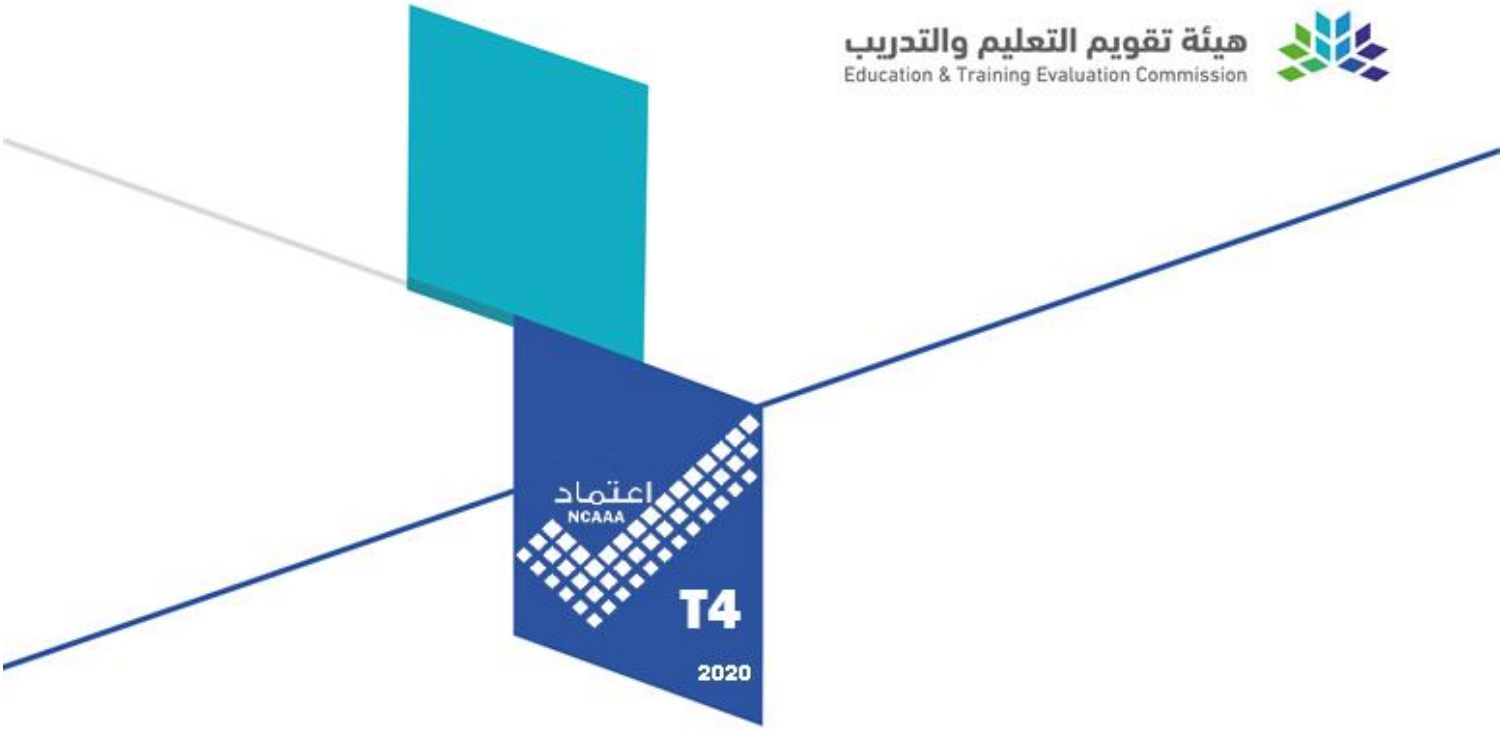
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	**Modern Physics 1**
Course Code:	**341Phys**
Program:	**Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Jazan University**

Table of Contents

A. Course Identification

1. Credit hours:
2. Course type **a.** University ☐ College ☐ Department ☒ Others ☐ **b.** Required ☒ Elective ☐
3. Level/year at which this course is offered: Level 5/ Year 3
4. Pre-requisites for this course (if any)**: Nil**
5. Co-requisites for this course (if any)**: Nil**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**40**	**89%**
2	**Blended**	**5**	**11%**
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**42**
2	**Laboratory/Studio**	**--**
3	**Tutorial**	**3**
4	**Others** (specify)	
	Total	**45**

B. Course Objectives and Learning Outcomes

1. Course Description

This course involves the extremes of very small distances and velocities close to the speed of light. These extremes demanded new theories in the early part of the 20th century and yielded the weird and wonderful results of Einstein's relativity theory and Schrodinger's equation in quantum mechanics. The course covers the birth of modern physics before launching into Einstein's theory of special relativity, and introducing quantum mechanics for the description of atomic physics.

2. Course Main Objective

This course is designed to provide students with:

- The changes in physics that took place near the end of 19^{th} century.
- Special Theory of Relativity.
- Experimental Basis of Quantum Physics.
- Solve problems related to the main physical concepts and theories of the 20_{th} century.
- Structure of the Atom and Wave Properties of Matter.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Define** the major 20th century developments in Physics, Doppler effect, blackbody, invariant quantity, Compton effect, De Broglie wavelength, Bremsstrahlung process.	**PLO1.1**
1.2	**State** Einstein's postulates of Special Relativity, proposal of nature of light, Maxwell's theory of electromagnetic waves, Galilean transformations, Lorentz transformations, X-ray properties, cathode ray properties, Wien's displacement law, Stefan Boltzmann Law, Duane-Hunt rule, assumption of atom models (Thomson, Rutherford, Bohr), Heisenberg's uncertainly principle	**PLO1.1**
1.3	**Explain** the solution of problems involving time dilation length contraction, relativistic momentum, and relativistic energy.	**PLO1.2**
2	**Skills :**	
2.1	**Solve** various problems related to time dilation length contraction, relativistic momentum, relativistic energy, the photoelectric effect, Compton scattering, Bohr model, Blackbody radiation, De Broglie wavelength and uncertainly principal.	**PLO2.1**
2.2	**Compare** Modern Physics with Classical Physics	**PLO2.2**
2.3	**Evaluate** quantum methods in the solution of problems involving atomic spectra, blackbody radiation, the photoelectric effect, X-ray emission, the structure of the atom, and one dimensional potential	**PLO2.2**
2.4	**Develop** communication and critical thinking competencies during interactive discussion, group assignments, essays or web-based activities	**PLO2.4**
3	**Values:**	
3.1	**Show** effective collaboration and bear individual responsibility during group work and/or assignments	**PLO3.1**

