

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: Particle Physics

Code: PHY – 306

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: Dielectric Properties of Materials. Polarization, Local electric field at an atom. Depolarization field, Lorentz fields of dipoles inside a cavity. Dielectric constant and polarizability: Electric susceptibility, polarizability, Clausius- Mosotti equation. Qualitative discussion of ferroelectric properties of materials and P-E hysteresis loop.

Unit II : Electrical Properties of Materials Qualitative description of free electron theory and its inadequacies with reference to Hall effect and specific heat of electrons in a metal. Elementary band theory-Bloch theorem, Kronig-Penney model, effective mass of electron, concept of hole. Band gaps, difference between conductors, semiconductors and insulators, intrinsic and action, conductivity in semiconductors, mobility of carriers (lattice & semiconductors (qualitative)).

Unit III : Crystal Structure Amorphous and crystalline materials. Lattice translation vectors. Lattice with a basis-central and non-central elements. Unit cell, reciprocal lattice. Types of lattices. Crystal diffraction : Bragg's law, diffraction of X-rays, atoms and geometrical structure factor. S-ray diffraction methods – measurement of lattice parameter for cubic lattices.

Unit IV: Elementary Lattice Dynamics Lattice vibrations. Linear monoatomic and diatomic chains. Acoustical and optical phonons. Qualitative description of the phonon spectrum in solid Brillouin zones. Einstein and Debye theories of specific heat of solids T³ law. Magnetic Properties of Matter Response of substances of magnetic field Dia, para and ferri and ferromagnetic materials. Classical Langevin theory of dia and paramagnetic domains. Quantum mechanical treatment of paramagnetism. Curle's law, Weiss's theory of ferromagnetism and ferromagnetic domains and discussion of B.H hysteresis. Qualitative discussion of ferrimagnets and ferrites. Theory (provide the number of hours of teaching)

Course Prerequisites: Physics and Mathematics in 12th Class

Course Objectives,

1. To inculcate the fundamentals of Thermodynamics
2. To understand the importance of various irreversible engines.
3. To comprehend the dynamics of Heat.
4. To understand various degrees of freedom and molecular movement.
5. To understand the role of Planck's law in origin of Quantum Mechanics

Course Outcomes,

1. Student gains the knowledge on Fundamentals of Thermodynamics
2. Student gets a thorough knowledge different types of reversible and irreversible engines
3. Student gets a thorough knowledge on dynamics of Heat flow.
4. Student gets a thorough knowledge on various degrees of freedom and molecular movement.
5. Finds the evolution of Quantum Mechanics, a new branch of Physics.

