هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	Elementary Particle Physics
Course Code:	PHYS 480
Program:	B.Sc. in Physics
Department:	Department of Physics and astronomy
College:	College of Science
Institution:	King Saud University
Version:	2.0.0
Last Revision Date:	Sep 2023

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	**2(2+0+0)**				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☐	Elective☒			
3. Level/year at which this course is offered:	eighth level/ fourth year				
4. Course general 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.					
5. Pre-requirements for this course (if any): Phys 452					
6. Co- requirements for this course (if any):					
7. Course Main Objective(s)					

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

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	30	100%
2.	E-learning	0	0
3.	Hybrid • Traditional classroom • E-learning	0	0
4.	Distance learning	0	0

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	0
5.	Others (specify)	0
	Total	30

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	List and name the content of Standard Model and their physical properties	K1	• Give extensive examples during lecture. • Give problem sheets to be discussed during lecture.	• Hold Class discussion, tutorial sessions. • Give quizzes, mid-term exam and final exam.
1.2	Define the 4 fundamental forces, their ranges, carriers and the particles to which they apply	K2		
1.3	Explain the role of special relativity and Quantum mechanics in particle physics	K3		
2.0	Skills			
2.1	Annalise the results of an experimental investigation of unresolved problems in particle physics.	S1	• Give extensive examples during lecture • Give problem sheets to be discussed during lecture and labs. • assignments. • Discussions in the classes	• Hold Class discussion, tutorial and lab sessions. • Give quizzes, mid-term exam and final exam.
2.2	Draw Feynman diagrams to calculate the cross section, width decay and relevant quantities	S2		
2.3	Ability to search in literature and present oral and written explanation in high energy problem.	S3		

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	Values, autonomy, and responsibility			
3.1	Work as a team and acknowledge others' work.	V1	• assignments. • Homework	Hold Class discussion
3.2	Ability to involve in scientific communication, and to be opened to other and NP ideas.	V2		

C. Course Content

No	List of Topics	Contact Hours
1.	**Elementary particles and their discovery. Leptons and quarks and their physical properties**	6
2.	**The fundamental forces of Nature and their carriers**	4
3.	**Four-vector notation in special relativity and relativistic collisions**	4
4.	**Symmetries that govern the elementary particle world**	6
5.	**Cross-Sections, Decays and Fermi's golden rule**	6
6.	**Quantum chromodynamics and Feynman diagrams**	4
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	First Midterm examination	Approx. 6	15%
2.	Second Midterm examination	Approx. 12	15%
3.	Quiz	Throughout	10%
4.	Homework	Throughout	10%
5.	In-class discussion	Throughout	10%
6.	Final examination	From 16 to 18	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Introduction to Elementary Particles, David Griffiths, Second Edition, 2008, Wiley-VCH
Supportive References	Modern Particle Physics, Mark Thomson, First Edition, 2013, Cambridge University Press
Electronic Materials	None
Other Learning Materials	Internet sites relevant to the course

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	A classroom which accommodates 25 students.
Technology equipment (projector, smart board, software)	Whiteboard and Smart board
Other equipment (depending on the nature of the specialty)	Not applicable

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students\ Peer Reviewer	Indirect \ direct
Effectiveness of students assessment	Students- Faculty	Direct
Quality of learning resources	students	Indirect
The extent to which CLOs have been achieved	Faculty	Indirect
Other	None	None

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	Physics Department's council
REFERENCE NO.	10th (2nd term 1445)
DATE	12/07/1445