SRI BHARATHI

ENGINEERING COLLEGE FOR WOMEN

(Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai)

Kaikkurichi, Pudukkottai -622 303

www.sbec.edu.in

NAAC DOCUMENTS

Quality Indicator Frame Work

Criterion – 1

CURRICULAR ASPECTS

Submitted by

IQAC

Internal Quality Assurance Cell

Sri Bharathi Engineering College for Women

SRI BHARATHI ENGINEERING COLLEGE FOR WOMEN

(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai-25)

Kaikkurichi, Pudukkottai, Tamil Nadu – 622 303, India

Criterion 1	Curricular Aspects	100

1.1 Curricular Planning and Implementation(20)

1.1.1 The Institution ensures effective curriculum planning and delivery through a well-planned and documented process including Academic calendar and conduct of continuous internal Assessment

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SRI BHARATHI ENGINEERING COLLEGE FOR WOMEN

(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai-25)
Kaikkurichi, Pudukkottai, Tamil Nadu – 622 303, India
DEPARTMENT OF SCIENCE AND HUMANITIES

PREFACE OF THE COURSE FILE

Batch : **2022-2026**

Academic Year : **2022-2023 / ODD**

Program : **COMPUTER SCIENCE AND ENGINEERING**

Year & Semester : **1st Year / 1stSemester / 'A' Section**

Course Code : **PH3151** NBA Course Code: **C103**

Name of the Course : **ENGINEERING PHYSICS**

Faculty in-charge : **Mrs.R.SARATHA,AP/PHYSICS**

Signature of the Faculty Incharge

HoD / S&H

Dr. S.THILAGAVATHI M.E., Ph.D.
PRINCIPAL
SRI BHARATHI ENGINEERING
COLLEGE FOR WOMEN
Kaikkurchi - 622 303, Pudukkottai Dt.

HOD / S&H
SRI BHARATHI ENGINEERING
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KAIKKURICHI
PUDUKKOTTAI - 622 303.

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DEPARTMENT OF SCIENCE AND HUMANITIES

REVIEW OF COURSE FILE

(To be pasted on the inner side of the file-backside).(#-State Yes/No.)

S.No	Details Date:	R-I-*	R-II-*&	R-III-*&	R-IV-*&$	R-V-*&$@
1.	Preface of the course file	Yes				
2.	Vision, Mission, PEOs, POs, PSOs, Blooms taxonomy	Yes				
3.	Subject handlers of yesteryears					
4.	Timetable/Workload of the staff – Distribution of teaching load – Roles and Responsibilities	Yes				
5.	Syllabus signed by staff & HoD	yes				
6.	Lecture Schedule signed by staff & HoD	Yes				
7.	Course Committee meeting circular and minutes	Yes				
8.	Identification of Curricular gap and Content Beyond the syllabus	Yes				
9.	Self-study topics	Yes				
10.	Previous AU Question papers	yes				
11.	Unit wise Q&A and Objective type questions	Yes				
12.	Unit wise course material	Yes				
13.	Assignment question paper with sample answer sheets and mark entry		Yes			
14.	Tutorial question paper with key and mark entry		Yes			
15.	Class test/IA test Q Paper with Key, sample answer papers and mark entry		Yes			
16.	IA Test- result analysis-CAP-evidence-root cause analysis.		Yes			
17.	Retest –Q paper-Attendance-marks		Yes			
18.	AU Web portal entry sheet		Yes			
19.	Very poor performance in first two tests-action taken.-communication to parents-evidence					
20.	Absence for two tests-action taken-communication to parents-evidence.					
21.	Indiscipline of student reported, if any					
22.	Special class/coaching class/remedial class/attendance-CAP					
23.	Conduct of Seminar, Quizzes - proof					
24.	Content beyond the syllabus - proof			Yes		
25.	Student feedback on faculty			yes		
26.	Course end survey					
27.	Internal Assessment sheet			Yes		
28.	AU question paper with students feedback					
29.	Discrepancy of the question paper and correspondence, if any					
30.	AU result analysis-Details of arrear students.					
31.	AU grade sheet				-	Yes
32.	CO – PO & PSO attainment sheet					Yes
	Signature of Course handling faculty	R. Seth	R. Seth	R. Seth	R. Seth	R. Seth
	Signature of HoD/ S&H	R. Seth	R. Seth	R. Seth	R. Seth	R. Seth

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ACADEMIC YEAR (2022 – 2023) -ODD SEMESTER

INDIVIDUAL STAFF WORKLOAD FOR FIRST YEAR

S. NO	STAFF NAME	SUBJECT CODE & NAME	YEAR & DEPT	NO OF HOURS	TOTAL HOURS
1	Dr.M.Iswarya	**MA3151**- Matrices and Calculus	I SEC-C& ECE & EEE	05	15
		MA8551- Algebra and number theory	III& CSE	05	
		MA3303-Probability and complex function	II& EEE	05	
2	Ms.R.Rajeswari	**MA3151**- Matrices and Calculus	I-SEC-B& CIVIL	05	10
		MA3355- Random process and linear algebra	II& ECE	05	
3	Ms.R.Divya	**MA3151**- Matrices and Calculus	I-SEC-A & CSE	06	16
		MA8353- Transforms &Partial Differential Equations	II& CIVIL	05	
		MA3354-Discrete mathematics	II& CSE	05	
4	Mrs.R.Saratha	**PH3151**-Engineering Physics	I SEC-A&CSE	04	07
		BS3171-Physics Laboratory	I SEC-A&CSE	03	
5	Mrs.V.Vinojini	**PH3151**-Engineering Physics	I SEC-C&ECE,EEE	04	07
		BS3171-Physics Laboratory	I SEC-C&ECE,EEE	03	
6	Mrs.T.Renugadevi	**PH3151**-Engineering Physics	I SEC-B& CSE,CIVIL	04	07
		BS3171-Physics Laboratory	I SEC-B& CSE,CIVIL	03	
7	Ms.T.Annalakshmi	**CY3151**-Engineering Chemistry	I SEC-A& CSE	04	13
		BS3171-Chemistry Laboratory	I SEC-A,SEC-B& CSE, CIVIL	06	
		GE3451-Environmental science	II&CSE	03	
8	Mrs.S.Renugadevi	**CY3151**-Engineering Chemistry	I SEC-B& SEC-C& CSE, CIVIL,ECE&EEE	10	13
		BS3171-Chemistry Laboratory	I SEC-C & ECE&EEE	03	
9	Mr.S.Ramesh Raja	**HS3152**- Professional English - I	I-SEC-A& CSE	05	18
		GE3172-English laboratory	I SEC-A,SEC-B&SEC-C& CSE ,CIVIL ECE&EEE	06	
		HS8581-Professional communication	III&CSE	02	
		HS8581-Professional communication	III& ECE , CIVIL	03	
		Soft Skills	IV&CSE	02	
10	Mrs.P.Alagumathi	**HS3152**- Professional English - I	I SEC-A, SEC-B& CSE,CIVIL,ECE&EEE	10	18
		GE3172-English laboratory	ISEC-A,SEC-B& SEC-C& CSE,CIVIL,ECE&EEE	06	
		Soft Skills	IV& ECE,CIVIL & EEE	02	

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DEPARTMENT OF SCIENCE AND HUMANITIES

COURSE PLAN

Subject code: PH3151	**Subject Name : Engineering Physics**
Branch/Year/Sem: B.E CSE / I/ I	**Batch: 2022 -2026**
Staff Name: Mrs.R.Saratha	**Academic year: 2022-2023**

COURSE OBJECTIVES

- To make the students effectively to achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to be successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

TEXT BOOKS:

1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw- Hill (Indian Edition), 2017.
4. Engineering physics,Dr.G.Senthilkumar,VRB publishers pvt.Ltd.

REFERENCES:

1. R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2. Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
3. K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.
4. D.Halliday, R.Resnick and J.Walker. Principles of Physics, Wiley (Indian Edition), 2015.
5. N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer-Verlag, 2012.

WEBSITE RESOURSE

W1. Gyroscope: https://www.youngwonks.com/blog/What-is-a-Gyroscope-and-How-Does-It-
W2. Nd-YAG laser: https://easyelectronics.co.in/nd-yag-laser/#gsc.tab=0
W3.ComptonEffect:https://eng.libretexts.org/Bookshelves/Materials_Science/Supplemental_Modules_(Materials_Science)/Electronic_Properties/Compton_Effect
W4. Tunneling Miicroscope: https://afm.oxinst.com/modes/scanning-tunneling-microscopy-stm
W5.Resonant Diode https://www.researchgate.net/publication/344001299_Resonant_Tunneling_Diodes_Working_and_Application

TEACHING METHODOLOGIES

- **BB** BLACK BOARD
- **PPT** POWER POINT PRESENTATION

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PH3151 ENGINEERING PHYSICS **L T P C**

3 0 0 3

UNIT I MECHANICS 9

Multiparticle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M .I –moment of inertia of continuous bodies – of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum – double pendulum –Introduction to nonlinear oscillations.

UNIT II ELECTROMAGNETIC WAVES 9

The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS 9

Simple harmonic motion - resonance –analogy between electrical and mechanical oscillating systems - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect. Reflection and refraction of light waves - total internal reflection - interference –Michelson interferometer –Theory of air wedge and experiment.Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO_2 laser, semiconductor laser –Basic applications of lasers in industry.

UNIT IV BASIC QUANTUM MECHANICS 9

Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes-Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS 9

The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)-Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

TOTAL : 45 PERIOD

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Topic No	Topic Name	T/R* Book	Page No	Teaching Methodology	Date	Period	Cumulative periods
UNIT-I	**MECHANICS**						**(9)**
1.	Multi purpose dynamics Centre of mass (CM) – CM of continous bodies	T1	113-116	BB	16.11.2022	1	1
2.	Motion of CM- Kinetic energy of the system of particles. Rotation of rigid body	T1	122-125	BB	19.11.2022	1	2
3.	Rotational Knematics, Rotational Kinetic energy and moment of inertia, Theorems of M.I**(Content beyond the syllabus)**	R1	462-464	BB	25.11.2022	1	3
4.	Moment of inertia of continous bodies and M.I of diatomic molecules	T1	156-158	PPT	28.11.2022	1	4
5.	Torque, Rotational dynamics of rigid bodies and conservation of Angular momentum	T1	233-236	PPT	30.11.2022	1	5
6.	Rotational energy state of rigid diatomic molecule - Gyroscope	W1	-	BB	06.12.2022	1	6
7.	Torsional Pendulam	R1	325-327	BB	07.12.2022	1	7
8.	Double pendulam	R1	328-329	BB	13.12.2022	1	8
9.	problems	T4	1.58-1.64	BB	16.12.2022	1	9
	LEARNING OUTCOME: **At the end of unit , the students will be able to** • Understand the importance of mechanics.						
UNIT-II	**ELECTROMAGNETICS**						**(9)**
10.	The Maxwell's equations	T2	436-441	BB	20.12.2022	1	10
11.	Wave Equations	T2	442-444	BB	21.12.2022	1	11
12.	Plane electromagnetic waves in vaccum	T2	572-575	BB	23.12.2022	1	12
13.	Conditions on the wave field	R1	250-256	BB	27.12.2022	1	13
14.	Properties of electromagnetic waves: speed, amplitude, Phase, orientation and waves in water	R1	572-578	PPT	28.12.2022	1	14
15.	Polaraization – producing electromagnetic waves	R4	861-866	BB	30.12.2022	1	15
16.	Energy momentum in EM waves: Intensity waves from localized sources , momentum and radistion pressure.	R4	859-860	BB	10.01.2023	1	16

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17.	Cell phone reception. Reflection and transmission of electromagnetic waves from a non conducting medium	R4	265-270	BB	11.01.2023	1	17
18.	Problems	T4	2.69-2.75	BB	12.01.2023	1	18
	LEARNING OUTCOME: **At the end of unit, the students will be able to** • Express their knowledge in Electromagnetic waves.						
UNIT – III	**OSCILLATIONS, OPTICS AND LASERS**						**(9)**
19.	Simple harmonic motion - resonance	R4	354-355	BB	16.01.2023	1	19
20.	Waves on a string	R4	388-387	BB	17.01.2023	1	20
21.	Standing waves	T1	263-265	BB	19.01.2023	1	21
22.	Traveling waves energy transfer of a wave , sound waves – Doppler effect	T1	265-267	BB	20.01.2023	1	22
23.	Reflection and refraction of light waves total internal reflection – interference, Michelson interferometer	R4	938-941	BB	21.01.2023	1	23
24.	Theory of air wedge and experiment	T1	258-259	BB	24.01.2023	1	24
25.	Theory of laser characteristics – Spotaneous and stimulated emission – Einsten's coefficients-	R3	268-270	BB	31.01.2023	1	25
26.	Nd-Yag laser and CO2 laser	W2	-	BB	01.02.2023	1	26
27.	Semiconductor laser - Basic applications of laser in industry	R3	383-385	BB	08.02.2023	1	27
	LEARNING OUTCOME: **At the end of unit, the students will be able to** • Strong foundational knowledge in oscillation, optics and laser.						
	UNIT-IV **BASIC QUANTUM MECHANICS**						**(9)**
28.	Photons and light waves - Electrons and matter waves	R4	1009-1010	BB	09.02.2023	1	28
29.	Compton effect	W3	-	BB	10.02.2023	1	29
30.	The Schrodinger equation - Time dependent form	T1	696-698	BB	11.02.2023	1	30
31.	Time independent form	T1	701-703	BB	15.02.2023	1	31
32.	Meaning of wave function - Normalization	R4	1035-1036	BB	17.02.2023	1	32
33.	Free particle - particle in a infinite potential well: 1D	R3	33-35	BB	21.02.2023	1	33
34.	Particle in a infinite potential well: 2D	R3	35-36	BB	02.03.2023	1	34

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35.	3D Boxes- Normalization	R3	42-45	BB	03.03.2023	1	35
36.	Probabilities and the correspondence principle, problems	R3/T4	49-50 6.53-6.75	BB	07.03.2023	1	36
	LEARNING OUTCOME: **At the end of unit , the students will be able to** • Understand the importance of quantum mechanics.						
	UNIT-V **APPLIED QUANTUM MECHANICS** **(9)**						
37.	The harmonic oscillator	R3	56-57	BB	08.03.2023	1	37
38.	Barrier penetration	T3	563-565	BB	09.03.2023	1	38
39.	Quantum tunnelling	T3	578-579	BB	10.03.2023	1	39
40.	Tunneling microscope	W4	-	PPT	13.03.2023	1	40
41.	Resonant diode	W5	-	PPT	16.03.2023	1	41
42.	Finite potential wells	R3	78-80	BB	17.03.2023	1	42
43.	Bloch's theorem for particles in a periodic potential	R4	1030-1032	BB	21.03.2023	1	43
44.	Basics of Kronig-Penney model	R4	1032-1034	BB	22.03.2023	1	44
45.	Origin of energy bands	R4	1045-1046	BB	23.03.2023	1	45
	LEARNING OUTCOME: **At the end of unit , the students will be able to** • Comprehend and apply quantum mechanical principles towards the formation of energy bands.						

COURSE OUTCOME

At the end of the course, the student should be able to:

- Acknowledge the importance of mechanics
- Express their knowledge in electromagnetic waves..
- Demonstrate a strong foundational knowledge in oscillations.
- Establish a strong foundational knowledge in fibre optics and laser.
- Comprehend the importance of quantum physics.
- Comprehend and apply quantum mechanical principles towards the formation of energybands.

