Name of the subject : MODERN PHYSICS - IV
Academic Year : 2023-2024
DIRECT CO ATTAINMENT

I - SESSIONAL MARKS (2023 - 24)					
S.No	Roll No	Total	Q1	Q2	Q3
1	223927101001	20	10	5	5
2	223927101002	18	9	5	4
3	223927101003	19	9	5	5
4	223927101004	15	7	4	4
5	223927101005	17	8	5	4
6	223927102006	20	10	5	5
7	223927102007	19	9	5	5
8	223927102008	17	8	4	5
9	223927102009	16	7	5	4
10	223927102011	20	10	5	5
11	223927102012	15	7	3	5
12	223927102013	19	9	5	5
13	223927102014	16	8	5	3
14	223927102015	14	6	4	4
15	223927102016	16	8	5	3
16	223927102017	15	4	5	1
17	223927102018	17	8	4	5
18	223927102019	16	7	3	5
19	223927102021	16	8	4	4
20	223927102044	17	10	3	5
No. of students attempted the question (COUNT)			**20**	**20**	**20**
Total No. of marks obtained for the question (SUM)			**162**	**89**	**86**
AVERAGE MARKS			**8.10**	**4.45**	**4.30**

II - SESSIONAL MARKS (2023-24)					
S.No	Roll No	Total	Q1	Q2	Q3
1	223927101001	12	5	2	5
2	223927101002	15	5	5	5
3	223927101003	14	5	4	5
4	223927101004	11	5	2	4
5	223927101005	10	5	2	3
6	223927102006	10	5	4	1
7	223927102007	14	5	4	5
8	223927102008	13	5	3	5
9	223927102009	10	5	2	3
10	223927102011	13	5	3	5
11	223927102012	12	5	4	3
12	223927102013	10	5	2	3
13	223927102014	14	5	4	5
14	223927102015	11	5	4	2
15	223927102016	13	5	3	5
16	223927102017	14	5	4	5
17	223927102018	13	5	3	5
18	223927102019	12	5	2	5
19	223927102021	10	4	3	3
20	223927102044	13	5	4	4
No. of students attempted the question (COUNT)			**20**	**20**	**20**
Total No. of marks obtained for the question (SUM)			**99**	**64**	**81**
AVERAGE MARKS			**4.95**	**3.20**	**4.05**

Q uiz and Assignment Marks		
S.No	Roll No	Quiz+Assignment
1	223927101001	15
2	223927101002	15
3	223927101003	15
4	223927101004	15
5	223927101005	15
6	223927102006	15
7	223927102007	15
8	223927102008	15
9	223927102009	15
10	223927102011	15
11	223927102012	15
12	223927102013	15
13	223927102014	15
14	223927102015	15
15	223927102016	15
16	223927102017	15
17	223927102018	15
18	223927102019	15
19	223927102021	15
20	223927102044	15
C OUNT		**20**
SUM		**285**
AVERAGE MARKS		**14.25**

END EXAMINATION MARKS		
CODENO	GRADE	MARKS
223927101001	A+	65
223927101002	A	20
223927101003	B+	65
223927101004	F	20
223927101005	A	20
223927102006	A+	20
223927102007	B+	65
223927102008	C	20
223927102009	B+	52.5
223927102011	A+	52.5
223927102012	C	20
223927102013	D	52.5
223927102014	F	20
223927102015	A	45
223927102016	B+	65
223927102017	C	20
223927102018	B	45
223927102019	C	20
223927102021	F	
223927102044	B+	
COUNT		**18**
SUM		**688**
AVERAGE MARKS		**38.19**

GRADE	MARKS
O	95
A+	85
A	75
B+	65
B	55
C	52.5
D	45
F	20

Name of the subject : MODERN PHYSICS - IV Academic Year : 2023-2024		1.62	0.89	0.86		CO ATTAINMENT from II sessional		0.99	0.64	0.81		CO ATTA INMENT from Quiz & Assignment		1.4250		CO ATTAINMENT from End Exams		0.38	
I Sessional CO Mapping	CO1	CO1				II Sessional CO Mapping	CO1					Quiz & Assignment CO Mapping		Mapped to all COs		End Exam CO Mapping	CO1	CO1	
	CO2		CO2				CO2										CO2	CO2	
	CO3						CO3	CO3									CO3	CO3	
	CO4						CO4		CO4								CO4	CO4	
	CO5			CO5			CO5			CO5							CO5	CO5	
	CO6						CO6	CO6									CO6	CO6	
I & II Sessional Exam CO Attainment		1.62	0	0		1.6200		0	0	0						External CO Attainment	CO1	0.38	0.3819
		0	0.89	0		0.8900		0	0	0							CO2	0.38	0.3819
		0	0	0		0.9900		0.99	0	0							CO3	0.38	0.3819
		0	0	0		0.6400		0	0.64	0							CO4	0.38	0.3819
		0	0	0.86		0.8350		0	0	0.81							CO5	0.38	0.3819
		0	0	0		0.9900		0.99	0	0							CO6	0.38	0.3819
Final Direct CO Attainment = 30% of Sessional Exams + 60% of End Exam + 10% of (Quiz and Assignment) CO Attainment	CO1	0.6720																	
	CO2	0.5625																	
	CO3	0.5775																	
	CO4	0.5250																	
	CO5	0.5542																	
	CO6	0.5775																	

