THANTHAI PERIYAR GOVERNMENT ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

SYLLABUS

2023 - 2024

B.SC., PHYSICS

Preamble

Physics is one of the basic and fundamental sciences. The curriculum for the graduate programme in Physics is revised as per the UGC guidelines on Learning Outcome based Course Framework. The learner-centric courses let the student progressively develop a deeper understanding of various aspects of physics.

The new curriculum offer courses in the core areas of mechanics, acoustics, optics and spectroscopy, electricity and magnetism, atomic and nuclear physics, solid state, electronics and other fields. The courses will train students with sound theoretical and experimental knowledge that suits the need of academics and industry. In addition to the theoretical course work, the students also learn physics laboratory methods for different branches of physics, specialized measurement techniques, analysis of observational data, including error estimation and etc. The students will have deeper understanding of laws of nature through the subjects like classical mechanics, quantum mechanics, statistical physics etc. The problem solving ability of students will be enhanced. The students can apply principles in physics to real life problems. The courses like integrated electronics and microprocessors will enhance the logical skills as well as employability skills. The numerical methods and mathematical physics provide analytical thinking and provides a better platform for higher level physics for research.

The restructured courses with well-defined objectives and learning outcomes, provide guidance to prospective students in choosing the elective courses to broaden their skills not only in the field of physics but also in interdisciplinary areas. The elective modules of the framework offer students choice to gain knowledge and expertise in specialized domains of physics like astrophysics, medical physics, etc.

Programme	B.Sc., PHYSICS
Programme Code:	
Duration:	3 years [UG]

Programme Outcomes: (These are mere guidelines. Faculty can create POs based on their curriculum or adopt from UGC or the University for their Programme)	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully; read and write analytically and present complex information in a clear and concise manner to different groups. **PO3: Critical thinking:** Capability to apply the analytic thought to a body of knowledge; analyse and evaluate the proofs, arguments, claims, beliefs on the basis of empirical evidences; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach. **PO4: Problem solving:** Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. **PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation **PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team **PO8: Scientific reasoning**: Ability to analyse, interprets and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and

	experiences from an open-minded and reasoned perspective. **PO9: Reflective thinking**: Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society. **PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data. **PO 11 Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion. **PO 12 Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups. **PO 13: Moral and ethical awareness/reasoning**: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work. **PO 14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way. **PO 15: Lifelong learning:** Ability to acquire knowledge and skills, including „learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/re-skilling.

Programme Specific Outcomes: **(These are mere guidelines. Faculty can create POs based on their curriculum or adopt from UGC or University for their Programme)**	**PSO1: Placement:** To prepare the students who will demonstrate respectful engagement with others ideas, behaviors, and beliefs and apply diverse frames of reference to decisions and actions. **PSO 2**: **Entrepreneur:** To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate start-ups and high potential organizations **PSO3**: **Research and Development:** Design and implement HR systems and practices grounded in researches that comply with employment laws, leading the organization towards growth and development. **PSO4**: **Contribution to Business World:** To produce employable, ethical and innovative professionals to sustain in the dynamic business world. **PSO 5**: **Contribution to the Society:** To contribute to the development of the society by collaborating with stakeholders for mutual benefit

THANTHAI PERIYAR GOVERNMENT ARTS AND SCIENCE COLLEGE (AUTONOMOUS),
(Affiliated to Bharathidasan University), TIRUCHIRAPPALLI-23.

GENERAL COURSE PATTERN FOR UG - PHYSICS - 2023-2024 ONWARDS

S. NO.	PART	COURSE	SUBJECT CODE	COURSE TITLE	Exam Hrs.	Hrs.	Credits	CIA	Semester Exam	Total
				I SEMESTER						
1	P - I	TAMIL-I		Tamil Language	3	6	3	25	75	100
2	P - II	ENGLISH-I		English Language	3	6	3	25	75	100
3	P - III	CORE - I		Properties of Matter And Acoustics	3	6	5	25	75	100
		CORE -II*P		Major Practical -I		2	-	-	-	-
4		FIRST ALLIED- **GE-I**		Generic Elective: Mathematics-I	3	4	4	25	75	100
		FIRST ALLIED **GEII*P**		Generic Elective: Mathematics-II	-	2	-	-	-	-
5	P - IV	VE		Value Education	3	2	2	25	75	100
6		SBE		PCSEC- Basic Instrumentation Skill	3	2	2	25	75	100
				TOTAL		**30**	**19**	**150**	**450**	**600**
				II SEMESTER						
7	P - I	TAMIL **-II**		Tamil Language	3	6	3	25	75	100
8	P - II	ENGLISH- **II**		English Language	3	4	3	25	75	100
9	P - III	CORE-**II-P**		Major Practical -I	3	4	4	40	60	100
10		CORE **-III**		Heat and Thermodynamics	3	5	5	25	75	100
11		FIRST ALLIED **GE II*P**		GE II :Mathematics-II	3	3	3	40	60	100
12		FIRST ALLIED-**GE III**		GE III :Mathematics-III	3	4	4	25	75	100
13	P - IV	ES		Environmental Science	3	2	2	25	75	100
14		NMSDC-**AECC -I**		Language proficiency for Employment(English dept)	3	2*	2*	25	75	100
				TOTAL		**30**	**26**	**230**	**570**	**800**
				III SEMESTER						
15	P - I	TAMIL **-III**		Tamil Language	3	6	3	25	75	100
16	P - II	ENGLISH- **III**		English Language	3	6	3	25	75	100
17	P - III	CORE **-IV**		General and Classical Mechanics	3	4	4	25	75	100
		CORE **-V*P**		Major Practical -II	-	2	-	-	-	-
18		SECOND ALLIED **-GEIV**		GE IV: Chemistry-I	3	4	4	25	75	100
		SECOND ALLIED **GEV*P**		Generic elective I: Allied Practical- II	-	2	-	-	-	-
19		**DSE-I**		**Energy Physics (or)** Medical instrumentation.	3	4	4	25	75	100
20	P - IV	**NME--1**		Non-Major Elective	3	2	2	25	75	100
				TOTAL		**30**	**20**	**150**	**450**	**600**
				IV SEMESTER						
21	P - I	TAMIL **-IV**		Tamil Language S	3	6	3	25	75	100
22	P - II	ENGLISH-**IV**		English Language	3	6	3	25	75	100
23	P - III	CORE-**V*P**		Major Practical -II	3	4	4	40	60	100
24		CORE-VI		Optics and Spectroscopy	3	5	5	25	75	100
25		SECOND ALLIED **-GE V*P**		Generic Elective V: Allied Practical II	3	3	3	40	60	100
26		SECOND ALLIED **-GE VI**		Generic Elective VI: Chemistry-III	3	4	3	25	75	100
27	P - IV	NMSDC-**AECC-II**		Digital skills for Employability	3	2	2	25	75	100
				TOTAL		**30**	**23**	**205**	**495**	**700**

V SEMESTER										
28	P - III	CORE- **VII**		Electricity, Magnetism, Electromagnetism and Electronics	3	5	5	25	75	100
29		CORE-**VIII**		Atomic Physics	3	5	5	25	75	100
30		CORE- **IX**		Relativity and Quantum mechanics	3	6	5	25	75	100
31		CORE - **XP**		Major Practical -III	3	5	5	40	60	100
32		ME-II-**DSEII**		Numerical methods and C Programming (OR) Advanced mathematical Physics	3	5	3	25	75	100
33	P - IV	**NME-II**		Non-Major Elective II	3	2	2	25	75	100
34		SSD		Soft Skill Development	3	2	2	25	75	100
35	P - V	EA		Extension Activities	3	-	1	25	75	100
				TOTAL		**30**	**28**	**215**	**585**	**800**
VI SEMESTER										
36	P - III	CORE-**XI**		Nuclear Physics	3	6	5	25	75	100
37		CORE- **XII**		Solid State Physics	3	6	5	25	75	100
38		CORE- **XIII**		Digital Electronics and Microprocessor	3	5	5	25	75	100
39		CORE - **XIVP**		Major practical IV	3	6	5	40	60	100

40		CORE- **XV**		Laser and Fiber Optics	3	5	4	25	75	100
41	P - IV	NMSDC- **AECCIII**		NMSDC Employability Readiness	3	2	2	25	75	100
				TOTAL		**30**	**26**	**165**	**435**	**600**
				GRAND TOTAL		**180**	**142**	**1115**	**2985**	**4100**

DISCIPLINE SPECIFIC ELECTIVES

1. COMMUNICATION SYSTEMS
2. ENERGY PHYSICS
3. MATHEMATICAL PHYSICS
4. ADVANCED MATHEMATICAL PHYSICS
5. NUMERICAL METHODS AND C PROGRAMMING
6. MATERIALS SCIENCE
7. LASERS AND FIBER OPTICS
8. DIGITAL PHOTOGRAPHY
9. NANO SCIENCE
10. MEDICAL INSTRUMENTATION

NON-MAJOR ELECTIVES

1. PHYSICS FOR EVERYDAY LIFE
2. ASTROPHYSICS
3. MEDICAL PHYSICS
4. HOME ELECTRICAL INSTALLATION
5. PHYSICS OF MUSIC

THANTHAI PERIYAR GOVERNMENT ARTS AND SCIENCE COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI-23.					
GENERAL COURSE PATTERN FOR UG - SCIENCE - 2023-2024 ONWARDS					
CREDIT ALLOCATION					
Part	**Course**	**Total no of papers**	**Credit allotment**	**Total credit**	**Grand total**
I	Tamil	4	4×3	12	12
II	English	4	4×3	12	12
III	Core Papers	11	9×5 2×4	71	99
	Core Practicals	4	2×5 2×4		
	Generic electives i, ii & iii(first allied papers) (3 out of 4)	3	2×4 1×3 (11)	21	
	Generic electives (second	3	1×4		

	allied papers) (3 out of 4)		2×3 (10)		
	Discipline specific elective (me) [2 out of 8]	2	1×3 1×4	7	
IV	Non major elective	2	2×2	4	18
	Ability enhancement compulsory course soft skill [nm]	3	3×2	6	
	SSD	1	1×2	2	
	Value education	1	1×2	2	
	Professional competency skill enhancement course	1	1×2	2	
	Environmental studies	1	1×2	2	
V	Extension activities	1	1×1	1	1
TOTAL		**41**		**142**	**142**

Course title	**PROPERTIES OF MATTER AND ACOUSTICS**		Credit	5	
Course code	23PH1C1		Total Hours	75	
Part	III Core paper I	Semester-I	Marks	CIA-25	SE-75
Objective:	The main objective of the course is to acquire knowledge in Properties of Matter and Sound and also acquire knowledge in the problems related to the topics involved in the syllabus.				

Unit I: Elasticity

Elasticity - Stress-Strain - Hooke's Law - Moduli of Elasticity - Relation Between Elastic Moduli - Poisson's Ratio **σ** - Bending of Beams - Expression for Bending Moment-Cantilever - Theory of Uniform and Non-Uniform Bending - Determination of Young's Modulus - Koenig's Method - Torsion of a Body - Expression for Couple per Unit Twist - Work Done in Twisting a Wire - Torsional Oscillation of a Body - Rigidity Modulus by Dynamic Torsion Method (Torsional Pendulum) and Static Torsion Method.

Unit II: Viscosity

Viscosity - Coefficient of Viscosity - Streamlined and Turbulent Motion - Critical Velocity - Rate of Flow of Liquid in a Capillary Tube - Poiseuille's Formula - Viscosity of Highly Viscous Liquid - Terminal Velocity - Stoke's Method - Ostwald Viscometer - Viscosity of Gas -Mayer's Formula - Rankine's Method.

Unit III: Surface Tension

Surface Tension - Definition - Molecular Force - Explanation of Surface Tension on Kinetic Theory - Surface Energy - Work Done in increasing the area of a surface - Excess pressure inside a curved liquid surface - Excess Pressure inside a spherical and cylindrical drops and bubbles-Drop Weight method - Angle of contact - Quincke's method - Variation of Surface Tension with temperature - Experimental determination - Jaeger's method.

Unit IV: WAVES AND OSCILLATIONS:

Simple Harmonic Motion (SHM) – differential equation of SHM – graphical representation of SHM –Lissajous's figures- Composition of two SHM in a straight line and at right angles – Free, damped, forced vibrations –resonance and Sharpness of resonance.

Unit V: Acoustics

Intensity of sound - Decibel - Intensity level - Laws of Transverse Vibrations - Sonometer – determination of AC frequency - Melde's string method - Absorption coefficient - Acoustics of buildings - Derivation of Sabine's Formula for Reverberation Time and Jaeger's method - Ultrasonics - Production by Piezoelectric and Magnetostriction method - Properties - Applications.