CONTENT BEYOND THE SYLLABUS

- Gain Knowledge about Kinematics

CONTINUES INTERNAL ASSESSMENT DETAILS

ASSESMENT NUMBER	I	II
UNIT	1^{st},2^{nd} ,3^{rd} (Half)	3^{rd} (Half),4^{th} & 5^{th} Units

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ASSIGNMET NUMBER	UNIT	ASSIGNMENT QUESTIONS/TOPIC	DEADLINE
1	I	Problems based on Mechanics	19/12/2022
2	II	Two mark questions in Mechanics	22/12/2022
3	III	Two mark questions in electromagnetic waves	26/12/2022
4	IV	Problems based on Electro Magnetic waves	02/01/2023
5	V	Two mark questions in Laser	11/01/2023
6	VI	Problems in Basic Quantum Mechanics	20/01/2023
7	VII	Problems in Basic Quantum Mechanics	27/01/2023
8	VIII	Problems based on ordinary differential equations	07/02/2023
9	IX	Finite square potential well	13/02/2023
10	X	Two marks in Applied Quantum mechanics	10/03/2023

PREPARED BY

11/11/22

Mrs.R.SARATHA , AP/PHYSICS

VERIFIED BY

11/11/22

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APPROVED BY

17/11/22

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DEPARTMENT OF SCIENCE & HUMANITIES

Ref: SBECW/ S&H/ Course committee meeting / EP/ 2022-2023 (Odd) DATE: 11.11.2022

COURSE COMMITTEE MEETING-PH3151-ENGINEERING PHYSICS

ACADEMIC YEAR/SEM: 2022-2023/ODD

PROGRAM : BE-CSE
REGULATION : 2021
SEM : 01
Members Present

DATE OF MEETING : 11.11.2022
TIME : 11.00AM
VENUE : S&H Dept. HoD Cabin

Table.1 Course committee members

S.No.	Name of the faculty & Designation, Program	Sem/Sec/Program	Signature
1.	Mrs. R.Saratha, HoD/S&H - Course coordinator	I SEM/A/ CSE	R. Sat
2.	Mrs.T.Renugadevi, ASP/ECE&EEE	I SEM/C/ ECE&EEE	T. R
3.	Mrs.V.Vinojini, ASP/CIVIL	I SEM/B/ CIVIL	V. Vinoj

HOD welcomed all the members present

1. Content of syllabus, unit wise discussed. Nature of qualitative, quantitative, problematic, theoretical concepts etc. have been discussed

Table.2 Allocation of Period

Number of period per unit	Total number of Peroids
09	45

2. Vision and mission of the college, department discussed. POs, PEOs, PSOs discussed.
3. Course outcomes defined for each units, considering learning outcomes.

Table.3 Course Outcomes

CO	Course Outcomes	POs	PSOs
C103.1	Acknowledge the importance of mechanics.	1,2,3,4,6,10,12	-
C103.2	Express their knowledge in electromagnetic waves.	1,2,3,4,6,10,12	-
C103.3	Demonstrate a strong foundational knowledge in oscillations.	1,2,3,4,6,10,12	-
C103.4	Establish a strong foundational knowledge in fibre optics and laser.	1,2,3,4,6,10,12	-
C103.5	Comprehend the importance of quantum physics.	1,2,3,4,6,10,12	-
C103.6	Comprehend and apply quantum mechanical principles towards the formation of energybands.	1,2,3,4,6,10,12	-

4. Mapping of COs with POs and PSOs is done with suitable correlation levels(1 for low, 2 for medium, 3 for high,"-" for no correlation, before content beyond syllabus)

Table.4 Mapping of COs, C, PSOs with POs- before CBS.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C103.1	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103.2	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103.3	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103.4	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103.5	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103.6	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103	3	3	2	2	-	1	-	-	-	1	-	1	-	-

5. Identification of content beyond syllabus- curricular gaps are identified considering industry needs, employers feedback, alumni feedback, government policy on industrialization, new investments by private/

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public sectors, societal needs and level of correlation of COs with POs and PSOs. Accordingly the details of CBS added and its correlation is given below.

Table.5 Identification of content beyond syllabus

Content beyond syllabus added	POs strengthened/Vacant filled	CO/Unit
Kinematics	PO7(1) Vacant filled	C103. 1/ I&I

6. Mapping of COs with POs, PSOs- after CBS.

Table.6 Mapping of COs, C, PSOs with POs- after CBS.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C103.1	3	3	2	2	-	1	1^{8}	-	-	1	-	1	-	-
C103.2	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103.3	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103.4	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103.5	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103.6	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103	3	3	2	2	-	1	-	-	-	1	-	1	-	-

7. Content beyond syllabus is thus identified based on the above. Plan for handling of CBS by internal/external resource person/ industrial visits are decided. This will be included in the class log book.
8. Lecture schedule should be prepared unit wise, as in the syllabus. Number of periods per unit and total number of periods planned should not be less than, periods allotted in the syllabus of Anna University.
9. Plan for additional Periods for Cycle tests, CBS, Seminar, Quiz etc are to be incorporated in the lecture schedule. These periods are added exclusive of number of periods prescribed in the syllabus.
10. Plan for at least three assignments (with level of correlation), seminar topic, quiz questions discussed.
11. Bright students and slow learners are to be identified, immediately after Cycle test - I. such students may be counselled suitably and the evidence for counselling to be recorded in the attendance cum assessment record. (Sign of students with date and time of counselling, to be strictly recorded and to be attached in the course file).
12. For those students secured less than 60% in the Cycle test, Makeup test should be conducted. Correspondingly root cause analysis for reasons of failure, corrective and preventive action, and follow up action taken should be filed properly.
13. Contents of course file to be reviewed periodically.
14. Lecture schedule, assignment questions, tutorial questions, course materials, AU questions (at least 5) should be supplied within one week after the commencement of classes.
15. Course material should be uploaded in the college website for student's reference.
16. Discrepancy in question paper, if any to be informed to the controller of examinations through web portal entry, after getting approval from the HoD & the Principal. Critically asked questions, if any to be discussed with the students of the next batch.
17. Immediately after the publication of the results, analysis are to be carried out and follow up action to be taken for the failures.
18. Cycle test question papers should be set as per the norms of the college, incorporating marks for learning outcomes and course outcomes. Common question papers should be set.
19. Certificate courses /guest lectures may be planned inviting experts from industry/higher learning institutions.
20. After Cycle test, an objective type tests may be conducted (3 times in a semester-30 minutes duration-maximum 10 questions). Questions asked in GATE, TANCET, IES or any other Competitive examination can be taken as a reference. This is to facilitate the bright students to prepare for higher level of thinking and to enhance placement and higher studies opportunities.
21. Cycle test papers, assignment papers or any other papers submitted by the students, should be returned to the students within 5 days after correction. Sample paper should be suitably filed.
22. Long absentees of students if any to be informed to the parents through class coordinator, if such students attendance less than 75%.

Course Coordinator

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DEPARTMENT OF SCIENCE & HUMANITIES

Identification of Curricular Gap & Content Beyond Syllabus(CBS)

Name of the Faculty: Mrs.R.SARATHA **Course Code & Name:PH3151 & EP**
Degree & Program: B.E/CSE **Semester & Section: I / A** **Academic Year:2022-2023/ODD**

I. Mapping of Course Outcomes with POs & PSOs.(Before CBS)

Table.1 Mapping of COs, C, PSOs with POs - before CBS.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C103.1	3	3	2	1	-	1	-	-	-	1	-	1	-	-
C103.2	3	3	2	1	-	1	-	-	-	1	-	1	-	-
C103.3	3	3	2	1	-	1	-	-	-	1	-	1	-	-
C103.4	3	3	2	1	-	1	-	-	-	1	-	1	-	-
C103.5	3	3	2	1	-	1	-	-	-	1	-	1	-	-
C103.6	3	3	2	1	-	1	-	-	-	1	-	1	-	-
C103	3	3	2	1	-	1	-	-	-	1		1	-	-

II. Identification of content beyond syllabus.

Table.2 Identification of content beyond syllabus

Details of Content Beyond Syllabus(CBS) added	POs strengthened/ vacant filled	CO/Unit
KINEMATICS	PO7(1) Vacant filled	C103.1 /I

III. Mapping of Course Outcomes with POs & PSOs. (After CBS)

Table.3 Mapping of COs, C, PSOs with POs- after CBS.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C103.1	3	3	2	2	-	1	1*	-	-	1	-	1	-	-
C103.2	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103.3	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103.4	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103.5	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103.6	3	3	2	2	-	1	-	-	-	1	-	1	-	-
C103	3	3	2	2	-	1	-	-	-	1	-	1	-	-

Signature of the Faculty

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DEPARTMENT OF SCIENCE AND HUMANITIES

Assignment Question Paper

Assignment – 07			Date of Issue:	25.01.2023	Marks	10
Course code	PH 3151	Course Title	Engineering Physics			
Year	I	Semester/Section	I /A	Date of Submission:	27.01.2023	

Q.No	Questions	CO
1	In a Compton scattering experiment, the incident photons have a wavelength of 3×10^{-10}. Calculate the wavelength of scattered photons if they are viewed at an angle of 60° to the direction of incidence.	C103.4
2	Find the change in wavelength of an X-rays photon when it is scattered through an angle of 135° by a free electron.($h = 6.635\times10^{-34}$ Js; $m_0 = 9.1\times10^{-31}$ Kg; $C = 3\times10^{8}$ m/s)	C103.4
3.	X-rays of wavelength 0.1 nm are scattered from a carbon block. Find the wavelength of the scattered beam in the direction making an angle of 90° with the incident beam. ($m_0 = 9.1\times10^{-31}$ Kg).	C103.4
4.	An electron is accelerated by a potential difference of 150V. What is the wavelength of that electron wave?	C103.4
5.	Calculate the de-Broglie wavelength of an electron of energy 100ev.	C103.4
6.	An electron at rest is accelerated through a potential of 5000V. Calculate the de-broglie wavelength of matter wave associated with it.	C103.4
7.	Calculate the de-Broglie wavelength associated with a proton moving with a velocity equal to $\frac{1}{20}^{th}$ of the velocity of light. Mass of proton = 1.675×10^{-27} kg.	C103.4

Name and Signature of the Faculty Incharge

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DEPARTMENT OF SCIENCE & HUMANITIES

Assignment Answer Sheet

Name of the Student : 912622104020

AU Register Number: S. JEEVITHA

Assignment – 07			Date of Issue:	25.01.2023	Marks	10
Course code	PH3151	Course Title	Engineering Physics			
Year	I	Semester/Section	I/ A	Date of Submission:	27.01.2023	

Q.No	Questions	CO
1	In a Compton scattering experiment, the incident photons have a wavelength of 3×10^{-10}. Calculate the wavelength of scattered photons if they are viewed at an angle of 60° to the direction of incidence.	C103.4
2	Find the change in wavelength of an X-rays photon when it is scattered through an angle of 135° by a free electron.($h = 6.635\times10^{-34}$ Js; $m_0 = 9.1\times10^{-31}$ Kg; $C = 3\times10^{8}$ m/s)	C103.4
3.	X-rays of wavelength 0.1 nm are scattered from a carbon block. Find the wavelength of the scattered beam in the direction making an angle of 90° with the incident beam. ($m_0 = 9.1\times10^{-31}$ Kg).	C103.4
4.	An electron is accelerated by a potential difference of 150V. What is the wavelength of that electron wave?	C103.4
5.	Calculate the de-Broglie wavelength of an electron of energy 100ev.	C103.4
6.	An electron at rest is accelerated through a potential of 5000V. Calculate the de-broglie wavelength of matter wave associated with it.	C103.4
7.	Calculate the de-Broglie wavelength associated with a proton moving with a velocity equal to $\frac{1}{20}^{th}$ of the velocity of light. Mass of proton = 1.675×10^{-27} kg.	C103.4

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Mark Allocation

Rubrics	Marks Allocated	Marks obtained
Content Quality	6	6
Presentation Quality	2	1
Timely submission	2	2
Total marks	10	09

Name and Signature of the Faculty Incharge

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IQAC Academic Audit Form

ACADEMIC YEAR: 2022-2023 ODD SEMESTER

Name of Department :	CSE	Year / Sem / Sec :	I/II/A	No. of Students Registered :	40
Details of Examination :	CT -1 / CT -2 / CT -3 / Model Test				

S.No.	Course Code	List of Reg.No Verified	Course Log Book Verified (Y / N)	Course File Verified (Y / N)	No of students Passed	No of Absentees	No of Failures	Pass %	Remarks
1	HS2151	912622104003	Y	Y	24		16	60	–
2	MA2151	912622104010	Y	Y	30		10	75	–
3	CY2151	912622104029	Y	Y	36	1	3	92	–
4	PH2151	912622104020	Y	Y	29		11	72.5	–
5	GE2151	912622104037	Y	Y	31		09	77.5	–

Verified by

External Member Name and Signature:	G. SUHAPRIYA
Internal Member Name and Signature:	ISHWARYA. M

Overall Remarks:

Try to improve the pass percentage in HS 2151 Subject.

R. Saft
HoD/S&H

23/3/23
IQAC Co-ordinator

23/3/23
Principal

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PUDUKKOTTAI DISTRICT

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DEPARTMENT OF SCIENCE AND HUMANITIES

SUBJECT CODE &TITLE : PH3151 & Engineering Physics
YEAR/SEM : I/I
SECTION/BRANCH :A/CSE

STUDENT FEEDBACK ON FACULTY

S.NO.	DESCRIPTION	SCORED OUT OF 4	SCORED OUT OF 100
1.	Syllabus coverage as prescribed by university	3.4	85
2.	Technical knowledge of the teacher	3.3	82.5
3.	Teacher's communication skill	3.4	85
4.	Regularity in taking classes	3.4	85
5.	Helping the students in conducting the experiment through set of instruction and demonstrations	3.3	82.5
6.	Tendency of inviting opinion and question on subject matter from students	3.5	87.5
7.	Knowledge of the Teacher in latest development of field	3.3	82.5
8.	Perfectness of valuation	3.3	82.5
OVERALL SCORE		3.3625	84.0625

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REPORT SHEET

SI.NO	REG.NO	NAME	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
1	912622104001	ABINAYA.E	4	3	3	4	3	4	3	3
2	912622104002	ABIRAMI.C	3	3	3	3	3	4	3	4
3	912622104003	AJITHA.M	4	3	4	3	3	3	4	4
4	912622104004	AKSHAYA.M	3	3	3	3	3	4	3	4
5	912622104005	ANANTHI.K	4	3	3	4	3	4	3	3
6	912622104006	ASIYA.A	3	3	4	3	2	4	3	3
7	912622104007	ATCHAYA.B	4	4	3	3	3	4	3	4
8	912622104008	BARJUSHFATHIMA.P	3	3	3	4	4	4	3	4
9	912622104009	BAVADHARANI.S	3	3	4	4	4	3	3	3
10	912622104010	DEVADHARSHINI.P	4	3	3	3	4	3	4	3
11	912622104011	DEVI SRI.R	3	3	4	3	4	4	4	3
12	912622104012	DHANALAKSHMI.G	3	3	4	3	4	3	4	4
13	912622104013	DHANASRI.E	4	3	4	4	4	3	3	3
14	912622104014	FEMINA.M	3	4	3	3	3	4	4	3
15	912622104015	GOMATHI.P	4	4	4	4	3	3	3	4
16	912622104016	GOPIKA SRI.Y	3	4	4	4	3	3	4	3
17	912622104017	INBA.M	4	4	3	3	3	4	4	3
18	912622104018	ISHWARYA.S	4	3	4	3	4	3	4	3
19	912622104019	JAMEELA.M.A	3	3	3	3	2	3	3	3
20	912622104020	JEEVITHA.S	3	4	3	3	4	3	3	3
21	912622104021	KAVIPRIYA.S	3	3	4	4	3	3	3	4
22	912622104022	KAVIYAPRIYA.P	4	4	3	3	4	4	3	4
23	912622104023	KAVIYARASI.M	3	4	3	3	4	3	3	4
24	912622104024	KEERTHANA.S **(9.10.2004)**	4	4	4	4	3	4	3	4
25	912622104025	KEERTHANA.S **(29.8.2005)**	3	4	3	4	3	4	3	3
26	912622104026	KRISHNAVENI.C	3	4	3	3	4	3	4	2
27	912622104027	LAKSHMI PRIYA.D	4	4	4	3	3	3	3	3
28	912622104028	LALITHAMBIGAI.K	3	3	3	3	4	4	4	3
29	912622104029	LATHIKA.G	3	3	4	4	3	3	4	3
30	912622104030	MADHUMITHRA.D	3	3	3	4	3	3	3	2
31	912622104031	MAHALAKSHMI.K	4	3	3	4	4	3	4	3
32	912622104032	MANIMEGALAI.V	3	3	3	3	4	3	3	4
33	912622104033	MANJULA.R	3	3	3	4	3	4	3	4
34	912622104034	MEENAKUMARI.K	3	4	3	4	3	4	3	3
35	912622104035	NANDHINI PRIYA.N	4	3	3	3	3	4	3	3
36	912622104036	POORANI.S	4	3	3	4	3	4	3	3
37	912622104037	PRADEEPA.P	3	3	3	3	3	4	3	4

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38	912622104038	PRIYADARSHINI.K	3	3	4	3	3	4	3	3
39	912622104039	PRIYADHARSHINI.D	3	3	4	3	4	3	4	3
40	912622104040	ROHINI.N	4	3	4	3	3	3	3	3
			3.4	3.3	3.4	3.4	3.3	3.5	3.3	3.3
			85	82.5	85	85	82.5	87.5	82.5	82.5

EXCELLENT	VERY GOOD	GOOD	AVERAGE	POOR
4	3	2	1	0

Faculty Incharge

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22 -23 - ODD

SRI BHARATHI ENGINEERING COLLEGE FOR WOMEN
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CIRCULAR

Date: 13.02.2023

The Second cycle test will be conducted from **23.02.2023 to 28.02.2023** for the I semester (I year) students.

