مختصر توصيف المقرر

معلومات المقرر * (Course Information):

اسم المقرر:	الفيزياء الذرية والجزيئية
رقم المقرر:	فيز 4542
اسم ورقم المتطلب السابق:	فيز 3522
اسم ورقم المتطلب المرافق:	--
مستوى المقرر:	السابع
الساعات المعتمدة:	3 (3+0+0)

Module Title:	Atomic and Molecular Physics
Module ID:	PHYS 4542
Prerequisite:	PHYS 3522
Co-requisite:	---
Course Level:	Seventh
Credit Hours:	3 (3+0+0)

وصف المقرر : **Module Description**

Introduction: Comparing between atomic emission spectroscopy and atomic absorption spectroscopy; Optical spectroscopy, Atomic spectrum, Atomic emission/ absorption spectrophotometry Molecular spectroscopy, Spectroscopy of inner electrons. Zeeman's effect, Sodium spectrum, Effect of magnetic field on the energy levels of atom. Theory of magnetic energy, Anomalous Zeeman's effect and Lande splitting factor. Molecular Spectra of diatomic molecules. Vibration energy levels in both classical mechanics and quantum mechanics. Rotational spectra of diatomic molecule in gaseous state and rotational energy levels. Molecular spectra; An harmonic Oscillator- Non Rigid Rotator - Infrared Vibration-Rotation spectra; spectrum, IR spectrum, RBS spectra, XRD spectrum - measurements of Absorbance, Transmitting and Reflecting using double beam Spectrophotometers in all ranges of wavelengths (UV-VIS-NIR-IR), Normal modes of vibrations; Natural of infrared absorption, Basic Laser principles, Laser behavior, Properties of laser radiations, Different types of lasers, Laser spectroscopy, The total losses of the laser system, Transmission at the mirrors. Absorption and scattering by the mirrors, Absorption in the laser medium. Diffraction losses at the mirrors, The Ruby Laser- Three Level Laser (Helium-Neon Laser) Four Level Laser (Carbon dioxide Laser), Laser applications

أهداف المقرر : **Module Aims**

1	The student knowledge of the basics of science atom and molecules.	1
2	Learn the basic atomic concepts and principles, and the basics of emission spectroscopy with a highlight on its practical and scientific significance.	2
3	The development of students' mental abilities.	3
4	The development of the students' practical achievements and prepare them for the areas of advanced in practical life and scientific and applied research.	4
5		5

Learning Outcomes: **مخرجات التعليم:**

1	**Knowledge:** • List different types of atomic spectra and related instrumentation. • Describe theories explaining the structure of atoms and the origin of the observed spectra. • Identify atomic effect such as space quantization and Zeeman effect. • Describe the molecular bonding and molecular energies. • Memorize different technique used in laser and applications.	1
2	**Cognitive Skills:** • Collect general information about some about some atomic spectra related topics. • Use the mathematical modelling, experimental work in understanding physics phenomena. • Apply the gained mathematical and experimental knowledge in any physical related topic.	2
3	**Communication, information Technology and Numerical Skills:** • Work in a group and learn time management. • Learn how to search for information through library and internet. • Present a short report in a written form and orally using appropriate scientific language.	3
4	• Operate questions and communicate with teacher through solve problems and work in groups.	4
5	**Psychomotor** Not Applicable.	5

Course Contents: **محتوى المقرر:**

ساعات التدريس (Hours)	عدد الأسابيع (Weeks)	قائمة الموضوعات (Subjects)
3	1	Basic principles of spectroscopy
6	2	Different models for atomic structures
6	2	Quantum mechanics of hydrogen atom and many electron atom
9	3	Effect of electric and magnetic fields on the atoms
9	3	Molecular spectroscopy
9	3	Laser spectroscopy
3	1	Review

Textbook and References: **الكتاب المقرر والمراجع المساندة:**

سنة النشر Publishing Year	اسم الناشر Publisher	اسم المؤلف (رئيسي) Author's Name	اسم الكتاب المقرر Textbook title
7th Ed. (2005)	Springer	H. Haken and H. Wolf	The Physics of Atoms and Quanta ISBN-10: 3-540-20807-0
سنة النشر Publishing Year	**اسم الناشر Publisher**	**اسم المؤلف (رئيسي) Author's Name**	**اسم الكتاب المقرر Textbook title**

6th Ed. (2003)	McGraw-Hill Higher Education	Arthur Beiser	Concepts of Modern Physics 0072448482
4th Ed. (2004)	Springer	Sune Svanberg	Atomic and Molecular Spectroscopy 3540203826