BOOK FOR STUDY

1. Properties of Matter - R. Murugesan, S. Chand & Co., New Delhi - 2004
Unit I Elasticity (1.1to1.23) Unit II Viscosity (2.1to2.14) Unit III Surface tension (3.1to3.18) Unit V Acoustics (11.9 to11.23) (14.1to14.5)

2 Properties of matter- Brijlal N. Subrahmanyam, S. Chand Company
Unit I (5.29 to 5.31)
Unit IV (4.2-4.4, 4.13-4.15)

3 Mechanics and Mathematical methods- R.Murugeshan- S.Chand & Company Ltd, New Delhi.
Unit IV- (16.4-16.6)

BOOKS FOR REFERENCE

1. Properties of matter - D.S. Mathur, S. Chand & Co., New Delhi - 2004
2. Sound - R.L Saihga , S. Chand & Co., 1998.
3. Properties of matter - Sundaravelusamy (Tamil medium book**)**

WEBLINKS	https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html https://www.youtube.com/watch?v=gT8Nth9NWPM https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3s https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work https://learningtechnologyofficial.com/category/fluid-mechanics-lab/ http://www.sound-physics.com/ http://nptel.ac.in/courses/112104026/

Course Outcomes:
On completion of the course the student will be able to

CO1	Identify the materials suitable for construction of buildings based on the moduli of elasticity.
CO2	Have knowledge on properties of liquids and its determination.
CO3	Understand the physics of sound and its applications.
CO4	Gain knowledge in SHM and various type of vibration.
CO5	The concept of acoustic comfort and better understanding of the theories used in buildings acoustics.

MAPPING WITH PROGRAM OUT COMES:
Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG(**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	S	M	S
CO2	M	S	S	S	M	M	S	M	S	S
CO3	S	M	S	M	S	S	M	S	S	S
CO4	M	S	M	S	M	M	S	M	M	M
CO5	M	M	S	S	M	S	S	S	S	M

Course title	**MAJOR PRACTICAL -I**		Credit	4	
Course code	23PH2CP2		Total Hours	60	
Part	III Core paper III	Semester 1&II	Marks	CIA-40	SE-60
Objective	Students acquire practical knowledge in general electronics experiments				

(Any 14 experiments only)

1. Non-uniform bending - Pin and Microscope- Determination of Young's modulus.
2. Uniform bending - Pin and Microscope-Determination of Young's modulus.
3. Cantilever - Mirror and Telescope method-Determination of Young's modulus.
4. Capillary flow method-Determination of Coefficient of viscosity of a liquid.
5. Stoke's method-Determination of Viscosity of a highly viscous liquid.
6. Static torsion - Determination of rigidity modulus of a rod.
7. Torsional pendulum - Determination of rigidity modulus and Moment of Inertia.
8. Compound pendulum - Determination of 'g' and 'k'.
9. Drop weight method-Determination of Surface tension of a liquid and interfacial surface tension between liquids.
10. Newton's law of cooling method-Determination of Specific heat capacity of a liquid.
11. Sonometer - Verification of laws and frequency determination of given tuning fork
12. Spectrometer - Refractive index of a solid prism.
13. Air wedge - Determination of thickness of a thin wire.
14. Potentiometer - Calibration of low range voltmeter
15. Meter bridge - specific resistance of a coil.
16. Sonometer - Determination of AC Frequency.
17. Melde's string - Frequency of the vibrator.
18. Single Optic Lever - Scale and telescope method-Determination of Young's modulus.

Course outcomes

After completing the course, students

- Acquire the data accurately and keep systematic record of laboratory activities
- Interpret findings using the physics tools
- Prepare graphical representation of data and results
- Comparing experimental and theoretical results

Course title	**BASIC INSTRUMENTATION SKILL**		Credit	2	
Course code	23PH1S1		Total Hours	30	
Part	IV SBE-1	Semester-I	Marks	CIA-25	SE-75
Objective	To get exposure with various aspects of instruments and their usage through hands-on mode.				

Unit I: Basic of Measurement:

Instruments - Accuracy - Precision - Sensitivity - Resolution - Range - Errors in measurements and loading effects - Multimeter - Principles of measurement of direct voltage and direct current- AC voltage-AC current and resistance - Specifications of a multimeter and their significance - Electronic voltmeter - Advantage - Principles of voltage - Measurement (Block diagram only) - Specifications of an Electronic voltmeter / Multimeter and their significance - AC millivoltmeter -Type of AC millivoltmeters.

Unit II: Cathode Ray Oscilloscope:

Block Diagram of basic CRO - Construction of CRT - Electron Gun - Time base operation - Synchronization - Front panel controls - Use of CRO for the measurement of voltage (DC and AC frequency, Time Period).

Unit III: Signal Generators and Analysis instruments:

Block diagram - Explanation and specifications of low frequency signal generators - Pulse generator and function generator - Brief idea for testing – Specifications - Distortion Factor meter - Wave analysis.

Unit IV: Impedance Bridges & Q-Meters:

Block diagram of bridge - Working principles of basic (Balancing type) RLC Bridge - Specifications of RLC Bridge - Block diagram and working principles of AQ – Meter - Digital LCR bridges.

Unit V: Digital Instruments:

Principle and working of Digital meters - Comparison of analog and digital instruments - Characteristics of a digital meter - Working principles of digital voltmeter - Digital multimeter - Block diagram and working of a digital multimeters.

Books for study:

1. A Course in Electronics and Electrical Measurements and Instrumentation - J. B. Gupta.

Unit I: Chapter 3 - Page No.: 62 - 71, Unit III: Chapter 23 - Page No.: 813 - 816, 817 - 821, Unit IV: Chapter 21 - Page No.: 713 -715, 702 - 703, Unit V: Chapter 30 - Page No.:1111 - 1116, 1144 - 1153.

2. Basic Electronics: Solid State - B. L. Theraja - S. Chand and Co.

Unit I: Chapter 37 - Page No.: 664 - 670, Unit II: Chapter 37 - Page No.: 673 - 680.

3. Modern Electronic Instrumentation and Measurement Techniques - Albert D. Helfrick & William D. Cooper - Eastern Economy Edition. Unit III: Chapter 8 - Page No.: 32 - 46.

Books for Reference:

1. A text book in Electrical Technology - B L Theraja - S Chand and Co.
2. Performance and design of AC machines - M G Say ELBS Edn.
3. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
4. Logic circuit design, Shimon P. Vingron, 2012, Springer.
5. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
6. Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill.

Course Outcomes:

On completion of the course, the student

CO1	Could identify the errors associated with the instruments
CO2	Understands the principle behind various meters
CO3	Get the knowledge of handling various meters
CO4	Familiarize with the working the CRO
CO5	Understands the working of signal generator and wave analysis

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG(**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	S	M	M	S	M	S
CO2	M	S	S	S	M	M	S	M	S	S
CO3	S	M	S	M	S	S	M	S	S	S
CO4	M	S	M	S	M	M	S	M	M	M
CO5	M	M	S	S	M	S	S	S	S	M

Course title	HEAT AND THERMODYNAMICS		Credit	5	
Course code	23PH2C3		Total Hours	75	
Part	III Core paper III	Semester-II	Marks	CIA-25	SE-75
Objective	To enable the student to acquire the importance of temperature, appreciate the thermodynamic concepts in real life and understand statistical thermo dynamical concepts. Also acquire knowledge in solving problems related to the topics involved in the syllabus.				

Unit I: Thermodynamics

Zeroth and First law of thermodynamics – Isothermal, adiabatic process-Reversible and irreversible process - Second law of thermodynamics - Carnot's ideal heat engine - Carnot's cycle – Efficiency – Entropy - Change of entropy in reversible cycle - Change of entropy in irreversible process-Maxwell's thermodynamical relations-Clausius-Clapeyron's equation.

Unit II: Low Temperature Physics

Van der Waal's equation of state - Values of critical constants - Porous plug experiment - Joule Kelvin effect – Liquefaction of hydrogen by Dewar method - Liquefaction of helium by H. K. Onnes method - Helium I & II properties - Adiabatic demagnetization

Unit III: Transmission of heat:

Conduction – Coefficient of thermal conductivity - Thermal conductivity measurements - Lee's disc method for bad conductor - Forbe's method - Thermal radiation-Black body - Stefan's law - Solar constant - Temperature of sun - Determination of solar constant by pyrheliometer.

Unit IV: Calorimetry

Specific heat capacity of solids and liquids - Newton's law of cooling - Specific heat capacity of gases - Mayer's relation - Determination of C_v by Joly's differential steam calorimeter- Determination of C_p by Regnault's method - Dulong Petit's law - Variation of specific heat with temperature

Unit V: Statistical mechanics

Basics of statistical mechanics - Thermodynamic probability - Fundamental postulates of statistical mechanics - Phase space - Maxwell Boltzmann energy distributive law - Bose - Einstein distribution law - Fermi Dirac distribution law - Comparison of three statistics

BOOK FOR STUDY

1 Heat and Thermodynamics & Statistical Physics - Brijlal, Subramanian & P.S Hemna, S. Chand & co. 2008 Revised Edition.
Unit I. 4.2, 4.7, 4.12, 4.13, 4.20, 4.28, 4.24, 5.1, 5.4, 5.6, 6.3
Unit II: 2.8, 2.11, 2.21, 2.24, 7.10, 7.11, 7.12, 7.16
Unit III: 15, 15.1, 15.9, 15.11, 8.1, 8.6, 8.12, 8.26, 8.27, 8.28
Unit IV: 14.1, 14.2, 14.3, 14.5, 14.10, 14.11, 14.12, 14.17, 14.18
Unit V: 9, 9.8, 10.8, 10.4, 11.3, 12.5, 12.8, 12.15

Book for reference:

1. J.B.Rajam & C.L.Arora, 1976, Heat and Thermodynamics, 8th edition, S.Chand& Co. Ltd.
2. D.S.Mathur, Heat and Thermodynamics, Sultan Chand & Sons.
3. Gupta, Kumar, Sharma, 2013, Statistical Mechanics, 26th Edition, S. Chand & Co.

WEBLINKS	1. https://youtu.be/M_5KYncYNyc 2. https://www.youtube.com/watch?v=4M72kQulGKk&vl=en

Course Outcomes:

On completion of the course the students will be able to

CO1	Acquire knowledge in laws of thermodynamics.
CO2	Gain knowledge on low temperature physics,
CO3	Get the knowledge about conduction and radiation
CO4	Gain knowledge on specific heat capacity,
CO5	Understand the concept of statistical mechanics and distribution laws

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG(**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	S	S	M	S	M
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	M	M	M
CO4	S	M	S	M	S	M	S	M	S	M
CO5	S	S	M	S	S	S	M	M	S	M

Course title	**GENERAL MECHANICS AND CLASSICAL MECHANICS**		Credit	4	
Course code	23PH3C4		Total Hours	60	
Part	III Core paper IV	Semester-III	Marks	CIA-25	SE-75
Objective	To have a basic understanding of the laws and principles of mechanics. To apply the concepts of forces existing in the system; To understand the forces of physics in everyday life: To visualize conservation laws.				

Unit I: GRAVITATION

Kepler's laws-Newton's law of gravitation – Boy's method of finding 'g' – Gravitational potential and intensity due to a sphere and shell – variation of 'g' with altitude, latitude (depth) and rotation of earth – escape velocity – stationary orbit – orbital velocity.

Unit II: CONSERVATION OF LINEAR AND ANGULAR MOMENTUM:

Centre of mass-centre of mass of rigid body- motion of centre of mass and linear momentum- Conservation of linear momentum- collision- angular momentum and torque conservation of angular momentum-examples.

Unit III: CONSERVATION OF LAWS OF ENERGY

Conservation laws – concepts of work, power and energy – conservative forces – energy – kinetic energy and potential energy – potential energy in an electric field - non-conservative forces – general laws of conservation of energy.

Unit IV: RIGID BODY DYNAMICS

Torque and moment of inertia - Analogy between Translatory and rotatory motion – - work done by a torque - perpendicular axes - parallel axes theorem – kinetic energy of a body rolling on a horizontal plane- acceleration of a body rolling down an inclined plane - Compound pendulum - Determination of acceleration due to gravity and radius of gyration.

Unit V: LAGRANGIAN MECHANICS:

Generalized coordinates –degrees of freedom – constraints - principle of virtual work and D' Alembert's Principle –Lagrange's equation from D' Alembert's principle – application – Atwood's machine.

TEXT BOOKS FOR STUDY

1 Properties of Matter by Brij Lal and N.Subrahmanyam.

UNIT I - (Page no. 126-177) (5.4, 5.6, 5.7, 5.22, 5.23-5.31)

2 Mechanics by D.S.Mathur, S.Chand & Co., 2nd Edition (2001)

UN1T-III (Page No. 216-249) (5.1 -5.4,5.7,5.10)

4 Mechanics and relativity - Brij Lal & Subramanyam S. Chand & Company Ltd. New Delhi 1990

UNIT II: 3.2, 3.4, 3.5, 3.9, 3.11, 3.13, 3.15, 3.16

UNIT IV: 3.20- 3.24, 3.41, 3.42.