The following instructions are to be followed by the faculty members.

- Total marks for which the question paper to be set will be for 100 marks. **(PART A** 10X2=20 **PART B** 5X16=80).
- It is responsibility of the faculty members to prepare **two set of question papers** and take the Xerox copies of the required number and it should be handed over to the Exam cell Coordinators **Ms. G. Gayathri AP/CIVIL, Mrs. G. Sugapriya AP/CSE** along with **answer key** on or before **20.02.2023**.
- The Exam Coordinator (exam cell) is requested to make necessary arrangements (hall arrangements, invigilation duty etc.,) for conducting the test.
- Faculty members are requested to handover the valued answer scripts to the students on or before **01.03.2023** and the class in-charges are requested to send the consolidated mark sheet along with the attendance percentage (from **11th November 2022** to **28th February 2023**) to the parents on or before **03.03.2023**.

PRINCIPAL

13/02/23

Cc:

- All HoD's CIVIL/CSE/EEE/ECE
- All faculty
- IQAC Co-ordinator
- Exam cell
- Office file

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SRI BHARATHI ENGINEERING COLLEGE FOR WOMEN
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CIRCULAR

Date: 13.02.2023

The Second cycle test will be conducted from **23.02.2023 to 28.02.2023** for the **I semester** (I year) B.E students for **100 marks** as per the time table given below. Students are directed to prepare well and score good marks.

Date	12.45 pm -03.45 pm (AN)
23.02.2023	**CY3151**-Engineering Chemistry
24.02.2023	**PH3151**-Engineering Physics
25.02.2023	**GE3151**-Problem Solving and Python Programming
27.02.2023	**MA3151**-Matrices and Calculus
28.02.2023	**HS3151**-Professional English I

PRINCIPAL

13/02/23

Cc:

- All I year B.E Classes
- All faculty
- IQAC Co-ordinator
- Exam cell
- Notice Board
- Office file

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Cycle Test - II			Date/Session	24.02.2023 / AN	Marks	100
Course code	PH3151	Course Title	ENGINEERING PHYSICS			
Regulation	2021	Duration	3 hours	Academic Year		2022 - 2023
Year	I	Semester	I	Department		All Branches

COURSE OUTCOMES

C103.1	Acknowledge the importance of mechanics.
C103.2	Express their knowledge in electromagnetic waves.
C103.3	Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
C103.4	Establish a strong foundational knowledge in fibre optics and laser
C103.5	Comprehend the importance of quantum physics.
C103.6	Comprehend and apply quantum mechanical principles towards the formation of energy bands.

Q.No.	Question	CO	BTS
	PART A (Answer all the Questions 10 x 2 = 20 Marks)		
1	List out the conditions to be satisfied for total internal reflection?	C103.3	K1
2	What is meant by Doppler effect?	C103.3	K2
3	What is the physical significance of a wave function?	C103.5	K2
4	What is meant by photon? Give any two properties.	C103.5	K2
5	What is meant by Degenerate and non-degenerate.	C103.5	K2
6	What is meant by correspondence principle? Give example.	C103.5	K2
7	What do you understand by the term Transmission Co-efficient?	C103.6	K2
8	What is meant by Quantum tunneling?	C103.6	K2
9	Give any two applications of STM.	C103.6	K1
10	What is the principle used in Resonant tunneling diode?	C103.6	K2
	PART B (Answer all the Questions 5 x 16 = 80 Marks)		
11a	What is meant by simple harmonic motion? Arrive at the differential equation for a particle executing SHM	C103.3	K2
	OR		
11b	Describe the construction and working of Michelson's Interferometer.	C103.3	K2
12a	Explain Compton effect and derive an expression for the wavelength of Scattered photon.	C103.5	K2
	OR		
12b	Explain the Schrödinger wave equation to one dimensional potential well	C103.5	K2
13a	Derive Schrödinger's time dependent and time independent equations .	C103.5	K3
	OR		
13b	Derive the Eigen values and Eigen functions for a 1-D potential box	C103.5	K3
14a	Derive the Eigen values and Eigen functions for a 3-D potential box	C103.6	K3
	OR		
14b	Describe the principle, construction and working of a scanning tunneling microscope	C103.6	K2
15a	Describe the barrier penetration process and quantum tunneling of an electron.	C103.6	K3
	OR		
15b	Write a brief note on Bloch's theorem for particles in a periodic potential and Kronig penney model	C103.6	K3

Course Faculty 20/2/23
R. SARATHA
(Name /Sign / Date)

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HoD
R. SARATHA
(Name /Sign / Date)

SRI BHARATHI ENGINEERING COLLEGE FOR WOMEN

B.E-DEGREE EXAMINATION, FEBRUARY-2023

CYCLE TEST-II

FIRST SEMESTER

PH3151 - ENGINEERING PHYSICS

Duration: 3.00hrs Answerkey Marks: 100

Part-A

1) List out the conditions to be satisfied for total internal reflection?

(i) Light should travel from denser medium to rarer medium

(ii) The angle of incidence (ϕ) at the interface should be greater than the critical angle (ϕ_c).

i.e, $\phi > \phi_c$

(iii) The refractive index of denser medium (n_1) should be greater than the refractive index of rarer medium (n_2)

i.e, $n_1 > n_2$

2) What is meant by Doppler effect?

Doppler Effect

The apparent change in frequency (or) Pitch either due to the motion of the source (or) observer (or) both is known as Doppler effect

3) What is the physical significance of a wave function?

(i) The probability of finding a particle in space, at any given instant of time is characterised by a function $\psi(x,y,z)$, called wave function

(ii) It relates the particle and the wave statistically

(iii) It gives the information about the particle behaviour

(iv) It is a complex quantity

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5) $|\psi|^2$ represents the probability density of the particle, which is real and positive

4) What is meant by photon? Give any two properties.

Definition :-

Photons are discrete energy values in the form of small quantas of definite frequency (or) wavelength

Properties:

1. They do not have any charge and they will not ionise
2. The energy and momentum of the photon is given by $E = h\nu$ and $P = mc$

where $\nu \rightarrow$ frequency, m - mass of the photon
$c \rightarrow$ Velocity of photon $h \rightarrow$ plank's constant

5) What is meant by Degenerate and non-degenerate.

(i) Degeneracy: It is For several Combination of quantum numbers we have same energy eigen value but different eigen functions. Such states and energy levels are called Degenerate state.

The three combinations of quantum numbers (112), (121), and (211), which gives same eigen value but different eigen functions are called Degenerate (or) 3 fold degenerate state

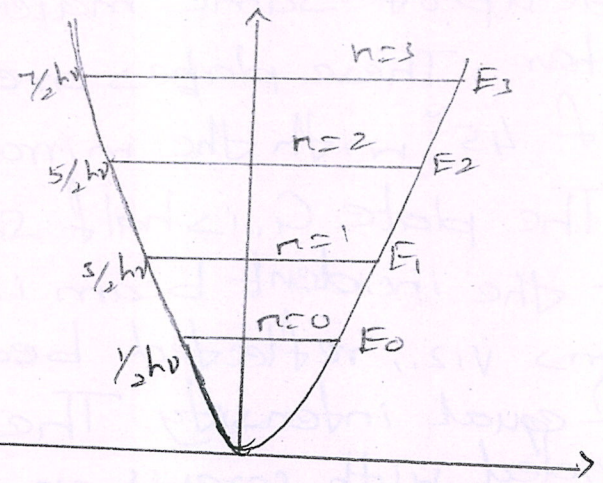
(ii) Non-Degeneracy: For various combinations of quantum number if we have same energy value and same (one) eigen function then such states and energy levels are called Non-Degenerate state.

Example

For $n_x = 2n_y = 2n_z = 2$ we have $E_{222} = \frac{12h^2}{8ma^2}$

$$\psi_{222} = \sqrt{\frac{8}{a^3}} \sin\frac{2\pi x}{a} \sin\frac{2\pi y}{a} \sin\frac{2\pi z}{a}$$

III^by for various values of n'. The energy eigen values of an harmonic oscillator are plotted



(or)

b) Describe the construction and working of Michelson's Interferometer.

Michelson's Interferometer and types of Frienges Interferometers

The phenomenon of Interference has been used to test the flames of surfaces and also used to reduce the reflecting power of the lens and prisms. Instruments based on the principle of interference of Light are known as interferometers

Michelson designed an interferometer to determine the wavelength of the light, resolution of the spectral line and the thickness of the thin transparent materials.

Principle:-

The amplitude of light beam from a source is divided into two parts of equal intensities by partial reflection and transmission. These beams are then sent in two directions at right angles and are brought together after they suffer reflections from plane mirrors to produce interference fringes

Construction

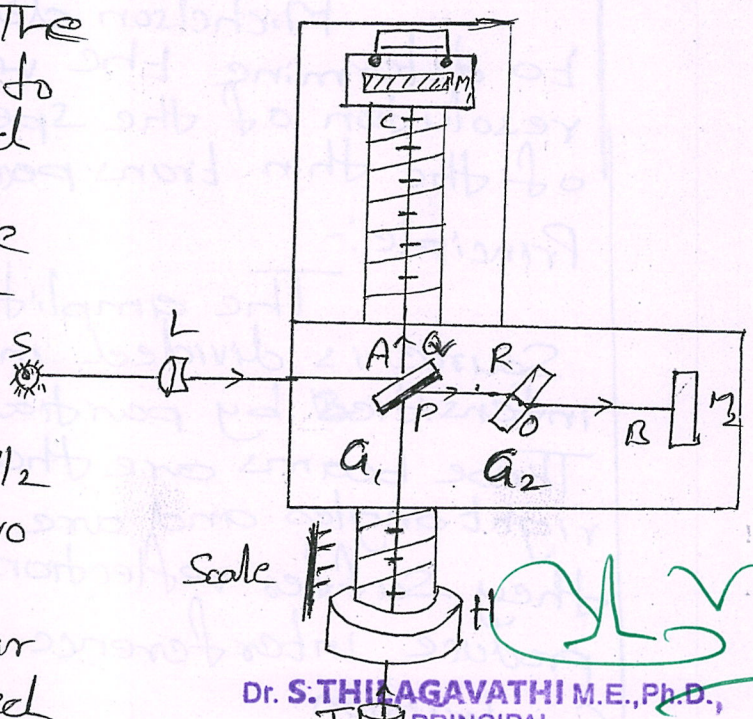
It consists of two highly polished plane mirrors M_1 and M_2 which are right

angles to each other. These two equally optically flat glass plates G_1 and G_2 of same thickness are made up of same material placed parallel to each other. These plates are inclined aban angle of 45° with the mirrors M_1 and M_2

The plate G_1 is half silvered at the back so that the incident beam is devided into two beams viz., reflected beam and transmitted beam of equal intensity. The mirrors M_1 and M_2 are provided with screws on their backs, so that they can be adjusted exactly perpendicular to each other

The mirror M_1 is mounted on a carriage which can be moved forward and backward using the handle 'H'. The distance at which the M_1 is moved can be read with the help of the scale. The interference fringes can be observed in the field of view of the telescope 'T'.

Working :- Light from a monochromatic source S is made parallel with the help of collimating lens L. The light beam is allowed to fall on the Semi silvered glass plate G_1, It is partly reflected at the back surface of G_1 and travel towards M_1 i.e., along (AC) and partly transmitted towards M_2 (i.e.) along AB. These two rays travel along two mutually perpendicular paths and are reflected back by the mirror M_1 and M_2. These two rays again meet at glass plate G_1 and



iv) A lens is then placed between G_1 and tin sheet and a plane mirror is placed between G_1 and lens normally.

(v) The lens position is adjusted till the image of the hole falls back on the pin plate very close to the hole, hence the light is made as a parallel beam when it leaves the lens.

(vi) If the plane mirror is removed, and if the beam is seen in the direction of A T. We can see four images of the hole. The mirrors are adjusted till the images coincide two by two.

(vii) At this stage, if the tin sheet is removed, then the two paths of light are exactly parallel to each other giving rise to circular fringes in the field of view, By tilting mirror M_2 slightly, the fringes can be made straight.

12) a) Explain compton effect and derive an expression for the wavelength of scattered photon.

Compton effect:- When a beam of monochromatic radiation such as X-rays - γ-rays etc, of high frequency is allowed to fall on a fine scatterer, the beam is scattered into two components viz.,

(i) one component having the same freq/, (or) wavelength as that of the incident radiation, so called unmodified radiation, and

(ii) The other component having lower frequency (or) higher wavelength compared to incident radiation, so called modified radiation.

This effect of scattering is called Compton effect

Compton shift:- When a photon of energy $h\nu$ collides with an electron of a scatterer at rest, the photon gives its energy to the electron. Therefore the scattered photon will have less energy (or) lower frequency (or) higher wavelength compared to the

The two rays which enter the telescope are originally derived from the same single beam, hence they cause the interference fringes in the field of view of the telescope. Hence a path difference can be introduced between the two reflected rays by moving the mirror M_1.

A ray PC passes twice through the glass plate G_1, i.e., 1st through PQ and 2nd through QP, after reflection from the mirror M_1, whereas the ray PB does not ever passes once through G_1, even after reflection from the mirror M_2. Thus in the absence of the glass plate G_2 the path traced by the beam between G_1M_1 and G_1M_2 are not equal.

To equalise the path difference, a glass plate G_2 of same thickness and material as that of G_1 is introduced between G_1 and M_2. So that the ray PB will also pass twice i.e., 1st through RO in glass plate G_2 and 2nd through OR in glass plate G_2, after reflection from the mirror M_2

Since the glass plate G_2 is used to compensate the path difference between the two rays; it is called as a compensation plate. Thus the path of the two rays Viz., PB and PC are made equal.

Adjustments

(i) The distance of the mirrors M_1 and M_2 are adjusted to be nearly equal from G_1.

(ii) In order to make the incident beam parallel, a tin sheet with a small hole is placed infront of source.

(iii) The hole and the light from the source are adjusted in line with the centre of glass plate G_1 and G_2 and mirror M_2.

wavelength of incident photon. Since the electron gains energy, it recoils with the velocity 'v'. This effect is called Compton effect and the shift in wavelength is called Compton shift.

Thus as a result of Compton scattering, we get (i) Unmodified radiation (ii) Modified radiations and (iii) recoil electron.

Theory of Compton effect.

Principle In Compton scattering, the collision between a photon and an electron is considered. Then by applying the laws of Conservation of energy and momentum, the expression for Compton wavelength is derived.