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

Unit	Title & Contents of the chapter	Number of Hours	PO	CO	Date		Methodology	Teaching aids used	Method of Assessment	No. of Students assessed				Remarks
1	Dielectric Properties of Materials.	1	1	1			a,c,e	I, II	A,C,D	7	13	20	23	
	Depolarization field, Lorentz fields of dipoles inside a cavity.	1	2	1			b,c	I	A,C,D	3	14	17	23	
	Dielectric constant and polarizability:	1	2	1			g,n,e	I,II,IV	A,C,D	3	14	17	23	
	Electric susceptibility, polarizability,	1	3	1			a,b,c,e	I,II,V I	A,C,D	2	14	16	23	
	Clausius- Mosotti equation.	1	2	1			a,b,c,e	I,II,V I	A,C,D	0	15	15	23	
	Qualitative discussion of ferroelectric properties of materials	1	2	1			a,b,c,e	I,II,V I	A,C,D	5	12	17	23	
	and P-E hysteresis loop.,	1	4	1			a,b,c,e	I,II,V I	A,C,D	4	14	18	23	
	Polarization, Local electric field at an atom.	1	5	1			a,b,c,e	I,II,V I	A,C,D	3	13	16	23	
	Problems	1	5	1			b,d,g	I,III, V	A,C,D	3	15	18	23	
Quiz	1	2	1			a,b,c,e	I, IV,II	A,C,D	1	14	15	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
2	Electrical Properties of Materials	1	2	2			a,b,c,e	I, IV,II	A,C,D	5	15	20	23	
	Qualitative description of free electron theory and its inadequacies	1	2	2			d,e,b	I,II,III	A,C,D	3	14	17	23	
	with reference to Hall effect	1	2	2			a,c,e	I, II	A,C,D	6	12	18	23	
	and specific heat of electrons in a metal	1	2	2			b,c	I	A,C,D	6	14	20	23	
	. Elementary band theory- Bloch theorem,	1	3	2			g,n,e	I,II ,IV	A,C,D	7	9	16	23	
	Kronig-Penney model,	1	2	2			a,b,c,e	I, IV,II	A,C,D	5	15	20	23	
	effective mass of electron, concept of hole	1	2	2			d,e,b	I,II,III	A,C,D	3	14	17	23	
	. Band gaps, difference between conductors, semiconductors and insulators,	1	2	2			a,c,e	I, II	A,C,D	6	12	18	23	
	intrinsic and action, conductivity in semiconductors,	1	1	3			a,b,c,e	I,II,V I	A,C,D	5	13	18	23	
	mobility of carriers (lattice & semiconductors (qualitative)..	1	3	2			g,n,e	I,II ,IV	A,C,D	7	9	16	23	
3	Crystal Structure Amorphous and crystalline materials.	1	1	3			a,b,c,e	I,II,V I	A,C,D	5	13	18	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
	Lattice translation vectors. Lattice with a basis-central and non-central elements..	1	1	3			b,d,g	I,III, V	A,C,D	6	14	20	23	
	Unit cell, reciprocal lattice. Types of lattices.	1	1	3			b,d,g	I,III, V	A,C,D	4	16	20	23	
	Crystal diffraction : Bragg's law, diffraction of X-rays,	1	1	3			b,c	I,III	A,C,D	5	12	17	23	
	atoms and geometrical structure factor.	1	3	3			b,c	I,III	A,C,D	5	14	19	23	
	X-ray diffraction methods – measurement of lattice parameter for cubic lattices	1	2	3			a,b,c	I,VI, V	A,C,D	6	13	19	23	
	Powder Method	1	4	4			a,b,c	I,V,V I	A,C,G	6	11	17	23	
	Laue Method	1	5	4			a,b,c	I,V,V I	A,C,G	5	13	18	23	
4	: Elementary Lattice Dynamics Lattice vibrations. Linear monoatomic and diatomic chains	1	1	5			a,b,c	I,V,V I	A,C,G	4	14	18	23	
	Acoustical and optical phonons.	1	1	5			a,b,c	I,V,V I	A,C,G	5	12	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
	Qualitative description of the phonon spectrum in solid Brillouin zones.	1	1	5			a, b,e	I,II,V	A,C,G	5	14	19	23	
	Einstein and Debye theories of specific heat of solids T3 law,	1	1	5			a, b,e	I,II,V	A,C,G	6	13	19	23	
	Magnetic Properties of Matter Response of substances of magnetic field Dia, para and ferri and ferromagnetic materials.	1	2	5			a, b,e	I,II,V	A,C,G	6	11	17	23	
	Classical Langevin theory of dia and paramagnetic domains	1	2	5			b,c	I,II	A,C,G	5	13	18	23	
	Quantum mechanical treatment of paramagnetism	1	3	5			a, b,e	I,II,V	A,C,G	4	14	18	23	
	Curle's law, Weiss's theory of ferromagnetism	1	3	5			a, b,e	I,II,V	A,C,G	5	14	19	23	
	ferromagnetic domains and discussion of B.H hysteresis.	1	3	5			a, b,e	I,II,V	A,C,G	5	14	19	23	
	Qualitative discussion of ferrimagnets and ferrites.	1	1	5			a, b,e	I,II,V	A,C,G	6	13	19	23	