5 Mechanics and mathematical methods R. Murugeshan S. Chand & Company Ltd.

UNIT V: 6.2, 6.3, 6.6-6.8, 6.10.

BOOKS FOR REFERENCE

1. Fundamentals of Physics by D. Halliday, R.Rensick and J. Walker, 6th edition, Wiley, NY (2001).
2. Mechanics by P.Duraipandian, Laxmi Duraipandian, Muthamizh Jayapragasam, S.Chand & Co., New Delhi (1988).
3. Properties of matter R, Murugeshan S.Chand and Company Ltd.

Course Outcomes:-

At the end of the Course, the students will be able to

CO1	Understand the Newton's law of motion and the basic principle behind planetary motion.
CO2	Acquire the knowledge on the conservation of law of energy.
CO3	Gain knowledge on rigid body dynamics and solve problems behind on this concept.
CO4	Understand the general theory of relativity.
CO5	Understand the application of relativity

Mapping with Programme Outcomes:

Map Course outcomes (CO) for reach course with programme outcomes (PO) in the 3 – point scale of STRONG (S), MEDIUM (M) and LOW (L).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	S	S	M	S	M
CO2	M	S	S	M	M	S	M	M	M	S
CO3	S	S	S	S	S	S	M	M	S	M
CO4	S	S	M	M	M	M	S	M	S	M
CO5	S	M	M	S	S	M	S	M	S	M

Course title	**MAJOR PRACTICAL -II**		Credit	4	
Course code	23PH4CP5		Total Hours	45	
Part	III Core paper V	Semester II1&IV	Marks	CIA-40	SE-60
Objective	Students acquire practical knowledge in general electronics experiments				

Any 14 experiments only

1. Spectrometer - Hollow prism-Refractive index of a liquid
2. Spectrometer - Grating - Minimum deviation method- Determination of wavelength of mercury spectrum.
3. Spectrometer- Small angled prism-Refractive index of solid prism.
4. Newton's rings - Determination of radius of curvature(R) and refractive index(μ)
5. Lee's disc - Determination of Thermal conductivity of a bad conductor.
6. Potentiometer - Ammeter calibration
7. Potentiometer – Determination of Specific resistance of a coil.
8. Potentiometer - Determination of Temperature coefficient of resistance of a coil.
9. Thermistor- Determination of Energy gap
10. Carey Foster's bridge method - Determination of specific resistance of a coil.
11. Post Office box- Determination of Specific resistance of a coil
12. Deflection and Vibration magnetometer-Determination of M and B_H
13. Comparison of magnetic moment - Deflection magnetometer.
14. Figure of merit - Table Galvanometer.
15. Study of characteristics of a junction diode.
16. Study of characteristics of a Zener diode.

Course outcomes

After completing the course, students

- Acquire the data accurately and keep systematic record of laboratory activities
- Interpret findings using the physics tools
- Prepare graphical representation of data and results
- Comparing experimental and theoretical results

Course title	**ENERGY PHYSICS**		Credit	4	
Course code	23PH3DSE-I		Total Hours	60	
Part	III Core Elective paper I	Semester-III	Marks	CIA-25	SE-75
Objective	To get the understanding of the Conventional and non-conventional Energy Sources, their conservation and storage systems.				

Unit 1: INTRODUCTION TO ENERGY SOURCES

Energy consumption as a measure of prosperity – world energy future – energy sources and their availability – conventional energy sources – non-conventional and renewable energy sources – comparison – merits and demerits.

Unit II: SOLAR ENERGY

Solar energy Introduction – solar constant – solar radiation at the Earth's surface – solar radiation geometry – Solar radiation measurements – solar radiation data –solar energy storage and storage systems – solar pond – solar cooker – solar water heater – solar greenhouse – types of greenhouses – solar cells.

Unit III: WIND ENERGY

Introduction –nature of the wind – basic principle of wind energy conversion – wind energy data and energy estimation – basic components of Wind Energy Conversion Systems (WECS) – advantages and disadvantages of WECS – applications – tidal energy

Unit IV: BIOMASS ENERGY

Introduction – classification – biomass conversion technologies –photosynthesis – fermentation - biogas generation –classification of biogas plants – anaerobic digestion for biogas – wood gasification – advantages & disadvantages.

Unit V: ENERGY STORAGE

Importance of energy storage- batteries - lead acid battery -nickel-cadmium battery – fuel cells – types of fuel cells – advantages and disadvantages of fuel cells – applications of fuel cells - hydrogen storage.

OKS FOR STUDY

1. Non – Conventional sources of Energy G. D. Rai, Khanna Publication 2009, 4th Edition.
   UNIT I : 1.1, 1.2, 1.3, 1.4, 1. 5.
   UNIT II: 2.1, 2.2, 2.3, 2.5, 4.2, 4.3, 5.11, 5.6
   UNIT III: 6.1, 6.2, 6.2.1, 6.2.2, 6.2.3, 6.5, 6.7, 6.13
   UNIT IV: 7.1, 7.2, 7.3, 7.4, 7.6, 7.7, 7.8
   UNIT V: 10.3, 10.3.6, 10.2, 10.2.4, 10.2.9, 11.6

BOOKS FOR REFERENCE:

1. S. P. Sukathme, J. K. Nayak, Solar Energy Principles of Thermal collection and storage, Mc. Graw Hill 2008, 3rd Edition.
2. S. A. Abbasi and Nasema Abbasi, Renewable Energy Sources and their Environmental impact, HI Learning Pvt. Ltd. 2008.
3 Non Conventional Sources of Energy, H.C. Jain Sterling Publications 1986.

Web Links:	http://www.un.org
	http://www.nrel.gov
	http://www.irnea.org
	http://www.energy.gov
	http://www.nrdc.org

Course outcomes:

On completion of the course students could have the ability to achieve and understand.

CO1	Description of basic concepts in solar energy
CO2	Explanation of the physical principles of solar energy conversions
CO3	Practicing the applications of solar energy
CO4	The applications of solar photovoltaic system
CO5	Usage of solar energy in various fields.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG(**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	M	M	S	S	M	S	S
CO2	M	M	M	M	S	M	S	M	S	M
CO3	M	M	S	S	M	S	M	S	M	S
CO4	M	M	M	M	M	S	S	M	S	M
CO5	S	S	M	S	S	M	M	S	M	M

Course title	**OPTICS AND SPECTROSCOPY**		Credit	5	
Course code	23PH4C6		Total Hours	75	
Part	III Core paper-VI	Semester-IV	Marks	CIA-25	SE-75
Objective	To understand the concept of physical and geometrical optics and to get comprehensive idea about spectroscopy. Also acquire knowledge in solving problems related to the topics involved in the syllabus.				

Unit I: Geometrical Optics

Refraction through a thin lens - Sign convention - Cardinal points and cardinal planes - Principal foci and focal planes - Principal points and principal planes - Nodal points and nodal planes - Chromatic aberration in lenses and achromatic condition for two lenses separated by a distance - Spherical aberration in lenses and methods of minimizing it - Huygens's and Ramsden's eyepieces - Construction, theory, merits and demerits.

Unit II: Interference

Introduction- Theory of Interference Fringes- Colours of thin films- Production of Colours in thin films- Wedge shaped film- Newton's rings- Determination of wavelength of sodium light by Newton's rings - Michelson's interferometer – application- determination of the wavelength of a monochromatic source of light

Unit III: Diffraction

Introduction - Fresnel's explanation of rectilinear propagation of light - Fresnel and Fraunhofer diffraction - Zone plate - Diffraction at a thin wire - Fraunhofer diffraction at a single slit - Plane transmission diffraction grating - Resolving power of a microscope and prism - Resolving power of a plane diffraction grating - Comparison between prism and grating spectra.

Unit IV: Polarization

Polarisation of Light - Polarisation by reflection - Law of Malus - Double refraction - Huygens theory of double refraction in uniaxial crystals - Nicol Prism - Quarter wave plate and Half wave plate - Production and deduction of plane, circularly, elliptically polarised Light - Optical activity - Specific rotation - Laurents' half shade Polarimeter.

Unit V: Spectroscopy

Introduction - Types of spectra - Infra Red spectroscopy - Ultraviolet spectroscopy - Rayleigh's scattering - Raman Effect - Experimental study of Raman Effect - Quantum theory of Raman Effect - Applications.

BOOKS FOR STUDY

1. Optics - N. Subrahmanyam & Brijlal, M.N. Avadhanulu, edition 2006.
   Unit I : Sec. 4.7,4.9,4.10,5.2,5.3,9.2,9.5,9.0,9.11,9.13,10.8,10.10,10.11,10.13.
2. Optics and spectroscopy - R. Murugesan, S. Chand Publishing, New Delhi.
   Unit ll: Sec 3.1, 3.2, 3.3, 3.9, 3.10, 3.12, 3.22, 3.23, 3.24, 3.25.
   Unit lll: Sec 4.1, 4.2, 4.4, 4.5, 4.6, 4.8, 4.12, 4.13, 4.14, 4.15, 4.19.
   Unit lV: Sec 5.1, 5.2,5 .3, 5.4, 5.5, 5.6, 5.7, 5.8.
   Unit V: Sec 8.2, 8.3, 8.4, 8.5, 8.6, 8.8, 8.9, 8.10

BOOK FOR REFERENCE

1 Optics - Ajoy Ghatak - Tata Mc Graw Hill - New Delhi, 2005.

2 Agarwal B.S, 2011, Optics, KedernathRamnath Publishers, Meerut.

3. Sathyaprakash, 1990, Optics, VII edition, RatanPrakashanMandhir, New Delhi

WEBLINKS	https://science.nasa.gov/ems/ https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCzwo7UlGkb-8Pr6svxWo-LA&start_radio=1&t=2472 https://science.nasa.gov/ems/https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCzwo7UlGkb-8Pr6svxWo-LA&start_radio=1&t=2472https://imagine.gsfc.nasa.gov/educators/gammarabursts/imagine/index.htmlhttp://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/http://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/

Course outcomes:

On the completion of the course, the students acquire knowledge in

CO1	Removing defects in lenses and prism
CO2	Theory of Interference and application of interferometer.
CO3	Different types of diffraction, resolving power of the optical instruments
CO4	Few topics in polarization
CO5	IR, UV spectroscopy and Raman effect.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG(**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	M	M	S	S	M	M
CO2	M	S	M	S	M	S	M	M	S	S
CO3	S	M	S	S	S	M	S	S	M	M
CO4	S	M	S	M	M	S	M	M	S	M
CO5	S	M	S	M	S	S	M	S	S	S

Course title	**ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM**		Credit	5	
Course code	23PH5C7		Total Hours	75	
Part	III Core paper VII	Semester-V	Marks	CIA-25	SE-75
Objective	The main objective is to acquire knowledge on the basics of Electricity, Magnetism Electromagnetism and electronics. Also acquire knowledge in solving problems related to the topics involved in the syllabus.				

Unit I: Electrostatics and Magnetism

Electric Potential at a point due to a point charge -Relation between Electric field and potential- Potential at a point due to a uniformly charged conducting sphere - Principle of a capacitor - Expression for capacity of a spherical capacitor - Energy of a capacitor - Loss of energy due to sharing of charges.

Magnetic induction - Magnetization - Magnetic susceptibility - Magnetic permeability - Experiment to draw M-H Curve - Experiment to draw B-H Curve - Energy loss due to magnetic hysteresis - Importance of hysteresis curve.

Unit II: Electromagnetic Induction

Laws of an Electromagnetic induction - Self-induction - Self-inductance of a solenoid - Determination of self-inductance by Rayleigh's method - Mutual induction - Mutual inductance between two coaxial solenoids - Experimental determination of mutual inductance - Coefficient of coupling - Eddy current and its applications.

Unit III: DC and AC Circuits

Growth and decay of current in a LR Circuit - Growth and decay of charge in a CR Circuit - Measurement of high resistance by leakage method - AC Circuit containing L, C and R in series - Q factor - Parallel resonant circuit - Comparison - Power in an AC circuit containing L, C and R - Wattles current - Choke coil.

Unit IV: Transistor Characteristics and Amplifier

Characteristics of common emitter and common base connection - relation between α and β - Transistor biasing - Base resistor method - Voltage divider biasing circuit - single stage amplifier (CE mode) - Phase reversal-Junction Field Effect Transistor(JFET) - Principle and working - Output characteristics of JFET- Parameters of JFET. Difference between voltage and power amplifier - Classifications of power amplifiers - Push pull amplifier.

