ANNEXURE 1

Course Folder -

1. List of all the documents in the Course Folder
2. Syllabus prescribed by the University.
3. Pre-requisites.
4. Course Objectives, Course Outcomes, Program Outcomes, Program Educational Objectives and Program Specific Objectives.
5. Curriculum (Theory and practical) with Augmentation (Use of Questionnaires to collect info from all stakeholders).
6. Modes of delivery of the concepts / courses.
7. Personal Time Table.
8. Lesson plan (Theory, Laboratory, Students, Slow learners and Fast learners).
9. List of prescribed text books from syllabus / Augmentation.
10. List of Reference books / Journals / Articles / URLs / Blogs / other sources.
11. Question bank.
12. Assignment bank.
13. Map of course outcome to assessment methodology.
14. Question Papers (along with their Scheme of valuation) – Theory and Practicals
15. Assessment methodologies and their scores (of all the students).
16. Classification of students (based on all the information).
17. Intervention for Slow / Fast learners.

Signature of Faculty **Signature of Principal**

Syllabus prescribed by the University (To be given as is)

Subject: Quantum Mechanics – I **Paper Code: PHY – 204**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer type's questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT – I

de – Broglie hypothesis, Compton effect, Davision – Germer experiment, Heisenberg uncertainty principle. concept of wave function as describing the dynamical state of a single particle, group velocity and phase velocity, classical velocity of a particle and group velocity of the wave representing the particle, principle of superposition

UNIT – II

Basic postulates of quantum mechanics, dynamical variables as linear Hermitian operators, eigenvalue equation satisfied by them, momentum energy and angular momentum operators, results of measurement of variables, expectation values

UNIT – III

Commutation relations between the operators, compatible observables and simultaneous measurements, Ehrenfest theorem, time dependent and time independent Schrödinger equation, Eigen states, normalization and ortho – normality of wave function

UNIT – IV

One dimensional potential well, boundary condition, penetration of rectangular potential barrier in one dimension, derivation of reflection and transmission coefficients, explanation of alpha decay Theory (provide the number of hours of teaching)

1. 40

Course Prerequisites: Physics and Mathematics in 12th Class

Course Objectives,

1. To inculcate the fundamentals of wave mechanics
2. To understand the importance of various coupled oscillations
3. To comprehend the dynamics of oscillations

4. To understand various degrees of freedom and molecular movement.
5. To understand the role of SHM in advancing science and technology

Course Outcomes,

1. Student gains the knowledge on Fundamentals of wave mechanics
2. Student gets a thorough knowledge different types of periodic motion and SHM, waves
3. Student gets a thorough knowledge on dynamics of energy transport in solids.
4. Student gets a thorough knowledge on various degrees of freedom and molecular movement.
5. Finds the evolution of new branch of Physics i.e., acoustics.

Program Outcomes,

Programme Specific Outcome (PSO):

On completion of the 03/ 04 years Degree in PHYSICS students will be able to:

PSO 1 : Culminate in depth knowledge of almost all basic branches of physics such as mechanics, properties of matter, relativity, electricity and magnetism, wave motion, optics, thermal physics, electronics, classical mechanics, quantum mechanics, spectroscopy, nuclear physics, condensed matter physics and also advanced areas like Nanoscience, energy science, astrophysics, instrumentation.

PSO 2 :Communicate effectively physics concepts with examples related to day to day life. Acquire ability of recognizing and distinguishing various aspects of physics found in real life.

PSO 3 : Learn, perform and design experiments in the laboratory to demonstrate the concepts principles, laws of physics, theories learnt in the class rooms and apply the knowledge and skill acquired through experiments of physics in laboratories to solve real life problems

PSO 4 : Acquire ability of critical thinking and logical reasoning in physics problems and their solutions

PSO 5 : Appreciate the importance of physics subjects and its application for pursuing interdisciplinary and multidisciplinary higher education and research in these areas.Pursue advanced studies and research in varied areas of physical science

Program Educational Objectives

PEO 1. Develop ability to analyze physics problem including simple to thought provoking problems and apply the acquired knowledge to solve real life problems.

PEO 2 Appreciate the importance of physics subjects and its application for pursuing interdisciplinary

and multidisciplinary higher education and research in these areas.

