جامعة المجمعة
Majmaah University

Course Specifications

Institution:	College of Education
Academic Department:	Physics
Programme:	Physics
Course:	Atomic and Molecular Physics
Course Coordinator:	Dr. Mohsen Challan
Programme Coordinator:	Dr. Fatma Mohamed
Course Specification Approved Date:	21/12/1437 H

This form compatible with NCAAA 2013 Edition

A. Course Identification and General Information

1 - Course title: Atomic and Molecular Physics Course Code: Phys413			
2. Credit hours: (3+1)			
3 - Program(s) in which the course is offered: B. of Education			
4 – Course Language: Arabic			
5 - Name of faculty member responsible for the course: Dr. Mohsen Challan			
6 - Level/year at which this course is offered : 7			
7 - Pre-requisites for this course (if any): • Phys321 + Phys322			
8 - Co-requisites for this course (if any): • None			
9 - Location if not on main campus: (Girls Campus)			
10 - Mode of Instruction (mark all that apply)			
A - Traditional classroom	√	What percentage?	100 %
B - Blended (traditional and online)		What percentage?	%
D - e-learning		What percentage?	%
E – Correspondence		What percentage?	%
F - Other		What percentage?	%
Comments :			

B Objectives

What is the main purpose for this course?

The application of quantum theory to atomic and molecular structure, and the interaction between electromagnetic radiation and atoms and simple molecules.

Briefly describe any plans for developing and improving the course that are being implemented:

1- The course content has been revised and a new syllabus is written.
2- Students are encouraged to communicate through the email and the lecturer site which has many links to important sources of knowledge in the field of atomic and molecular physics.
3- The use of the Internet in the preparation of the necessary lessons References.
4- Use progressive presentations to explain syllabus.

C. Course Description:

1. Topics to be covered:

List of Topics	No. of Weeks	Contact Hours
Overview of the atomic structure: the atomic models, Rutherford atom،	1	3
Bohr model, Sommerfeld model of the atom, the study of the atomic spectrum, spectral imaging, flame spectrum, electric arc spectrum	2	3
Experimental investigations of discrete levels of Atomic Energy, the Pauli principle of exclusion, electronic distribution.	3	3
Review the meaning of the quantum numbers and degeneracy, problems.	4	3
Quantization rule and magnetic moments.	5	3
The general rules of selection (dual beam), the intensity of spectral lines, intensity ratios lines available, special selection rules, forbidding transitions, problems.	6	3
Magnetic dipole moment, Bohr Magneton.	7	3
Quantum numbers and solving Schrödinger equation.	8	3
Orbital angular momentum and magnetic dipole moment.	9	3
Larmour precession, Zeeman effect, problems. Stern - Gerlach, experiment, problems.	10	3
Summation rule, general considerations for the analysis of the atomic spectrum, forbidden transitions, Lande Interval Rule.	11	3
Ultra-fine structure hyperbolic of atomic spectral lines, the Victorian model of nuclear wrap.	12	3
Rotation spectra caused by the rotational motion of the diatomic molecules, the Raman effect and Raman spectroscopy.	13	3
Molecular oscillation spectra caused by the vibratory motion of the nuclei of diatomic molecules (infrared spectrum).	14	3
Spectrum resulting from the electronic transitions in diatomic molecules (the visible spectrum + UV spectrum), physical and chemical applications (physical properties – ionization energy – electronic affinity - electronic bonds). Spectrography, flame spectroscopy, D.C. arc spectroscopy).	15	3

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory	Practical	Other:	Total
Contact Hours	48		32			
Credit	48		16			

3. Additional private study/learning hours expected for students per week. 7h

7 hours weekly for reading, translating (text books are usually in English) and solving the home work problems.