Unit V: Feedback Amplifier, Oscillator And Opertional Amplifier

Positive feedback amplifier (oscillator) - Essential of Transistor oscillator-Explanation of Barkhausen criterion - Colpitt's oscillator - Hartley oscillator (theory) - Multivibrator - Transistor astable multivibrator, Operational amplifier - Ideal Op-Amp characteristics - Inverting - Non-inverting op-amp - Applications of Summing amplifiers - Subtractor - Differentiator and integrator.

BOOKS FOR STUDY

1 Electricity and magnetism - R. Murugeshan, S. Chand & company, New Delhi, Seventh Revised Edition 2008
UNIT I: 3.3-3.5 , 4.1, 4.2, 4.3,4.9 & 4.11, 15.1-15.5, 15.14-15.17.
UNIT II: 11.1-11.5, 11.7-11.10, 11.16
UNIT III: 12.1-12.3, 30.1-30.6, 13.4-13.6.

2 Principles of Electronics - V. K. Mehta & Rohit Mehta S. Chand & Company Ltd. Eleventh edition 2014
UNIT IV: 8.12, 9.2, 9.8, 9.12, 10.4, 19.1-19.4, 19.8, 12.4,12.6, 12.17.
UNIT V: 14.5-14.7, 14.10, 14,11, 18.10, 18.12.

3 Basic Electronics -B. L. Theraja S. Chand & Company Ltd. Reprint 1998.
UNIT V: 31.18-31.22, 31.27-31.30

BOOKS FOR REFERENCE

1 Electricity and Magnetism - Brijilal and Subramanyam, Ratan Prakashan Mandir, New Delhi,1995
2 Electricity and Magnetism - Nagarathnam and Lakshminarayan, Super power press, Chennai, 1997
3 Electricity and Magnetism - K.K.Tewari, S.Chand & company,New Delhi,1990.

WEBLINKS	https://www.britannica.com https://books.google.com https://www.electronics-tutorials.ws https://www.coursera.org https://www.instructables.com https://www.udemy.com

Course Outcomes:
On completion of the course, the students will be able to

CO1	Get brief knowledge in electric potential, capacitors and magnetism.
CO2	Discuss about the applications of laws of an electromagnetic induction.
CO3	Understand various AC and DC circuits.
CO4	Study CE characteristics and the working principle of amplifiers and power amplifiers.
CO5	The concept of oscillators, astable multivibrators and few application of OP-AMP

MAPPING WITH PROGRAM OUT COMES:
Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG(**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	M	M	M	S	M	M
CO2	M	S	M	M	M	S	M	M	S	S
CO3	S	M	S	M	S	M	S	M	M	M
CO4	S	M	S	M	M	S	M	M	S	M
CO5	S	M	S	M	M	S	M	S	M	S

Course title	**ATOMIC PHYSICS**		Credit	5	
Course code	23PH5C8		Total Hours	75	
Part	III Core paper VIII	Semester-V	Marks	CIA-25	SE-75
Objective	To understand the theories of atomic models, information about X-ray, determination of crystal structure by different methods. Also acquire knowledge in solving problems related to the topics involved in the syllabus.				

Unit I- THE ELECTRON AND POSITIVE RAYS:

Charge of electron by Millikan's oil drop method- e/m of electron by Dunnington's method – – properties of positive rays –e/m of positive rays by Thomson's parabola method (*problems calculation of e/m ratio of positive rays*)–Aston's mass spectrographs and uses– Bainbridge and Dempster's mass spectrographs.

Unit II- ATOM MODELS

Sommerfield's atom model - Elliptical orbits for hydrogen - Vector atom model - Various quantum numbers - Coupling schemes: L-S and J-J coupling - Pauli's exclusion principle- Statement, Explanation, Applications - Electronic configuration of elements - Magnetic dipole moment due to orbital and spin - Bohr magnetron - Stern - Gerlach experiment.

Unit III- ZEEMAN EFFECT

Zeeman effect - Experiment for normal Zeeman effect - Expression for Zeeman shift - Larmor's theorem - Debye's quantum mechanical explanation of normal Zeeman effect - Anomalous Zeeman effect - Theoretical explanation -Lande 'g' factor - Paschen - Back effect - Stark effect: Experimental study and results.

Unit IV: X-RAYS

Introduction - Production of X - rays - Bragg's law - Bragg's x- ray spectrometer - X - ray study of crystal structures - Powder crystal method - Laue's method - Rotating crystal method -Continuous and Characteristics X - rays - Hard and Soft X - rays - X- ray spectra: Continuous and Characteristic X - ray spectrum - Mosley's law and its importance - Compton effect: Theory and experimental verification.

Unit V: PHOTOELECTRIC EFFECT

Introduction - Photoelectric effect - Lenard's method to determine e/m for photoelectron - Richardson and Compton experiments - Laws of photoelectric emission - Einstein's photoelectric equation - Millikan's experiment - Determination of Plank's constant - Photoelectric cells - Applications of photoelectric cells.

BOOKS FOR STUDY

1. Modern Physics - R. Murugesan - S. Chand & Co, New Delhi, 2008. (Edition: Thirteenth 2008),
   Unit I 2.1, 2.2, 3.2-3.6.
   Unit II: 6.11 - 6.20; Unit III: 6.23-6.28; Unit IVI: 7.1 - 7.2, 7.6-7.9, 7.12 - 7.14;
   Unit V: 8.1 - 8.6

BOOKS FOR REFERENCES

1. Solid State Physics - S. L. Gupta & V. Kumar - K. Nath and Co., Meerut.
2. Atomic Physics - J. B. Rajam - S. Chand & Co.
3. An Introduction to Lasers- Theory and Applications - M.N. Avadhanulu & P.S. Hemne - S. Chand & Co, New Delhi, 2012. (Edition: Second Revised)
4. Concepts of Modern Physics - A Beiser - Tata McGraw Hill, 1987.

WEBLINKS	1. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html 2. https://makingphysicsfun.files.wordpress.com/2015/01/photoelectric-effect.pptx 3. https://www.khanacademy.org/science/physics/quantum-physics/in-in-nuclei/v/types-of-decay 4. https://www.khanacademy.org/science/in-in-class-12th-physics-india/nuclei

Course Outcomes:

On completion of the course the students will be able to

CO1	Understand the atomic models and their concepts.
CO2	Understand the concepts of quantum mechanical theories behind atomic models.
CO3	Know about the concept of X ray and determination of crystal structure using X-ray.
CO4	Analysis the concept of Photoelectric effect and photovoltaic cell.
CO5	Understand the principle, methods and applications of LASER.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG(**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	S	M	S	M	M	S	M
CO2	S	M	M	S	M	S	M	M	M	M
CO3	M	S	S	M	S	M	M	S	S	M
CO4	M	S	M	S	M	M	S	M	M	M
CO5	S	M	S	M	M	S	M	M	M	S

Course title	**RELATIVITY AND QUANTUM MECHANICS**		Credit	5	
Course code	23PH5C9		Total Hours	75	
Part	III Core paper-IX	Semester-V	Marks	CIA-25	SE-75
Objective	To understand the theory of relativity, its postulates and the importance of transformation equations and also to differentiate between special and general theory of relativity. To interpret the wave theory of matter with various theoretical and experimental evidences, to derive and use Schrodinger's wave equation and also learn about various operators. To solve Schrodinger's wave equation for simple problems.				

Unit I: THEORY OF RELATIVITY

Frame of reference – Newtonian principle of relativity - Galilean transformation equation – Ether hypothesis - Michelson-Morley experiment - Special theory of relativity - Lorentz transformation equations – Length contraction - Time Dilation - Relativity of simultaneity – Addition of velocities.

Unit II: APPLICATION OF THEORY OF RELATIVITY

Variation of mass with velocity – Mass energy equivalence – Relationship between the total energy, the rest energy and the momentum – Mass less particles – To show that the rest mass of a photon is zero – Minkowski's four dimensional space-time continuum – The general theory of relativity.

Unit III: DUAL NATURE OF MATTER

Introduction - The De-Broglie's wavelength - Expression for group velocity - Group velocity of De - Broglie's waves - Experimental study of matter waves - Davison and experiment - G.P. Thomson's experiment for verifying De - Broglie's relation - Heisenberg's uncertainty principle - Illustration- Diffraction of electrons at a slit- Postulates of wave mechanics.

Unit IV: OPERATORS AND SCHRODINGER EQUATION:

Schrodinger's one-dimensional Time-dependent wave equation- Time -independent equation- Physical interpretation of the Wave function- Operators in Quantum mechanics, Eigen functions, Eigen value and Eigen value equation- Expectation value-Postulates of Quantum mechanics- Transition probability.

Unit V: SOLVING SCHRODINGER EQUATION

Particle in a One-dimensional box- Particle in a rectangular three-dimensional box-One dimensional Simple harmonic oscillator in quantum mechanics -Transmission across a potential barrier (Tunnel effect).

BOOKS FOR STUDY:

1 Modern Physics - R. Murugeshan, Er. Kiruthiga Sivaprasath- S Chand & Co, New Delhi, seventh Edition 2012, reprint 2013.

UNIT-I (Page No. 3 -13) (1.1–1.12)
UNIT-II (Page no. 4-21) (1.13 to 1.19)
UNIT III - 11.1-11.4, 11.7

2 Elements of Quantum Mechanics - Kaml Singh and S. P. Singh S. Chand & Company Ltd. First Edition 2005

UNIT IV- 4.1 -4.7
UNIT V- 5.1-5.3,5.3b, 5.5.

BOOKS FOR REFERENCE

1. Modern Physics - J. B. Rajam, S Chand & Co
2 Nuclear Physics - Irwing Kaplan - Addison & Wesley Publishing Company, 1955.

WEBLINKS	1. http://hyperphysics.phy-astr.gsu.edu/hbase/qapp.html 2. https://swayam.gov.in/nd2_arp19_ap83/preview 3. https://swayam.gov.in/nd1_noc20_ph05/preview 4. https://www.khanacademy.org/science/physics/special-relativity/minkowski-spacetime/v/introduction-to-special-relativity-and-minkowski-spacetime-diagrams 5. https://www.britannica.com 6. https://books.google.com

COURSE OUTCOMES:
On completion of the course, the student will be able to

CO1	Understand various postulates of special theory of relativity.
CO2	Appreciate the importance of transformation equations and also the general theory of relativity
CO3	Realize the wave nature of matter and understand its importance
CO4	Derive Schrodinger equation and also realize the use of operators.
CO5	Apply Schrodinger equation to simple problems.

MAPPING WITH PROGRAM OUT COMES:
Map course outcomes **(CO)** for each course with program outcomes **(PO)**in the 3-point scale of STRONG(**S**),MEDIUM(**M**) and LOW(**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	S	M	S	M
CO2	S	S	M	S	M	M	S	M	M	M
CO3	M	M	S	M	S	S	M	S	S	S
CO4	M	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	M	M	S	M	M	S

Course title	**MAJOR PRACTICAL -III**		Credit	5	
Course code	23PH5CP10		Total Hours	75	
Part	III Core paper X	Semester V	Marks	CIA-40	SE-60
Objectives	Students acquire practical knowledge in general electronics experiments				

(General and Electronics experiments)

(Any 12 experiments)

1. Koenig's method -Non uniform bending -Determination of q.
2. Spectrometer - i-d curve-Refractive index of a glass prism.
3. Spectrometer - Grating - normal incidence method.
4. Spectrometer - Dispersive power of Grating
5. Potentiometer - High range voltmeter.
6. Potentiometer - EMF of a thermocouple.
7. Verification of Kirchhoff's current and voltage law
8. Series resonant circuit.
9. Parallel resonant circuit.
10. Multimeter principle
11. Zener regulated power supply.
12. Transistor characteristics-CE configuration
13. Hartley oscillator using transistor
14. Logic gates using discrete components.
15. Characteristics of LDR.
16. Single stage RC coupled amplifier using transistor.
17. C Program to find the largest and smallest of given numbers.
18. C Program to solve the given Quadratic equation.
19. C program for temperature conversion
20. Figure of merit Voltage and current sensitivity- BG
21. Charge sensitivity-BG

Course outcomes

On the completion of the course, the students will be able to

- Acquire the data accurately and keep systematic record of laboratory activities
- Interpret findings using the physics tools
- Prepare graphical representation of data and results
- Comparing experimental and theoretical results and find the percentage of error in the result.

Course title	**NUMERICAL METHODS AND C PROGRAMMING**		Credit	3	
Course code	23PH5 DSE-II		Total Hours	75	
Part	III Discipline Elective- II	Semester-V	Marks	CIA-25	SE-75
Objective:	To understand the methods in numerical differentiation and integration and to develop the problem solving skills and acquiring knowledge in C programming for solving numerical method.				