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF BASIC AND APPLIED SCIENCES

TIME TABLE

FACULTY NAME: Dr. N. RAKESH CHANDRA

ACADEMIC YEAR - 2022 – 2023

ODD 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 - 101	PHY - 201		PHY - 301	LUNCH	ENGG. PHYSICS	PHY - 107	PHY - 107
TUESDAY	PHY - 303	PHY - 203	PHY - 101			ENGG. PHY LAB	ENGG. PHY LAB	
WEDNESDAY	PHY - 105	PHY - 205A	PHY - 305B			ENGG. PHY LAB	ENGG.PHY LAB	
THURSDAY	PHY - 301	PHY - 201	PHY - 105			ENGG. PHYSICS	PHY - 207	PHY - 207
FRIDAY	PHY - 103	PHY - 203	PHY - 305B			ENGG.PHY LAB	ENGG. PHY LAB	
SATURDAY	PHY - 303	PHY - 205A	PHY - 103			ENGG. PHYSICS	PHY - 307	PHY - 307

Convener

Co-convener

HOD

Dean

Portions for Sessionals examination

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

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 University Syllabus

SI 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	Nil
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	Nil
3	Heat and Thermodynamics: An Intermediate Textbook	By Mark Waldo Zemansky, Richard Dittman	1981	McGraw-Hill	Nil
4	Thermal Physics by	Garg, Bansal and Ghosh	1993	Tata McGraw-Hill,	Nil

List of Reference text books from University Syllabus

SI 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

SI 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
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Module / Chapter No 2

SI 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

SI 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

SI 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

SI 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

SI 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

SI 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

SI 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 – 103

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 %)	
1	Remedial teaching	HEMSINGH GURJAR
2	Questions for practice	MANDEEP JANGIR

3	Special guidance beyond college hour	NIKHIL JANGIR
4	Trace out physical and mental	NITIN KUMAR
5	problems if any	PRATEEK
6	Encourage even for small	RAHUL YADAV
	achievement	SAHIL
7	Giving memory tip	SAHIL KUMAR
8	Review time to time	SHEKHAR YADAV
		SONU YADAV
		SAHIL YADAV
		ARUN KUMAR

S.No	Classification	Name of the students
	Average learners (51-75 %)	
	Actions taken	
1	Motivate students	ANSHIKA YADAV
2	Audio-visual aids	NEETU YADAV
3	Create confidence level in their interest areas	NEETU, PUNIT, SUMIT KUMAR
	Mind map	NISHIKANT, MAHESH NEHRA, PIYUSH

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

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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