Assumptions

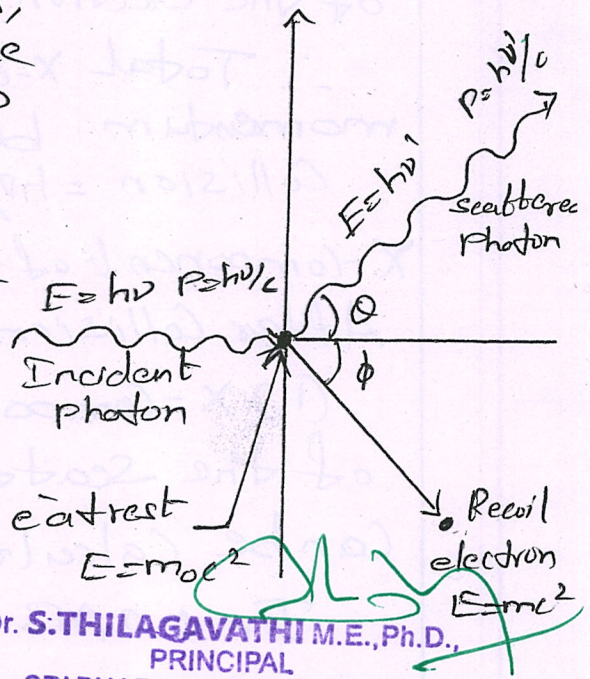
1, The collision occurs between the photon and an electron in the scattering material

2, The electron is free and is at rest before collision with the incident photon.

With these assumptions, let us consider a photon of energh 'hν' colliding with an electron at rest

During the collision process, a part of energy is given to the electron, which inturn increases the kinetic energy of the electron and hence it recoils at an angle of ϕ. The scattered photon moves with an energy hν' (lesser than hν), at an angle θ with respect to the original direction.

Let us find the energy and momentum components before and after collision Process



Energy before Collision

(i) Energy of the incident Photon = $h\nu$

(ii) Energy of the electron at rest = m_0c^2

where m_0 is the rest mass energy of the electron

$\therefore$ Total Energy before Collision = $h\nu + m_0c^2$ ——— ①

Energy after Collision

(i) Energy of the scattered Photon = $h\nu'$

(ii) Energy of the recoil electron = mc^2

where m is the mass of the electron moving with velocity 'v'

$\therefore$ Total energy after Collision = $h\nu' + m_0c^2$ ——— ②

We know that according to the law of conservation of energy

Total energy before Collision = Total energy after Collision

$\therefore$ Equ ① = Equ ②

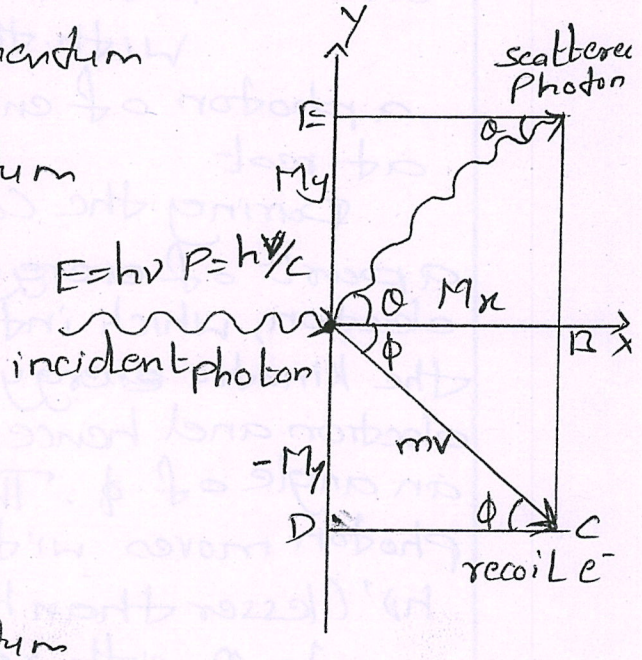
(i.e.,) $h\nu + m_0c^2 = h\nu' + mc^2$

X-Component of momentum Before Collision

(i) X-component momentum of the incident photon = $\frac{h\nu}{c}$

(ii) X-component momentum of the electron at rest = 0

$\therefore$ Total X-component of momentum before Collision = $h\nu/c$



X-Component of momentum After Collision

(i) X-Component momentum of the scattered photon can be calculated

In $\triangle OAB$ $\cos\theta = \dfrac{M_x}{h\nu'/c}$

Special cases

Case(i) When $\theta = 0$; $\cos\theta = 1$

$\therefore$ eqn (18) becomes $\Delta\lambda = 0$

This implies that at $\theta = 0$ the scattering is absent and the outcoming radiation has the same wavelength (or) frequency as that of the incident radiation. Thus we get the output as a single peak.

Case(ii) when $\theta = 90^\circ$; $\cos\theta = 0$

$\therefore$ eqn (18) becomes $\Delta\lambda = \frac{h}{m_0 c}$

Sub the values of h, m_0 and c we get

$$\Delta\lambda = \frac{6.625 \times 10^{-34}}{(9.11 \times 10^{-31})(3 \times 10^8)}$$ (or) $\Delta\lambda = 0.02424 A^\circ$

This wavelength is called compton wavelength

Case(iii) when $\theta = 180^\circ$; $\cos\theta = -1$

$\therefore$ Eqn (18) becomes $\Delta\lambda = \frac{h}{m_0 c}(1 - (-1))$

(or) $\Delta\lambda = \frac{2h}{m_0 c}$

Sub $\therefore$ the values of h, m_0 and c we get

$\Delta\lambda = 0.04848 A^\circ$

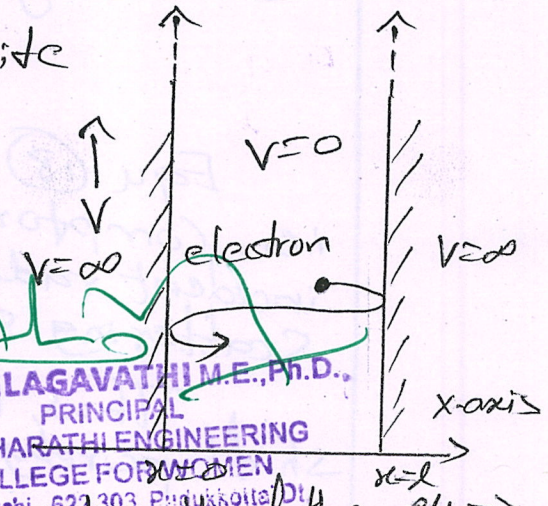
Thus for $\theta = 180^\circ$ the shift in wavelength is found to be max^m.

(or)

b) Explain the schrodinger wave eqn to one dimensional potential well

Let us consider a particle (electron) of mass 'm' moving along x-axis, enclosed in a one dimensional (1D) infinite potential well

$\therefore$ the walls are of infinite Potential, the particle doesnot penetrate out from the potential well. Also, the particle is confined between the length 'l' of the well and has elastic collisions with the walls. $\therefore$ the potential energy of the e^- inside the well is constant & can be taken as zero



Squaring, we get $m^2 = \frac{m_0^2}{\left(1-\frac{v^2}{c^2}\right)}$ (or) $m^2 = \frac{m_0^2 c^2}{c^2 - v^2}$

(or) $m^2(c^2-v^2) = m_0^2 c^2$ ——— (15)

In order to make this equ, similar to LHS of equ (14) multiply it by c^2 on both sides

$\therefore$ we get $m^2c^2(c^2-v^2) = m_0^2 c^4$ ——— (16)

Equating equ (16) and (14), we can write

$m_0^2c^4 = m_0^2c^4 + 2hm_0c^2(v-v') - 2h^2vv'(1-\cos\theta)$

(or) $2hm_0c^2(v-v') = 2h^2vv'(1-\cos\theta)$

(or) $\frac{v-v'}{vv'} = \frac{h}{m_0c^2}(1-\cos\theta)$

(or) $\frac{v}{vv'} - \frac{v'}{vv'} = \frac{h}{m_0c^2}(1-\cos\theta)$

(or) $\frac{1}{v'} - \frac{1}{v} = \frac{h}{m_0c^2}(1-\cos\theta)$

$\times$, both sides by 'c' we get

$\frac{c}{v'} - \frac{c}{v} = \frac{hc}{m_0c^2}(1-\cos\theta)$ ——— (17)

$\therefore \lambda = \frac{c}{v}$ & $\lambda' = \frac{c}{v'}$ we can write equ (17) as

$\lambda' - \lambda = \frac{h}{m_0c}(1-\cos\theta)$

(or) Change in wavelength

$\Delta\lambda = \frac{h}{m_0c}(1-\cos\theta)$ ——— (18)

Equ (18) represents the shift in wavelength i.e., compton shift which is independent of the incident radiation as well as the nature of the scattering substance

Thus, the shift in wavelength (or) Compton shift purely depends on the angle of scattering

X-component of Momentum After Collision

(i) X-component momentum of the scattered photon can be calculated

$$\text{In } \triangle OAB \quad \cos\theta = \frac{M_x}{h\nu'/c}$$

∴ X-component momentum of the scattered Photon $= \frac{h\nu'}{c}\cos\theta$

(ii) X-component momentum of the recoil can be calculated

$$\text{In } \triangle OBC \quad \cos\phi = \frac{M_x}{mv}$$

∴ X-component momentum of the recoil electron $= mv\cos\phi$

∴ Total X-component of momentum after Collision $= \frac{h\nu'}{c}\cos\theta + mv\cos\phi$ —— (5)

we know that according to the Law of Conservation of momentum

Total momentum before collision = Total momentum after collision

Equ (4) = Equ (5)

$$\therefore = \frac{h\nu}{c} = \frac{h\nu'}{c}\cos\theta + mv\cos\phi \quad \text{—— (6)}$$

Y-component of Momentum Before Collision

(i) Y-component momentum of the incident photon = 0

(ii) Y-component momentum of the electron at rest = 0

∴ Total Y-component of momentum before collision = 0 —— (7)

Y-component of momentum After Collision

(i) $\text{In } \triangle OAE, \sin\theta = \frac{M_y}{h\nu'/c}$

∴ Y-component momentum of the scattered Photon $= \frac{h\nu'}{c}\sin\theta$

(ii) In $\triangle OCD$, $\sin\phi = \frac{-My}{mv}$

$\therefore$ Y-component momentum of the recoil electron $= -mv\sin\phi$

Total Y-component of momentum after collision $= \frac{h\nu'}{c}\sin\theta - mv\sin\phi$

According to the law of conservation of momentum

Equ (7) = Equ (8)

$$\therefore 0 = \frac{h\nu'}{c}\sin\theta - mv\sin\phi$$

from equ (6), we can write

$$\frac{h\nu}{c} - \frac{h\nu'}{c}\cos\theta = mv\cos\phi$$

(or) $$mcv\cos\phi = h(\nu - \nu'\cos\theta) \quad \text{---(10)}$$

from equ (9) we can write

$$mcv\sin\phi = h\nu'\sin\theta \quad \text{---(11)}$$

squaring adding equ (10) and (11) we get

$$m^2c^2v^2(\cos^2\phi + \sin^2\phi) = h^2[\nu^2 - 2\nu\nu'\cos\theta + (\nu')^2\cos^2\theta] + h^2(\nu')^2\sin^2\theta$$

since $\cos^2\phi + \sin^2\phi = 1$ & $h^2(\nu')^2[\cos^2\theta + \sin^2\theta] = h^2(\nu')^2$

we get (or) $$m^2c^2v^2 = h^2[\nu^2 - 2\nu\nu'\cos\theta + (\nu')^2]$$

from equ (4), we can write

$$mc^2 = m_oc^2 + h(\nu - \nu')$$

squaring on both sides we get

$$m^2c^4 = m_o^2c^4 + 2hm_oc^2(\nu - \nu') + h^2[\nu^2 - 2\nu\nu' + (\nu')^2] \quad \text{---(12)}$$

Subtracting equ (12) from equ (13), we get

$$m^2c^2(c^2 - v^2) = m_o^2c^4 + 2hm_oc^2(\nu - \nu') - 2h^2\nu\nu'(1 - \cos\theta)$$

From the theory of relativity, the relativistic formula for the variation of mass with the velocity of the electron is given by

$$m = \frac{m_o}{\sqrt{1 - \frac{v^2}{c^2}}}$$

Outside the wall, on the wall of the well, the PE of e^- is ∞.

Inside the well the potential energy (V) of the e^- is zero

the boundary conditions as

$V(x) = 0$ when $0 < x < l$

$V(x) = \infty$ when $0 \geq x \geq l$

$\therefore$ the particle cannot exist outside the well

the wave fun/: $\psi = 0$ when $0 \geq x \geq l$

To find the wave fun/: of the particle within the well of length 'l', let us consider the Schrodinger ondimensional time independent wave equ (i.e)

$$\frac{d^2\psi}{dx^2} + \frac{2m}{\hbar^2}[E-V]\psi = 0$$

Since the potential energy inside the well is '0' ($V=0$) $\therefore$ only Kinetic energy & it is a free e^-

for a free particle

$$\frac{d^2\psi}{dx^2} + \frac{2m}{\hbar^2}E\psi = 0 \quad \text{--- (1)} \qquad \frac{d^2\psi}{dx^2} + k^2\psi = 0 \quad \text{--- (2)}$$

$\therefore k^2 = \frac{2mE}{\hbar^2}$

The Solution of equ (1) is

$\psi(x) = A\sin kx + B\cos kx$

A&B $\rightarrow$ arbitary constants.

Boundary conditions $\rightarrow$ (i) at $x=0$, P.E $\rightarrow V=\infty$

$\therefore \psi(x) = 0$

$0 = A\sin 0 + B\cos 0$

$\therefore \boxed{B = 0}$

Boundary conditions $\rightarrow$ (ii) at $x = l$ P.E $V=\infty$ $\therefore \psi(x) = 0$

$0 = A\sin kl + B\cos kl$

$0 = A\sin kl$

A $\neq$ 0 $\sin kl = 0$ we know $\sin n\pi = 0$

So $kl = n\pi$ $\quad k = \frac{n\pi}{l}$

$\therefore$ wave fun for one dimensional

Energy of the Particle (e^-)

$$k^2 = \frac{2mE}{\hbar^2} = \frac{2mE}{\frac{h^2}{4\pi^2}} \quad k^2 = \frac{8\pi^2 mE}{h^2}$$

We know $k^2 = \frac{n^2\pi^2}{l^2}$ $\therefore \frac{8\pi^2 mE}{h^2} = \frac{n^2\pi^2}{l^2}$

so Energy of the particle (e^-) $E_n = \frac{n^2 h^2}{8ml^2}$

energy value $E_n \rightarrow$ Eigen Value and the Corresponding Value of ψ_n is called Eigen function.

Energy levels of e^-s

$n \rightarrow$ various energy levels of e^-s

The lowest energy value ($n=1$)

$\therefore$ when $n=1$ we get $E_1 = \frac{h^2}{8ml^2}$

$n=2$ we get $E_2 = \frac{4h^2}{8ml^2} = 4E_1$

$n=3$ " $E_3 = \frac{9h^2}{8ml^2} = 9E_1$

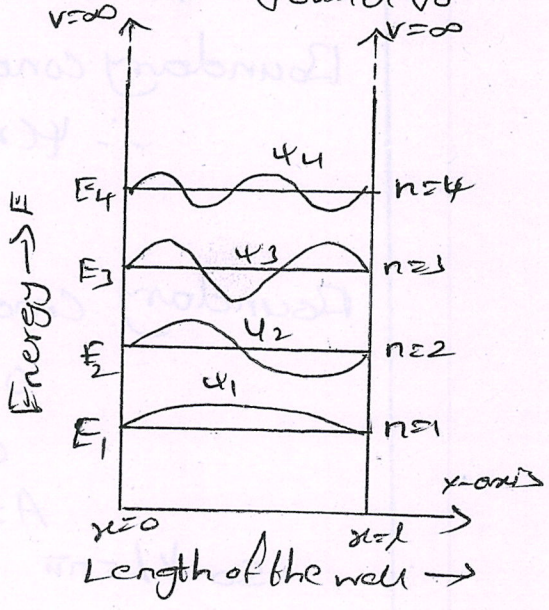
$n=4$ " $E_4 = \frac{16h^2}{8ml^2} = 16E_1$

$\therefore$ In general $\boxed{E_n = n^2 E_1}$

The energy levels E_1, E_2, E_3 etc are discrete energy levels

The energy levels in classical mechanics is found to be continuous

The various energy eigen values and their corresponding eigen fun/s of an electron enclosed in a one dimensional well. Thus we have discrete energy values



Normalisation of the ware function :-

Normalisation :- It is the process by which the probability (P) of finding the particle (e⁻) inside the well can be done

Total probability (P) is equal to 1 means, there is a particle inside the well

∴ The probability

$$P = \int_0^l |\psi|^2 dx = 1 \qquad \psi = A \sin \frac{n\pi x}{l}$$

$$P = \int_0^l A^2 \sin^2 \frac{n\pi x}{l} dx = 1 \text{ (or) } A^2 \int_0^l \left[\frac{1 - \cos 2n\pi x/l}{2}\right] dx = 1$$

$$A^2 \left[\frac{x}{2} - \frac{1}{2} \frac{\sin 2n\pi x/l}{2n\pi/l}\right]_0^l = 1$$

$$A^2 \left[\frac{l}{2} - \frac{1}{2} \frac{\sin 2n\pi l/l}{2n\pi/l}\right] = 1$$

$$A^2 \left[\frac{l}{2} - \frac{1}{2} \frac{\sin 2n\pi}{2n\pi/l}\right] = 1 \qquad \because \sin n\pi = 0 \therefore \sin 2n\pi = 0$$

$$\therefore \frac{A^2 l}{2} = 1 \quad A^2 = \frac{2}{l} \quad A = \sqrt{\frac{2}{l}}$$

Then the normalised ware equ is

$$\psi_n = \sqrt{\frac{2}{l}} \sin \frac{n\pi x}{l}$$

13) (a) Derive Schrodinger's time dependant and time independent equations.