Unit-I: NUMERICAL SOLUTIONS

Roots of linear and nonlinear algebraic and transcendental equations – Iteration (Successive approximation) method - and Newton - Raphson methods – Geometrical meaning of Newton's method-Criterion for convergence- Newton's method- Application - find square root cube roots and reciprocal of number.

Unit-II: NUMERICAL DIFFERENTIATION, INTEGRATION AND CURVE FITTING

Newton's forward and backward interpolation – Lagrange's interpolation – trapezoidal rule – Simpson's 1/3 and 3/8 rule– principle of least squares – fitting a straight line parabola and exponential curve - Modified Euler's method- Runge - Kutta Second and Fourth Order Method.

Unit-III: INTRODUCTION TO C

Importance of C – basic structure of C programming – constants, variables and data types – character set, key words and identifiers – declaration of variables and data types – operators – expressions: arithmetic, relational, logical, assignment – increment and decrement – conditional – comma operators- *getc, putc*, Formatted input and output statement.

Unit-IV: CONTROL STATEMENTS

Decision making with if, if-else, nested if – switch –go to – break – continue –while, do while, for statements – arrays, one dimensional and two dimensional – declaring arrays – storing arrays in memory –initializing arrays.

Unit –V: ALGORITHM, FLOW CHART AND PROGRAM

Development of algorithm – flow chart for solving simple problems–Conversion of Fahrenheit to Celsius and Celsius to Kelvin, average of set of numbers – greatest, smallest — sorting set of numbers in ascending and descending order - Fibonacci series -Summation of odd and even numbers - C program for Newton Raphson method, trapezoidal, Simpson 1/3 and 3/8 rule.

BOOKS FOR STUDY

1 Numerical methods P. Kandasamy, K.Thilagavathy, K. Gunavathi, S.Chand, Reprint 2016.
Unit I - 3.2, 3.2.1, 3.2.2, 3.4, 3.4.1, 3.4.2.
Unit II-9.7-9.9, 9.13, 9.14-1.6-1.9, 11.11-11.13

2 Numerical methods in science and engineering- Dr. M.K. Venkataraman. The National Publishing company Fifth Edition. Reprinted July 2013
Unit II -6.3 6.4 8.4,

3 Programming in ANSI C, E. Balagurusamy, Tata Mc Graw- Hill Publishing Company Limited New Dehli Third Reprint 1999.
Unit III -2.1 -2.9, 3.1- 3.9, 4.1- 4.4
Unit IV -5.1- 5.9, 6.1-6.4, 7.1-7.4

4 Materials given by Department of Physics for C Programs

.

BOOKS FOR REFERENCE

1. Schaum's outline series, Theory and Problems of programming in C, C.Byron& S. Gottfried, Tata McGraw Hill 2003

2. Numerical methods and C Programming, Veerarajan, 2015.

3 Numerical methods, Singaravelu, Meenakshi Publication, 4th Edition.1999.

4 Numerical Analysis, B.D. Gupta, Konark Publishers, New Delhi, 2013

WEBLINKS	https://www.konenig-solutions.com https://www.coursera.org htttps://onlinecourses.swayam2.ac.in https://atozmath.com https://play.google.com

Course Outcomes:

On completion of this course, the student should be able to:

CO1	Use several methods of solving algebraic and transcendental equations of one variable.
CO2	Finding the interpolating values of the function, obtaining the solution numerical integration and differentiation and solving first order differential equation.
CO3	Acquiring knowledge in basic concepts of C-programming,
CO4	Understanding the syntax of various control statements in C programming.
CO5	Developing skills in writing C program for simple programs and numerical methods

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and program specific outcomes **(PSO)** in the 3-point scale of STRONG, MEDIUM and LOW.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	S	S	M	S	M	M	S
CO2	S	M	S	S	S	M	S	M	M	S
CO3	S	M	S	M	M	M	S	M	M	S
CO4	S	M	S	M	M	M	S	M	M	S
CO5	S	M	S	S	S	M	S	M	M	S

Course title	**NUCLEAR PHYSICS**		Credit	5	
Course code	23PH6C11		Total Hours	90	
Part	III Core paper XI	Semester-VI	Marks	CIA-25	SE-75
Objectives	Students acquire knowledge on the basic properties of nuclei, its stability, radioactivity reaction and elementary particle. Also acquire knowledge in solving problems related to the topics involved in the syllabus.				

Unit I: PROPERTIES OF NUCLEUS

General properties of nucleus - Nuclear Size, Charge, Mass, Density, Spin angular momentum, Resultant angular momentum - Nuclear magnetic dipole moments - Electric quadrupole moment - Binding energy - mass defect-Packing fraction - Nuclear forces - Mesons theory of nuclear forces - Nuclear model - The liquid drop model (Qualitative treatment only) - shell model-magic numbers.

Unit II: RADIOACTIVITY

Natural radioactivity - laws of radioactivity-decay constant- half-life, mean life(only final formulae)- Alpha ray spectra - Theory of alpha decay - Beta ray spectra - The neutrino theory of beta decay - Origin of gamma rays - Nuclear isomerism- Internal conversion - Preparation of radio elements - Applications of radio isotopes - Discovery and detection of neutron - Basic properties of neutron.

Unit III: NUCLEAR FISSION AND FUSION

Nuclear fission - Energy released in fission - Bohr and Wheeler's theory of nuclear fission - Chain reaction - Atom bomb - Nuclear reactor - Nuclear fusion - Source of stellar energy - Carbon - Nitrogen cycle - Proton-Proton cycle - Hydrogen bomb - Thermonuclear reactions-controlled thermo nuclear reactions.

Unit IV: PARTICLE DETECTORS AND ACCELERATORS

Accelerator - linear accelerators - Cyclotron - The betatron - Proton synchrotron - Detector: ionization chamber-G.M. Counter - The Wilson's cloud chamber.

Unit V: ELEMENTARY PARTICLES

Particles and antiparticles – classification of elementary particles – types of fundamental interactions – quantum numbers of elementary particles – conservation laws and symmetry – quarks and types – quark model (elementary ideas only).

BOOKS FOR STUDY

1 Modern Physics - R. Murugeshan, Er. Kiruthiga Sivaprasath- S Chand & Co, New Delhi, seventh Edition 2012, reprint 2013.

Unit I - 27.3, 27.4, 27.7, 27.8, 27.10,27.11
Unit II - 31.2, 31.13, 31.14, 31.19, 31.22, 31.25-27, 34.10, 34.11, 34.13.
Unit III - 35.2-35.9, 38.1, 38.4, 38.6, 38.7
Unit IV - 29.3, 39.6, 29.7, 30.3,30.4,30.6,30.8.

BOOKS FOR REFERENCE

2. Modern Physics - J. B. Rajam, S Chand & Co
3 Nuclear Physics - Irwing Kaplan - Addison & Wesley Publishing Company, 1955.

WEBLINKS	https://www.sciencedirect.com htttps://books.google.com https://en.wikipedia.org htttps://onlinecourses.swayam2.ac.in https://rcub.ac.in https://www.iaea.org

Course outcomes:

After completing the course, the students acquire knowledge in

CO1	The basic properties of nuclei, various models of nuclei, counters and detectors
CO2	The natural and artificial radioactivity
CO3	The concepts of fission, fusion and elementary particles
CO4	The dual nature of matter and basic postulates of wave mechanics
CO5	The properties of wave function and application of Schrodinger equation

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MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and program specific outcomes **(PSO)** in the 3-point scale of STRONG, MEDIUM and LOW.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	M	S	S	M	S	M
CO2	S	S	M	S	M	M	S	M	M	M
CO3	M	M	S	M	S	S	M	S	S	S
CO4	M	S	S	S	S	S	S	M	S	M
CO5	S	M	S	S	M	M	S	M	M	S

Course title	**SOLID STATE PHYSICS**		Credit	5	
Course code	23PH6C12		Total Hours	90	
Part	III Core paper XII	Semester-VI	Marks	CIA-25	SE-75
Objectives	The main objective is to acquire knowledge about the crystalline state of solids, provide introduction to various types of bond in solids and to discuss about the different types of materials in solids. Also acquire knowledge in solving problems related to the topics involved in the syllabus.				

Unit I: Crystal Structure

Introduction - Space lattice - Basis - Unit cell - Bravais lattice - Seven crystal system - Crystal planes and Miller indices - Procedure for finding Miller indices - Miller indices in a cube - Important features of Miller indices - Inter planar spacing - Crystal structures - SC, BCC, FCC, HCP - Important crystal structures - Sodium chloride, Cesium chloride and Diamond.

Unit II: Bonding In Solids

Force between atoms - Cohesion of atoms and cohesive energy - Calculation of cohesive energy - Bonding in solids - Ionic bonding - Bond energy of NaCl molecule - Calculation of lattice energy ionic crystals - Calculation of Madelung constant of ionic crystals - Born-Haber cycle - Covalent bond - Hybridization - Metallic bond - Dispersion bonds - Hydrogen bonds.

Unit III: Semiconductors

Introduction - Intrinsic semiconductors - Extrinsic semiconductors - N-type semiconductors - Carrier concentration in N-type semiconductors - P-type semiconductors - Carrier concentration in P-type semiconductors - Hall effect - Determination of Hall co-efficient - Concentration of charge carriers - Mobility of charge carriers - Applications of Hall effect.

Unit IV: Conducting and Dielectric Materials

Introduction - Atomic interpretation of Ohm's law - Derivation of electrical conductivity of a metal - Thermal conductivity - Derivation of K due to conduction electrons - Wiedemann-Franz law - Fundamental definitions in dielectric - Types of polarisation - Local field or internal field - Clausius-Mossotti relation - Determination of dielectric constant of a dielectric constant.

Unit V: Magnetic Material and Super Conductivity

Introduction - Basic definitions - Classification of magnetic materials - Diamagnetic materials - Classical theory of diamagnetism - Paramagnetic materials - Langevin theory of paramagnetism - Ferromagnetic materials - Weiss theory of ferromagnetism - Introduction to superconductors - Properties of superconductors - Types of superconductors - BCS theory - London equations.

BOOKS FOR STUDY

1 Solid state physics - K. Ilangovan, MJP Publishers, 2013
UNIT I: 1.1, 1.2, 1.3, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.4, 1.5, 1.6.1, 1.6.2, 1.6.3, 1.6.4, 1.7.1, 1.7.2, 1.7.3
UNIT V: 6.1, 6.2, 6.3, 6.4, 6.4.1, 6.5, 6.5.1, 6.6, 6.6.1, 7.1, 7.2, 7.2.1, 7.2.2, 7.2.3, 7.2.4, 7.2.5, 7.2.6, 7.3, 7.3.1, 7.3.2, 7.3.3, 7.4, 7.4.1, 7.4.2, 7.4.3, 7.5, 7.5.1, 7.5.2, 7.5.3
UNIT III: [9.1, 9.2, 9.3, 9.3.1, 9.3.2, 9.3.3, 9.3.4, 9.4]

2 Solid state physics - S.O. Pillai, New age international publishers, 2015
UNIT II: Chapter 3 II, III, IV, V, VI, VII, VIII, IX, XI, XIV, XVII, XIX, XXII, XXIV]

3 Materials science - Dr. M. Arumugam, Anuradha publishers, 2016.
UNIT IV: 5.1, 5.2, 5.3.1, 5.7, 5.8, 6.2, 6.3, 6.6, 6.7, 6.8

BOOKS FOR REFERENCE

1. Fundamentals of solid state physics - B.S. Saxena, R.C. Gupta, P. N. Saxena, Pragati Prakashan, Meerut, 2005
2. Solid state physics - S.L. Gupta, V. Kumar - K.Nath &Co, Meerut 2005
3. Solid state physics R.L. Singhal, Kedarnath Ramnath & Co, Meerut, 2003.

WEBLINKS	https://www.sciencedirect.com htttps://books.google.com https://en.wikipedia.org htttps://onlinecourses.swayam2.ac.in https://rcub.ac.in https://www.iaea.org

Course outcomes:

On completion of the course the students will be able to

CO1	Understand the various types of crystal structures
CO2	Discuss about the inter atomic forces and bonds between solids.
CO3	Get brief knowledge about the carrier concentration in various types of semiconductors.
CO4	Discuss about the properties of conducting and dielectric materials.
CO5	Understand the properties of various types of magnetic materials and to analyse the importance of superconductors.

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and program specific outcomes **(PSO)** in the 3-point scale of STRONG, MEDIUM and LOW.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	S	S	S	S	M	S	S
CO2	M	S	M	S	M	M	S	M	M	M
CO3	S	M	S	M	S	M	M	S	S	S
CO4	S	S	S	S	M	S	S	M	M	M
CO5	S	M	M	S	S	M	S	M	M	S

Course title	**DIGITAL ELECTRONICS AND MICROPROCESSOR**		Credit	5	
Course code	23PH6C13		Total Hours	75	
Part	III Core paper XIII	Semester-VI	Marks	CIA-25	SE-75
Objectives	To acquire knowledge on number system, data processing circuits, combinational logic circuits, sequential logic circuits and Microprocessor.				