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	Dielectric Properties of Materials.	1	1	1			a,c,e	I, II	A,C,D	3	6	9	12	
	Depolarization field, Lorentz fields of dipoles inside a cavity.	1	2	1			b,c	I	A,C,D	4	6	10	12	
	Dielectric constant and polarizability:	1	2	1			g,n,e	I,II,IV	A,C,D	2	7	9	12	
	Electric susceptibility, polarizability,	1	3	1			a,b,c,e	I,II,V I	A,C,D	2	8	10	12	
	Clausius- Mosotti equation.	1	2	1			a,b,c,e	I,II,V I	A,C,D	2	9	11	12	
	Qualitative discussion of ferroelectric properties of materials	1	2	1			a,b,c,e	I,II,V I	A,C,D	1	7	8	12	
	and P-E hysteresis loop.,	1	4	1			a,b,c,e	I,II,V I	A,C,D	2	6	8	12	
	Polarization, Local electric field at an atom.	1	5	1			a,b,c,e	I,II,V I	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
	Problems	1	5	1			b,d,g	I,III, V	A,C,D	3	8	11	12	
	Quiz	1	2	1			a,b,c,e	I, IV,II	A,C,D	1	8	9	12	
2	Electrical Properties of Materials	1	2	2			a,b,c,e	I, IV,II	A,C,D	2	9	11	12	
	Qualitative description of free electron theory and its inadequacies	1	2	2			d,e,b	I,II,III	A,C,D	3	7	10	12	
	with reference to Hall effect	1	2	2			a,c,e	I, II	A,C,D	2	6	8	12	
	and specific heat of electrons in a metal	1	2	2			b,c	I	A,C,D	4	7	11	12	
	. Elementary band theory-Bloch theorem,	1	3	2			g,n,e	I,II, ,IV	A,C,D	2	7	9	12	
	Kronig-Penney model,	1	3	2			a,b,c,e	I,II,V I	A,C,D	3	6	9	12	
	effective mass of electron, concept of hole	1	4	2			a,b,c,e	I,II,V I	A,C,D	2	5	7	12	
	. Band gaps, difference between conductors, semiconductors and insulators,	1	2	2			a,b,c,e	I,II,V I	A,C,D	2	5	7	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
	intrinsic and action, conductivity in semiconductors,	1	1	2			a,b,c,e	I,II,V I	A,C,D	3	7	10	12	
3	mobility of carriers (lattice & semiconductors (qualitative)..	1	1	3			a,b,c,e	I,II,V I	A,C,D	4	7	11	12	
	Crystal Structure Amorphous and crystalline materials.	1	1	3			b,d,g	I,III, V	A,C,D	4	6	10	12	
	Lattice translation vectors. Lattice with a basis-central and non-central elements..	1	1	3			b,d,g	I,III, V	A,C,D	2	7	9	12	
	Unit cell, reciprocal lattice. Types of lattices.	1	1	3			b,c	I,III	A,C,D	2	8	10	12	
	Crystal diffraction : Bragg's law, diffraction of X-rays,	1	3	3			b,c	I,III	A,C,D	2	9	11	12	
	atoms and geometrical structure factor.	1	2	3			a,b,c	I,VI, V	A,C,D	1	7	8	12	
	X-ray diffraction methods – measurement of lattice parameter for cubic lattices	1	4	4			a,b,c	I,V,V I	A,C,G	2	6	8	12	
	Powder Method	1	5	4			a,b,c	I,V,V I	A,C,G	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
4	Laue Method	1	1	5			a,b,c	I,V,V I	A,C,G	2	7	9	12	
	: Elementary Lattice Dynamics Lattice vibrations. Linear monoatomic and diatomic chains	1	1	5			a,b,c	I,V,V I	A,C,G	2	8	10	12	
	Acoustical and optical phonons.	1	1	5			a, b,e	I,II,V	A,C,G	2	9	11	12	
	Qualitative description of the phonon spectrum in solid Brillouin zones.	1	1	5			a, b,e	I,II,V	A,C,G	1	7	8	12	
	Einstein and Debye theories of specific heat of solids T ³ law,	1	2	5			a, b,e	I,II,V	A,C,G	2	6	8	12	
	Magnetic Properties of Matter Response of substances of magnetic field Dia, para and ferri and ferromagnetic materials.	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			Total Students	Remarks
