COURSE SPECIFICATIONS
(CS)

Modern Physics

PHYS 353

June 2018

Course Specifications

Institution: King Saud University	Date: 12/2017
College/Department: Science/Physics and Astronomy	

A. Course Identification and General Information

1. Course title and code: Modern Physics 1 – PHYS 353
2. Credit hours: 3(3+0+0)
3. Program(s) in which the course is offered: B.Sc. in Physics (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course: Dr. Maien Yahya Binjonaid
5. Level/year at which this course is offered: Level 5
6. Pre-requisites for this course (if any): MATH 209
7. Co-requisites for this course (if any): None
8. Location if not on main campus: NA
9. Mode of Instruction (mark all that apply)

a. traditional classroom	*	What percentage?	100
b. blended (traditional and online)		What percentage?	
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? 1. To familiarize the student with the special relativity and its consequences. 2. The student should understand the particle-like properties of waves. 3. The student should understand the wave-like properties of particles. 4. The student should understand Schrodinger equation and the basics of quantum mechanics. 5. The student should understand Rutherford and Bohr work on atoms. 6. The basics of the Hydrogen atom
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). The content of the course will be made available via Blackboard. Using computational packages such as Mathematica and Matlab in solving some known problems in quantum mechanics

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

Course Description: Classical relativity, Michaelson-Morley experiment, Postulates of special relativity, Lorentz transformations, the consequences of special relativity. The photoelectric effect, Compton effect, the photon. De Broglie waves, the uncertainty principle, wave packets. Probabilities and randomness. Wave at boundaries, trapping particles, the Schrodinger equation, applications of Schrodinger equation, the harmonic oscillator, steps and barriers. The basic properties of the atom, Thomson model, Rutherford experiment, spectral lines, Bohr model. Atom in one dimension, Angular momentum, Spin, Zeeman effect.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours

Classical relativity, Michaelson-Morley experiment, Postulates of special relativity,	1	3
Lorentz transformations, the consequences of special relativity	2	6
The photoelectric effect, Compton effect, the photon.	2	6
De Broglie waves, the uncertainty principle, wave packets. Probabilities and randomness.	3	9
Wave at boundaries, trapping particles, the Schrodinger equation, applications of Schrodinger equation, the harmonic oscillator, steps and barriers.	3	9
The basic properties of the atom, Thomson model, Rutherford experiment, spectral lines, Bohr model	2	6
Atom in one dimension, Angular momentum, Spin, Zeeman effect.	2	6

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

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	45					45
Credit	45					45

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

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	To outline the concepts special relativity	Lecture, Smart Board	Exams and homework
1.2	To describe the concepts of quantum physics	Lecture, Smart Board	Exams and homework
2.0	**Cognitive Skills**		
2.1	Calculate the dynamical properties of objects moving close to the speed of light	Lecture, Discussion	Discussion
2.2	Analyze quantum mechanical systems using the Schrodinger equation	Lecture, Discussion	Discussion
3.0	**Interpersonal Skills & Responsibility**		
3.1	Show how special relativity and quantum mechanics are used to study physical systems	Role playing / inverted class	Presentation / discussion
3.2			
4.0	**Communication, Information Technology, Numerical**		
4.1	Illustrate how to solve problems in special relativity and basic quantum physics	Group presentation	Presentation
4.2			
5.0	**Psychomotor**		
5.1			
5.2			

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	Midterm 1	5	15%
2	Midterm 2	11	15%
3	Quiz	Throughout	10%
4	Homework	Throughout	10%
5	In-class discussion	Throughout	10%
6	Final	End of term	40%
7			
8			

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) 2 hours per week of office hours

E Learning Resources

1. List Required Textbooks Modern Physics, Kenneth S. Krane, Third Edition, 2012, Wiley Modern Physics, John Morrison, Second Edition, 2015, Academic Press
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
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.) Lecture hall for 30 students
2. Computing resources (AV, data show, Smart Board, software, etc.) Smart 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 Feedback to be taken at the end of each class
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department Peer consultation
3 Processes for Improvement of Teaching Developing teaching based on regular feedback and peer consultation
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) Double-checking by independent peers
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. Creating a table for the course to ensure that the goals are achieved, and taking into account feedback and peer consultation

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received: _____