PEO 3 Understand the vast scope of physics as theoretical and experimental science with application in finding solution of problems in nature spanning from smallest dimension 10^{-15} m to highest dimension 10^{26} m in space, covering energy ranges from 10-10 eV to 10^{25} eV.

PEO 4 think independently and develop algorithm and program using programming techniques for solving real world physics problems.

PEO 5 develop ability of working independently and to make in-depth study of various notions of physics.

Program Specific Objectives

PSO1. Understanding and Exploration of various disciplines of Physics

PSO2. Focus and Immersion in the discipline and gaining perspective of context.

PSO3. In depth learning of major and minor disciplines, Skill sets for employability.

PSO4. Deeper and Advanced Learning of Major Discipline Foundation to pursue Doctoral Studies & Developing Research competencies

PSO5. Deeper and Advanced Learning of the Major Discipline towards gaining proficiency

TEACHING PLAN THEORY

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
					Planned	Engaged				Correctly Responded	Not Correctly Responded	Total Assessed	Total Students Enrolled	
1	de – Broglie hypothesis,	1	1	1			a,c,e	I, II	A,C,D	7	13	20	23	
	Compton effect,	1	2	1			b,c	I	A,C,D	3	14	17	23	
	Davision – Germer experiment,.	1	2	1			g,n,e	I,II ,IV	A,C,D	3	14	17	23	
	Heisenberg uncertainty principle.	1	3	1			a,b,c,e	I,II,VI	A,C,D	2	14	16	23	
	Numerical	1	2	1			a,b,c,e	I,II,VI	A,C,D	0	15	15	23	
	concept of wave function as describing the dynamical state of a single particle,	1	2	1			a,b,c,e	I,II,VI	A,C,D	5	12	17	23	
	group velocity and phase velocity,	1	4	1			a,b,c,e	I,II,VI	A,C,D	4	14	18	23	
	classical velocity of a particle	1	5	1			a,b,c,e	I,II,VI	A,C,D	3	13	16	23	

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
	group velocity of the wave representing the particle,	1	5	1			b,d,g	I,III, V	A,C,D	3	15	18	23	
	principle of superposition,..	1	2	1			a,b,c,e	I, IV,II	A,C,D	1	14	15	23	
2	Basic postulates of quantum mechanics,	1	2	2			a,b,c,e	I, IV,II	A,C,D	5	15	20	23	
	dynamical variables as linear Hermitian operators,	1	2	2			d,e,b	I,II,III	A,C,D	3	14	17	23	
	eigenvalue equation satisfied by them,	1	2	2			a,c,e	I, II	A,C,D	6	12	18	23	
	momentum energy and angular momentum operators,	1	2	2			b,c	I	A,C,D	6	14	20	23	
	results of measurement of variables,	1	3	2			g,n,e	I,II ,IV	A,C,D	7	9	16	23	
	expectation values	1	3	2			a,b,c,e	I,II,V I	A,C,D	7	11	18	23	
	Numerical problems	1	1	2			a,b,c,e	I,II,V I	A,C,D	4	14	18	23	
3	Commutation relations between the operators,	1	1	3			a,b,c,e	I,II,V I	A,C,D	5	13	18	23	
	compatible observables	1	1	3			b,d,g	I,III, V	A,C,D	6	14	20	23	

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
	and simultaneous measurements,	1	1	3			b,d,g	I,III, V	A,C,D	4	16	20	23	
	Ehrenfest theorem,	1	1	3			b,c	I,III	A,C,D	5	12	17	23	
	time dependent Schrödinger equation,	1	3	3			b,c	I,III	A,C,D	5	14	19	23	
	time independent Schrödinger equation,	1	2	3			a,b,c	I,VI, V	A,C,D	6	13	19	23	
	Eigen states, normalization and	1	4	4			a,b,c	I,V,V I	A,C,G	6	11	17	23	
	ortho – normality of wave function	1	5	4			a,b,c	I,V,V I	A,C,G	5	13	18	23	
4	One dimensional potential well,	1	1	5			a,b,c	I,V,V I	A,C,G	4	14	18	23	
	boundary condition,	1	1	5			a,b,c	I,V,V I	A,C,G	5	12	17	23	
	penetration of rectangular potential barrier in one dimension,	1	1	5			a, b,e	I,II,V	A,C,G	5	14	19	23	
	derivation of reflection coefficients	1	1	5			a, b,e	I,II,V	A,C,G	6	13	19	23	
	and transmission coefficients,	1	2	5			a, b,e	I,II,V	A,C,G	6	11	17	23	

