session for students to assess their engagement in the lecture.
Week 10	Events of the mass extermination graves committed by the Ba'ath regime in Iraq.
Week 11	Discussion of reports assigned to students as part of the course requirements.
Week 12	Temporal classification of mass extermination graves in Iraq from 1963 to 2003.
Week 13	Conducting an extensive discussion of the course material and identifying the main obstacles faced by students.
Week 14	Preparatory week before the final Exam.

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	- Ayman Abdul Aziz Salama, International Responsibility for Committing the Crime of Genocide, 1st edition, Dar Al-Uloom for Publishing and Distribution, Cairo, 2006. - Raed Abis, Dr. Abbas Atiyah Al-Quraishi, UN Reports Condemning the Ba'ath Regime for Human Rights Violations from 1991 to 2003, Publisher: Iraqi Center for Documenting Extremism Crimes, 1st edition, Al-Kafl Printing House, Karbala, 2023.	YES
Recommended Texts	- Hassan Al-Khayyat, Geography of the Marshes and Swamps in Southern Iraq, Al-Matba'a Al-Alamiya, Cairo, 1975. - Abbas Atiyah Al-Quraishi, Raed Abis, Hussein Ali Atwan, Documentary Encyclopedia of Open Mass Graves in Iraq from 1963 to 2003, Publisher: Iraqi Center for Documenting Extremism Crimes, 1st edition, Al-Kafl Printing House, Karbala, 2003.	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 Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Inorganic Chemistry			**Module Delivery**	
Module Type	SUPLEMENT			☒**Theory** ☐**Lecture** ☒**Lab** ☒**Tutorial** ☒**Practical** ☒**Seminar**	
Module Code	CRINOCHE				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	2		**Semester of Delivery**	1	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Ahmed Sabeeh Majeed		**e-mail**	ahmed.sabeeh@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	PhD	
Module Tutor	Ahmed Sabeeh Majeed		**e-mail**	ahmed.sabeeh@nahrainuniv.edu.iq	
Module Reviewer	Ahmed Sabeeh Majeed		**e-mail**	ahmed.sabeeh@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. General view to periodic table and atomic structure. 2. Energy levels, orbitals. 3. Groups 1 & 2, the Alkali Metals and the Alkaline Earth metals. 4. Atoms, Molecules, Ions and ionic compounds. 5. Ionization energy, Atomic Radii, Electron Affinity, electronegativity. 6. Shielding effect, Dipole moment, Polarity, Hydrogen bonding, Melting point, Boiling point Solubility Orbital hybridization.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Teach students the principle of chemistry. 2. Explain the atomic structures and its compounds. 3. Explain some of chemical phenomena. 4. Study the properties of some chemical elements. 5. Practical and laboratory skills. 6. Improvement skills, to improve student's mind and to let students think more about chemistry. 7. Productive skills.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. Areas of inorganic chemistry. 2. The current role of inorganic chemistry. 3. Improve the student's mind by how he or she can deal with chemicals and its uses. 4. Teach students about hazardous chemicals in the lab and how can avoid any risk in the lab.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning strategy depends on the following: 1. In class interactive lectures involving educational videos. 2. Practical in lab lectures. 3. Adapting interactivity with student's interaction by raising a question and asking the group to find the relevant answers to them as a main way of teaching. 4. Power point presentation, examples from books and internet.

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	6.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	31	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.1
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**	1	10% (10)	Continuous	All
	Online Assignments	1	5% (5)	Continuous	All
	Lab	1	15% (15)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	14	LO # 1-13
	Final Exam	4hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Atomic Structure.
Week 2	Atomic Structure.
Week 3	Energy levels, orbitals, Groups 1 & 2, the Alkali Metals and the Alkaline Earth metals.
Week 4	Energy levels, orbitals, Groups 1 & 2, the Alkali Metals and the Alkaline Earth metals.
Week 5	Energy levels, orbitals, Groups 1 & 2, the Alkali Metals and the Alkaline Earth metals.
Week 6	Atoms, Molecules, Ions and ionic compounds.
Week 7	Atoms, Molecules, Ions and ionic compounds.
Week 8	Atoms, Molecules, Ions and ionic compounds.
Week 9	Ionization energy, Atomic Radii, Electron Affinity, electronegativity.
Week 10	Ionization energy, Atomic Radii, Electron Affinity, electronegativity.