					Planned	Engaged				Correctly Responded	Not Correctly Responded	Total Assessed		
1	Dielectric Properties of Materials.	1	1	1			a,c,e	I, II	A,C,D	4	3	7	8	
	Depolarization field, Lorentz fields of dipoles inside a cavity.	1	2	1			b,c	I	A,C,D	5	2	7	8	
	Dielectric constant and polarizability:	1	2	1			g,n,e	I,II,IV	A,C,D	5	1	6	8	
	Electric susceptibility, polarizability,	1	3	1			a,b,c,e	I,II,V	A,C,D	4	2	6	8	
	Clausius- Mosotti equation.	1	2	1			a,b,c,e	I,II,V	A,C,D	5	1	7	8	
	Qualitative discussion of ferroelectric properties of materials	1	2	1			a,b,c,e	I,II,V	A,C,D	6	1	7	8	
	and P-E hysteresis loop.,	1	4	1			a,b,c,e	I,II,V	A,C,D	6	1	7	8	
	Polarization, Local electric field at an atom.	1	5	1			a,b,c,e	I,II,V	A,C,D	4	2	6	8	
	Problems	1	5	1			b,d,g	I,III, V	A,C,D	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
	Quiz	1	2	1			a,b,c,e	I, IV,II	A,C,D	3	2	5	8	
2	Electrical Properties of Materials	1	2	2			a,b,c,e	I, IV,II	A,C,D	3	2	5	8	
	Qualitative description of free electron theory and its inadequacies	1	2	2			d,e,b	I,II,III	A,C,D	4	2	6	8	
	with reference to Hall effect	1	2	2			a,c,e	I, II	A,C,D	5	2	7	8	
	and specific heat of electrons in a metal	1	2	2			b,c	I	A,C,D	5	2	7	8	
	. Elementary band theory-Bloch theorem,	1	3	2			g,n,e	I,II ,IV	A,C,D	5	2	7	8	
	Kronig-Penney model,	1	3	2			a,b,c,e	I,II,V I	A,C,D	6	2	8	8	
	effective mass of electron, concept of hole	1	4	2			a,b,c,e	I,II,V I	A,C,D	6	2	8	8	
	. Band gaps, difference between conductors, semiconductors and insulators,	1	2	2			a,b,c,e	I,II,V I	A,C,D	6	2	8	8	
	intrinsic and action, conductivity in semiconductors,	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
3	mobility of carriers (lattice & semiconductors (qualitative)..	1	1	3			a,b,c,e	I,II,V I	A,C,D	4	2	6	8	
	Crystal Structure Amorphous and crystalline materials.	1	1	3			b,d,g	I,III, V	A,C,D	4	2	6	8	
	Lattice translation vectors. Lattice with a basis-central and non-central elements..	1	1	3			b,d,g	I,III, V	A,C,D	4	2	6	8	
	Unit cell, reciprocal lattice. Types of lattices.	1	1	3			b,c	I,III	A,C,D	2	2	4	8	
	Crystal diffraction : Bragg's law, diffraction of X-rays,	1	3	3			b,c	I,III	A,C,D	2	2	4	8	
	atoms and geometrical structure factor.	1	2	3			a,b,c	I,VI, V	A,C,D	2	2	4	8	
	X-ray diffraction methods – measurement of lattice parameter for cubic lattices	1	4	4			a,b,c	I,V,V I	A,C,G	3	2	5	8	
	Powder Method	1	5	4			a,b,c	I,V,V I	A,C,G	3	2	5	8	
4	Laue Method	1	1	5			a,b,c	I,V,V I	A,C,G	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
	: Elementary Lattice Dynamics Lattice vibrations. Linear monoatomic and diatomic chains	1	1	5			a,b,c	I,V,V I	A,C,G	3	2	5	8	
	Acoustical and optical phonons.	1	1	5			a, b,e	I,II,V	A,C,G	4	2	6	8	
	Qualitative description of the phonon spectrum in solid Brillouin zones.	1	1	5			a, b,e	I,II,V	A,C,G	3	2	5	8	
	Einstein and Debye theories of specific heat of solids T ³ law,	1	2	5			a, b,e	I,II,V	A,C,G	4	2	6	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			Total Students	Remarks
