ATTACHMENT 5.

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

T6. Course Specifications (CS)

Course Specifications

Institution: Taibah University	Date of Report: 12 January 2017
College/Department : Science / Chemistry	

A. Course Identification and General Information

1. Course title and code: Physical Chemistry III : CHEM 344

2. Credit hours:3

3. Program(s) in which the course is offered.
(If general elective available in many programs indicate this rather than list programs)
B.Sc. Chemistry

4. Name of faculty member responsible for the course
A member of the Physical Chemistry Division

5. Level/year at which this course is offered: Sixth Level /Third Year

6. Pre-requisites for this course (if any)
CHEM 343& MATH320

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

8. Location if not on main campus
NA

9. Mode of Instruction (mark all that apply)

a. Traditional classroom	✓	What percentage?	70
b. Blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. Correspondence		What percentage?	
f. Other	✓	What percentage?	30

Comments:

B Objectives

1. What is the main purpose for this course?

- Students will be acquainted with the basic principles that govern the structure and properties of individual atoms and molecules.
- Students will also become familiar with the experimental results that overthrew the concepts of classical mechanics.
- Students will learn the fundamentals of rotational, vibrational and electronic spectroscopy, with specific consideration will be given to electronic spectra of diatomic and polyatomic molecules
- The fundamental concepts of magnetic resonance spectroscopy will be introduced.

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)

1. Planning to use learning management systems available to create a culture of interaction between students and course instructor.
2. Planning to continuously update course content and course materials in accordance with advances in the field.
3. Students will be able to register for the online website learning resources.
4. Using various internet resources that offer informative details to supplement the lecture material.

C. Course Description (Note: General description in the form to be used for the Bulletin or handbook should be attached)

Course Descriptions:

Physical Chemistry III covers the introduction of quantum chemistry and molecular spectroscopy. In quantum chemistry, students are exposed to the basic principles that govern the structure and properties of individual atoms and molecules. The experimental results that overthrew the concepts of classical mechanics will also be discussed. In molecular spectroscopy, students will learn the fundamental concepts of rotational and vibrational spectroscopy, the electronic spectra of diatomic and polyatomic molecules, and the fundamental concepts of magnetic resonance spectroscopy.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact Hours
Introduction: the origin of quantum mechanics, Schrodinger equation; sections: 8.1- 8.3	2	6
Wave function, the information in wave function, the uncertainty principle, Postulates of quantum mechanics; sections: 8.4- 8.7	1	3
Particle in a box, motion in two and more dimensions; sections: 9.1, 9.2	2	6
Vibrational and rotational motions: The energy levels and relation to wave functions; sections: 9.4-9.7	1	3
The structure of hydrogenic atoms, atomic orbitals and their energies, spectroscopic transition and selection rules; sections: 10.1-10.3	2	6
Molecular spectroscopy 1:-rotational and vibrational spectra:- General features of spectroscopy - pure rotational spectra. Sections: 13.1- 13.	1	3
The rotational energy levels – nuclear statistics and rotational state. Sections: 13.5- 13.8	1	3
The vibrations of diatomic molecules, molecular vibrations, vibrational Raman spectra of diatomic molecules. Sections: 13.9-13.13 The vibrations of polyatomic molecules. Sections: 13.14 -13.17	2	6
Molecular spectroscopy 2: electronic transitions, the vibrational structure, dissociation and pre-dissociation. Sections: 14.1- 14.4	1	3
Molecular spectroscopy 3:- The effect of magnetic fields on electrons and nuclei. Sections: 15.1- 15.3 Nuclear magnetic resonance. Sections: 15.4-15.7	1	3

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

	Lecture	Tutorial	Laboratory	Practical	Other:	Total
Contact Hours	42	-	-	-	3 exams	45
Credit	3	-	-	-	-	3

