هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Modern Physics I**
Course Code:	**341PHYS**
Program:	**Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Jazan University**
Version:	**V2022**
Last Revision Date:	**27th December 2022**

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	3				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered:	$7^{th}/3^{rd}$				
4. Course General 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.					
5. Pre-requirements for this course (if any): None					
6. Co- requirements for this course (if any): None					
7. Course Main Objective(s) **This course is designed to provide students with the following:** - The changes in physics that took place near the end of the 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.					

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	30	91%
2.	E-learning	3	9%
3.	Hybrid ● Traditional classroom ● E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	3
5.	Others (specify)	
	Total	33

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	**Define** the major 20th century developments in Physics, Doppler effect, blackbody, invariant quantity, Compton effect, De Broglie wavelength, Bremsstrahlung process.	**PLO1.1**	Interactive Lectures,	Homework, Quizzes, mid-term exam, 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	**PLO1.2**	Interactive Lectures	Homework, Quizzes, mid-term exam, and final exam
1.3	**Explain** the solution to problems involving time dilation length contraction, relativistic momentum, and relativistic energy.	**PLO1.3**	tutorial	Homework, Quizzes, mid-term exam, and final exam
2.0	Skills			
2.1	**Solve** various problems related to time dilation length		Interactive Lectures	Homework, Quizzes,

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	contraction, relativistic momentum, relativistic energy, the photoelectric effect, Compton scattering, Bohr model, Blackbody radiation, De Broglie wavelength and uncertainty principle.	**PLO2.1**		mid-term exam, and final exam
2.2	**Compare** Modern Physics with Classical Physics	**PLO2.2**	Interactive Lectures,	Homework, Quizzes, mid-term exam, 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	**PLO2.3**	Tutorial	Homework, Quizzes, mid-term exam, and final exam
2.4	**Develop** communication and critical thinking competencies during an interactive discussions, group assignments, essays or web-based activities	**PLO2.4**	Seminar	Homework, Quizzes, mid-term exam, and final exam
3.0	Values, autonomy, and responsibility			
3.1	**Show** effective collaboration and bear individual responsibility during group work and/or assignments	**PLO3.1**	Seminar	Case study- reports- project work- presentation

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	7
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	8
3.	**Experimental Basis of Quantum Physics** · Discovery of the X-ray and the Electron · Blackbody Radiation · Photoelectric Effect · Experimental results of the Photoelectric effect · Classical Interpretation · Quantum Interpretation · X-Ray Production · Compton Effect · Pair Production and Annihilation	**7**
4.	**Structure of the Atom**	**3**

	· 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	
5.	**Wave Properties of Matter and Quantum Mechanics** · X-Ray Scattering · De Broglie Waves · Wave Motion · Uncertainty principle	**5**
6.	**Review**	**3**
Total		33

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Assignment 1**	2	**2.5** (2.5%)
2.	**Assignment 2**	4	**2.5** (2.5%)
3.	**Quiz 1**	5	**5** (5.0 %)
.4	**Mid-term exam**	6	**20** (20%)
5.	**Assignment 4**	7	**2.5** (2.5%)
6.	**Quiz 2**	8	**5** (5%)
7.	**Assignment 5**	9	**2.5** (2.5%)
8.	**Others (Group work, Essay, Attendance, class discussion participations)**	Blended	**10** (10%)
9.	**Final Exam**	12	**50** (50%)

*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 Textbook	Modern Physics for Scientists and Engineers, by Stephen Thornton & Andrew Rex (Brooks Cole Publishing, Cengane Learning, 2013).
Supportive References	- Modern Physics, by P. A. Tipler, and R. A. Llewellyn, (Freeman, 4th edition, 2002). - Modern Physics; by K. S. Krane, (Wiley, John & Sons, Inc., 1995).

	- Concepts of Modern Physics; by Arthur Beisser, (McGraw-Hill Book Co., 1987).
Electronic Materials	http://ocw.mit.edu/courses/physics/ http://www.physics.org/explore.asp
Other Learning Materials	Teacher Slides and Hand-outs.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, Computers, etc.)	1 Lecture room for at least 25 students
Technology equipment (projector, smart board, software)	Data-Show, Smart-board
Other equipment	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Peer and program leader	Indirect (CES)- Indirect peer evaluation
Effectiveness of students assessment	Students, Program assessment committee	Direct/ Indirect
Quality of learning resources	Instructor	Direct/Indirect
The extent to which CLOs have been achieved	Students, Faculty members	Indirect
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

Areas Evaluation (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)

G. Specification Approval Data

COUNCIL /COMMITTEE	DEPARTMENT BOARD
REFERENCE NO.	PHYS2304
DATE	28/2/2023