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Unit I: NUMBER SYSTEM

Review of decimal number system - Binary number system - Binary to decimal conversion - Decimal to binary conversion - Hexadecimal number system - Hexadecimal to decimal conversion - Decimal to hexadecimal conversion - Hexadecimal to binary conversion - Binary to hexadecimal conversion - Octal number system - Octal to decimal conversion - Decimal to octal conversion - Octal to binary conversion - Binary to octal conversion - 1's, 2's compliments, 9's and 10's compliments - Subtraction using compliments - BCD code - 8421code - excess -3 - Gray code - Alphanumeric code .

Unit II: DATA PROCESSING CIRCUITS-USING BASIC LOGIC GATES

Logic gates - Three basic logic gates - OR gate - AND gate - NOT gate - Inverter - Combination of basic logic gates - Half adder and full adder - Half subtractor and Full subtractor - Multiplexer (16 to 1) – Demultiplexer (1 to 16) - 1 of 16 decoder - BCD to decimal decoders- Encoder - Adder / Subtractor.

Unit III: COMBINATIONAL LOGIC CIRCUITS

Laws of Boolean algebra - (reducing Boolean expressions using Boolean laws) -De Morgan's theorems - NAND as universal gate - NAND - NAND network - NOR as universal gate - NOR-NOR network - Sum of products method- Truth table to Karnaugh's map - Pairs, quads and octets - Karnaugh's map simplifications - Don't care conditions - Product of sums method - Product of sums simplification.

Unit IV: SEQUENTIAL LOGIC CIRCUITS

RS latches - Level clocking - Clocked RS flip-flop - D flip-flop - J-K flip-flop and J-K master - slave flip-flop - Shift registers - Ripple counter -UP and DOWN counter - Ring counter - Other counters (mod 10 counter) - Binary weighted resistors D/A converter - Successive approximation A/D converter .

Unit V: MICROPROCESSOR

Intel 8085 - ALU - Timing and control unit - Registers - Data and address bus - Pin configuration - Intel 8085 instructions - Op-codes and operands - Instruction word size - Instruction cycle - Fetch operation - Execute operation - Instruction and data flow - Addressing modes - Assembly language programming - Programs for 8-bit addition with carry, 8-bit subtraction, 8-bit multiplication and division.

BOOKS FOR STUDY

1 **An Introduction to Integrated Electronics (Digital & Analog) -V. Vijayendran-S. Viswanathan Printers & Publishers, Private. Ltd-2005**

Unit-I: [1.1-1.14, 2.5, 2.6, 3.1, 3.3-3.5]
Unit-**II:** [7.2, 7.12]
Unit-III: [5.1-5, 6]
Unit-IV: [16.1, 16.4]

2 Principles of Electronics (Multicolour Revised 11th edition) - V. K. Mehta and Rohit Mehta - S. Chand & Company Pvt Ltd. **Unit-II:** [26.10-26.15]

3 Digital Principles and Applications Donald P Leach, Albert Paul Malvino, Goutam Saha-Sixth Edition, The Mc Graw Hill Companies.] Unit-**II** [4.1- 4.4, 4.6, and 6.8]

Unit-**III:** [3.2-3.8,]

4 Digital Computer Electronics-Second Edition- Albrert Paul Malvino Tata McGraw-Hill Publishing Company Limited, New Delhi. **Unit-IV:** [7.1-7.3, 7.5, 7.6, 8.2, 8.4, 8.6, 8.7]

5 Fundamentals of Microprocessor and Microcomputer- Badri Ram, Dhanpat Rai& Sons VI Edition. **UNIT -V** [3.1, 3.1.1-3.1.8, 3.2, 3.2.1-3, 2.4, 4.3, 5.2]

6 Digital Electronics and Microprocessor-8085V.Vijayendran S.Viswanathan Printers & Publishers, PVT., Ltd, 2013. **Unit-IV:** [5.1-5.4]

BOOKS FOR REFERENCE

1. Digital Electronics - AK Saxena, CBS Publishers and Distributors Pvt Ltd, First Edition, 2014.

2. A Text Book of Digital Electronics-Dr R. S.Sedha, S.Chand &Company Ltd

Course outcome: On the completion of the course, the students are able to

CO1	Familiarise the various number systems
CO2	Realize the functioning of arithmetic and logical circuits
CO3	Reduction of Boolean laws and K-maps
CO4	Understand the various types of flip-flops and counters
CO5	Fundamentals of microprocessors and its applications

MAPPING WITH PROGRAM OUTCOMES:
Map course outcomes **(CO)** for each course with program outcomes **(PO)** and program specific outcomes **(PSO)** in the 3-point scale of STRONG, MEDIUM and LOW.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	S	S	S	S	M	S	S
CO2	M	S	M	S	M	M	M	M	M	M
CO3	S	S	S	M	S	M	M	S	M	S
CO4	S	S	S	S	M	S	S	M	M	M
CO5	S	M	S	S	S	M	S	M	M	S

Course title	**MAJOR PRACTICAL -IV**		Credit	5	
Course code	23PH6CP14		Total Hours	90	
Part	III Core paper XIV	Semester VI	Marks	CIA-40	SE-60

(General and Electronics experiment)

(Any 12 experiment)

1 Field along the axis of the coil -Determination of M.
2 Spectrometer - i-i' curve.
3 Spectrometer- Dispersive power of a prism.
4 Spectrometer - Cauchy's constant.
5 Determination of M and H - TAN C position.
6 Potentiometer- Temperature coefficient of a thermistor.
7 Basic logic gates using ICs.
8 Verification of De Morgan's theorems-IC.
9 FET Characteristics.
10 Colpitt's oscillator using Transistor.
11 OP-AMP -Integrator and differentiator.
12 Astable multivibrator using OP-AMP.
13 Monostable multivibrator using Op-Amp.
14 Determination of absolute Capacitance of a Condenser.-BG.
15 Half adder and Full adder using basic gates.
16 RS, D and JK flip- flop.
17 8085 Microprocessor - 8-bit addition and subtraction program.
18 8085 Microprocessor - 8-bit multiplication and division program.
19 8085 Microprocessor - Logical operation program.
20 8085 Microprocessor - largest and smallest of a numbers.

Course Outcomes

After completing the course, students

- Acquire the data accurately and keep systematic record of laboratory activities
- Interpret findings using the physics tools
- Prepare graphical representation of data and results
- Comparing experimental and theoretical results.

Course title	**LASER AND FIBER OPTICS**		Credit	4	
Course code	23PH6C15		Total Hours	75	
Part	III Elective Core paper III	Semester-VI	Marks	CIA-25	SE-75
Objective	The students will learn the fundamentals, types of lasers, laser instrumentation and their applications also the interconnect between optics with lasers.				

Unit - I: FUNDAMENTALS OF LASER

Basic principles: Absorption and emission of light - spontaneous emission, stimulated emission - Einstein's relation - Condition for light amplification - Population inversion - Pumping methods - Active medium - Metastable states – Two, Three and Four level laser system – Properties of Laser.

Unit - II: TYPES OF LASER

Classification of Lasers - Solid state Lasers: Ruby Laser - Nd:YAG Laser - Neodymium : Glass laser - Gas Lasers : Neutral atom gas laser , Helium – Neon(He-Ne) Laser – Copper Vapour Laser - Semiconductor Lasers : Intrinsic Semiconductor Lasers – Doped semiconductor laser – Injection laser - Chemical Lasers : HCL Laser, DF-CO_2 Laser.

Unit – III: APPLICATIONS OF LASER

Lasers in material processing – Laser in electronic industry – Laser in nuclear energy - LASER in Medicine and Surgery – Eye laser surgery - LASER endoscopy - photo coagulations – Laser in angioplasty - LASER in defence – Laser in optical communication.

Unit – IV: FIBER OPTICS

Basic principles of Fiber optics - Total internal reflection - Construction of optical fiber – Acceptance angle and Numerical aperture – Principles of light propagation in optical fiber – classification of optical fibers based on the Materials used - classification of optical fibers based on the refractive index profile (step index and graded index fiber) –classification of optical fibers based on the number of modes of propagation.

Unit – V: CHARACTERISTICS AND FABRICATION OF OPTICAL FIBER

Preparation of optical fibers – Double crucible method – Modified chemical vapour deposition technique – Losses in optical fibers – Attenuation – Dispersion – Bending losses – Fresnel reflection loss – Mismatch in numerical aperture and core diameter - Splicing of fibers – Fiber applications – fiber optic communication system – Fiber optic endoscope.

BOOKS FOR STUDY

1. Avadhanulu M.N. Hemne P.S, *An introduction to LASERS theory and applications*.(Second Edition). S. Chand & Company, New Delhi, 2012.
   Unit I 1.18-1.25, 1.27, 1.29, 1.30, 1.31, 1.48.1, 1.48.2, 1.48.3, 1.50
   Unit III 5.3 – 5.8, 5.12, 5.15, 5.22
2. B.B. Laud, *Lasers and non-liner optics*,(3rd Edition) New Age International Publishers, New Delhi, 2011
   Unit II 7.1, 7.5, 8.1, 8.2, 9.2, 9.3, 9.5, 10.3, 10.3.1, 10.3.3
3. Marikani A, *Engineering Physics*, PHI learning private limited, Delhi, 2013
   Unit IV 3.1, 3.2, 3.3, 3.4, 3.5, 3.6
   Unit V 3.7, 3.8, 3.9, 3.11.3, 3.12

BOOKS FOR REFERENCE

1. Nambiyar K.R., *Laser: Principles, Types and Applications*.2004.
2. S. Nagabhushana, N. Sathyanarayana. *Lasers and optical instrumentation*, Reprint. 2013.

Web links	1. https://www.eriesd.org/cms/lib/PA01001942/Centricity/Domain/691 /Science-Resource- Guide.pdf
	https://www.fisica.net/optica/Laser-and-its-Applications.pdf

Course Outcomes

On completion of the course, student will be able to

CO-1	describe the fundamentals of light and their properties, Explainthe basic principle of Laser emission
CO-2	illustrate and explain the principles and design considerations of various lasers, Categorize modes of their operation.
CO-3	describe the applications of laser in industries, Execute theobtained knowledge in various technology of applications of Lasers.
CO-4	describe the fundamentals of fiber optics and their classifications.
CO-5	develop the knowledge in characteristics and production of fiber.

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and program specific outcomes **(PSO)** in the 3-point scale of STRONG, MEDIUM and LOW.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	S	M	S	M	S	S
CO2	M	S	M	S	M	S	M	M	M	M
CO3	S	M	M	M	S	M	M	S	M	S
CO4	M	S	M	S	M	M	S	M	M	M
CO5	S	M	S	M	S	M	S	M	M	S

Course title	**GENERIC ELECTIVE COURSE- IV**		Credit	4	
Course code	23MT3A1/23CH3A1		Total Hours	60	
Part	III Second Allied paper I	Semester-III	Marks	CIA-25	SE-75
Objective	This paper introduces the students to the basic concepts of Elasticity, Rotational motion, Heat and thermodynamics, Sound, Optics, Atomic and Nuclear Physics				

(FOR MATHS AND CHEMISTRY STUDENTS)

(For Candidate admitted from the academic year 2023 - 24)

Unit - I: WAVES AND OSCILLATIONS

Simple harmonic motion and circular motion - composition of two simple harmonic motions at right angles (periods in the ratio 1:1) - Lissajou's figures - uses - Laws of transverse vibrations of strings - determination of A.C. frequency using sonometer (steel and brass wires) - Ultrasonics - production - application and uses - Acoustics of buildings - reverberation - Absorption coefficient - Requirements for a good auditorium.

Unit - II: PROPERTIES OF MATTER

Elasticity: Elastic constants - energy stored in a stretched wire - bending of beams - expression for bending moment - Young's modulus by non-uniform bending.

Viscosity: Streamline flow and turbulent flow- Coefficient of viscosity - Poissuelle's formula - Stoke's law - terminal velocity - viscosity of highly viscous liquids.

Surface tension: Molecular theory of surface tension – Determination of Surface tension by drop weight method

Unit - III: THERMAL PHYSICS

Postulates of kinetic theory of gases - Joule-Kelvin effect - Porous plug experiment - theory of Porous plug Experiment - adiabatic demagnetization - Helium I and II - Thermodynamic equilibrium - laws of thermodynamics - entropy - change of entropy in reversible and irreversible processes.

