هيئة تقويم التعليم
Education Evaluation Commission
المركز الوطني للتقويم والاعتماد الأكاديمي
National Center for Academic Accreditation and Evaluation

ATTACHMENT 5.

T6. COURSE SPECIFICATIONS (CS)

هيئة تقويم التعليم
Education Evaluation Commission

Course Specifications

Institution	Date of Report
King Saud University	**01/01/2018**
College/Department **Science/ Physics & Astronomy**	

A. Course Identification and General Information

1. Course title and code: **Relativistic Quantum Mechanics PHYS 510**
2. Credit hours **03**
3. Program(s) in which the course is offered.
(If general elective available in many programs indicate this rather than list programs)
Ph.D.
4. Name of faculty member responsible for the course **Prof. Md. Harunor Rashid Khan**
5. Level/year at which this course is offered **Ph.D.**
6. Pre-requisites for this course (if any)
PHYS 505 (Advanced Quantum Mechanics)
7. Co-requisites for this course (if any): **Nothing**
8. Location if not on main campus : **Not Applicable**
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: **Nothing Special**

B Objectives

1. What is the main purpose for this course?

The Relativistic quantum theory is applicable to massive particles propagating at all velocities up to those comparable to the speed of light c, and can accommodate massless particles. The theory has application in high energy physics, particle physics and accelerator physics, as well as atomic physics and condensed matter physics. There are many experimental phenomena which firstly cannot be explained or understood within the purely non-relativistic domain. Secondly aesthetically and intellectually it would be profoundly unsatisfactory if relativity and quantum mechanics could not be united. Finally there are theoretical reasons why one would expect new phenomena to appear at relativistic velocities. Relativity impacts when the velocity approaches the speed of light, c or, more intrinsically, when its energy is large compared to its rest mass energy, mc^2. For instance, electrons or protons in the accelerator are accelerated to energies of several tens to hundreds GeV which is considerably larger than their rest mass energy. Therefore it is mandatory to apply the Relativistic quantum theory to all types of particle physics experiments.
These are the main purposes to study the relativistic quantum mechanics.

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)

Nothing Special

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

Course Description:

To provide students with an opportunity to develop knowledge and understanding of the key principles and applications of **Relativistic Quantum Mechanics**, and their relevance to current developments in physics, at a level appropriate for a professional physicist.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours

Relativistic wave equation for spin zero particle (Klein-Gordon equation)	2	6
Wave equation for spin half particle (Dirac equation	2	6
Spinors under special reflection, Lorentz-Covariance of the Dirac equation,	2	6
Bilinear covariant of the Dirac spinors, Dirac particles in external fields	3	9
The hole theory	3	9
The Weyl equation-The neutrino	3	9

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	Planed	45					45
	Actual	45					45
Credit	Planed	03					03
	Actual	03					03

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

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.)

	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Ass Metho
1.0	**Knowledge**		
1.1		In-class discussion	

1.2		In-class problems solving.		
1.3		Pop Quizzes.		
1.4		Homework assignments		
2.0	**Cognitive Skills**			
2.1		Discuss the duties for each chapter and homework assignments		
2.2		Problem solving.		
2.3		Quizzes.		
3.0	**Interpersonal Skills & Responsibility**			
3.1		Conducting group discussions and solving problems.		
3.2		Enhance educational skills.		
3.3		Encourage student attendance by giving bonus marks for attendance and by giving pop quizzes.		
3.4		Learn how to search the internet and use the library.		
4.0	**Communication, Information Technology, Numerical**			
4.1		Encourage group discussions during class and group problems solving.		
4.2				
5.0	**Psychomotor**			
5.1		**Not applicable**		
5.2				

5. 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	Mid Term Exam	9	20%
2	Assignment	6	20%
3	Home Work	3	20%
4	Final Examination	0	40%

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) Approximately one hour per week if needed.

E Learning Resources

1. List Required Textbooks a. **Relativistic Quantum Mechanics** and Introduction to Field Theory; Francisco J. Ynduráin, ISBN: 978 -3-642-64674-4; Publisher: Springer Berlin Heidelberg b. **Quantum Field Theory; Frantz Mandl & Graham Shaw;** ISBN-13: 978-0471496847; Wiley
2. List Essential References Materials (Journals, Reports, etc.)
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.) A normal Classroom.
2. Technology 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) Nothing Special

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department
3. Processes for Improvement of Teaching
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.

Faculty or Teaching Staff: Dr. Md. Harunor Rashid Khan

Signature:  **Date Report Completed: 01/01/2018**

Received by: _____ Dean/Department Head

Signature: _____ Date: _____