Week 11	Shielding effect, Dipole moment, Polarity, Hydrogen bonding, Melting point, Boiling point Solubility Orbital hybridization.
Week 12	Shielding effect, Dipole moment, Polarity, Hydrogen bonding, Melting point, Boiling point Solubility Orbital hybridization.
Week 13	Shielding effect, Dipole moment, Polarity, Hydrogen bonding, Melting point, Boiling point Solubility Orbital hybridization.
Week 14	Mid Exam
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Laboratory Report.
Week 2	Lab 2: Laboratory safety practices.
Week 3	Lab 3: Glasses and laboratory equipement.
Week 4	Lab 4: Preparation of sodium hydroxide
Week 5	Lab 5: Purification of table salt.
Week 6	Lab 6: Preparation and reaction of barium peroxide.
Week 7	Lab 7: Calculate the percentage of water in hydrated salt.
Week 8	Lab 8: Paper chromatography.
Week 9	Lab 9: Synthesis of alum from aluminum.
Week 10	Lab 10: Halogens (Group VII B).
Week 11	Lab 11: Preparation of Calcium Peroxide CaO2.
Week 12	Lab 12: Preparation of Copper Iodate and Determination of Its Solubility Product in Water.
Week 13	Lab 13: Identification of Oxalate in their Complex as Below.
Week 14	Mid Exam
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Inorganic chemistry, Sharpe, A. G. (Alan George), Harlow: Longman Scientific and Technical, 3rd Edition 1992	YES
Recommended Texts	Basic Inorganic Chemistry F. Albert Cotton, Geoffrey Wilkinson, Paul L. Gaus, , 3rd Edition, 1995	YES
Websites	https://courses.lumenlearning.com/boundless-chemistry/chapter/the-structure-of-the-atom/ https://www.acs.org/content/acs/en/careers/chemical-sciences/areas/inorganic-chemistry.html https://courses.lumenlearning.com/boundless-chemistry/chapter/periodic-trends/	

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

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Mathematical Physics			**Module Delivery**	
Module Type	CORE			☒**Theory** ☒**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☒**Seminar**	
Module Code	MPHY2101				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	2		**Semester of Delivery**	1	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Hassan N. Hahsim		**e-mail**	hassan.hashim@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	PhD	
Module Tutor	Intidhar Malik Hady		**e-mail**	entidhar.malik@nahrainuniv.edu.iq	
Module Reviewer	Zaid Malk Abbas		**e-mail**	zaid.malk@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. Teaching the students the principles of Mathematical Physics. 2. Give the Students the ability and experience to solve and discuss the problems related with Mathematical Physics. 3. Make a connection between the theoretical principles and the experimental applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Enabling students to know the basics of mathematical physics. 2. Enabling students to understand the applied aspects of mathematical physics.
Indicative Contents المحتويات الإرشادية	1. Teaching the student the basic concepts of mathematical physics. 2. Providing the student with the skills of discussing and solving applied problems related to mathematical physics. 3. Linking theoretical concepts with practical applications.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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 student's homework that requires finding solutions on their own.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.1
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	1	10% (10)	Continuous	All
	Online Assignments	1	10% (10)	Continuous	All
	Onsite Assignments	1	10% (10)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	Midterm Exam	2 hr	10% (10)	13	LO # 1-12
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction Special functions. The Factorial Function.
Week 2	Gamma Function.
Week 3	The Gamma function of negative number.
Week 4	Some important formulas involving Gamma Function.
Week 5	Solutions of some Examples.
Week 6	Beta Function.
Week 7	Other forms of Beta Function.
Week 8	The Relation between Gamma and Beta functions.
Week 9	(Test #1)
Week 10	The Error function.
Week 11	Series: Solutions of Differential Equations**.**
Week 12	Legendre's Equation.
Week 13	(Test #2) Mid Exam
Week 14	Preparatory week.
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	Mathematical Methods in the Physical Sciences" By: Mary L. Boas, 3rd Edition, 2006.	No
Recommended Texts	Advanced Calculus, 3rd Edition, Angus E. Taylor, and W. Robert Mann, 1983.	YES
Websites	Any website related with mathematical physics https://www.christs.cam.ac.uk/sites/default/files/inline-files/0a187866618ca3049030ec5014860ae8-original.pdf	