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
	explanation of alpha decay	1	2	5			b,c	I,II	A,C,G	5	13	18	23	
	Quiz	1	4	5			b,e	I,II	A,C,G	5	14	19	23	

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF BASIC AND APPLIED SCIENCES

TIME TABLE

FACULTY NAME: Dr. N. RAKESH CHANDRA **ACADEMIC YEAR - 2021 – 2022**

EVEN SEMESTER

DAY↓ /TIME→	9:30-10:20	10:20-11:10	11:10-12:00	12:00-12:50	12:50-1:50	1:50-2:40	2:40-3:30	3:30-4:20
MONDAY	PHY - 102	PHY – 202		PHY – 302	LUNCH	ENGG. PHYSICS	PHY – 108	PHY – 108
TUESDAY	PHY – 304	PHY – 204	PHY – 102			ENGG. PHY LAB	ENGG. PHY LAB	
WEDNESDAY	PHY – 106	PHY – 206A	PHY – 306B			ENGG. PHY LAB	ENGG.PHY LAB	
THURSDAY	PHY – 302	PHY – 202	PHY – 106			ENGG. PHYSICS	PHY – 208	PHY – 208
FRIDAY	PHY – 104	PHY – 204	PHY – 306B			ENGG.PHY LAB	ENGG. PHY LAB	
SATURDAY	PHY – 304	PHY – 206A	PHY – 104			ENGG. PHYSICS	PHY – 308	PHY – 308

Convener **Co-convener** **HOD** **Dean**

Portions for Sessionals examination

I -Sessional Exam	II- Sessional Exam	III- Sessional Exam	Re-Sessional Exam
Unit – 1 Unit – 2	NA	NA	NA

PRACTICAL

Chapter No.	Title & Contents of the chapter	After completion of the chapter the student shall be able to	Skills and Competency Developed	Course Outcome
	NA	NA	NA	NA
	NA			

Portions for sessional examination

I- Sessional Exam	II- Sessional Exam	III- Sessional Exam	Re-Sessional Exam

Assessment of course outcomes:

Assessment method	Course outcomes in Percentage				
	CO1	CO2	CO3	CO4	CO5
Unit Test	50	50			
Sessional Examination					
Pre-final Exam					
Assignment					
Others Specify					

Course Outcomes-Program Outcomes mapping

Cos	Program Outcomes					Total
	1	2	3	4	5	
CO1	x	x		x	x	
CO2	x		x	x	x	
CO3	x	x	x		x	
CO4	x	x	x	x		
CO5		x	x	x	x	
Total						

Modes of delivery of courses

Methodology	Code	% of Delivery
Lecturing	a	20%
Discussion	b	6%
Group discussion	c	5%
Demonstration	d	10%
Power point presentation	e	15%
Tutorial class	f	5%
Assignment	g	10%
Seminar	h	5%
Remedial class	i	10%
Project work	j	
Industrial visit	k	
Role play	l	8%
Quiz	m	4%
Mind mapping	n	2%
Others specify	o	

Assessment Method	Code	% of Scheme of evaluation
Viva	A	10%
Synopsis	B	
Continuous assessment	C	5%
Unit test	D	20%
End Semester exam	E	60%
Prefinal exam	F	
Assignments	G	5%
Others specify	H	

Teaching Aids used	Code
Chalkboard	I
Power point	II
Videos	III
Posters	IV
Charts	V
Models	VI
Flash cards	VII
Others specify	VIII

List of prescribed text books from UniversitySyllabus

Sl No	Title of the book	Author/s	Edition, Year of Publication	Publisher	No. of copies available in the library
1	Thermodynamics	Enrico Fermi	1956	Courier Dover Publications	Nill
2	A Treatise on Heat : Including Kinetic Theory of Gases, Thermodynamics and Recent Advances in Statistical Thermodynamics	Meghnad Saha, B. N. Srivastava	1958	Indian Press	Nill
3	Heat and Thermodynamics: An Intermediate Textbook	By Mark Waldo Zemansky, Richard Dittman	1981	McGraw-Hill	Nill
4	Thermal Physics by	Garg, Bansal and Ghosh	1993	Tata McGra-Hill,	Nill