3. Additional private study/learning hours expected for students per week.	5

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 fundamental concepts of quantum chemistry and molecular spectroscopy.	-Active learning through class projects, and use of Internet resources. -Inquiry-Based Learning - Team learning. -Class projects	-Homework problem solving -Independent assignments -Class work including short quizzes - Two tests - Final examination.
1.2	**Recognize** the failure of classical mechanics to account for structure and the properties atomic and subatomic particles.		
1.3	**Recognize** the correlation of molecular spectroscopy and quantum mechanical aspects.		
1.4	**Outline** the molecular spectra and their correspondence to concepts of quantum chemistry.		
2.0	**Cognitive Skills**		
2.1	**Estimate** the importance of quantum mechanics and molecular spectroscopy to describe the behavior of subatomic, atoms and molecular scale species.	-Classroom active -Learning lectures -Research activities -Collaborative learning - Brainstorming	-Active student participation in classroom discussions -Short-answer type, short-notes questions.
2.2	**Predict** the correlation between energy quantization behavior of atoms and molecules to the experimental results of atomic and molecular spectroscopy		
3.0	**Interpersonal Skills & Responsibility** demonstrate, judge, choose, illustrate, modify, show, use, appraise, evaluate, justify, analyze, question, and write		
3.1	**Develop** communicational skills through discussions and classroom participations between students themselves and their course instructors.	-Giving students an opportunity to take part in active classroom discussions under the supervision of instructors	Follow-up assessments of student progress on his own compared to when working as a member of a team - Self-evaluations
3.2	**Demonstrate** self learning capacity .		
3.3	**Show** active participations in classroom		

	discussions.	-Grouping students in doing home works to develop their teamwork and interpersonal skills skills	
3.4	**Appraise** the assignments of fellow team members		
3.5	**Write** up homework concisely in a scientific manner.		
4.0	**Communication, Information Technology, Numerical**		
4.1	**Demonstrate** ability to write up homework using word processors and present work using presentation software.	-Giving students home works that require the use of IT and software. -Encouraging students to make use of internet. - Classroom exercises that allow students employ the advanced features of a scientific calculator.	-Questionnaires to identify how effectively students use IT to improve their skills and knowledge of the course materials and their personal communications. - Continuous Assessment in classroom activities.
4.2	**Use** the worldwide web to research topics covered in the lectures.		
4.3	**Use** of the advanced features in scientific calculators.		
5.0	**Psychomotor**		
5.1	NA	NA	NA

5. Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes (Use Program LO Code #s provided in the Program Specifications)**								
	1.1	**1.2**	**2.1**	**2.2**	**2.3**	**3.1**	**3.2**	**4.1**	**4.2**
1.1	✓								
1.2	✓								
1.3	✓								
1.4	✓								
2.1				✓					
2.2				✓					
3.1						✓			
3.2						✓			
3.3						✓			
3.4						✓			
3.5							✓		

4.1								✓	
4.2								✓	
4.3								✓	

6. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Drills		
2	Exercises & Home works	All weeks	5%
3	Project (single\group)		
4	Research		
	Essay/Report		
5	Participation	All weeks	5%
6	Practical Tests		
7	Oral Tests		
8	Quizzes	All weeks	10%
	Written Test (1)	6^{th} week	20%
	Written Test (2)	11^{th} week	20%
	Final Exam (theoretical)	Final week	40%
	Final Exam (practical)	-	-
	Others		

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: 8 hours per week.

E. Learning Resources

1. List Required Textbooks Physical Chemistry; *10* th edition, Peter Atkins and Julio de Paula, Oxford University Press, 2014, ISBN: 9780199697403
2. List Essential References Materials (Journals, Reports, etc.) 1. Michael Mueller, 2002, Fundamental of Quantum Chemistry, 2nd edition ,Kluwer Academic Publishers, New York, Boston, Dordrecht, London, Moscow
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials (eg. Web Sites, Social Media, Blackboard, etc.) Online resources http://www.oup.com/uk/orc/bin/9780199543373/ Online tutorials http://www.oup.com/uk/orc/bin/9780199543373/01student/weblinks/
5. 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.) • Classrooms suitable for a minimum of 25 students
2. Computing resources (AV, data show, Smart Board, software, etc.) • Smartboard • Data show • Computers • Software
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 • Regular evaluation of the course to identify the weaknesses areas.
2. Other Strategies for Evaluation of Teaching by the Program/Department Instructor • A statistical regular review and analysis of student achievement in the department. • Prepare a questionnaire to be completed by the students at the end of the term subsequently analyzed and studied.
3. Processes for Improvement of Teaching Arrange workshops. • Form committees to follow up progress and work on improvement. • Provide opportunities to improve academic courses and research through conferences. • Provide training and workshop opportunities for the teaching staff to improve their teaching strategies • Provide the teaching staff with all the necessary references and electronic resources.

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) • Check progress level of the students (this can be done by an independent teacher by reviewing student records and comparing the student's work with that of students from a different institution). • Review answer sheets of the students using the same method as above. • Review the answer sheets of the students that have failed.

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Compare the syllabus with the syllabus of accredited universities. • Form a specialized committee from the department to review the progress of teaching and update the available resources.

Name of Instructor:
Signature: _____ Date Report Completed: 12 January 2017

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received: _____