Schrodinger time dependent ware equation

A particle can be behaves as a ware only under motion

$$E = V + \tfrac{1}{2} m v^2 \text{ (or) } E = V + \frac{1}{2} \frac{m^2 v^2}{m}$$

$$(\because P = mv) \quad E = V + \frac{P^2}{2m} \text{ (or) } E\psi = V\psi + \frac{P^2}{2m}\psi$$

Acc/: to classical mechanics, if 'x' is the position of the particle moving with the velocity 'v', then the displacement of the particle at any time 't' is given by

$$Y = Ae^{-i\omega(t - x/v)} \quad \omega = \text{Angular frequency}$$

W.K.T, in Quantum mechanics the wave fun $\psi(x,y,z,t)$ represents position (x,y,z) & of a moving particle at any time 't' and is given by

$$\psi(x,y,z,t) = Ae^{-i\omega(t - x/v)}$$

$\omega = 2\pi\nu$

$$\psi(x,y,z,t) = Ae^{-2\pi i\left(\nu t - \frac{\nu x}{v}\right)} \qquad E = h\nu \quad \frac{E}{h} = \nu$$

$\therefore \nu = v/\lambda \quad \frac{\nu}{v} = 1/\lambda$

$$\psi(x,y,z,t) = Ae^{-2\pi i\left(\frac{E}{h}t - \frac{x}{\lambda}\right)}$$

P = momentum $\quad \lambda = \frac{h}{mv} = \frac{h}{p} \quad \therefore \frac{1}{\lambda} = \frac{p}{h}$

$$\psi(x,y,z,t) = Ae^{-2\pi i\left(\frac{E}{h}t - \frac{px}{h}\right)}$$

$$\psi(x,y,z,t) = Ae^{-\frac{2\pi}{h}i(Et - px)}$$

$\left(\hbar = \frac{h}{2\pi}\right)$ $\quad \psi(x,y,z,t) = Ae^{-i/\hbar(Et - px)}$ ——— (a)

differentiating the above equ w.r.t to 'x'

$$\frac{\partial\psi}{\partial x} = Ae^{-i/\hbar(Et - px)}\left(\frac{-p}{\hbar}\right)$$

$$\frac{\partial^2\psi}{\partial x^2} = Ae^{-i/\hbar(Et - px)}\left(\frac{i^2p^2}{\hbar^2}\right)$$

$$\therefore \frac{\partial^2\psi}{\partial x^2} = Ae^{-i/\hbar(Et - px)}\frac{-p^2}{\hbar^2}$$

(or) $$p^2\psi = -\hbar^2\frac{\partial^2\psi}{\partial x^2}$$

differentiating equ (a) w.r.t to 't'

$$\frac{\partial\psi}{\partial t} = Ae^{-i/\hbar(Et - px)}\left[\frac{-iE}{\hbar}\right] \quad (or)$$

$$\frac{\hbar}{-i}\frac{\partial\psi}{\partial t} = \psi(x,y,z,t)E \quad (or) \quad E\psi = i\hbar\frac{\partial\psi}{\partial t} \qquad (b)$$

$i\hbar\frac{\partial}{\partial t}\psi=\left[V-\frac{\hbar^2}{2m}\frac{\partial}{\partial x^2}\right]\psi=0$ this is the Schrodinger time dependent equ in one dimension

For 3-dimension $i\hbar\frac{\partial\psi}{\partial t}=\left[V-\frac{\hbar^2}{2m}\nabla^2\right]\psi=0$

$E\psi=H\psi$ $E\rightarrow i\hbar\frac{\partial}{\partial t}$ H-hamiltonian operator

$H=V-\frac{\hbar^2}{2m}\nabla^2$

Schrodinger Time independent wave equ.

Time dependent wave function

$\psi(x,y,z,t)=Ae^{-i/\hbar(Et-Px)}$

$\psi(x,y,z,t)=Ae^{-iEt/\hbar}e^{iPx/\hbar}$

$\psi(x,y,z,t)=A\psi e^{-iEt/\hbar}$ $(\psi=e^{iPx/\hbar})$ ——(a)

differentiate the equ (a) we get

$\frac{\partial\psi}{\partial t}=A\psi e^{-iEt/\hbar}\left(\frac{-Et}{\hbar}\right)$

$\frac{\partial^2\psi}{\partial x^2}=Ae^{-iEt/\hbar}\frac{\partial\psi}{\partial x}$, $\frac{\partial^2\psi}{\partial x^2}=Ae^{-iEt/\hbar}\frac{\partial^2\psi}{\partial x^2}$

Schrodinger time dependent wave equ. is

$i\hbar\frac{\partial\psi}{\partial t}=V\psi-\frac{\hbar^2}{2m}\frac{\partial^2\psi}{\partial x^2}$ ——(b)

sub the differentiate equs in equ (b) we get

$\frac{\partial^2\psi}{\partial x^2}+\frac{2m}{\hbar^2}[E\psi-V\psi]=0$

It is one dimensional Schrodinger time independent wave equ: $\nabla^2\psi+\frac{2m}{\hbar^2}[E-V]\psi=0$ → 3-D schrodinger time independent wave equ.

Free particle P.E $V=0$

$\frac{\partial^2\psi}{\partial x^2}+\frac{2m}{\hbar^2}E\psi=0$ (or) $\nabla^2\psi+\frac{2m}{\hbar^2}E\psi=0$.

(or)

b) Derive the Eigen values and Eigenfunctions for a 3-D Potential box

In a three dimensional box there are three quantum numbers n_x, n_y and n_z corresponding the three co-ordinate axis x, y & z respy

Boundary conditions

(i) $V(x,y,z)=0$ when $0<x<a$
$V(x,y,z)=0$ when $0<x<b$
$V(x,y,z)=0$ when $0<x<c$

Inference: within this boundary the particle exist and we need to find the energy values & wave function

ii) $V(x,y,z)=\infty$ when $0\geq x\geq a$
$V(x,y,z)=\infty$ when $0\geq x\geq b$
$V(x,y,z)=\infty$ when $0\geq x\geq c$

In this area the particle does not exist and therefore the wave fun^{n} $=0$

3-D Schrodinger time independent wave equ

$$\frac{\partial^2\psi}{\partial x^2}+\frac{\partial^2\psi}{\partial y^2}+\frac{\partial^2\psi}{\partial z^2}+\frac{2m}{\hbar^2}[E-V]\psi=0$$

$\because V=0$

$$\frac{\partial^2\psi}{\partial x^2}+\frac{\partial^2\psi}{\partial y^2}+\frac{\partial^2\psi}{\partial z^2}+\frac{2mE}{\hbar^2}\psi=0 \quad \text{---(a)}$$

solution for equ (a) is

$$\psi(x,y,z)=X(x)\,Y(y)\,Z(z)$$

(or) $\psi=XYZ$

$$\frac{\partial\psi}{\partial x}=YZ\frac{dX}{dx},\quad \frac{\partial^2\psi}{\partial x^2}=YZ\frac{d^2X}{dx^2}$$

$$\frac{\partial\psi}{\partial y}=XZ\frac{dY}{dy},\quad \frac{\partial^2\psi}{\partial y^2}=XZ\frac{d^2Y}{dy^2}$$

$$\frac{\partial\psi}{\partial z}=XY\frac{dZ}{dz},\quad \frac{\partial^2\psi}{\partial z^2}=XY\frac{d^2Z}{dz^2}$$

sub above three equ in equ (a) we get

$$\frac{1}{X}\frac{d^2X}{dx^2}+\frac{1}{Y}\frac{d^2Y}{dy^2}+\frac{1}{Z}\frac{d^2Z}{dz^2}=-\left[\frac{2m}{\hbar^2}E\right]XYZ$$

(or)

$$\frac{1}{X}\frac{d^2X}{dx^2}+\frac{1}{Y}\frac{d^2Y}{dy^2}+\frac{1}{Z}\frac{d^2Z}{dz^2}=-[k_x^2+k_y^2+k_z^2]$$

$$\frac{1}{X}\frac{d^2X}{dx^2}=-k_x^2 \quad \therefore \frac{d^2X}{dx^2}+k_x^2X=0$$

$$\frac{1}{Y}\frac{d^2Y}{dy^2}=-k^2Y \quad \therefore \frac{d^2Y}{dy^2}+k_y^2Y=0$$

$$\frac{1}{Z}\frac{d^2Z}{dz^2}=-k^2Z \quad \therefore \frac{d^2Z}{dz^2}+k_z^2Z=0$$

The solution is

$$X(x) = A_x \sin k_x x + B_x \cos k_x x$$

Boundary conditions

(i) when $x=0$ $X=0$

$\therefore B_x = 0$

(ii) when $x=a$, $X=0$

$$0 = A_x \sin k_x a$$

$$X(x) = A_x \sin \frac{n_x \pi x}{a}$$

Normalization

$$\int_0^a |X(x)|^2 dx = 1 \quad (\text{or}) \quad \int_0^a A_x^2 \sin^2 \frac{n_x^2 \pi x}{a} dx = 1$$

$$X(x) = \sqrt{\frac{2}{a}} \sin \frac{n_x \pi x}{a} \quad Y(y) = \sqrt{\frac{2}{b}} \sin \frac{n_y \pi y}{b} \quad Z(z) = \sqrt{\frac{2}{c}} \sin \frac{n_z \pi z}{c}$$

Eigenfunction:-

$$\psi_{n_x n_y n_z} = \frac{2\sqrt{2}}{\sqrt{abc}} \sin \frac{n_x \pi x}{a} \sin \frac{n_y \pi y}{b} \sin \frac{n_z \pi z}{c}$$

Eigen Values:-

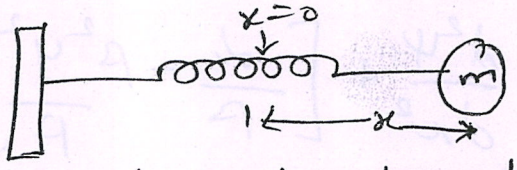
$$E_{n_x n_y n_z} = \frac{h^2}{8m} \left[\frac{n_x^2}{a^2} + \frac{n_y^2}{b^2} + \frac{n_z^2}{c^2} \right]$$

14) (a) Obtain the energy values and eigenfunctions of a harmonic oscillator

In quantum harmonic oscillator the molecular atomic vibrations are quantized and the allowed energies of a quantum harmonic oscillator are discrete and evenly spaced

Derivation / Proof

Let us consider a particle of mass 'm' executing simple harmonic motion along the 'x' direction



As the particle is displaced through a distance 'x' from its equilibrium position ($x=0$) a restoring force (F) acts so as to return the particle again its equilibrium position $F = -kx$

Schrodinger time independent wave eqn:

$$\frac{d^2\psi}{dx^2} + \frac{2m}{\hbar^2}(E-V)\psi = 0$$

P.E of the particle $V = \frac{1}{2}kx^2$

$$\therefore \frac{d^2\psi}{dx^2} + \frac{2m}{\hbar^2}\left(E - \frac{1}{2}kx^2\right)\psi = 0$$

$$\frac{d^2\psi}{dx^2} + \frac{8\pi^2 m}{h^2}\left[E - \frac{1}{2}kx^2\right]\psi = 0$$

$$\frac{d^2\psi}{dx^2} + \left[\frac{8\pi^2 mE}{h^2} + \frac{4\pi^2 m}{h^2}kx^2\right]\psi = 0$$

$$\frac{8\pi^2 mE}{h^2} = \alpha^2 \qquad \left[\frac{4\pi^2 mk}{h^2}\right]^{1/2} = \beta$$

$$\frac{d^2\psi}{dx^2} + \left[\alpha^2 - \beta^2 x^2\right]\psi = 0$$

$y = x\sqrt{\beta} \quad x = \frac{y}{\beta} \quad x^2 = \frac{y^2}{\beta} \quad \frac{dy}{dx} = \sqrt{\beta}$

$\frac{d\psi}{dx}$ as $\frac{d\psi}{dx} = \frac{d\psi}{dy}\frac{dy}{dx}$

$$\frac{d\psi}{dx} = \frac{d\psi}{dy}\sqrt{\beta}$$

$$\frac{d^2\psi}{dx^2} = \frac{d^2\psi}{dy^2}\beta.$$

$$\therefore \beta\frac{d^2\psi}{dx^2} + \left[\alpha^2 - \beta^2 x^2\right]\psi = 0$$

$$\frac{\beta}{\beta}\frac{d^2\psi}{dx^2} + \left[\frac{\alpha}{\beta} - \frac{\beta^2 y^2}{\beta}\right]\psi = 0$$

$$\frac{d^2\psi}{dx^2} + \left[\frac{\alpha}{\beta} - y^2\right]\psi = 0$$

$$\psi = f(x)e^{-y^2/2}$$

By introducing ψ of equ (12) in equ (4)

$$\frac{d^2f}{dy^2} - 2y\frac{df}{dy} + \left[\frac{\alpha}{\beta} - 1\right] f = 0 \quad \text{——(13)}$$

$\frac{\alpha}{\beta} - 1 = 2n$

∴ Equ (13) becomes

$$\frac{d^2f}{dy^2} - 2y\frac{df}{dy} + 2nf = 0 \quad \text{——(14)}$$

This is the standard mathematical equ/. which is similar to the Hermite's equ/.

i.e., $$\frac{d^2H}{dy^2} - 2y\frac{dH}{dy} + 2nH = 0 \quad \text{——(15)}$$

∴ The solution for equ (15) are called Hermite polynomials, which is similar to equ (12), i.e.,

$$\psi_n(y) = N H_n(y) e^{-y^2/2} \quad \text{——(16)}$$

Where 'N' is the Normalization constant.

∴ Equ (16) represents the Eigen fun/. of the harmonic oscillator.

Energy Eigen Values

The energy eigen values (Permitted energy values) shall be obtained as follows:

We know $\frac{\alpha}{\beta} - 1 = 2n$ (or)

$$\frac{\alpha}{\beta} = 2n+1$$

$$\alpha = (2n+1)\beta \quad \text{——(17)}$$

∴ $\alpha = \frac{8\pi^2 mE}{h^2}$ & $\beta = \left[\frac{4\pi^2 mk}{h^2}\right]^{1/2}$, we can write equ (17) as

$$\frac{8\pi^2 mE}{h^2} = 2n+1 \left[\frac{4\pi^2 mk}{h^2}\right]^{1/2}$$

(or) $$E = \frac{h^2}{8\pi^2 m}(2n+1)\left[\frac{4\pi^2 mk}{h^2}\right]^{1/2}$$

(or) $E = \frac{h}{4\pi}(2n+1)\frac{[mk]^{1/2}}{m}$

(or) $E = 2\left[n+\frac{1}{2}\right]\frac{\hbar}{4\pi}\left[\frac{k}{m}\right]^{1/2}$ $\because \left[\frac{m^{1/2}}{m} = \frac{\sqrt{m}}{\sqrt{m}\sqrt{m}} = \frac{1}{\sqrt{m}}\right]$

$\therefore E = \left[n+\frac{1}{2}\right]\frac{h}{2\pi}\sqrt{\frac{k}{m}}$ ——— (18)

we know that, for hamonico-scillator, the frequency of oscillation

$$\nu = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$$

Equ (18) becomes

$$E = \left[n+\frac{1}{2}\right]h\nu$$

Thus, the energy of the harmonic oscillator is quantised in steps of $h\nu$

$\therefore E_n = \left[n+\frac{1}{2}\right]h\nu$ where $n = 0, 1, 2, 3$ ——— (19)

where eq^{n} (19) represents the energy Eigen value for a harmonic oscillator

Eigen values plot.