4. Course learning outcomes in NQF domains of learning and alignment with assessment methods and teaching strategy:

	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	Knowledge		
1.1	This is an introductory course which gives the student a wide and general look at the different aspects of atomic and molecular physics.	Give lectures to demonstrate the basic information and principles of the course	Formal homework
1.2	Especially that related to general properties of the atoms	Discussing phenomena with illustrating diagrams	Spontaneous questions
1.3	Excitation reactions and decay spectra.	Revisit concepts	Major and Final exams
1.4	Atomic models	Ask questions during lectures	Scientific reports
2.0	Cognitive Skills		
2.1	Know the content of the subject	Preparing main outlines for teaching	Spontaneous questions to connect different parts of the course to each other
2.2	Develop the students ability to solve and analyse problems related to the course.	Following some proofs	Revisiting concepts
2.3	Develop the student's ability to use physical laws.	Spontaneous questions during lectures	Quizzes and homework
2.4	principles to understand the subject	Discussions	Major and final exams
3.0	Interpersonal Skills & Responsibility		

	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
3.1	Work independently	Encouraging students to solve problems independently and through communication and discussion with other members of the group	Grading homework
3.2	Work within a group	Set group assignments involving internet search.	Grading group assignments on the internet
3.3	Share research ideas and findings with others	learn how to cover missed lectures	Quizzes on previous lectures
3.4	Leadership development (managing time, resources and people)	Learn how to summarize lectures and collect the material of the course	Revisiting concepts
4.0	Communication, Information Technology, Numerical		
4.1	communicating with peers, lecturers and community, use of the computer and the internet, problem solving	Set and receive homework through the lecturers electronic site	Discussions
4.2	communicating with lecturers	students to use the internet to seek course	Grading the student homework

	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
		related information	
4.3	communicating with community	Set homework based on search through the internet with the help of key links provided by the lecturer through his electronic site	Grading essays
4.4	Use of the computer and the internet.	set group assignment (assay)	Revisiting concepts
4.5	Problems solving.	plan visits to scientific institutes	Quizzes on previous lectures
5.0	Psychomotor		
5.1	Not applicable	Not applicable	Not applicable

5. Schedule of assessment tasks for students during the semester:

	Assessment task	Week Due	Proportion of Total Assessment
1	Quiz I	5	10
2	Mid-term Examination	7.	20
3	Quiz II	9	10
4	Laboratory Exam.	13	20
5	Final (term) Exam.	14	40

D. Student Academic Counseling and Support:

- Office hours 6 hr/week

E. Learning Resources

1. List Required Textbooks :
   - Atomic Spectra and Atomic Structure, by G. Herzberg, 1984.
2. List Essential References Materials :
   - Physics of Atoms and Molecules, by Bransden and Joachain, 1994.
   - Fundamentals of Modern Physics, by Eisberg, John&Wiley, 1995.
3. List Recommended Textbooks and Reference Material :
   - (Attach List)
4. List Electronic Materials :
   - ……
   - ……
   - ……..
5. Other learning material :
   - ……
   - ……
   - ……..

F. Facilities Required

1. Accommodation
   - Lecture room with at least 30-40 seats
2. Computing resources
   - Scientific calculator for each student
   - Data show facility
3. Other resources
   - ……
   - ……
   - ……..

G. Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching: • Examination results and type of questions answered • Course evaluation by student • Students- faculty meetings
2. Other Strategies for Evaluation of Teaching by the Program/Department Instructor: • Peer consultation on teaching • Departmental council discussions • Discussions within the group of faculty teaching the course
3. Processes for Improvement of Teaching: • Workshops on teaching and learning methods
4. Processes for Verifying Standards of Student Achievement • Exchanging the course with other lecturers and comparing results • Providing statistical information based on examination results
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement: • The course material is periodically reviewed and the changes to be taken are approved in the departmental and higher councils. • The head of department and faculty take the responsibility of implementing the proposed changes.

Course Specification Approved
Department Official Meeting No (2) Date 21/12 /1437 *H*

Course's Coordinator		Department Head	
Name:	Dr. Mohsen Challan	*Name:*	Dr. Fatma Mohamed
Signature:	……...	*Signature:*	……...
Date:	21/12/1437 *H*	*Date:*	21/12/1437 *H*