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 Department of Medical Physics	

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	MPHY2102				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	2		**Semester of Delivery**	1	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Marwa Abdul Muhsien		**e-mail**	marwa@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	PhD	
Module Tutor	Zaid Malk Abbas		**e-mail**	zaid.malk@nahrainuniv.edu.iq	
Module Reviewer	Rafah Mohammed		**e-mail**	rafah.m.h@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 basic principles of modern physics: Focus on principles developed during the 20th century such as relativity, quantum mechanics, and nuclear physics. 2. Introduce students to new concepts: Quantum energy, particle-wave duality, special and general relativity, and atomic structure. 3. Motivating students for scientific research: Encourage them to follow the latest developments and discoveries in physics. 4. The ability to understand and apply basic principles: Understanding the foundations of special relativity, quantum mechanics, and nuclear physics. 5. The ability to solve complex physics problems: Using the laws and theories of modern physics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Analyze physics data and use mathematical methods and theoretical models to solve complex issues. 2. Critical thinking and problem solving: The student learns how to use modern physics knowledge to analyze new issues and come up with innovative solutions. 3. Ability to explain complex natural phenomena: Using the principles of modern physics, such as explaining phenomena associated with high speeds, large masses, or subatomic particles. 4. Familiarity with the practical applications of modern physics: In the fields of technology, medicine, engineering, and the environment, such as laser applications, magnetic resonance imaging, and renewable energy technologies. 5. Understanding the basic principles of modern physics: Such as the special theory of relativity, quantum mechanics, and particle physics.
Indicative Contents المحتويات الإرشادية	1. Introduction to Modern Physics: - The difference between classical and modern physics. - The theories that laid the foundations for modern physics such as special relativity and quantum mechanics. 2. Special relativity: - The concept of a frame of reference and relative speed. - The principle of relativity. - Lorentz transformations. - The relationship between mass and energy ($E = mc^2$). 3. quantum theory: - The wave-particle nature of light (wave-particle duality). - The Compton effect.

	- Planck's interpretation of blackbody radiation. - Bohr's model of the atom. 4. Quantum mechanics: - Basic principles of quantum mechanics (Heisenberg's uncertainty principle, wave function, quantization of energy). - Schrödinger's wave equation. - Atoms and atomic structures. 5. Elementary particles : - Classification of particles (e.g. quarks and leptons). - Basic forces in nature (strong and weak nuclear force, electromagnetism, gravity) - The standard model of particles.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Inquiry-based learning: Encourages students to ask questions and discover concepts on their own through experiments and research projects, which enhances critical thinking and problem-solving skills. 2. Collaborative learning: Encouraging teamwork where students exchange ideas and collaborate in solving scientific questions and experiments. 3. Brainstorming and group discussion: This strategy helps to promote group thinking and the cultural exchange of scientific ideas among students. 4. Problem-based learning: Students learn physics by facing real issues and solving those using physics tools and concepts. 5. Constructive assessment: Using continuous assessment to measure students' progress and understanding of concepts, rather than relying solely on final exams.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	1	10% (10)	Continuous	All
	Online Assignments	1	10% (10)	Continuous	All
	Onsite Assignments	1	10% (10)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	14	LO # 1-13
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Special Relativity, Postulates of Special Relativity.
Week 2	Time Dilation.
Week 3	Doppler Effect, Length Contraction.
Week 4	Twin Paradox, Relativistic Momentum.
Week 5	Relativistic Mass, Relativistic Second Law.
Week 6	Mass and Energy, Energy and Momentum.
Week 7	The Lorentz Transformation.
Week 8	Velocity Addition.
Week 9	Electromagnetic Waves, Blackbody Radiation.
Week 10	Photoelectric Effect.
Week 11	X-Rays, Compton Effect, Pair Production, photon Absorption.
Week 12	De Broglie (Matter) Waves, Describing a Wave.
Week 13	Phase and Group, Velocities Particle Diffraction.
Week 14	Mid Exam
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	Concepts of modern physics Arthur Beiser	No
Recommended Texts	Modern Physics by Paul A. Tipler Modern Physics for Scientists and Engineers, by Stephen Thornton.	YES
Websites	http://library.lol/main/802283D1032C91B4201CACCA52578A98 http://library.lol/main/A014282B63FE52E8510AC53A7ED0D0C8 http://library.lol/main/7275D2ADDF609FA6CCAC053E5CC8C9FA	