Energy Eigen values for various values of 'n' shall be obtained as follows:

(i) when $n=0$ equ (19) becomes

$$E_0 = \frac{1}{2}h\nu \quad \text{——— (20)}$$

Equ (20) represents the lowest value of energy, that the oscillator can have and is called zero point energy

(ii) when $n=1$ equ (19) becomes

$$E_1 = \left[1+\frac{1}{2}\right]h\nu \text{ (or) } E_1 = \frac{3}{2}h\nu$$

(iii) when $n=2$,

$$E_2 = \left[2+\frac{1}{2}\right]h\nu \text{ (or) } E_2 = \frac{5}{2}h\nu$$

b) Describe the principle construction and working of a scanning tunneling microscope

Introduction :- In 1980, Gerd Binning and Heinrich Rohrer Invented a new type of microscope called scanning tunneling microscope.

Principle

Tunneling of electron between the sharp metallic tip of the probe and the surface of a sample

Here, constant tunnelling current is maintained by adjusting the distance between the tip and the sample, with an air gap for e^- to tunnel. In a similar way the tip is used to scan atom by atom and line by line of the sample and the topography of the sample is recorded in the computer

Construction

i) The tip is tapered down to a single atom, so that it can follow even a small change in the contours of the sample, tip is connected to scanner

(ii) The sample for which the image has to be recorded is kept below the tip of the probe at a particular distance.

(iii) The computer is also used to record the path of the probe and the topography of the sample in a grey scale

Working

1. Circuit is switched ON and necessary biasing voltage is given to the probe

ii) The tunneling current flows through the circuit only if the tip is in contact with the sample through the small air gap at a distance 'd' between them.

iii) The current produced is amplified and

iv) For maintaing constant current, the distance (d) between the tip and the sample should be continously adjusted.

v) The height fluctuations (d) between the tip and the sample is accurately recorded.

vi) The tip is scanned atom by atom and line by line of the sample and the topography of the sample is recorded in the computer

Advantages

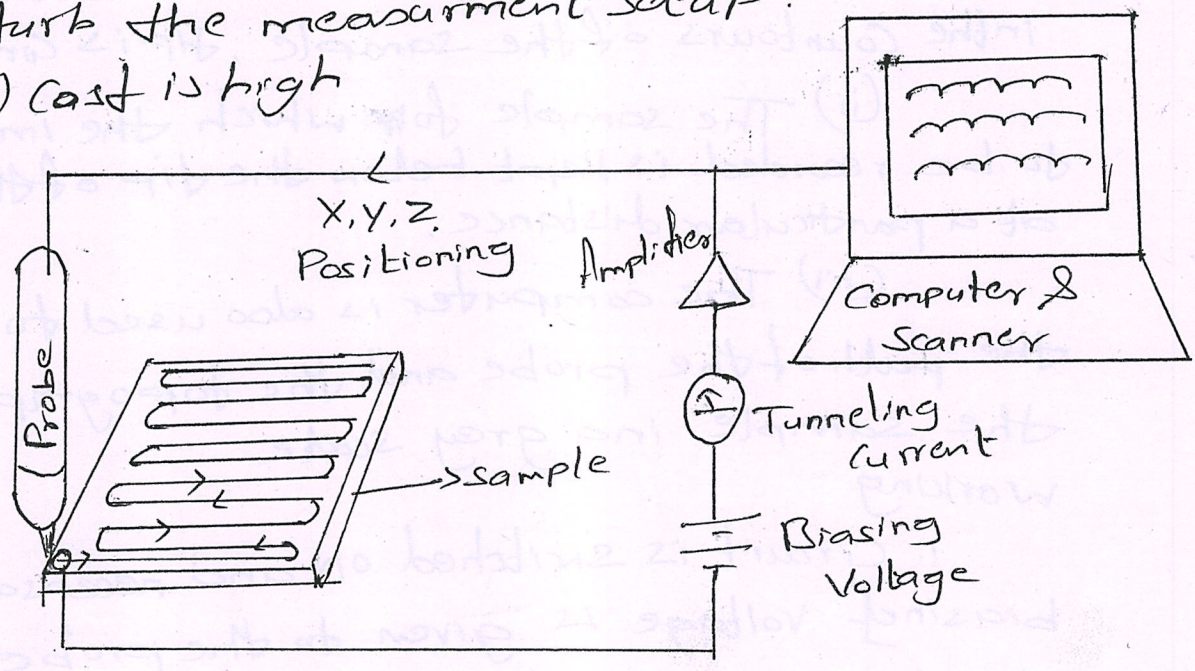
i) It can scan, the positions & topography atom by atom (or) even electrons

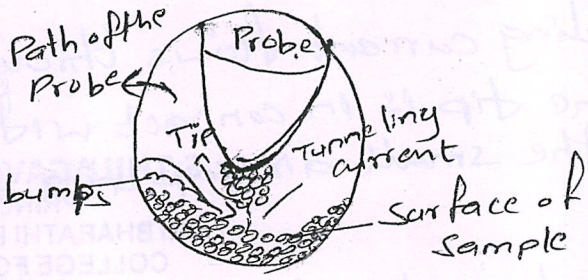
ii) Very accurate measurement shall be obtained

Disadvantages

i) Even a very small sound (or) vibrations will disturb the measurment setup.

ii) Cost is high





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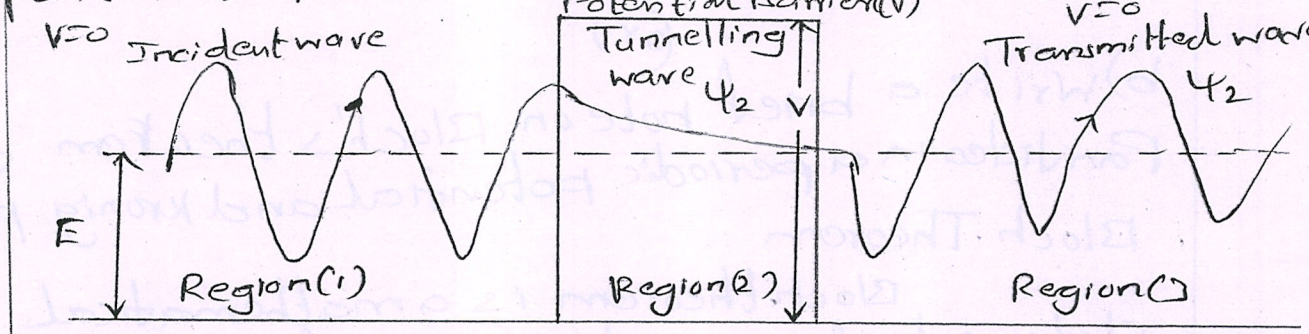
15) (a) Describe the barrier penetration process and quantum tunneling of an electron

Barrier penetration

If a particle with energy 'E' is incident on a thin energy barrier of height 'V' greater than 'E', then there is a finite probability of the particle to penetrate the barrier → barrier penetration



For region :-1 when $x<0$; $V=0$

For region 2 when $0<x<l$; $V=V$

for region 3 when $x>l$; $V=0$

For region 1 $\frac{d^2\psi_1}{dx^2}+\frac{2m}{\hbar^2}E\psi_1=0$ $\frac{d^2\psi_1}{dx^2}+\alpha^2\psi_1=0$

For region 2 $\frac{d^2\psi_2}{dx^2}+\frac{2m}{\hbar^2}[V-E]\psi_2=0$ $\frac{d^2\psi_2}{dx^2}-\beta^2\psi_2=0$

For region 3 $\frac{d^2\psi_3}{dx^2}+\frac{2m}{\hbar^2}E\psi_3=0$ $\frac{d^2\psi_3}{dx^2}+\alpha^2\psi_3=0$

Region-1 ψ_1(Incident) $=Ae^{i\alpha x}$ A - amplitude of Incident wave

Region-2 ψ_1(Reflected) $=Be^{-i\alpha x}$

$\psi_2=Fe^{\beta x}+Ge^{-\beta x}$ $\beta=\frac{\sqrt{2m(V-E)}}{\hbar}$

Region-3 ψ_3(Transmitted) $=Ce^{i\alpha x}$

ψ_3(Reflected) $=0$

Transmission co-efficient

The transmission coeff: $T = \frac{|C|^2}{|A|^2} = \frac{4\sqrt{E}\sqrt{E-V}}{\left[\sqrt{E}+\sqrt{E-V}\right]^2}$

Reflection co-efficient

$$R = \frac{|B|^2}{|A|^2} = \left[\frac{\sqrt{E}-\sqrt{E-V}}{\sqrt{E}+\sqrt{E-V}}\right]^2$$

(or)

b) Write a brief note on Bloch's theorem for Particles in a periodic potential and kronig penney model.

Bloch Theorem

Bloch theorem is a mathematical statement of an electron wave fun/. moving in a perfectly periodic potential

$$\frac{d^2\psi}{dx^2} + \frac{2m}{\hbar^2}\left[E - V(x)\right]\psi(x) = 0$$

$V(x) = V(x+a)$, $\psi(x) = e^{ikx} u_k(x)$, $u_k(x) = u_k(x+a)$

$\therefore \psi(x+a) = e^{ik(x+a)} u_k(x+a)$

$$\boxed{\psi(x) = \psi(x+a)}$$

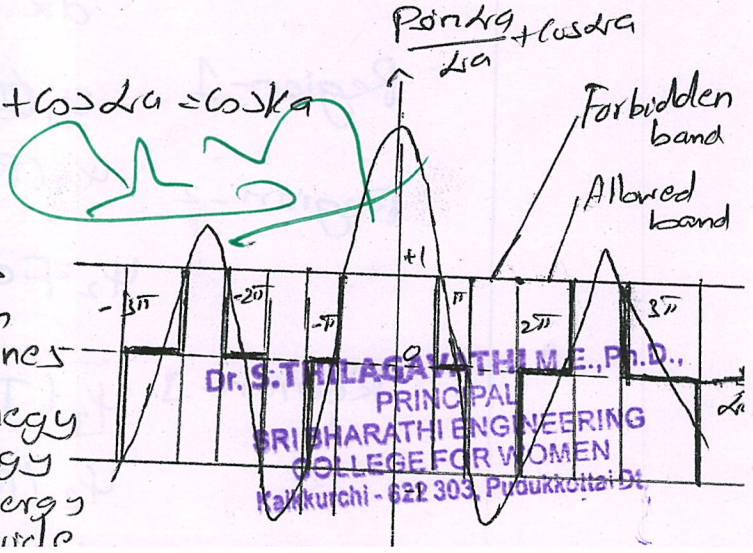
Kronig-Penney model.

Region i) $0 < x < a$ $\quad \frac{d^2\psi}{dx^2} + \frac{2m}{\hbar^2}(E-0)\psi = 0$

Region ii) $-b < x < a$ $\quad \frac{d^2\psi}{dx^2} + \frac{2m}{\hbar^2}(E-V_0)\psi = 0$

$\psi(x) = e^{ikx} u_k(x)$

$$\frac{P \sin\alpha a}{\alpha a} + \cos\beta a = \cos ka$$



Conclussions

(i) The energy spectrum allowed energy bands is horizontal lines & forbidden gaps denoted by dotted lines

ii) P is increased binding energy increased so allowed energy become narrow -> binding energy

iii) P decreased -> binding energy

Part-B (5×16=80 marks)

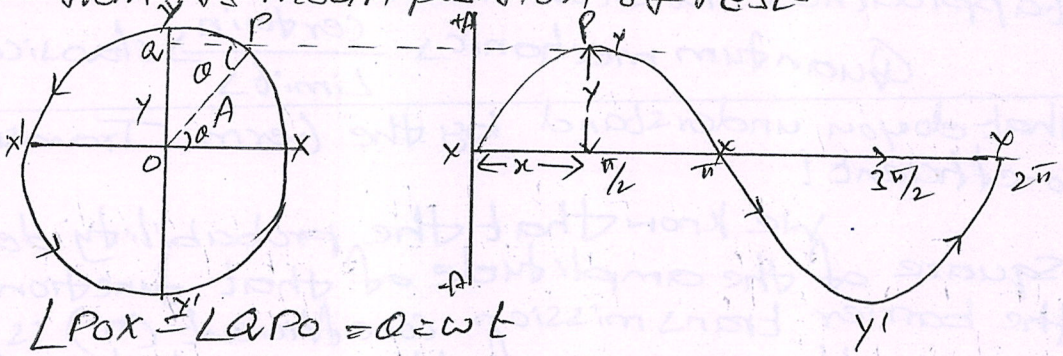
11) a) What is meant by Simple harmonic motion? Arrive at the differential equation for a particle executing SHM

Definition

Simple Harmonic motion is the motion in which the acceleration of a body is directly proportional to the displacement from a fixed point and is always directed towards the fixed point (or) equilibrium position

Differential Equ: for a Simple Harmonic Motion

(i) Displacement:- This displacement of Vibrating particle at any instant is defined as the distance moved by the particle from its mean position of rest



$\angle POX = \angle QPO = \theta = \omega t$

$Y = A \sin \omega t$

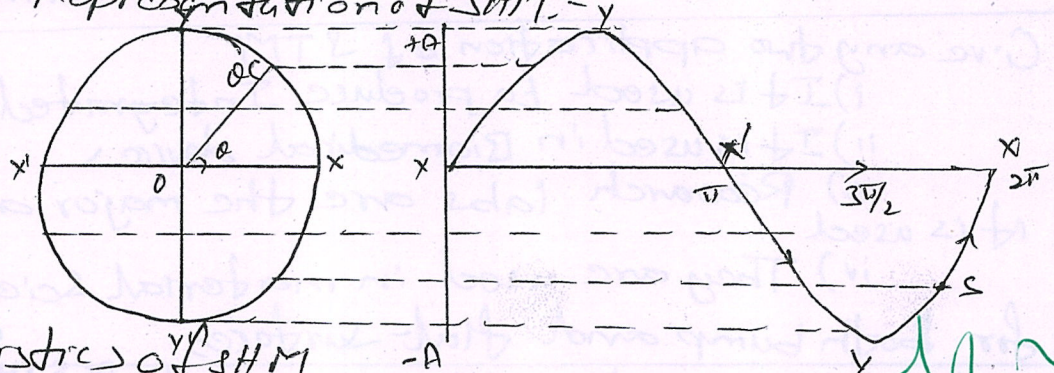
ii) Velocity :- Velocity of the Vibrating particle is defined as the rate of change of displacement.

$V = A\omega \cos \omega t$

iii) Acceleration:- Acceleration of the Vibrating particle is defined as the rate of change of Velocity

$$\frac{d^2y}{dt^2} = -\omega^2 y$$

Graphical Representation of SHM:-



Characteristics of SHM

(i) The motion of the particle is periodic

ii) The motion of the particle is along a straight line about its mean position

iii) Acceleration of the particle is proportional to that

6) What is meant by correspondance principle? Give examples

Correspondance principle

According to correspondance principle "For large value of principal quantum number 'n', the quantum mechanics merges with classical mechanics", i.e., the classical theory and quantum theory will have same results

In other words we can say that the quantum mechanics under certain limits like high energy (or) high mass (or) high length (or) higher quantum numbers etc. it approaches classical mechanics

Quantum mechanics $\xrightarrow[\text{Limits}]{\text{certain}}$ classical mechanics

7) What do you understand by the term Transmission co-efficient?