SCIM GOVERNMENT COLLEGE
DEPARTMEN OF PHYSICS

MODERN PHYSICS

Programme: B.Sc Year: II Semester: IV
Course: (CORE) Credits: 3 Hours:3

COURSE OBJECTIVES (CO)- MODERN PHYSICS

CO1- To CREATE AWARENESS ON THE TOPICS OF ATOMIC & MOLECULAR PHYSICS, QUANTUM MECHANICS, NUCLEAR PHYSICS AND SOLID STATE PHYSICS.

CO2- TO EXPLAIN ALL THE TOPICS OF EXPERIMENTS, CONCEPTS, AND DERIVATIONS TO STUDENT

CO3- TO EXPLAIN THE BASIC PRINCIPLES OF QUANTUM MECHANICS AND APPLY THEM TO ATOMIC&MOLECULAR STRUCTURES

CO4 - TO ENCOURAGE THE STUDENTS TOWARDS RESEARCH IN NUCLEAR AND PARTICLE PHYSICS

CO5: TO KNOW THE PROPERTIES OF SUPERCONDUCTORS

CO6-TO LEARN THE SCHRODINGER'WAVE EQUATION AND ITS SIGNIFICANCE

COURSE CONTENTS

Content	**CO**	**HOURS**
UNIT I: Atomic and molecular physics: Introduction –Drawbacks of Bohr's atomic model. Vector atom model and Stern- Gerlach experiment - quantum numbers associated with it. L-S and j- j coupling schemes. Zeeman effect(Definition only) -Raman effect, hypothesis, Stokes and Anti Stokes lines. Quantum theory of Raman effect. Experimental arrangement –Applications of Raman effect.	CO1,CO2,CO3	**9**

UNITII:Matter waves & Uncertainty Principle Matter waves, de Broglie's hypothesis - wavelength of matter waves, Properties of matter waves - Davisson and Germer experiment – Heisenberg's uncertainty principle for position and momentum (x and p) & Energy and time (E and t).	CO1,CO2,CO3	**9**
UNITIII:Quantum (wave) mechanics: Basic postulates of quantum mechanics-Schrodinger time independent and time dependent wave equations-derivations. Physical interpretation of wave function.Eigen functions, Eigen values. Application of Schrodinger wave equation to particle in one dimensional infinite box.	CO1,CO3,CO6	**9**
UNIT IV:General Properties of Nuclei Basic ideas of nucleus -size, mass, charge density (matter energy), binding energy,magnetic moment, electric moments. Liquid drop model and Shell model (qualitative aspects only) - Magic numbers. Radioactivity decay: Alpha decay: basics of α-decay processes. Theory of α-decay, Gamow's theory,Geiger Nuttal law.β-decay, Energy kinematics for β-decay, positron emission, electron capture, neutrino hypothesis.	CO1,CO2,CO4	**9**
UNITV:Crystal Structure: Amorphous and crystalline materials, unit cell, Miller indices, reciprocal lattice,types of lattices, diffraction of X-rays by crystals, Bragg's law, experimental techniques, Laue's method. Superconductivity Introduction - experimental facts, critical temperature - critical field - Meissner effect– Isotope effect - Type I and type II superconductors - applications of superconductors.	CO1,CO2,CO5	**9**

Assessment / Evaluation Methods:

Assessment Tool	**Weightage (Marks)**
Sessional1	15
Sessional2	
Assignment	5
Seminar	5
Final Examination	75
Total	100

PROGRAM OBJECTIVES (PO)- B.SC

PO1: Apply the knowledge of mathematics, fundamentals of physical and chemical sciences specialization to the solution of scientific problems

PO2: Identify, formulate, review research literature, and analyse elementary to complex level scientific problems reaching substantiated conclusions using first principles of mathematics, physical and chemical sciences.