Unit - IV: ELECTRICITY AND MAGNETISM

Capacitor - energy of charged capacitors - loss of energy due to sharing of charges - Biot - Savart's law - magnetic induction at a point on the axis of a circular coil carrying current - EMF induced in a coil rotating in a magnetic field - Mean value of alternating current - RMS values of a ac current and voltage - Electric circuit - switch and its types - fuses - circuit breaker – Relays.

Unit - V: GEOMETRICAL OPTICS

Refraction - Normal refraction - Refractive index by microscopy - air cell method - refraction through a prism and thin prism - Spectrometer - determination of refractive index - combination of two small angled prisms to produce dispersion without deviation and deviation without dispersion - direct vision spectroscope .

BOOKS FOR STUDY:

1. Properties of Matter - R. Murugesan, S. Chand & Co., New Delhi - 2004
   UNIT II - (2.1 to 2.5, 3.1, 3.2, 3.16, 3.17, 3.18)
2. Allied Physics -1 - A. Sundaravelusamy.
   UNIT I PAGE 1-10
   UNIT IV PAGE 75-94
   UNIT V PAGE 14-20, 24-31, 35, 36
3. Heat and Thermodynamics- Brijlal and Subramaniyam S Chand & Company. Fifth edition
   UNIT III PAGE 59-70

BOOKS FOR REFERENCE:

1. Properties of Matter- Brijlal and Subramanian, S. Chand & Co.Pvt.Ltd.2005.
2. Thermal Physics, - . Brijlal and Subramaniyan. S. Chand & Co 2001.
3. A Text Book of Optics Murugeshan and Kiruthiga Sivaprasath. S. Chand & Co. Pvt.Ltd. - Ninth revised Edition Ramnagar 2014, Newdelhi110055.

WEBLINKS	https://www.physicstutoronline.co.uk www.khanacademy.org/science . https://sites.google.com/brown.edu/lecture-demonstrations

Course Outcomes:

On completion of the course, students will be able to

CO1	Understand the concepts of centre of gravity,
CO2	Basic ideas of viscosity and surface tension in fluid,
CO3	Thermal conductivity and specific heat capacity
CO4	Fibre-optic communication
CO5	The concepts of intensity of sound and identify the factors affecting the acoustics of buildings.

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and program specific outcomes **(PSO)** in the 3-point scale of STRONG, MEDIUM and LOW.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	S	M	M	M	S	S
CO2	M	S	M	S	M	M	M	M	M	M
CO3	S	S	S	M	S	M	M	S	M	S
CO4	S	S	M	S	M	S	S	M	M	M
CO5	S	M	S	M	S	M	S	M	M	S

Course title	**GENERIC ELECTIVE COURSE -V**		Credit	3	
Course code	23MT4AP2/23CH4AP2		Total Hours	45+45	
Part	III Core paper III	Semester II1&IV	Marks	CIA-40	SE-60
Objective	Students acquire practical knowledge in general electronics experiments				

(FOR MATHS AND CHEMISTRY STUDENTS)

(For Candidate admitted from the academic year 2023 - 24)

(Any 14 experiments only)

1. Non-uniform bending-pin and microscope.
2. Uniform Bending - Scale and Telescope method.
3. Surface tension and interfacial surface tension-drop weight method.
4. Co-efficient of viscosity of a liquid using graduated burette.
5. Specific heat capacity of a liquid by cooling method.
6. Lee's disc-thermal conductivity of a bad conductor.
7. Spectrometer -Refractive index of a solid prism
8. Air wedge-Thickness of wire.
9. Newton's rings-radius of curvature of a convex lens.
10. Sonometer - Verification of transverse laws.
11. Carey Foster's Bridge -Specific resistance.
12. Potentiometer-Calibration of low range voltmeter.
13. Figure of merit- Spot galvanometer.
14. Energy gap of thermistor- direct method.
15. Characteristics of Zener diode.
16. Characteristics of a junction diode.
17. AND, OR and NOT logic gates-verification of truth tables using ICs.
18. NAND as universal gate.
19. NOR as universal gate.
20. Half adder and subtractor.

Course outcomes

After completing the course, students

- Acquire the data accurately and keep systematic record of laboratory activities
- Interpret findings using the physics tools
- Prepare graphical representation of data and results
- Comparing experimental and theoretical results

Course title	**GENERIC ELECTIVE COURSE -VI**		Credit	3	
Course code	23MT4A3/23CH4A3		Total Hours	45	
Part	III Second Allied paper III	Semester-IV	Marks	CIA-25	SE-75
Objectives	To understand the basic concepts of optics, modern Physics, concepts of relativity and quantum physics, semiconductor physics, and electronics.				

(FOR MATHS AND CHEMISTRY STUDENTS)
(For Candidate admitted from the academic year 2023 -24)

Unit-I: OPTICS

Interference – interference in thin films –colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – diffraction – normal incidence – experimental determination of wavelength using diffraction grating

Unit-II: ATOMIC PHYSICS

Atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model – various quantum numbers – Pauli's exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton – Stark effect – Zeeman effect (elementary ideas only).

Unit-III: NUCLEAR PHYSICS

Nuclear models – liquid drop model – Shell model - nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life - radio isotopes and uses– nuclear fission and fusion – energy released in fission – chain reaction – critical reaction – critical size - atom bomb – nuclear reactor.

Unit-IV: RELATIVITY AND GRAVITATIONAL WAVES

Frame of reference – postulates of special theory of relativity – Galilean transformation equations – Lorentz transformation equations – derivation – length contraction – time dilation– mass-energy equivalence.

Unit-V: SEMICONDUCTOR PHYSICS:

p-n junction diode – forward and reverse biasing – characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – full wave bridge rectifier – construction and working – advantages (no mathematical treatment) – Transistor – CE configuration.

BOOKS FOR STUDY

1. A text Book of Optics, N. Subramaniyam, Brij Lal & Avadhanulu (Ed. 2008), S.

Chand & Co., New Delhi
Unit I: 14.1, 15.5, 15.5.5, 18.5, 18.7

2. Modern Physics, R. Murugesan and Er. Kiruthiga Sivaprasath, (Ed. 2013), S. Chand & Co, New Delhi.
Unit II: 6.4, 6.12, 6.13, 6.15, 6.16, 6.17, 6.23, 6.28
Unit III: 27.1-27.4, 27.10, 27.11, 31.1, 31.30, 31.31, 35.2-35.6
Unit IV: 1.2, 1.7-1.10, 1.14
3. Principle of Electronics, V.K. Mehta, Rohit Mehta (Ed. 2016), S. Chand & Co., New Delhi.
4. Unit V: 6.1, 6.2, 6.3, 6.8, 6.11-6.13, 6.25, 6.27.
5. R. Murugesan (2005), Allied Physics, S. Chand &Co, NewDelhi.
6. K.Thangaraj and D. Jayaraman(2004), Allied Physics, Popular Book Depot, Chennai.

BOOKS FOR REFERENCE

1. Resnick Halliday and Walker (2018), Fundamentals of Physics, 11thEdn., John Wiley and Sons, Asia Pvt.Ltd., Singapore.
2. D.R. Khanna and H.R. Gulati (1979), Optics, S. Chand & Co. Ltd., New Delhi.
3. A. Beiser (1997), Concepts of Modern Physics, Tata McGraw Hill Publication, New Delhi.
4. Thomas L. Floyd (2017), Digital Fundamentals, 11th Edn., Universal Book Stall, New Delhi.
5. V.K.Metha (2004), Principles of electronics, 6th Edn., S.Chand and Company, New Delhi.

WEBLINKS	1. https://www.berkshire.com/learning-center/delta-p-facemask/https://www.youtube.com/watch?v=QrhxU47gtj4https://www.youtube.com/watch?time_continue=318&v=D38BjgUdL5U&feature=emb_logo 2. https://www.youtube.com/watch?v=JrRrp5F-Qu4 3. https://www.validyne.com/blog/leak-test-using-pressure-transducers/ 4. https://www.atoptics.co.uk/atoptics/blsky.htm - 5. https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects

Course Outcome

On completion of the course, the students will be able to

CO1	Understand the basic concept in optics
CO2	Know the concept of atomic models, Zeeman Effect and `related theories.
CO3	Understand the nuclear model and fission, fusion reaction.
CO4	Gain some idea of special theory of relativity.
CO5	Understand the principle and basic knowledge on semiconductor physics

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and program specific outcomes **(PSO)** in the 3-point scale of STRONG, MEDIUM and LOW.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	S	M	M	M	S	S
CO2	M	S	M	S	M	M	M	M	M	M
CO3	S	S	S	M	S	M	M	S	M	S
CO4	S	S	M	S	M	S	S	M	M	M
CO5	S	M	S	M	S	M	S	M	M	S

(For Computer Science Students)
(For Candidate admitted from the academic year 2023 - 24)

Course title	**APPLIED PHYSICS- I**		Credit	4	
Course code	23CS3A1		Total Hours	45	
Part	III Second Applied paper I	Semester-III	Marks	CIA-25	SE-75
Objective	To understand basic concept in electrostatics and its application, drawing B-H curve, principle of potentiometer, electromagnetic induction and AC circuits.				

Unit-I: Electrostatics

Basic concepts of electrostatics - Coulomb's inverse square law - Gauss theorem and its applications (intensity at a point due to a charged sphere & cylinder) - Principle of a capacitor - Capacity of spherical and cylindrical capacitors - Energy stored in a capacitor - Loss of energy due to sharing of charges.

Unit- II: Magnetostatics

Magnetic field - Magnetic flux density - Magnetization - Intensity of magnetization - Susceptibility - Permeability - Types of magnetic materials - Properties dia, para, ferro magnetic materials - Hysteresis - BH curve - Application of BH curve.

Unit-III: Current Electricity

Ohm's law - Verification of Ohm's law - Kirchoff's law - Applications of Kirchoff's law - Sensitivity of Wheatstone's bridge - Carey Foster's bridge - Determination of temperature co-efficient of resistance - Potentiometer - Measurement of current and resistance - Calibration of low range voltmeter - Fleming's left hand rule - Ballistic galvanometer - Damping correction in BG.

Unit-IV: Electromagnetic Induction

Laws of electromagnetic induction - Self and mutual induction - Self-inductance of a solenoid - Mutual inductance of a pair of solenoids - Coefficient of coupling - Experimental determination of self - inductance (Rayleigh's method) and mutual inductance - Growth and decay of charge in circuit containing C and R - High resistance by leakage - Charging and discharging of capacitor through L and R - Eddy current.

Unit-V: Alternating Current

AC circuits with double components - Power in an AC circuit - Power factor (derivation) - Wattless current - Choke - Alternating emf applied to circuits containing L and R - C and R – LCR - Series and parallel resonance circuits - Impedance - Q factor - Sharpness of resonance.

Books for Study:

1. Electricity and Magnetism by Brijlal and Subramaniyam, S. Chand & Company Ltd., 2008.
   (**Unit-III:** Section 6.1; 6.4; 6.6; 7.1; 7.2; 10.1; 10. 11).

2. Electricity and Magnetism by R. Murugeshan, S. Chand & Company Ltd., 10th Edition, 2017.
(**Unit-I:** Section 1.1; 1.2; 2.2; 2.5; 2.8; 4.1; 4.2; 4.3; 4.4; 4.8; 4.11.
Unit-II: Section 10.1; 14.2; 14.4; 14.5; 14.6; 14.7; 14.8; 14.16; 14.17; 14.18.
Unit-IV: Section 11.1; 11.3; 11.4; 11.5; 11.15; 11.18; 11.19; 11.20; 12.3; 12.4.
Unit-V: Section 13.2; 13.3; 13.4; 13.5; 13.6).

Books for Reference:

1. Electricity and Magnetism by Narayanamurthi and Nagarathinam, The National Publishing Company, Madras, 1994.
2. Applied Physics by Sanjay D Jain, Universities Press, Hyderabad, Telengana.

Course Outcomes:

On the successful completion of the course, students will be able to

Course Outcome

On completion of the course, the students will be able to

CO1	Gain knowledge in electric intensity and capacitance of various capacitors.
CO2	Acquire the behaviour of various types' magnetic material
CO3	Principle and usage of Potentiometer, Carey Foster Bridge and BG
CO4	Concept of electromagnetic induction
CO5	Analysis of AC circuits with R, C and L.