					Planned	Engaged				Correctly Responded	Not Correctly Responded	Total Assessed		
1	Dielectric Properties of Materials.	1	1	1			a,c,e	I, II	A,C,D	3	2	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	
	Depolarization field, Lorentz fields of dipoles inside a cavity.	1	2	1			b,c	I	A,C,D	2	2	4	05	
	Dielectric constant and polarizability:	1	2	1			g,n,e	I,II,IV	A,C,D	1	3	4	05	
	Electric susceptibility, polarizability,	1	3	1			a,b,c,e	I,II,V I	A,C,D	2	2	4	05	
	Clausius- Mosotti equation.	1	2	1			a,b,c,e	I,II,V I	A,C,D	1	3	4	05	
	Qualitative discussion of ferroelectric properties of materials	1	2	1			a,b,c,e	I,II,V I	A,C,D	1	4	5	05	
	and P-E hysteresis loop.,	1	4	1			a,b,c,e	I,II,V I	A,C,D	1	4	5	05	
	Polarization, Local electric field at an atom.	1	5	1			a,b,c,e	I,II,V I	A,C,D	2	2	4	05	
	Problems	1	5	1			b,d,g	I,III, V	A,C,D	2	3	5	05	
	Quiz	1	2	1			a,b,c,e	I, IV,II	A,C,D	2	3	5	05	
2	Electrical Properties of Materials	1	2	2			a,b,c,e	I, IV,II	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	
	Qualitative description of free electron theory and its inadequacies	1	2	2			d,e,b	I,II,III	A,C,D	2	2	4	05	
	with reference to Hall effect	1	2	2			a,c,e	I, II	A,C,D	2	3	5	05	
	and specific heat of electrons in a metal	1	2	2			b,c	I	A,C,D	2	3	5	05	
	. Elementary band theory-Bloch theorem,	1	3	2			g,n,e	I,II,IV	A,C,D	2	2	4	05	
	Kronig-Penney model,	1	3	2			a,b,c,e	I,II,V I	A,C,D	2	3	5	05	
	effective mass of electron, concept of hole	1	4	2			a,b,c,e	I,II,V I	A,C,D	2	3	5	05	
	. Band gaps, difference between conductors, semiconductors and insulators,	1	2	2			a,b,c,e	I,II,V I	A,C,D	2	3	5	05	
	intrinsic and action, conductivity in semiconductors,	1	1	2			a,b,c,e	I,II,V I	A,C,D	2	3	5	05	
3	mobility of carriers (lattice & semiconductors (qualitative)..	1	1	3			a,b,c,e	I,II,V I	A,C,D	2	3	5	05	
	Crystal Structure Amorphous and crystalline materials.	1	1	3			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	
	Lattice translation vectors. Lattice with a basis-central and non-central elements..	1	1	3			b,d,g	I,III, V	A,C,D	2	2	4	05	
	Unit cell, reciprocal lattice. Types of lattices.	1	1	3			b,c	I,III	A,C,D	2	2	4	05	
	Crystal diffraction : Bragg's law, diffraction of X-rays,	1	3	3			b,c	I,III	A,C,D	2	2	4	05	
	atoms and geometrical structure factor.	1	2	3			a,b,c	I,VI, V	A,C,D	2	2	4	05	
	X-ray diffraction methods – measurement of lattice parameter for cubic lattices	1	4	4			a,b,c	I,V,V I	A,C,G	2	2	4	05	
	Powder Method	1	5	4			a,b,c	I,V,V I	A,C,G	2	3	5	05	
4	Laue Method	1	1	5			a,b,c	I,V,V I	A,C,G	2	3	5	05	
	: Elementary Lattice Dynamics Lattice vibrations. Linear monoatomic and diatomic chains	1	1	5			a,b,c	I,V,V I	A,C,G	2	3	5	05	
	Acoustical and optical phonons.	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	
	Qualitative description of the phonon spectrum in solid Brillouin zones.	1	1	5			a, b,e	I,II,V	A,C,G	2	3	5	05	
	Einstein and Debye theories of specific heat of solids T ³ law,	1	2	5			a, b,e	I,II,V	A,C,G	2	3	5	05	
	Magnetic Properties of Matter Response of substances of magnetic field Dia, para and ferri and ferromagnetic materials.	1	4	5			b,e	I,II	A,C,G	2	2	4	05	