C. Course Content

No	List of Topics	Contact Hours
1	**The Birth of Modern Physics** · Classical Physics of the 1890s · Mechanics, Electromagnetism, Thermodynamics · The Kinetic theory of gases · Waves and Particles · Conversation Laws and Fundamental Forces	**9**
2	**Special Theory of Relativity** · The Michelson-Morley Experiments · Einstein's postulates · The Lorentz Transformation · Time Dilation and Length Contraction · Twin Paradox · Spacetime · Doppler Effect · Relativistic Momentum · Relativistic Energy	**9**

3	**Experimental Basis of Quantum Physics** · Discovery of the X ray and the Electron · Blackbody Radiation · Photoelectric Effect · Experimental results of Photoelectric effect · Classical Interpretation · Quantum Interpretation · X-Ray Production · Compton Effect · Pair Production and Annihilation	**9**
4	**Structure of the Atom** · The Atomic Models of Thomson and Rutherford · The Classical Atom Model · The Bohr Model of the Hydrogen Atom · Success and Failures of the Bohr Model	**6**
5	**Wave Properties of Matter and Quantum Mechanics** · X-Ray Scattering · De Broglie Waves · Wave Motion · Uncertainty principle	**9**
6	**Review**	**3**
Total		

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Define**__the major 20th century developments in Physics, Doppler effect, blackbody, invariant quantity, Compton effect, De Broglie wavelength, Bremsstrahlung process.	Lectures, discussion, tutorial	Homework, Quizzes, mid-term exams, and final exam
1.2	**State** Einstein's postulates of Special Relativity, proposal of nature of light, Maxwell's theory of electromagnetic waves, Galilean transformations, Lorentz transformations, X-ray properties, cathode ray properties, Wien's displacement law, Stefan Boltzmann Law, Duane-Hunt rule, assumption of atom models (Thomson, Rutherford, Bohr), Heisenberg's uncertainly principle	Lectures, discussion, tutorial	Homework, Quizzes, mid-term exams, and final exam
1.3	**Explain** the solution of problems involving time dilation length contraction, relativistic momentum, and relativistic energy.	Lectures, discussion, tutorial	Homework, Quizzes, mid-term exams, and

			final exam
2.0	**Skills**		
2.1	**Solve** various problems related to time dilation length contraction, relativistic momentum, relativistic energy, the photoelectric effect, Compton scattering, Bohr model, Blackbody radiation, De Broglie wavelength and uncertainly principal.	Lectures, discussion, tutorial	Homework, Quizzes, mid-term exams, and final exam
2.2	**Compare** Modern Physics with Classical Physics	Lectures, discussion, tutorial	Homework, Quizzes, mid-term exams, and final exam
2.3	**Evaluate** quantum methods in the solution of problems involving atomic spectra, blackbody radiation, the photoelectric effect, X-ray emission, the structure of the atom, and one dimensional potential	Lectures, discussion, tutorial	Homework, Quizzes, mid-term exams, and final exam
2.4	**Develop** communication and critical thinking competencies during interactive discussion, group assignments, essays or web-based activities	Interactive discussion-Case study, group project, open discussion - reviews	Brainstorming - Project work, Written reports, Written assignments, presentations
3.0	**Values**		
3.1	**Show** effective collaboration and bear individual responsibility during group work and/or assignments	Individual and group practices-Brain storming – free related small web-based topics	Case study- reports-project work-presentation

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Homework assignment**	**2**	**5**
2	**Lecture Quiz 1**	**4**	**5**
3	**Mid-term exam** 1	**6**	**15**
4	**Homework assignment**	**10**	**5**
5	**Lecture Quiz 2**	**11**	**5**
6	**Mid-term exam** 2	**12**	**15**
7	**Final Exam**	**16**	**50**

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each group of students is assigned to a staff member who will be available for help and academic guidance office hours at specific 2h on daily basis.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Modern Physics for Scientists and Engineers, Stephen & Andrew Brooks/Cole, Cengane Learning, 2013.
Essential References Materials	- Modern Physics, P. A. Tipler, and R. A. Llewellyn, Freeman, 4th edition 2002. - Modern Physics; K. S. Krane, Wiley, John & Sons, Inc., 1995. - Concepts of Modern Physics; Arthur Beiser, McGraw-Hill Book Co., 1987.
Electronic Materials	**http://ocw.mit.edu/courses/physics/** **http://www.physics.org/explore.asp** **http://www.wikipedia.org/**
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	1 Lecture room(s) for groups of 25 students.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show- smart board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Students, Peer and program leader	Indirect (CES)- Indirect peer evaluation
Assessment	Students, Program assessment committee	Direct/ Indirect
Extent of achievement of course learning outcomes	Instructor	Direct/Indirect
Quality of learning resources	Students, Faculty members	Indirect
Effectiveness of teaching	Students, Peer and program leader	Indirect (CES)- Indirect peer evaluation

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	**Council of Physics Department**
Reference No.	8

Date	16/4/1442