COURSE SPECIFICATIONS
(CS)

Elementary Particle Physics

PHYS 480

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:Elementary Particle Physics – PHYS 480

2. Credit hours: 2(2+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 8
6. Pre-requisites for this course (if any): PHYS 452

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 concepts of elementary particles: Quarks and Leptons, and their discovery.
2. The student should understand the fundamental forces of nature: strong nuclear force, weak nuclear force, electromagnetism, and gravity.
3. The student should learn four-vector notation in relativity, relativistic collisions, and their role in describing elementary particle processes.
4. The student should know the symmetries governing nature.
5. The student should learn the basics of quantum electrodynamics, Fermi's golden rule, and Feynman diagrams

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 Matlabin solving some known problems in quantum mechanics

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

Course Description:
Elementary particles and their discovery. Leptons and quarks and their physical properties. The fundamental forces of Nature. The strong nuclear force, the weak nuclear force, the electromagnetic force, and the gravitational force, and their carriers: the gluon, W plus and minus and Z, and the photon. Four-vector notation in special relativity, relativistic collisions. Symmetries that govern elementary particle interactions, Fermi's golden rule, Quantum chromodynamics and Feynman diagrams.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours

Elementary particles and their discovery. Leptons and quarks and their physical properties	3	6	
The fundamental forces of Nature and their carriers	2	4	
Four-vector notation in special relativity and relativistic collisions	2	4	
Symmetries that govern the elementary particle world	3	6	
Cross-Sections, Decays and Fermi's golden rule	3	6	
Quantum chromodynamics and Feynman diagrams	2	4	

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

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	30					30
Credit	30					30

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 list quarks and leptons, and their physical properties	Lecture, Smart Board	Exams and homework
1.2	Define the four fundamental forces and their ranges	Lecture, Smart Board	Exams and homework

2.0	**Cognitive Skills**		
2.1	Explain the role of special relativity and quantum mechanics in particle physics	Lecture, Discussion	Discussion
2.2	Analyze relativistic collisions between elementary particles	Lecture, Discussion	Discussion
3.0	**Interpersonal Skills & Responsibility**		
3.1	Show how Feynman diagrams are used to study particle interactions	Role playing / inverted class	Presentation / discussion
3.2			
4.0	**Communication, Information Technology, Numerical**		
4.1	Illustrate the symmetries of nature that govern particle interactions	Group presentations and discussion	Presentation / Class discussion / Report
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
Introduction to Elementary Particles, David Griffiths, Second Edition, 2008, Wiley-VCH
Modern Particle Physics, Mark Thomson, First Edition, 2013, Cambridge University 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:_____