



منهج دراسة الدكتوراه  
الفصل الدراسي الأول

الرمز	عدد الوحدات	عدد الساعات الأسبوعية		الموضوع
		عملي	نظري	
601	3	3	3	فيزياء الحالة الصلبة (I)
602	3	3	3	علم المواد (I)
603	3	3	3	التحليل الطيفي
604	3	3	3	ميكانيك الكم المتقدم
605	2	2	2	الالكترونيات الحالة الصلبة
606	1	1	1	اللغة الانكليزية
	15	15	15	مجموع الساعات / الوحدات

Lecturer Name	Relativistic Quantum Mechanics (PhD Students)
Subject Name	Advanced Quantum Mechanics
Academic Year	2023- 2024, 1 <sup>st</sup> Semester
Credit Hours	2

Students do study the following fields:

- 1- Fundamental Quantum Mechanics

Course Outcomes:

Relativistic Quantum Mechanics formulations and Applications

Weekly Teaching Plan

Week 1	Klein Gordan Equation
Week 2	Klein Gordan Equation Solution and Applications
Quiz	



Week 3	Dirac Equation
Week 4	Applications of Dirac Equation
Quiz	
Course Final Term Exam	

Computer Usage: Good

Teaching Techniques: Explanation

Assessment methods: Presentations

References (text book) :

- Griffiths - Introduction to quantum mechanics
- Anthony G. Williams - Introduction to Quantum Field Theory - Classical Mechanics to Gauge Field Theories-Cambridge University Press (2022)
- Griffiths\_D\_J\_Introduction\_to\_quantum\_mechanics\_2nd\_ed\_Solutions. "Introduction to Surface Engineering and Functionally Engineered Materials" by Peter J. Martin
- Wolfgang Hollik - Introduction To Quantum Field Theory And The Standard Model (2022).



2023-2024

Lecturer Name	Mohammed Khayri Zeki Abed
Subject Name	Quantum Mechanics
Academic Year	2023- 2024
Credit Hours	3

Students do study the following fields:

1. Historical Notes.
2. Mathematical Tools of Quantum Mechanics
3. Representation in Discrete Bases., Solved problems and Exercises.
4. Schrodinger Equation .
5. Quantum Tunneling .
6. Perturbation Theory .
7. Scattering Theory .
8. The Harmonic Oscillator .
9. Wentzel – Kramers – Brillouin (WKB) Approximation .

Course Outcomes:

1. Learn mathematics and how to use in physics.

## First Semester

Weekly Teaching Plan

Week 1, 2 (3-9-2023)	<b>Topics Covered: Historical Notes</b> : Founder of Quantum Mechanics , The old quantum theory , Quantum Theory Development , The main features of quantum mechanics , Significance of Quantum Mechanics .
Week 3,4	<b>Topics Covered : Mathematical Tools of Quantum Mechanics.</b> The Hilbert space, Dirac notation and Wave function, Hermitian operators , Eigenvalue problem and Expectation , Commuting operators , Uncertainty principle...
Week 5,6	<b>Topics Covered : Representation</b> : Position and Momentum Representations
Week 7,8	<b>Topics Covered: Schrodinger Equation</b> : Schrödinger picture, Heisenberg picture , Interaction picture.
Week 9,10	<b>Topics Covered: Quantum Tunneling</b> : potential well wave functions for the bound state ,
Week 11,12	<b>Topics Covered: Perturbation Theory:</b> Time dependent and independent perturbation theory :Example : harmonic oscillator .
Week 12, 13	<b>Topics Covered: Scattering Theory</b> : Differential cross section in classical and quantum mechanics
Week 14,15 (15-1-2024)	<b>Topics Covered: The Harmonic Oscillator:</b> classical and quantum theory, Wentzel – Kramers – Brillouin (WKB) Approximation, exercises and solved problems .
<b>Course Final Term Exam</b>	

Computer Usage:

Teaching Techniques:

Assessment methods:

References (text book) :

- 1- Quantum Mechanics : John L. Powell . Addison- Wesley publishing Company , INC.
- 2- Quantum Mechanics: Concepts and Applications, Nouredine Zettili.
- 3- Introduction to Quantum Mechanics, D. J. Griffiths.