List of Reference text books from University Syllabus

Sl No	Title of the book	Author/s	Edition, Year of Publication	Publisher	No. of copies available in the library
1	Engineering Physics	MN Avadhanulu, PG Ksheersagar			
2	Modern Physics and Electronics	SL Guptha			
3	Thermodynamics and Statistical Physics	Singhal, Agarwal and Sathya Prakash			
4	Engineering Thermodynamics	PK Nag			

List of URLs / Blogs / Other e-Sources

1	**https://www.youtube.com/watch?v=PMpoamNGceM**
2	**https://www.youtube.com/watch?v=PMpoamNGceM&list=RDLVPMpoamNGceM&start_radio=1&rv=PMpoamNGceM&t=52**
3	**https://www.youtube.com/watch?v=zl3Uj18eHek&list=RDLVPMpoamNGceM&index=11**
4	**https://www.youtube.com/watch?v=bow4rworT-k**
5	**https://www.youtube.com/watch?v=etjZmdmrjSU**
6.	**https://onlinecourses.nptel.ac.in/noc19_mm16/preview**

Module / Chapter No 1

Sl No	Question	Max Marks	Related course outcome
1	State and explain First law of thermodynamics.	5	1
2	Define Internal energy.	2	1
3	Derive an expression for work done in Isothermal process.	5	1
4	Derive an expression for work done in Adiabatic process.	5	1
5	With a neat labelled diagram explain the construction and working of carnot Engine	5	1
6	Explain the term thermodynamic scale of temperature.	5	1
7	.Derive an expression for its efficiency. State and explain Carnot's theorem	5	1

Module / Chapter No 2

Sl No	Question	Max Marks	Related course outcome
1	Define Entropy. Derive an expression for Entropy in reversible and irreversible processes.	5	2
2	State and explain two different statements of Thermodynamics second law	5	2
3	Establish the relationship between Thermodynamic potentials.	5	2
4	Explain Joule Thomson effect. Define Triple point of water.	5	2
5	Derive Maxwell's equations.	5	2

Module / Chapter No 3

Sl No	Question	Max Marks	Related course outcome
1	Derive Maxwell-Boltzmann Law of Distribution of Molecular Velocities.	5	3
2	Define and derive expressions for r.m.s. velocity, Average and Most Probable Speeds.	5	3
3	. Define Mean Free Path. Transport Phenomenon, Degree of freedom,	5	3
4	State and explain equi-partition of energy	5	3
5	Define specific heat of gases.	5	3

Module / Chapter No 4

Sl No	Question	Max Marks	Related course outcome
1	Define Emissive and Absorptive Powers.	5	4
2	Write the Kirchhoff's Law of Black Body Radiation.	5	4
3	State and explain Stefan-Boltzmann Law.	5	4
4	Write a short note on Distribution of energy in the spectrum of black body radiation.	5	4
5	Write a short note on Wein's displacement law.	5	4

Module / Chapter No 1

Sl No	Assignment	Max Marks	Related course outcome
1	With a neat labelled diagram explain the construction and working of carnot Engine	5	1
2	Explain the term thermodynamic scale of temperature	5	1
3	Applications of First law of thermodynamics	5	1

Module / Chapter No 2

Sl No	Assignment	Max Marks	Related course outcome
1	Illustrate Entropy. List few examples of entropy change in day to day life.	5	2

2	Explain the working of AC. State the law of thermodynamics which governs the working of AC.	5	2
3	Establish the relationship between Thermodynamic potentials.	5	2
4.	Explain Joule Thomson effect. Explain one real time example.	5	2
5.	Derive Maxwell's equations.	5	2

Module / Chapter No 3

Sl No	Assignment	Max Marks	Related course outcome
1	Explain the concept of electron gas. Maxwell Boltzmann distribution law is applicable for it?	5	3
2	The wind velocity estimated in weather report is mean velocity or RMS velocity or Most probable velocity? Justify.	5	3
3	Define Mean Free Path. Transport Phenomenon, Degree of freedom,	5	3
4	State and explain equi-partition of energy. Explain its significance	5	3
5.	Define specific heat of gases.	5	3