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 Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Ordinary Differential Equations			**Module Delivery**	
Module Type	SUPLEMENT			☐**Theory** ☒**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	CRORDDIF				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	2		**Semester of Delivery**	1	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Fatimah Sahib Kadhim		**e-mail**	fatimah.altaie@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	PhD	
Module Tutor	Abbas Ibrahim		**e-mail**	Abbas.Ibrahim@nahrainuniv.edu.iq	
Module Reviewer	Abbas Ibrahim		**e-mail**	Abbas.Ibrahim@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	The aim of this course is for the students to be primarily concerned with learning the basic concepts of mathematics, application in reality, solution of ordinary differential equations with first-, and higher-order and their applications. In addition, different classes of ODEs are considered.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Learning the basic concepts of differential equations, such as: 1. To be able to deal with ordinary differential equations (ODE) and their applications. 2. To be familiar with first order ODE and learning how to solve such equations. 3. To deal with higher order ODE and their solutions. 4. To learn the difference between homogeneous and non-homogeneous differential equations. 5. To have experience in applications of Laplace transform.
Indicative Contents المحتويات الإرشادية	1. Differential Equations: definition, properties, classifications. 2. First-order DE: Types, methods of solution: separable, homogeneous, exact, non-exact, linear, Bernoulli differential equation. 3. Higer-order DE: Definition, homogeneous linear DE., methods of solution. 4. Non-homogeneous DE: definitions, properties, <ethods of solution. 5. Laplace Transform: Definitions, properties, applications.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching strategy is presented by: Providing the students with a sufficient amount of mathematical terms and definitions by attending lectures and presenting on the whiteboard to connect the students with the lecturer to solve as many real-life applications as possible. The pdf lectures, homework, quizzes, reports, seminar, and exercises are shared on Google Classroom. The subject will be given to the students through a series of lectures with 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 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	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
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**	1	10% (10)	Continuous	All
	Online Assignments	1	10% (10)	Continuous	All
	Onsite Assignments	1	10% (10)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	10	LO # 1-9
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to DE's: Definition and classification of Differential Equations (DE's).
Week 2	First-order DE's: Separable DE.
Week 3	Homogeneous first-order DE.
Week 4	Exact differential equations.
Week 5	Non-exact differential equations.
Week 6	Linear differential equation and Bernoulli equation.
Week 7	Higher-order DE's: The general form of higher-order DE's.
Week 8	Homogeneous DE's, Definition and methods on solving homogeneous DE's.
Week 9	Nonhomogeneous DE's, Definition, properties, and methods of solving non-homogeneous DE's.

Week 10	Mid Exam
Week 11	Reducing second-order DE to first-order DE.
Week 12	Laplace Transform.
Week 13	Definition / properties of Laplace transform and then using Laplace transformation in solving DE's.
Week 14	Preparatory week before the final Exam.
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	[1] C. Henry Edwards and David E. Penney, Differential Equations and Linear Algebra, ser. Pearson International Edition, third edition. Pearson Education, United States of America, 2010. [2] William E. Boyce, and Richard C. DiPrima, Elementary Differential Equations and Boundary Value Problems, John Wiley and Sons, Inc. Seventh edition, United State of America. 2001.	No
Recommended Texts	Earl D. Rainville and Phillip E. Bedient, Elementary Differential Equations, Collier Macmillan Publishers, fifth Edition, New York, 1974.	YES

Websites	https://www.khanacademy.org/math/differential-equations , www.google.com ,

APPENDIX:

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