هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Modern physics**
Course Code:	**2033105-4**
Program:	**Bachelor in Physics**
Department:	**Physics Department**
College:	**College of Science**
Institution:	**Taif University**

Table of Contents

A. Course Identification

1. Credit hours: 4
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: 7th Level / 3rd Year
4. Pre-requisites for this course (if any)**: None**
5. Co-requisites for this course (if any)**: None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	7	100%
2	**Blended**	0	0%
3	**E-learning**	0	0%
4	**Distance learning**	0	0%
5	**Other**	0	0%

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	50
2	**Laboratory/Studio**	20
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	**70**

B. Course Objectives and Learning Outcomes

1. Course Description

This course presents the student with an important introduction to the concepts of modern physics that arose at the beginning of the twentieth century, starting with the special theory of relativity, the particle aspects of electromagnetic radiation, the wave aspects of material particles and ending with the modern atomic concept.

2. Course Main Objective

- Special theory of relativity
- Particle aspects of electromagnetic radiation
- Wave aspects of material particles
- Atomic structure

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	State the differences between Galileo relativity and Einstein's special relativity.	K2
1.2	Describe the particle aspects of electromagnetic radiation and the wave aspect of material particles, in addition recall the probabilistic interpretation of De Broglie waves.	K2
2	**Skills :**	
2.1	Explain physical principles and concepts relevant to the course and their applications.	S4
2.2	Develop physics problems solving skills.	S2
3	**Values:**	
3.1	Work effectively in groups even when performing experiments.	V2
3.2	Act responsibly and be able to prepare a written scientific report.	V3

C. Course Content

No	List of Topics	Contact Hours
Part1		
1	Unit1: Special theory of relativity • Galileo relativity • Michelson and Morley experiment • Einstein's relativity postulates • Time dilatation • Length contraction • Twins paradox • Energy and momentum transformation in four dimensional space Mass and energy	**13**
2	Unit2: Particle aspects of electromagnetic radiation • Black body radiation • Photoelectric effect • Compton effect • Pair production and Annihilation	**12**
3	Unit3: Wave aspects of material particles • De Broglie – matter- waves • Davisson and Germer experiment • Electron diffraction • Heisenberg uncertainty principle	**12**

	• Correspondence principle • Probabilistic interpretation of De Broglie waves	
4	Unit4: Atomic structure • Introduction, planetary model • Electron orbits • Atomic spectra • Bohr's model for Hydrogen atom • Energy levels and spectra • Nuclear motion • Atomic excitation	**13**
Part2		
1	Experiment 1: Determination of the Specific charge of the electron" e/m"	**2**
2	Experiment 2: Study the Photoelectric effect & determination of Planks constant	**2**
3	Experiment 3: Diffraction of electrons in a polycrystalline lattice (Debye-Scherrer diffraction)	**2**
4	Experiment 4: Determining the wavelengths Hα, Hβ and Hγ from the Balmer seriesof hydrogen	**2**
5	Experiment 5: *Bragg reflectio*n: diffraction of x-rays at a monocrystal on NaCl crystal	**2**
6	Experiment 6: Study the Frank – Hertz curve on Mercury	**2**
7	Experiment 7: Observing the normal *Zeeman* effect in transverse and longitudinal configuration	**2**
8	Experiment 8: Electron spin resonance at DPPH Determining the magnetic field as a function of the resonance frequency	**2**
9	Experiment 9: Nuclear magnetic resonance in polystyrene, glycerine and teflon	**2**
10	Experiment 10: Study of Millikan experiment for oil drop	**2**
Total		**70**

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	State the differences between Galileo relativity and Einstein's special relativity.	Lecture Discussion	Written exam and Homework reports
1.2	Describe the particle aspects of electromagnetic radiation and the wave aspect of material particles, in addition recall the probabilistic interpretation of De Broglie waves.	Lecture and Group discussion	Written exam and Quizzes
2.0	**Skills**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.1	Explain physical principles and concepts relevant to the course and their applications.	Lectures	Written exam and activities
2.2	Develop physics problems solving skills.	Problem solving	Written exam and homework reports
3.0	**Values**		
3.1	Work effectively in groups even when performing experiments.	Group discussion	Lab reports Project
3.2	Act responsibly and be able to prepare a written scientific report.	Group discussion	Homework reports and lab reports

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm exam I	6th	20%
2	Activities	Periodically	10%
3	Lab reports	Weekly/ 10th	20%
4	Final Lab Exam	10th	10%
5	Final exam	12th	40%

***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 faculty member is assigned a group of students for continuous academic advice during six office hours weekly (6 hrs./week).
- Teaching staff are available for individual student consultations during office hours.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	* **Concepts of modern physics**. — 6th **ed**. (2003), **Arthur Beiser Published by** McGraw-Hill, a business unit of The McGraw-Hill Companies, Inc.
Essential References Materials	* Modern physics, S. Kenneth, Willey, 1995
Electronic Materials	* Web Sites on the internet that are relevant to the topics of the course & general physics websites such as : - http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html - http://www.hazemsakeek.info/magazine/ - wikipedia.org/wiki/ physics subjects
Other Learning Materials	* Multi media / CD associated with the text books (when available). * Lecture notes and PowerPoint presentations prepared by the lecturer.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms Modern physics laboratory
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show Laptop Smart board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student Feedback on Effectiveness of Teaching	• Students	Indirect
Evaluation of Teaching	• Instructor • Program coordinator • Departmental council • Faculty council	Indirect
Improvement of Teaching	• Program leaders • Relevant committee	Direct
Quality of learning resources	• Students • Instructor • Faculty	Indirect
Extent of achievement of course learning outcomes,	• Program leaders • Instructor	Direct
Course effectiveness and planning for improvement	• Program leaders • Instructor	Indirect

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	
Reference No.	
Date	October 2, 2022