Module / Chapter No 4

Sl No	Assignment	Max Marks	Related course outcome
1	Define Emissive and Absorptive Powers.	5	4

2	Write the Kirchhoff's Law of Black Body Radiation. Find the surface temperature of Sun	5	4
3	Discuss the completeness of Blackbody radiation	5	4
4	Write a short note on Distribution of energy in the spectrum of black body radiation.	5	4
5.	Explain the quantization of atomic energy levels	5	4

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF BASIC AND APPLIED SCIENCES
MIDTERM EXAMINATIONS (PCM & PCsM)

SEMESTER – I YEAR – I SUB: THERMODYNAMICS SUB CODE: PHY – 104

DATE: 16 – 11 – 2022 TIMINGS: 02:30 – 03:30 HRS MAX MARKS: 10

NOTE: ANSWER ANY FOUR OF THE FOLLOWING 2.5 X 4 = 10 M

1. State 1st law of thermodynamics and write any three applications of it.
2. State Kelvin Planck and Clausius statements of 2nd law of thermodynamics.
3. Write a brief note on Triple point.
4. Show that in a reversible process entropy remains constant.
5. Derive 4th Maxwell's thermodynamic potential – Gibb's function.

S.No	Classification	Name of the students
	Slow learners (less than 50 %)	
	Remedial teaching **Questions for practice** **Special guidance beyond college hour** **Trace out physical and mental problems if any** **Encourage even for small achievement** **Giving memory tip** **Review time to time**	**ARVIND YADAV** **BABRI BHAN SINGH YADAV** **BITTU SAINI** **DEEPAK** **NITIN KUMAR** **PURSHOTAM JANGIR** **RAHUL YADAV** **SHIVAM SINGH YADAV** **YUVRAG SINGH** **ANMOL YADAV** **VIJAY RAJPUT**

S.No	Classification	Name of the students
	Fast learners (Above 76 %)	
	Actions taken	
1 2	Solve Engineering Problems Study beyond the syllabus	**Kanika, Prashanth, Simran, Shubham, Shivani, Vinay, Preethi,**

S.No	Classification	Name of the students
	Average learners (51-75 %)	
	Actions taken	
1 2 3 4	Motivate students Audio-visual aids Create confidence level in their interest areas Mind map	**Neha, Mayank, Manjeet, Pankaj, Paras, Ashish**

Feedback on Curriculum

Formats have been developed for the following stakeholders

1. Present / Current students
2. Students just passing out (Exit Interview)
3. Alumni
4. Parents
5. Industry based supervisors
6. Placement (campus recruiters)
7. Departmental Advisory Board

S.No	Classification	Name of the students
	Fast learners (Above 76 %)	
	Actions taken	
1 2 3	Solve Engineering Problems Study beyond the syllabus Project work	**JASMINE, PAYAL YADAV, NIDHI YADAV**

TEACHING PLAN (SLOW LEARNERS)

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
					Planned	Engaged				Correctly Responded	Not Correctly Responded	Total Assessed	Total Students	
1	**de – Broglie hypothesis,**	1	1	1			a,c,e	I, II	A,C,D	3	6	9	12	
	Compton effect,	1	2	1			b,c	I	A,C,D	4	6	10	12	
	Davision – Germer experiment,.	1	2	1			g,n,e	I,II ,IV	A,C,D	2	7	9	12	
	Heisenberg uncertainty principle.	1	3	1			a,b,c,e	I,II,VI	A,C,D	2	8	10	12	
	Numerical	1	2	1			a,b,c,e	I,II,VI	A,C,D	2	9	11	12	
	concept of wave function as describing the dynamical state of a single particle,	1	2	1			a,b,c,e	I,II,VI	A,C,D	1	7	8	12	
	group velocity and phase velocity,	1	4	1			a,b,c,e	I,II,VI	A,C,D	2	6	8	12	
	classical velocity of a particle	1	5	1			a,b,c,e	I,II,VI	A,C,D	2	7	9	12	