We know that the probability density is the square of the amplitude of that function. Therefore the barrier transmission co-efficient (T) is the ratio between the square of the amplitudes of the transmitted wave $|C|^2$ and the incident wave $|A|^2$

$\therefore$ The transmission coeffi: $= T = \frac{|C|^2}{|A|^2}$

it is called as "Penetrability" of the barrier

8) What is mean by Quantum tunneling?

In quantum mechanics a particle having lesser energy (E) than the barrier potential (V) can easily cross over the potential barrier having a finite width 'l' even without climbing over the barrier by tunneling through the barrier. This process is called Tunnelling

9) Give any two application of STM

i) It is used to produce Integrated Circuit

ii) It is used in Biomedical devices

iii) Research labs are the major areas in which it is used

iv) They are used in material science studies for both bump and flat surfaces.

10) What is the principle used in Resonant diode?

Resonant tunneling diode works on the principle of tunneling effect, in which the charge carriers cross the energy barrier even with lesser energy than the barrier potential, Quantum mechanically. The Probability

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Internal Assessment Test Answer Book

Name	R. Manjula			**Year/ Semester**	I/I
Reg No.	912622104033	**Date/Session**	24.02.23 AN	**Department**	CSE
Course code	PH3151	**Course Title**	Engineering Physics.		
Cycle Test (Put a tick mark)		**CT 1** ☐	**CT 2** ☑	**CT 3** ☐	**Model** ☐
Name and Signature of the Invigilator with date		S. Raj 24/2/23	S. RENUGADEVI		

Instruction to the Student: Put tick mark to the question attended in the column against question.

Part A			Part B / Part C						Total Marks
Q. No.	✓	Marks	Q. NO.	✓	a Marks	✓	b Marks		
1	✓	2	11	✓	14				14
2	✓	2	12			✓	15		15
3	✓	2	13	✓	14				14
4	✓	2	14			✓	14		14
5	✓	2	15	✓	15				15
6	✓	2	16						
7	✓	2					Grand Total		72
8	✓	1	91						
9	✓	2	Grand Total						
10	✓	2							
Total		19							

R. Sathya 25/2/23
[R. SARATHA]
Name and Signature of the Examiner with date

To be filled by the examiner							
Course Outcomes	1	2	3	4	5	6	Total
Marks allotted			20		40	40	100
Marks Obtained			18		37	36	91

IQAC Audit - Remarks

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B Priya 23/3/23
Name and Signature of the IQAC member
(Mrs. B. PRIYA)

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ACADEMIC YEAR 2022-2023 -- ODD SEMESTER

STUDENTS MARK STATEMENT– CO BASED

SECTION –A

CYCLE TEST-II

PROGRAM : B.E / CSE
YEAR/SEM : I/II
SUBJECT CODE & TITLE : PH3151 & ENGINEERING PHYSICS
DATE : 24.02.2023

SI .NO	REG.NO	NAME	CO3 (20)	CO5 (40)	CO6 (40)	MAXIMUM MARKS 100
1	**912622104001**	**ABINAYA.E**	**06**	**12**	**11**	**29**
2	**912622104002**	**ABIRAMI.C**	**08**	**18**	**14**	**30**
3	912622104003	AJITHA.M	10	18	28	56
4	**912622104004**	**AKSHAYA.M**	**08**	**09**	**18**	**35**
5	912622104005	ANANTHI.K	10	32	26	68
6	912622104006	ASIYA.A	09	19	24	52
7	912622104007	ATCHAYA.B	15	33	36	84
8	912622104008	BARJUSHFATHIMA.P	10	29	24	63
9	**912622104009**	**BAVADHARANI.S**	**05**	**11**	**09**	**25**
10	912622104010	DEVADHARSHINI.P	12	22	29	63
11	912622104011	DEVI SRI.R	10	23	25	58
12	**912622104012**	**DHANALAKSHMI.G**	**05**	**06**	**07**	**18**
13	912622104013	DHANASRI.E	14	27	33	74
14	912622104014	FEMINA.M	09	22	23	54
15	912622104015	GOMATHI.P	12	19	20	51
16	912622104016	GOPIKA SRI.Y	11	23	25	59
17	912622104017	INBA.M	10	21	23	54
18	912622104018	ISHWARYA.S	12	23	25	61
19	912622104019	JAMEELA.M.A	19	37	34	90
20	912622104020	JEEVITHA.S	14	32	36	82
21	912622104021	KAVIPRIYA.S	13	22	23	58
22	912622104022	KAVIYAPRIYA.P	16	36	30	82
23	912622104023	KAVIYARASI.M	14	25	28	67
24	912622104024	KEERTHANA.S**(9.10.2004)**	13	21	26	60
25	912622104025	KEERTHANA.S(29.8.2005)	12	19	19	50
26	912622104026	KRISHNAVENI.C	09	26	15	50
27	912622104027	LAKSHMI PRIYA.D	16	29	09	54
28	912622104028	LALITHAMBIGAI.K	16	34	36	86
29	912622104029	LATHIKA.G	05	20	32	57
30	**912622104030**	**MADHUMITHRA.D**	**08**	**11**	**15**	**34**
31	912622104031	MAHALAKSHMI.K	14	26	33	73
32	912622104032	MANIMEGALAI.V	11	24	33	68

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33	912622104033	MANJULA.R	17	36	38	91
34	**912622104034**	**MEENAKUMARI.K**	**06**	**12**	**09**	**27**
35	**912622104035**	**NANDHINI PRIYA.N**	**00**	**11**	**06**	**17**
36	**912622104036**	**POORANI.S**	**06**	**09**	**18**	**33**
37	912622104037	PRADEEPA.P	11	18	33	62
38	**912622104038**	**PRIYADARSHINI.K**	01	06	02	**09**
39	912622104039	PRIYADHARSHINI.D	17	22	37	76
40	**912622104040**	**ROHINI.N**	**11**	**09**	**02**	**22**

MARK RANGE:

<20	20-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
03	05	03	02	11	07	03	05	01

Total Number of Present	**40**
Total Number of Absent	**NIL**
Total Number of Candidates Pass	**29**
Total Number of Candidates Fail	**11**
Pass Percentage	**72.5%**

Signature Of the Faculty Incharge

HOD /S&H

28/2/23

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COLLEGE FOR WOMEN
KAIKKURICHI
PUDUKKOTTAI - 622 303.

Principal

28/2/23

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KAIKKURICHI - 622 303.
PUDUKKOTTAI DISTRICT

Dr. S.THILAGAVATHI M.E.,Ph.D.,
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Kaikkurichi, Pudukkottai, Tamil Nadu – 622 303, India
DEPARTMENT OF SCIENCE AND HUMANITIES

ROOT CAUSE ANALYSIS

Name of the Faculty : **Mrs R.Saratha** | **Course Code & Name: PH3151& Engineering Physics**
Degree & Program : **B.E & CSE** | **Semester** : **I**
Cycle Test : **I/II** | **Month & Year** : **February & 2023**
Target : **100%** | **Achieved** : **72.5 %**

S.NO	REG NO	NAME OF THE STUDENT	CAUSES FOR FAILURE	CORRECTIVE ACTION TAKEN
1.	912622104001	ABINAYA.E	Confussed in derivation Part	Advise the students to Practice on derivation Part
2.	912622104002	ABIRAMI.C	Lack of Practise in derivation Part	During office hours test Conducted
3.	912622104004	AKSHAYA.M	Not study well	Home test given
4.	912622104009	BAVADHARANI.S	Lack of Revision in cycle test Syllabus	Instructed to Revise the syllabus
5.	912622104012	DHANALAKSHMI.G	Confused in derivation Part	Advise the Students to give more Practice
6.	912622104030	MADHUMITHRA.D	Not Prepared well	Instructed to Prepare well
7.	912622104034	MEENAKUMARI.K	Careless mistake	Home test given
8.	912622104035	NANDHINI PRIYA.N	Poor Concentration on cycle test Syllabus	Instruct the students to Concentrate on derivation Part
9.	912622104036	POORANI.S	Not study well	Counselling given to attend test

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10.	912622104038	PRIYADARSHINI.K	Lack of Practise on derivation Part	Instruct the students to Prepare well
11.	912622104040	ROHINI.N	Confussed in applying the derivation Part	Instructed to study well

Signature of the Faculty Member

Signature of the HoD/S&H

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CIRCULAR Date: 02.03.2023

Retest for Second cycle test will be conducted from **04.03.2023 to 14.03.2023** for the I semester (I year) students.

The following instructions are to be followed by the faculty members.

- Total marks for which the question paper to be set will be for 50 marks. **(PART A** 9X2=18 **PART B** 2X16=32 Only for Mathematics Subject) **and (PART A** 5X2=10 **PART B** 2X13=26 & **PART C** 1X14=14)
- It is the responsibility of the **question paper** setter to take the Xerox copies of the required number of question papers.
- Concerned Faculty members are requested to conduct the examination as per the scheduled and handover the valued answer scripts to the students on or before **15.03.2023**.

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02/03/23

Cc:

- All HoD's CIVIL/CSE/EEE/ECE
- All faculty
- IQAC Co-ordinator
- Exam cell
- Office file

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CIRCULAR

Date: 02.03.2023

Retest for Second cycle test will be conducted from **04.03.2023 to 14.03.2023** for the **I semester** (I year) B.E students for **50 marks** as per the time table given below. Students are directed to prepare well and score good marks.

Date	04.00 pm -05.30 pm
04.03.2023	**CY3151**-Engineering Chemistry
06.03.2023	**PH3151**-Engineering Physics
10.03.2023	**GE3151**-Problem Solving and Python Programming
11.03.2023	**MA3151**-Matrices and Calculus
14.03.2023	**HS3151**-Professional English I

PRINCIPAL

02/03/23

Cc:

- All I year B.E Classes
- All faculty
- IQAC Co-ordinator
- Exam cell
- Notice Board
- Office file

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Register Number: | | | | | | | | | | | | |

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Cycle test – II (Retest)			Date/Session	06.03.2023 /AN	Marks	50
Course code	PH3151	Course Title	ENGINEERING PHYSICS			
Regulation	2021	Duration	1.30 hours	Academic Year	2022 - 2023	
Year	I	Semester	I	Department	All Branches	

COURSE OUTCOMES

C103.1	Acknowledge the importance of mechanics.
C103.2	Express their knowledge in electromagnetic waves.
C103.3	Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
C103.4	Establish a strong foundational knowledge in fiber optics and laser
C103.5	Comprehend the importance of quantum physics.
C103.6	Comprehend and apply quantum mechanical principles towards the formation of energy bands.

Q.No.	Question	CO	BTS
	PART A (Answer all the Questions 9 x 2 = 18 Marks)		
1	State the law of refraction.	C103.4	K2
2	Define Damped oscillations	C103.3	K1
3	What are the properties of matter waves?	C103.5	K2
4	State de-Broglie's hypothesis.	C103.5	K2
5	What is meant by Degenerate and non- degenerate.?	C103.5	K2
6	What is meant by correspondence principle? Give example.	C103.5	K2
7	What do you understand the term 'Wave function".	C103.5	K2
8	What do you understand by the term Transmission Co-efficient	C103.6	K2
9	State Bloch's theorem.	C103.6	K2
	PART B (Answer all the Questions 2 x 16 = 32 Marks)		
11a	Describe an experiment to determine the thickness of a thin material by forming an Air Wedge	C103.4	K2
	OR		
11b	Explain the formation of standing waves at various interval of time	C103.4	K2
12a	Derive the eigen values for a particle in a finite square well potential	C103.6	K3
	OR		
12b	Write a brief note on Bloch's theorem for particles in a periodic potential and Kronig penney model	C103.6	K3

Course Faculty
R. SARATHA
(Name /Sign / Date)

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HoD
R. SARATHA
(Name /Sign / Date)

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Kaikurichi,Pudukkottai -622 303

ACADEMIC YEAR 2022-2023 -- ODD SEMESTER

ATTENDANCE SHEET FOR RETEST

SECTION -A

RETEST FOR CYCLE TEST-II

PROGRAM : B.E / CSE
YEAR/SEM : I/I
SUBJECT CODE & TITLE : PH3151 – ENGINEERING PHYSICS
DATE : 06.03.2023

SI .NO	REG.NO	NAME	SIGNATURE
1	912622104001	ABINAYA.E	E. Abinaya
2	912622104002	ABIRAMI.C	Abirami.C
3	912622104004	AKSHAYA.M	Akshaya.M
4	912622104009	BAVADHARANI.S	Bavadharani
5	912622104012	DHANALAKSHMI.G	Dhanalakshmi.G
6	912622104030	MADHUMITHRA.D	Madhumithra.D
7	912622104034	MEENAKUMARI.K	K. Meena
8	912622104035	NANDHINI PRIYA.N	Nandhinipriya.N
9	912622104036	POORANI.S	Pooran.S
10	912622104038	PRIYADARSHINI.K	K. Priy
11	912622104040	ROHINI.N	Rohini.N

R. Sch

Signature of the Faculty Incharge

R. Sch

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ACADEMIC YEAR 2022-2023 -- ODD SEMESTER

STUDENTS MARK STATEMENT– CO BASED

SECTION -A

RETEST FOR CYCLE TEST-II

PROGRAM : B.E / CSE
YEAR/SEM : I/I
SUBJECT CODE & TITLE : PH3151 & ENGINEERING PHYSICS
DATE : 06.03.2023

SI .NO	REG.NO	NAME	CO4 (20)	CO5 (10	CO5 (20)	Marks 50	MAXIMUM MARKS 100
1	912622104001	ABINAYA.E	16	5	14	35	70
2	912622104002	ABIRAMI.C	14	8	15	37	74
3	912622104004	AKSHAYA.M	15	8	16	39	78
4	912622104009	BAVADHARANI.S	14	8	16	38	76
5	912622104012	DHANALAKSHMI.G	14	7	15	36	72
6	912622104030	MADHUMITHRA.D	16	7	15	38	76
7	912622104034	MEENAKUMARI.K	14	7	15	37	74
8	912622104035	NANDHINI PRIYA.N	13	6	14	33	66
9	912622104036	POORANI.S	16	7	13	36	72
10	912622104038	PRIYADARSHINI.K	14	4	13	31	62
11	912622104040	ROHINI.N	14	8	15	37	74

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DEPARTMENT OF SCIENCE AND HUMANITIES

ACADEMIC YEAR 2022 - 2023 (ODD SEMESTER)

FINAL INTERNAL STUDENTS MARK STATEMENT(Out of 40)

SUBJECT CODE &TITLE: PH3151 & ENGINEERING PHYSICS
YEAR/SEM : I/I
SECTION/BRANCH : A/ CSE

SI .NO	REG.NO	NAME	TOTAL (40)
1	912622104001	ABINAYA.E	30
2	912622104002	ABIRAMI.C	33
3	912622104003	AJITHA.M	30
4	912622104004	AKSHAYA.M	31
5	912622104005	ANANTHI.K	37
6	912622104006	ASIYA.A	32
7	912622104007	ATCHAYA.B	38
8	912622104008	BARJUSHFATHIMA.P	35
9	912622104009	BAVADHARANI.S	32
10	912622104010	DEVADHARSHINI.P	34
11	912622104011	DEVI SRI.R	37
12	912622104012	DHANALAKSHMI.G	32
13	912622104013	DHANASRI.E	36
14	912622104014	FEMINA.M	34
15	912622104015	GOMATHI.P	32
16	912622104016	GOPIKA SRI.Y	33
17	912622104017	INBA.M	32

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18	912622104018	ISHWARYA.S	35
19	912622104019	JAMEELA.M.A	37
20	912622104020	JEEVITHA.S	34
21	912622104021	KAVIPRIYA.S	34
22	912622104022	KAVIYAPRIYA.P	39
23	912622104023	KAVIYARASI.M	38
24	912622104024	KEERTHANA.S	36
25	912622104025	KEERTHANA.S	35
26	912622104026	KRISHNAVENI.C	31
27	912622104027	LAKSHMI PRIYA.D	33
28	912622104028	LALITHAMBIGAI.K	37
29	912622104029	LATHIKA.G	34
30	912622104030	MADHUMITHRA.D	31
31	912622104031	MAHALAKSHMI.K	35
32	912622104032	MANIMEGALAI.V	36
33	912622104033	MANJULA.R	38
34	912622104034	MEENAKUMARI.K	31
35	912622104035	NANDHINI PRIYA.N	32
36	912622104036	POORANI.S	32
37	912622104037	PRADEEPA.P	33
39	912622104038	PRIYADARSHINI.K	38
38	912622104039	PRIYADHARSHINI.D	36
40	912622104040	ROHINI.N	30

