ATTACHMENT 5.

T6. COURSE SPECIFICATIONS (CS)

Phys 536

Atomic & Molecular Spectroscopy

هيئة تقويم التعليم
Education Evaluation Commission

Course Specifications

Institution: KSU	Date: Dec 31, 2017
College/Department : Physics and Astronomy Department	

A. Course Identification and General Information

1. Course title and code: Atomic & Molecular Spectroscopy Code: Phys 536

2. Credit hours: (3+0) per week

3. Program(s) in which the course is offered.
(If general elective available in many programs indicate this rather than list programs)
MSc degree in Physics - Laser physics and spectroscopy program

4. Name of faculty member responsible for the course
Dr. Zeyad A. Alahmed

5. Level/year at which this course is offered: Master 3rd Level

6. Pre-requisites for this course (if any): Phys 505

7. Co-requisites for this course (if any):

8. Location if not on main campus:
Main campuses for Male and female

9. Mode of Instruction (mark all that apply):

a. traditional classroom		What percentage?	
b. blended (traditional and online)	X	What percentage?	100
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course?
The course is a continuation of the Atomic and Molecular Physics course and will be discussed more in detail. The first part of this course deals principally with atomic structure and the interaction between atoms and fields. It covers Fine structure of one electron, two electrons and many electrons systems; L-S and j-j coupling. The second part of the course deals with Electronic, vibrational and rotational energy levels; Electronic configuration of simple molecules. The third part of the course deals with molecular spectroscopy and their methods.

2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)
a. Implement Blackboard to highlight interesting links for the relative topics.
b. Use simulation software to visualize and understand the basic knowledge.
c. Introducing students to a specialized software to deal with advanced problems.
c. Lab visit to observe some studied experiment.

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description:
Bohr's atom; Vector atom models; Space, spin quantization. Fine structure of one electron, two electrons and many electrons systems; L-S and j-j coupling; Zeeman effect; Low and high magnetic fields; Stark effect; Electronic, vibrational and rotational energy levels, Electronic configuration of simple molecules; Vibrational modes; P.Q.R. branches of rotational transition; Fluorescence, phosphoresce; Frank, Candon factors; Raman effect. Tunable lasers; Spectral and temporal tuning; Raman lasers; CARS; Horses; Harmonic and parametric oscillators; Picosecond, continuum, femtosecond spectroscopy; LIBS, PAS, Rydberge states; Photogalvanic, multiphoton spectroscopy; High resolution spectroscopy; Lamb dip and saturation spectra; Laser cooling.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Bohr's atom; Vector atom models; Space, spin quantization;	2	6
Fine structure of one electron system	2	6
Fine structure of two electrons and many electrons systems	2	6
L-S and j-j coupling;	1	3
Zeeman effect; Low and high magnetic fields; Stark effect;	1	3
Electronic, vibrational and rotational energy levels, Electronic configuration of simple molecules;	2	6
Vibrational modes; P.Q.R. branches of rotational transition;	1	2
Fluorescence, phosphoresce; Frank, Candon factors; Raman effect.	1	2

Tunable lasers; Spectral and temporal tuning; Raman lasers; CARS; Horses; Harmonic and parametric oscillators; Picosecond, continuum, femtosecond spectroscopy;	1	3
LIBS, PAS, Rydberge states; Photogalvanic, multiphoton spectroscopy; High resolution spectroscopy; Lamb dip and saturation spectra; Laser cooling.	1	3

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	Planed	40	0	0	0	0	40
	Actual	40					40
Credit	Planed	40	0	0	0	0	40
	Actual	40	0	0	0	0	40

3. Additional private study/learning hours expected for students per week. 6

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Define the limitation of Bohr's model of H	Lecturing	Presentation
1.2	Describe electron transition in H atom	Exercises	Mid-term exam
2.0	**Cognitive Skills**		
2.1	Solve Schrodinger equation for one-electron atoms	Class discussion	Mid-term exam
2.2		Problem solving	
3.0	**Interpersonal Skills & Responsibility**		
3.1	Present a short report	Group presentation	Presentation
3.2			
4.0	**Communication, Information Technology, Numerical**		

4.1	Demonstrate advanced functions using simulation software	Demonstration	Write report
4.2			
5.0	**Psychomotor**		
5.1			
5.2			

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	HW (Problem solving)	3rd, 6th, 9th, and 12th	18%
2	Mid-Exam	4th,8th	40%
3	Final Exam	15th	40%
4	Report and Presentation	14th	2%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week) Office hours: 3 hours per week

E Learning Resources

1. List Required Textbooks • **Physics of Atoms and Molecules;** B.H. Bransden & C.J. Joachain, Prentice Hall 1983
2. List Essential References Materials (Journals, Reports, etc.) • **Spectroscopy;** Walker and Straw, Chapman Hall (1961). • **Fundamentals of Molecular Spectroscopy;** Colin N. Banwell and Elaine M. McCash (1994) • **Advances in Laser Spectrocopy;** Bruce A. Garetz and John R. Lombardi, Wiley, John & Sons, Incorporated (1986) • **Laser Spectroscopy;** W. emtroder , 3rd Ed., Springer-Verlag (2003).
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) • Classroom for 10 students • Library
2. Technology resources (AV, data show, Smart Board, software, etc.) • Smart Board • Black Board
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching Student evaluation electronically organized by the University
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department Lecturers Committee to review the final results Departmental review of the final results
3. Processes for Improvement of Teaching • Course report • Program report • Program Self study
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution)
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Student evaluation • Course report • Program report • Program Self study

Name of Course Instructor: _____ **Zeyad A. Alahmed** _____

Signature: _____ Date Specification Completed: **Dec 31, 2017**_

Program Coordinator: _____

Signature: _____ Date Received: _____