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
	group velocity of the wave representing the particle,	1	5	1			b,d,g	I,III, V	A,C,D	3	8	11	12	
	principle of superposition,..	1	2	1			a,b,c,e	I, IV,II	A,C,D	1	8	9	12	
2	Basic postulates of quantum mechanics,	1	2	2			a,b,c,e	I, IV,II	A,C,D	2	9	11	12	
	dynamical variables as linear Hermitian operators,	1	2	2			d,e,b	I,II,III	A,C,D	3	7	10	12	
	eigenvalue equation satisfied by them,	1	2	2			a,c,e	I, II	A,C,D	2	6	8	12	
	momentum energy and angular momentum operators,	1	2	2			b,c	I	A,C,D	4	7	11	12	
	results of measurement of variables,	1	3	2			g,n,e	I,II ,IV	A,C,D	2	7	9	12	
	expectation values	1	3	2			a,b,c,e	I,II,V I	A,C,D	3	6	9	12	
	Numerical problems	1	4	2			a,b,c,e	I,II,V I	A,C,D	2	5	7	12	
	Commutation relations between the operators,	1	2	2			a,b,c,e	I,II,V I	A,C,D	2	5	7	12	
	compatible observables	1	1	2			a,b,c,e	I,II,V I	A,C,D	3	7	10	12	

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
	and simultaneous measurements,	1	1	3			a,b,c,e	I,II,VI	A,C,D	4	7	11	12	
	Ehrenfest theorem,	1	1	3			b,d,g	I,III,V	A,C,D	4	6	10	12	
	time dependent Schrödinger equation,	1	1	3			b,d,g	I,III,V	A,C,D	2	7	9	12	
	time independent Schrödinger equation,	1	1	3			b,c	I,III	A,C,D	2	8	10	12	
3	Eigen states, normalization and	1	3	3			b,c	I,III	A,C,D	2	9	11	12	
	ortho – normality of wave function	1	2	3			a,b,c	I,VI,V	A,C,D	1	7	8	12	
	One dimensional potential well,	1	4	4			a,b,c	I,V,VI	A,C,G	2	6	8	12	
	boundary condition,	1	5	4			a,b,c	I,V,VI	A,C,G	2	7	9	12	
4	penetration of rectangular potential barrier in one dimension,	1	1	5			a,b,c	I,V,VI	A,C,G	2	7	9	12	
	derivation of reflection coefficients	1	1	5			a,b,c	I,V,VI	A,C,G	2	8	10	12	

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
	and transmission coefficients,	1	1	5			a, b,e	I,II,V	A,C,G	2	9	11	12	
	explanation of alpha decay	1	1	5			a, b,e	I,II,V	A,C,G	1	7	8	12	
	Quiz	1	2	5			a, b,e	I,II,V	A,C,G	2	6	8	12	
	de – Broglie hypothesis,	1	2	5			b,c	I,II	A,C,G	2	7	9	12	
	Compton effect,	1	3	5			a, b,e	I,II,V	A,C,G	2	8	10	12	
	Davision – Germer experiment,.	1	3	5			a, b,e	I,II,V	A,C,G	2	9	11	12	
	Heisenberg uncertainty principle.	1	3	5			a, b,e	I,II,V	A,C,G	1	7	8	12	
	Numerical	1	4	5			b,e	I.II	A,C,G	2	6	8	12	
	concept of wave function as describing the dynamical state of a single particle,	1	4	5			b,e	I,II	A,C,G	2	6	8	12	

TEACHING PLAN (AVERAGE LEARNERS)

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
					Planned	Engaged				Correctly Responded	Not Correctly Responded	Total Assessed	Total Students 8	
1	**de – Broglie hypothesis,**	1	1	1			a,c,e	I, II	A,C,D	**4**	3	**7**	**8**	
	Compton effect,	1	2	1			b,c	I	A,C,D	**5**	2	**7**	**8**	
	Davision – Germer experiment,.	1	2	1			g,n,e	I,II ,IV	A,C,D	**5**	1	**6**	**8**	
	Heisenberg uncertainty principle.	1	3	1			a,b,c,e	I,II,VI	A,C,D	**4**	2	**6**	**8**	
	Numerical	1	2	1			a,b,c,e	I,II,VI	A,C,D	**5**	1	**7**	**8**	
	concept of wave function as describing the dynamical state of a single particle,	1	2	1			a,b,c,e	I,II,VI	A,C,D	**6**	1	**7**	**8**	
	group velocity and phase velocity,	1	4	1			a,b,c,e	I,II,VI	A,C,D	**6**	1	**7**	**8**	
	classical velocity of a particle	1	5	1			a,b,c,e	I,II,VI	A,C,D	**4**	2	**6**	**8**	