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DEPARTMENT OF SCIENCE AND HUMANITIES

ACADEMIC YEAR 2022 – 2023 (ODD SEMESTER)

ANNA UNIVERSITY RESULT STATEMENT NOV/DEC-2022

SUBJECT CODE &TITLE : PH3151 & Engineering Physics
YEAR/SEM : I/I
SECTION/BRANCH : A/CSE

S.NO	REG NO	STUDENT NAME	GRADE
1.	912622104001	ABINAYA.E	U
2.	912622104002	ABIRAMI.C	B+
3.	912622104003	AJITHA.M	U
4.	912622104004	AKSHAYA.M	U
5.	912622104005	ANANTHI.K	A
6.	912622104006	ASIYA.A	U
7.	912622104007	ATCHAYA.B	B+
8.	912622104008	BARJUSHFATHIMA.P	B+
9.	912622104009	BAVADHARANI.S	U
10.	912622104010	DEVADHARSHINI.P	B+
11.	912622104011	DEVI SRI.R	A
12.	912622104012	DHANALAKSHMI.G	U
13.	912622104013	DHANASRI.E	B+
14.	912622104014	FEMINA.M	B+
15.	912622104015	GOMATHI.P	U
16.	912622104016	GOPIKA SRI.Y	B
17.	912622104017	INBA.M	U
18.	912622104018	ISHWARYA.S	U

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19.	912622104019	JAMEELA.M.A	B+
20.	912622104020	JEEVITHA.S	B+
21.	912622104021	KAVIPRIYA.S	U
22.	912622104022	KAVIYAPRIYA.P	B+
23.	912622104023	KAVIYARASI.M	U
24.	912622104024	KEERTHANA.S	U
25.	912622104025	KEERTHANA.S	B+
26.	912622104026	KRISHNAVENI.C	U
27.	912622104027	LAKSHMI PRIYA.D	U
28.	912622104028	LALITHAMBIGAI.K	B+
29.	912622104029	LATHIKA.G	U
30.	912622104030	MADHUMITHRA.D	U
31.	912622104031	MAHALAKSHMI.K	U
32.	912622104032	MANIMEGALAI.V	A
33.	912622104033	MANJULA.R	A
34.	912622104034	MEENAKUMARI.K	U
35.	912622104035	NANDHINI PRIYA.N	U
36.	912622104036	POORANI.S	U
37.	912622104037	PRADEEPA.P	U
38.	912622104038	PRIYADARSHINI.K	B+
39.	912622104039	PRIYADHARSHINI.D	U
40.	912622104040	ROHINI.N	U

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SRI BHARATHI ENGINEERING COLLEGE FOR WOMEN, KAIKKURICHI

Department of Science and Humanities

Internal Assessment -Attainment of Course Outcomes (Through Direct Assessment)

ACADEMIC YEAR - 2022 - 23		BATCH	2022 - 2026					
COURSE CODE/TITLE	PH3151 (C103) / ENGINEERING PHYSICS	COURSE OUTCOME	1	2	3	4	5	6
YEAR/SEM	I/ I	TARGET(%)	65	65	65	65	65	65
COURSE COORDINATOR	R.SARATHA	TOTAL STRENGTH	40					

ATTAINMENT LEVEL	Level	Range
	1	UP TO 60% of the students scored more than target
	2	61 - 79% of the students scored more than target
	3	80% & ABOVE of the students scored more than target

S.NO	REG NO	NAME OF THE STUDENT	IAT 1 - MARKS ALLOTED						IAT 2 - MARKS ALLOTED						IAT 3 - MARKS ALLOTED						Assignment / Mini Project /Tutorial / Seminar						TOTAL COURSE OUTCOME					
			C1	C2	C3	C4	C5	C6	C1	C2	C3	C4	C5	C6	C1	C2	C3	C4	C5	C6	C1	C2	C3	C4	C5	C6	C1	C2	C3	C4	C5	C6
			40	30	30							40	30	30								10	10		10	10	40	40	40	40	40	40
1	912622104001	ABINAYA.E	30	23	23							29	23	23								9	8		9	8	30	32	31	29	32	31
2	912622104002	ABIRAMI.C	34	25	25							29	23	23								8	9		7	7	34	33	34	29	30	30
3	912622104003	AJITHA.M	28	21	21							32	24	24								9	8		8	8	28	30	29	32	32	32
4	912622104004	AKSHAYA.M	32	23	23							31	24	24								8	8		8	8	32	31	31	31	32	32
5	912622104005	ANANTHI.K	37	27	27							37	29	29								8	8		8	9	37	35	35	37	37	38
6	912622104006	ASIYA.A	31	23	23							34	25	25								8	7		9	8	38	37	36	38	38	37
7	912622104007	ATCHAYA.B	38	29	29							38	29	29								8	9		9	8	33	34	35	36	35	34
8	912622104008	BARJUSHFATHIMA.P	33	26	26							36	26	26								8	8		8	8	32	31	31	33	33	33
9	912622104009	BAVADHARANI.S	32	23	23							33	25	25								9	9		9	9	32	34	34	34	35	35
10	912622104010	DEVADHARSHINI.P	32	25	25							34	26	26								7	8		8	9	36	35	36	37	35	36
11	912622104011	DEVI SRI.R	36	28	28							37	27	27								9	8		9	8	31	33	32	32	33	32
12	912622104012	DHANALAKSHMI.G	31	24	24							32	24	24								8	9		8	9	37	35	36	37	35	36
13	912622104013	DHANASRI.E	37	27	27							37	27	27								9	9		9	9	32	34	34	36	36	36
14	912622104014	FEMINA.M	32	25	25							36	27	27								7	8		7	8	32	31	32	33	31	32
15	912622104015	GOMATHI.P	32	24	24							33	24	24								8	8		8	9	33	32	32	34	33	34
16	912622104016	GOPIKA SRI.Y	33	24	24							34	25	25								8	7		8	9	31	32	31	33	33	34

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17	912622104017	INBA.M	31	24	24							33	25	25								8	7		7	7	33	34	33	36	33	33
18	912622104018	ISHWARYA.S	33	26	26							36	26	26								7	7		9	8	35	33	33	38	38	37
19	912622104019	JAMEELA.M.A	35	26	26							38	29	29								9	8		8	9	32	33	32	35	35	36
20	912622104020	JEEVITHA.S	32	24	24							35	27	27								9	8		7	9	32	34	33	35	33	35
21	912622104021	KAVIPRIYA.S	32	25	25							35	26	26								8	9		9	9	37	37	38	38	38	38
22	912622104022	KAVIYAPRIYA.P	37	29	29							38	29	29								7	7		9	9	37	35	35	39	38	38
23	912622104023	KAVIYARASI.M	37	28	28							39	29	29								9	7		8	7	37	37	35	36	35	34
24	912622104024	KEERTHANA.S **(9.10.2004)**	36	28	28							36	27	27								8	8		7	8	33	34	34	36	34	35
25	912622104025	KEERTHANA.S **(29.8.2005)**	33	26	26							36	27	27								9	9		9	9	29	32	32	33	33	33
26	912622104026	KRISHNAVENI.C	29	23	23							33	24	24								9	8		8	9	31	33	32	35	34	35
27	912622104027	LAKSHMI PRIYA.D	31	24	24							35	26	26								7	8		8	8	37	34	35	38	37	37
28	912622104028	LALITHAMBIGAI.K	37	27	27							38	29	29								8	9		8	7	32	33	34	36	34	33
29	912622104029	LATHIKA.G	32	25	25							36	26	26								9	9		9	8	29	32	32	32	34	33
30	912622104030	MADHUMITHRA.D	29	23	23							32	25	25								7	7		7	9	34	33	33	37	34	36
31	912622104031	MAHALAKSHMI.K	34	26	26							37	27	27								8	7		8	7	36	34	33	36	35	34
32	912622104032	MANIMEGALAI.V	36	26	26							36	27	27								9	8		8	8	36	37	36	39	37	37
33	912622104033	MANJULA.R	36	28	28							39	29	29								8	9		9	9	30	30	31	33	33	33
34	912622104034	MEENAKUMARI.K	30	22	22							33	24	24								8	7		9	8	33	32	31	32	33	32
35	912622104035	NANDHINI PRIYA.N	33	24	24							32	24	24								8	8		9	7	32	32	32	32	34	32
36	912622104036	POORANI.S	32	24	24							32	25	25								7	9		7	9	31	31	33	34	32	34
37	912622104037	PRADEEPA.P	31	24	24							34	25	25								8	8		9	9	38	36	36	38	37	37
38	912622104038	PRIYADARSHINI.K	38	28	28							38	28	28								7	9		9	9	36	34	36	36	37	37
39	912622104039	PRIYADHARSHINI.D	36	27	27							36	28	28								9	7		8	9	28	30	28	32	33	34
40	912622104040	ROHINI.N	28	21	21							32	25	25								8	8		9	9	28	29	29	32	34	34
												CO's Target Value															26.0	26.0	26.0	26.0	26.0	26.0
												No. of Students scored above CO's Target Value															40	40	40	40	40	40
												Percentage of Students scored above Target															100.0	100.0	100.0	100.0	100.0	100.0
												CO Attainment															3	3	3	3	3	3
												CO attainment Values to plot the Graph															3	3	3	3	3	3

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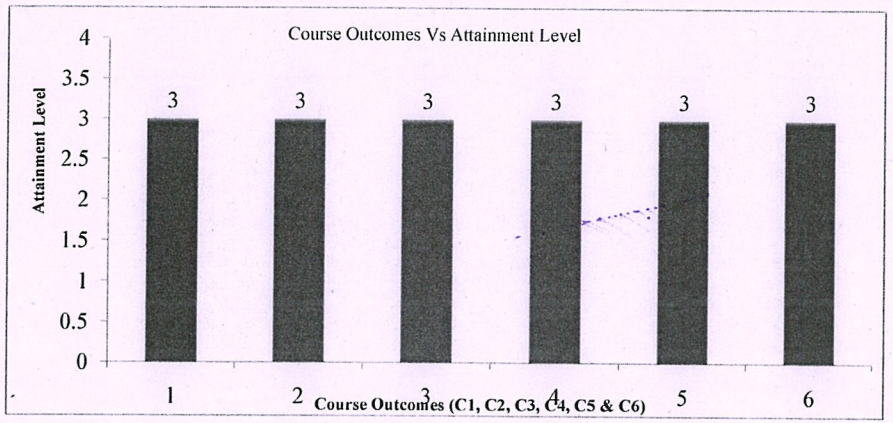

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SRI BHARATHI ENGINEERING COLLEGE FOR WOMEN
DEPARTMENT OF SCIENCE AND HUMANITIES
COURSE OUTCOME ATTAINMENT - UNIVERSITY EXAMINATION
ACADEMIC YEAR : 2022 - 2023 (ODD SEM)

YEAR /SEM: I/I Batch:2022-2026

SUBJECT : PH3151 (C103) / ENGINEERING PHYSICS

CO Attainment Level: 1 - (UPTO 60%) 2- (61%-79) 3-(80% and Above)

TOTAL STRENGTH : 40

S.NO	Register No	NAME	Univ. Grade
1	912622104001	ABINAYA.E	U
2	912622104002	ABIRAMI.C	B+
3	912622104003	AJITHA.M	U
4	912622104004	AKSHAYA.M	U
5	912622104005	ANANTHI.K	A
6	912622104006	ASIYA.A	U
7	912622104007	ATCHAYA.B	B+
8	912622104008	BARJUSHFATHIMA.P	B+
9	912622104009	BAVADHARANI.S	U
10	912622104010	DEVADHARSHINI.P	B+
11	912622104011	DEVI SRI.R	A
12	912622104012	DHANALAKSHMI.G	U
13	912622104013	DHANASRI.E	B+
14	912622104014	FEMINA.M	B+
15	912622104015	GOMATHI.P	U
16	912622104016	GOPIKA SRI.Y	B+
17	912622104017	INBA.M	U
18	912622104018	ISHWARYA.S	U
19	912622104019	JAMEELA.M.A	B+
20	912622104020	JEEVITHA.S	B+
21	912622104021	KAVIPRIYA.S	U
22	912622104022	KAVIYAPRIYA.P	B+
23	912622104023	KAVIYARASI.M	U
24	912622104024	KEERTHANA.S **(9.10.2004)**	U
25	912622104025	KEERTHANA.S **(29.8.2005)**	B+
26	912622104026	KRISHNAVENI.C	U
27	912622104027	LAKSHMI PRIYA.D	U
28	912622104028	LALITHAMBIGAI.K	B+
29	912622104029	LATHIKA.G	U
30	912622104030	MADHUMITHRA.D	U
31	912622104031	MAHALAKSHMI.K	U
32	912622104032	MANIMEGALAI.V	A
33	912622104033	MANJULA.R	A
34	912622104034	MEENAKUMARI.K	U
35	912622104035	NANDHINI PRIYA.N	U
36	912622104036	POORANI.S	U
37	912622104037	PRADEEPA.P	U
38	912622104038	PRIYADARSHINI.K	B+
39	912622104039	PRIYADHARSHINI.D	U
40	912622104040	ROHINI.N	U

No. of O Grade	0	0
No. of A+ Grade	0	0
No. of A Grade	4	4
No.of B+ Grade	13	13
No. of B Grade	0	0
No. of C Grade	0	0
No. of U Grade	23	23
No. of UA Grade	0	0
Target for course outcome Attainment	60	40
No of students above the target	17	
CO-Attainment University (%)	42.50	

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Overall Attainment Sheet – COs - POs & PSOs attainment calculation

CO	CO-Attainment Internal (CO-INT) (Avg. Attainment of All section) (%)	CO-Attainment University (CO-UNI) (Avg. Attainment of All section) (%)	Direct CO Attainment (0.20xCO-INT + 0.80xCO-UNI) (%)	CO Attainment Level
C103.1	100.0	42.50	54.0	1
C103.2	100.0	42.50	54.0	1
C103.3	100.0	42.50	54.0	1
C103.4	100.0	42.50	54.0	1
C103.5	100.0	42.50	54.0	1
C103.6	3.0	42.50	34.6	1

Expected CO-PO Level

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C103.1	3	3	2	2	-	1	-	-	-	1	-	1	-	-	-
C103.2	3	3	2	2	-	1	-	-	-	1	-	1	-	-	-
C103.3	3	3	2	2	-	1	-	-	-	1	-	1	-	-	-
C103.4	3	3	2	2	-	1	-	-	-	1	-	1	-	-	-
C103.5	3	3	2	2	-	1	-	-	-	1	-	1	-	-	-
C103.6	3	3	2	2	-	1	-	-	-	1	-	1	-	-	-
C103	**3**	**3**	**2**	**2**	-	**1**	-	-	-	**1**	-	**1**	-	-	-

PO Attainment Level

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C103.1	1	1	0.67	0.67	-	0.33	-	-	-	0.33	-	0.33	-	-	-
C103.2	1	1	0.67	0.67	-	0.33	-	-	-	0.33	-	0.33	-	-	-
C103.3	1	1	0.67	0.67	-	0.33	-	-	-	0.33	-	0.33	-	-	-
C103.4	1	1	0.67	0.67	-	0.33	-	-	-	0.33	-	0.33	-	-	-
C103.5	1	1	0.67	0.67	-	0.33	-	-	-	0.33	-	0.33	-	-	-
C103.6	1	1	0.67	0.67	-	0.33	-	-	-	0.33	-	0.33	-	-	-
C103	1	1	0.67	0.67	-	0.33	-	-	-	0.33	-	0.33	-	-	-

Attainment of POs and PSOs:

Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C203	3	3	2	2	-	1	-	-	-	1	-	1	-	-	-
Attainment	1	1	0.67	0.67	-	0.33	-	-	-	0.33	-	0.33	-	-	-

Comments by Program Coordinator

1.

2.

Remarks by HoD

Name and Signature of the Faculty Member

R. SARATHA

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