PO3: Design solutions for complex scientific problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Create, select, and apply appropriate techniques, resources, and modern scientific and IT tools including prediction and modelling to complex scientific activities with an understanding of the limitations.

PO6: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the scientific process

PO7: Understand the impact of the scientific solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the scientific practice.

PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary setting

PO10: Communicate effectively on complex engineering activities with the scientific community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Demonstrate knowledge and understanding of the scientific principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

PSO1: should be able to understand the concepts at advanced level of Mathematics, Physics and Chemistry &computer science, their applications in the field of scientific research and other relevant areas.

PSO2: Should have an ability to apply sound theoretical knowledge of mathematics, physical chemical sciences &computer sciences and usage of modern tools for solving real world problems.

PSO3: Should have the capability to analyse, comprehend, design & develop the solutions for a variety of scientific both theoretical and applicative problems and thus demonstrating professional ethics & human values concern for societal well being

Mid-I QUESTIONS

Question	**Course Objective**	**Bloom's Taxonomy level**
DESCRIBE THE STERN-GERLACH EXPERIMENT AND WRITE ITS PHYSICAL SIGNIFICANCE	co-1,co-2	ANALYSING(AN)
BRIEFLY EXPLAIN THE J-J COUPLING	co-1,co-3,co5	UNDERSTANDING(U)
WRITE THE PROPERTIES OF MATTER WAVES.	co-1,co-2	REMEMBERING(R)

Mid-II QUESTIONS

Question	**Course Objective**	**Bloom's Taxonomy level**
Explain the merits and demerits of liquid drop model	co-1,co-2,co-3,co-4	EVALUATING(E)
WHAT IS SUPER CONDUCTIVITY.DISTINGUISH BETWEEN TYPE-1,TYPE-2 SUPER CONDUCTOR.	co-1,co-2,co-4,	REMEMBERING(R)
WHAT IS THE MASS NUMBER A OF A NUCLEUS WHOSE RADIUS IS r=2.71 fermi? GIVEN THAT r0=1.3*10-15 m	co-6	APPLYING(A)

S.No	Assignment topics	**Bloom's Taxonomy level**
•	EXPLAIN THE BOHR'S ATOMIC MODEL	UNDERSTANDING(U)
•	WHY CLASSICAL FAILS TO EXPLAIN MANY PHENOMENA	Remembering(R)
•	DEDUCE SCHRODINGER'S TIME INDEPENDENT WAVE EQUATION	EVALUATING(A)
•	WRITE A SHORT NOTE WILSON CLOUD CHAMBER	REMEMBERING(R)
5	STATE AND EXPLAIN BRAGG'S LAW	ANALYSING(An)

S.No	**Seminar topics**	**Bloom's Taxonomy level**
•	GIVE ELEMENTARY THEORY OF THE RAMAN EFFECT.	Understanding(U)
•	WHAT IS PHOTOELECTRIC EFFECT	Understanding(U)
•	DISCUSS ABOUT HEISENBERG'S UNCERTAINTY PRINCIPLE	Evaluating(E)
•	DISCUSS IN DETAIL THE BETA-RAY SPECTRUM	Evaluating(E)
•	EXPLAIN THE MAGLEV VEHICLES	Understanding(U)

Table 1: Mapping of course outcomes with program outcomes (CO/ PO&PSO Matrix)

CO /PO/PSO	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**
CO 1	3	3				3	3
CO 2	3	3				3	3
CO 3	3	3				3	3
CO4	3	3				3	3
CO5	3	3				3	3
CO6	3	3				3	3

Note: 1-Weak correlation 2-Medium correlation 3-Strong correlation

Table 2: CO Attainments (Direct and Indirect)

CO	DIRECT	INDIRECT	Total CO Attainment
CO1	57.22	70.56	58.55
CO2	57.33	67.78	58.37
CO3	56.98	69.44	58.22
CO4	57.23	63.33	57.84
CO5	56.78	72.67	58.36
CO6	57.18	75.00	58.96

Total CO Attainment = 90% of Direct CO Attainment + 10% of Indirect CO Attainment

Table 3: PO and PSO Attainments (Direct and Indirect)

CO	PO1	PO2	PSO1	PSO2
	3	3	3	3
CO1	58.55	58.55	58.55	58.55
CO2	58.37	58.37	58.37	58.37
CO3	58.22	58.22	58.22	58.22
CO4	57.84	57.84	57.84	57.84
CO5	58.36	58.36	58.36	58.36
CO6	58.96	58.96	58.96	58.96
PO Attainment	58.42	58.38	58.38	58.38

Course coordinator

M.Ragunadha Reddy

Lecturer in Physics