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
	group velocity of the wave representing the particle,	1	5	1			b,d,g	I,III, V	A,C,D	**3**	2	**5**	**8**	
	principle of superposition,..	1	2	1			a,b,c,e	I, IV,II	A,C,D	**3**	2	**5**	**8**	
2	Basic postulates of quantum mechanics,	1	2	2			a,b,c,e	I, IV,II	A,C,D	**3**	2	**5**	**8**	
	dynamical variables as linear Hermitian operators,	1	2	2			d,e,b	I,II,III	A,C,D	**4**	2	**6**	**8**	
	eigenvalue equation satisfied by them,	1	2	2			a,c,e	I, II	A,C,D	**5**	2	**7**	**8**	
	momentum energy and angular momentum operators,	1	2	2			b,c	I	A,C,D	**5**	2	**7**	**8**	
	results of measurement of variables,	1	3	2			g,n,e	I,II ,IV	A,C,D	**5**	2	**7**	**8**	
	expectation values	1	3	2			a,b,c,e	I,II,V I	A,C,D	**6**	2	**8**	**8**	
	Numerical problems	1	4	2			a,b,c,e	I,II,V I	A,C,D	**6**	2	**8**	**8**	
	Commutation relations between the operators,	1	2	2			a,b,c,e	I,II,V I	A,C,D	**6**	2	**8**	**8**	
	compatible observables	1	1	2			a,b,c,e	I,II,V I	A,C,D	**6**	2	**8**	**8**	

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
	and simultaneous measurements,	1	1	3			a,b,c,e	I,II,VI	A,C,D	4	2	6	8	
	Ehrenfest theorem,	1	1	3			b,d,g	I,III, V	A,C,D	4	2	6	8	
	time dependent Schrödinger equation,	1	1	3			b,d,g	I,III, V	A,C,D	4	2	6	8	
	time independent Schrödinger equation,	1	1	3			b,c	I,III	A,C,D	2	2	4	8	
3	Eigen states, normalization and	1	3	3			b,c	I,III	A,C,D	2	2	4	8	
	ortho – normality of wave function	1	2	3			a,b,c	I,VI, V	A,C,D	2	2	4	8	
	One dimensional potential well,	1	4	4			a,b,c	I,V,VI	A,C,G	3	2	5	8	
	boundary condition,	1	5	4			a,b,c	I,V,VI	A,C,G	3	2	5	8	
4	penetration of rectangular potential barrier in one dimension,	1	1	5			a,b,c	I,V,VI	A,C,G	4	2	6	8	
	derivation of reflection coefficients	1	1	5			a,b,c	I,V,VI	A,C,G	3	2	5	8	

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
	and transmission coefficients,	1	1	5			a, b,e	I,II,V	A,C,G	**4**	2	**6**	**8**	
	explanation of alpha decay	1	1	5			a, b,e	I,II,V	A,C,G	**3**	2	**5**	**8**	
	Quiz	1	2	5			a, b,e	I,II,V	A,C,G	**4**	2	**6**	**8**	
	de – Broglie hypothesis,	1	2	5			b,c	I,II	A,C,G	**5**	2	**7**	**8**	
	Compton effect,	1	3	5			a, b,e	I,II,V	A,C,G	**5**	2	**7**	**8**	
	Davision – Germer experiment,.	1	3	5			a, b,e	I,II,V	A,C,G	**6**	2	**8**	**8**	
	Heisenberg uncertainty principle.	1	3	5			a, b,e	I,II,V	A,C,G	**6**	2	**8**	**8**	
	Numerical	1	4	5			b,e	I.II	A,C,G	**4**	2	**6**	**8**	
	concept of wave function as describing the dynamical state of a single particle,	1	4	5			b,e	I,II	A,C,G	**5**	2	**7**	**8**	

TEACHING PLAN (FAST LEARNERS)

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
					Planned	Engaged				Correctly Responded	Not Correctly Responded	Total Assessed	Total Students	
1	de – Broglie hypothesis,	1	1	1			a,c,e	I, II	A,C,D	3	2	5	05	
	Compton effect,	1	2	1			b,c	I	A,C,D	2	2	4	05	
	Davision – Germer experiment,.	1	2	1			g,n,e	I,II ,IV	A,C,D	1	3	4	05	
	Heisenberg uncertainty principle.	1	3	1			a,b,c,e	I,II,VI	A,C,D	2	2	4	05	
	Numerical	1	2	1			a,b,c,e	I,II,VI	A,C,D	1	3	4	05	
	concept of wave function as describing the dynamical state of a single particle,	1	4	1			a,b,c,e	I,II,VI	A,C,D	1	4	5	05	
	group velocity and phase velocity,	1	5	1			a,b,c,e	I,II,VI	A,C,D	2	2	4	05	
	classical velocity of a particle	1	5	1			b,d,g	I,III, V	A,C,D	2	3	5	05	

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
	group velocity of the wave representing the particle,	1	2	1			a,b,c,e	I, IV,II	A,C,D	2	3	5	05	
2	principle of superposition,..	1	2	2			a,b,c,e	I, IV,II	A,C,D	2	3	5	05	
	Basic postulates of quantum mechanics,	1	2	2			d,e,b	I,II,III	A,C,D	2	2	4	05	
	dynamical variables as linear Hermitian operators,	1	2	2			a,c,e	I, II	A,C,D	2	3	5	05	
	eigenvalue equation satisfied by them,	1	2	2			b,c	I	A,C,D	2	3	5	05	
	momentum energy and angular momentum operators,	1	3	2			g,n,e	I,II ,IV	A,C,D	2	2	4	05	
	results of measurement of variables,	1	3	2			a,b,c,e	I,II,VI	A,C,D	2	3	5	05	
	expectation values	1	4	2			a,b,c,e	I,II,VI	A,C,D	2	3	5	05	
	Numerical problems	1	2	2			a,b,c,e	I,II,VI	A,C,D	2	3	5	05	
	Commutation relations between the operators,	1	1	2			a,b,c,e	I,II,VI	A,C,D	2	3	5	05	
3	compatible observables	1	1	3			a,b,c,e	I,II,VI	A,C,D	2	3	5	05	

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
	and simultaneous measurements,	1	1	3			b,d,g	I,III, V	A,C,D	2	3	5	05	
	Ehrenfest theorem,	1	1	3			b,d,g	I,III, V	A,C,D	2	2	4	05	
	time dependent Schrödinger equation,	1	1	3			b,c	I,III	A,C,D	2	2	4	05	
	time independent Schrödinger equation,	1	3	3			b,c	I,III	A,C,D	2	2	4	05	
	Eigen states, normalization and	1	2	3			a,b,c	I,VI, V	A,C,D	2	2	4	05	
	ortho – normality of wave function	1	4	4			a,b,c	I,V,VI	A,C,G	2	2	4	05	
	One dimensional potential well,	1	5	4			a,b,c	I,V,VI	A,C,G	2	3	5	05	
4	boundary condition,	1	1	5			a,b,c	I,V,VI	A,C,G	2	3	5	05	
	penetration of rectangular potential barrier in one dimension,	1	1	5			a,b,c	I,V,VI	A,C,G	2	3	5	05	
	derivation of reflection coefficients	1	1	5			a, b,e	I,II,V	A,C,G	2	3	5	05	

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
	and transmission coefficients,	1	1	5			a, b,e	I,II,V	A,C,G	2	3	5	05	
	explanation of alpha decay	1	2	5			a, b,e	I,II,V	A,C,G	2	3	5	05	
	Quiz	1	3	5			a, b,e	I,II,V	A,C,G	2	3	5	05	
	de – Broglie hypothesis,	1	3	5			a, b,e	I,II,V	A,C,G	2	2	4	05	
	Compton effect,	1	3	5			a, b,e	I,II,V	A,C,G	2	2	4	05	
	Davision – Germer experiment,.	1	4	5			b,e	I.II	A,C,G	2	2	4	05	
	Heisenberg uncertainty principle.	1	4	5			b,e	I,II	A,C,G	2	2	4	05	