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and program specific outcomes **(PSO)** in the 3-point scale of STRONG, MEDIUM and LOW.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	S	M	M	M	M	S
CO2	M	S	M	M	M	M	M	M	M	M
CO3	S	M	S	M	S	M	M	S	M	S
CO4	S	S	M	S	M	S	S	M	M	M
CO5	M	M	S	M	S	M	S	M	M	S

(For Computer Science Students)
(For Candidate admitted from the academic year 2023 - 24)

Course title	**APPLIED PHYSICS- Practical**		Credit	3	
Course code	23CS4AP2		Total Hours	45+45	
Part	III Second Allied paper II	Semester II1&IV	Marks	CIA-40	SE-60
objectives	The students acquire practical knowledge in general electronics experiments				

(Any 14 experiments only)

1. Field along the axis of a coil - Magnetic moment.
2. Potentiometer - Ammeter calibration.
3. Potentiometer -Specific resistance of the given coil.
4. Carey Foster's bridge - Specific resistance.
5. Transistor characteristics-CB mode.
6. Transistor characteristics- CE mode.
7. Zener regulated power supply.
8. Zener diode characteristics.
9. PN Junction diode characteristics.
10. Series resonant circuit.
11. Parallel resonant circuit.
12. Astable multivibrator using OP-AMP.
13. Basic logic gates using ICs.
14. Verification of De Morgan's theorem using ICs.
15. Half adder and Half Subtractor using ICs
16. NAND as a universal gate.
17. NOR as a universal gate.
18. Operational Amplifier -Scale Changer.
19. Operational Amplifier -Inverting of Non- inverting. Amplifier.
20. OP- Amp - Adder and Subtractor.

Course outcomes

After completing the course, students

- Acquire the data accurately and keep systematic record of laboratory activities
- Interpret findings using the physics tools
- Prepare graphical representation of data and results
- Comparing experimental and theoretical results

For Computer Science Students)
(For Candidate admitted from the academic year 2023-24)

Course title	**APPLIED PHYSICS- III**		Credit	3	
Course code	23CS4A3		Total Hours	60	
Part	III Second Allied paper III	Semester IV	Marks	CIA-25	SE-75
Objective:	To understand basic concepts in semiconductor, Transistor, Lasers, Opto - electronics and Operational amplifier.				

Unit-I: Semiconductor physics

Theory of energy bands in crystals - Distinction between conductors, insulators and semiconductors - Intrinsic extrinsic semiconductors - Hall effect in semiconductor – PN junction diode - Zener diode - Characteristics - Zener diode as voltage regulated power supply - Tunnel diode - Backward diode - Breakdown voltage - Avalanche breakdown.

Unit -II: Transistors

Transistors - PNP and NPN transistors - DC characteristics of CE and CB configuration - Hybrid parameters - Functions of transistor as an amplifier and oscillator - FET-N-Channel FET - Performance characteristics - FET amplifier- Comparison of FET and transistor.

Unit -III: Lasers

Laser and Maser - Basic concepts of stimulated emission - Population inversion and meta stable state - He-Ne Laser - Ruby Laser - Ammonia Maser - Production - Advantages.

Unit -IV: Optoelectronic

Light Emitting Diode - Theory - Construction - Applications - Liquid Crystal Display - Construction - Working - PN Junction Photo Diode - LED configuration and performance - Photoconductive cell - Theory and working -Photo Transistor - Photo Conductor - Photo Diode- Photo Transistor - Electronic watches - Seven Segment Display -LCD.

Unit -V: Operational Amplifier

The Basic Operational Amplifier - Inverting and Non Inverting Operational Amplifier - Differential Operational Amplifier - CMRR - Basic uses of Operational Amplifier as sign and scale changer and phase shifter - Adder - Subtractor - Comparator - Differentiator - AC successive approximation

BOOKS FOR STUDY

1. Applied Physics - II by A. Sundaravelusamy, Priya Publications, 2016. (**Unit**-I, II, III, IV & V)

BOOKS FOR REFERENCE

1. Electronic devices and circuits - B.L. Theraja & A.K. Theraja, S. Chand & company Ltd. 1999, Edition.
2. Principle of Electronics by V.K. Mehta and Rohit Mehta, S. Chand & company Ltd. 1999, Edition.

Course Outcomes:

On the completion of the course the students will be able to

CO1	Gain knowledge in Semiconductors, PN junction diode and Zener diode
CO2	Know transistor types, Characteristics and its application as an amplifier.
CO3	Study the fundamentals of Laser action and various kinds of Laser.
CO4	Get knowledge in Optoelectronic devices.
CO5	Study the basic operation of Operational amplifier and its application.

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** and program specific outcomes **(PSO)** in the 3-point scale of STRONG, MEDIUM and LOW.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	S	M	M	M	M	S
CO2	M	S	M	M	S	M	M	M	M	M
CO3	S	M	S	M	S	M	M	S	M	S
CO4	S	M	M	S	M	M	S	M	M	M
CO5	M	M	S	M	S	M	S	M	M	S

Course title	**PHYSICS FOR EVERYDAY LIFE**		Credit	2	
Course code	**NME-I**		Total Hours	30	
Part	**IV Non- Major Elective -I**	**Semester III**	Marks	CIA-25	SE-75
Objective:	To know where all physics principles have been put to use in daily life and appreciate the concepts with a better understanding also to know about Indian scientists who have made significant contributions to Physics				

Unit-I: MECHANICAL OBJECTS:

Spring scales – bouncing balls –roller coasters – bicycles –rockets and space travel.

Unit-II: OPTICAL INSTRUMENTS AND LASER:

Vision corrective lenses – polaroid glasses – UV protective glass – polaroid camera colour photography – holography and laser.

Unit-III: PHYSICS OF HOME APPLIANCES:

Bulb – fan – hair drier – television – air conditioners – microwave ovens – vacuum cleaners

Unit-IV: SOLAR ENERGY:

Solar constant – General applications of solar energy – Solar water heaters – Solar Photo – voltaic cells – General applications of solar cells.

Unit-V: INDIAN PHYSICIST AND THEIR CONTRIBUTIONS:

C.V. Raman, Homi Jehangir Bhabha, Vikram Sarabhai, Subrahmanyan Chandrasekhar, Venkatraman Ramakrishnan, Dr. APJ Abdul Kalam and their contribution to science and technology.

TEXT BOOKS

1. The Physics in our Daily Lives, Umme Ammara, Gugucool Publishing, Hyderabad, 2019.
2. For the love of physics, Walter Lawin, Free Press, New York, 2011.

Web Links:

1. https://electricalworkbook.com/spring-balance/
2. https://www.explainthatstuff.com/bicycles.html
3. http://vfsilesieux.free.fr/Physics_1S_euro_Bloomfield.pdf
4. https://www.visionease.com/wp-content/uploads/2016/09/SunRxTechnicalEducation511.pdf
5. https://itstillworks.com/polaroid-camera-work-1488.html
6. https://www.britannica.com/technology/holography
7. http://sriyncollege.org/wp-content/uploads/2021/03/Unit-III-Electrical-Appliances.pdf
8. https://www.britannica.com/science/solar-energy
9. https://www.wikiwand.com/en/C._V._Raman
10. https://entri.app/blog/homi-j-bhabha-inventions-contribution-awards-quotes/
11. https://www.isro.gov.in/sarabhaiformer.html
12. https://en.wikipedia.org/wiki/Subrahmanyan_Chandrasekhar
13. https://en.wikipedia.org/wiki/Venki_Ramakrishnan
14. https://en.wikipedia.org/wiki/A.P.J. Abdul Kalam

Course title	**ASTROPHYSICS**		Credit	2	
Course code	**NME-II**		Total Hours	30	
Part	**IV Non- Major Elective -I**	**Semester III**	Marks	CIA-25	SE-75
Objective	To know where all physics principles have been put to use in daily life and appreciate the concepts with a better understanding also to know about Indian scientists who have made significant contributions to Physics				

Unit-I: TELESCOPES

Optical telescopes – magnifying power, brightness, resolving power and f/a ratio – types of reflecting and refracting telescopes – detectors and image processing – radio telescopes – Hubble space telescope.

Unit-II: SOLAR SYSTEM

Bode's law of planetary distances – meteors, meteorites, comets, asteroids – Kuiper belt – Oort cloud – detection of gravitational waves – recent advances in astrophysics.

Unit-III: ECLIPSES

Types of eclipses – solar eclipse – total and partial solar eclipse – lunar eclipse – total and partial lunar eclipse – transits.

THE SUN:

Physical and orbital data – solar atmosphere – photosphere – chromosphere – solar corona – prominences – sunspots – 11 year solar cycle – solar flares.

Unit-IV: STELLAR EVOLUTION

H-R diagram – birth & death of low mass, intermediate mass and massive stars – Chandrasekar limit – white dwarfs – neutron stars – pulsars – black holes – supernovae.

Unit-V: SATELLITE AND ITS APPLICATIONS

Orbital velocity - Stationery satellites - Escape velocity - Applications of satellites - Weather forecasting - Navigation - Astronomy - Satellite phone - Satellite television - Military satellites - Satellite internet - Satellite radio.

TEXT BOOKS FOR STUDY

1. Baidyanath Basu, (2001). An introduction to Astrophysics, Second printing, Prentice – Hall of India (P) Ltd, New Delhi
2. K.S.Krishnaswamy, (2002), Astrophysics – a modern perspective, New Age International (P) Ltd, New Delhi.
3. Shylaja, B.S. & Madhusudan, H.R.,(1999), Eclipse: A Celestial Shadow Play, Orient Black Swan,

Web links:

1. https://www.britannica.com/science/optical-telescope
2. https://www.encyclopedia.com/science-and-technology/astronomy-and-space-exploration/astronomy-general/solar-system
3. https://www.timeanddate.com/eclipse/eclipse-information.html
4. https://www.space.com/17160-sun-atmosphere.html
5. https://spaceplace.nasa.gov/solar-activity/en/
6. https://en.wikipedia.org/wiki/Stellar_evolution
7. https://www.britannica.com/science/galaxy
8. https://chhattisgarh.pscnotes.com/cgpcs-mains-updated-notes-2019/cgpcs-mains-paper-iv-gs-ii/cgpsc-mains-paper-iv-science/simple-telescope-and-astronomical-telescope-construction-working-uses-ray-diagram/
9. https://www.scienceinschool.org/article/2012/eclipses

Course title	**MEDICAL INSTRUMENTATION**		Credit	4	
Course code	23PH3DSE-I		Total Hours	60	
Part	III Core Elective paper I	Semester-III	Marks	CIA-25	SE-75
Objective	This course aims to provide background of the Physics principles in medical instrumentation technologies through theoretical & practical learning.				

Unit-I: BIOMETRICS

Introduction to man-instrument system and its components –problems encountered in measuring living systems – transducers– force, motion, pressure transducers.

AUDIOMETRY:

Mechanism of hearing – air and bone conduction – threshold of hearing –audiometer – masking in audiometry – pure tone and speech audiometer – evoked response audiometry – hearing aids

Unit-II: BIOELECTRIC POTENTIALS AND ELECTRODES

Biomedical signals – sources of bioelectric potentials – resting, action and propagation of bioelectric potentials –bio-potential electrodes – skin surface, needle electrodes.

BIOMEDICAL RECORDERS:

Electro- conduction system of heart – electro cardiogram (ECG) – Einthoven's triangle — electro encephalogram (EEG) –brain waves – EEG instrumentation – recording of evoked potentials – electro myogram (EMG)–pulse oximeter.

Unit-III: DIAGNOSTIC RADIOLOGY

Radiography – primary radiological image – contrast agents, filters– beam restrictor, grid –image quality

COMPUTED TOMOGRAPHY:

Linear tomography – computed tomography – helical and multi slice –image quality– radiation dose.

RADIOISOTOPES AND NUCLEAR MEDICINE:

Radioisotopes – radiopharmaceuticals – technetium generator – gamma camera – positron emission tomography – disposal of radioactive waste.

Unit-IV: ULTRASOUND IMAGING

Ultrasound transducer – ultrasound imaging– Doppler ultrasound – ultrasound image quality and bio-effects.

MAGNETIC RESONANCE IMAGING:

Proton & external magnetic field – precession – radiofrequency and resonance – MRI signal – relaxation time – MRI instrumentation – imaging sequences – biosafety

Unit-V: PROJECT ASSIGNMENT

Clinical practice of one of the following:electro cardiogram, electro encephalogram, electro myogram, electro oculogram, computed tomography, positron emission tomography, ultrasound

TEXT BOOKS

1. Biomedical Instrumentation & Measurements Prentice Hall of India, New Delhi. Leslie Cromwell, Fred Weibell, Erich Pfieffer (2002).
2. Handbook of Biomedical Instrumentation 2nd Edn. R. S. Khandpur (2003) Tata McGraw Hill, New Delhi.
3. Basic Radiological Physics, Kuppusamy Thayalan (2017), 2nd Edn. Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.

REFERENCE BOOKS

1. Bio-instrumentation John Wiley and Sons, Singapore. John Webster (2004)
2. Introduction to Biomedical Engineering, 2nd Ed. Elsevier, San Deigo John Enderle, Susan Blanchard, Joseph Bronzino (2005
3. Radiation therapy Physics William Hendee, Geoffrey Ibbott, Eric Hendee (2005) 3rd Edition. Wiley-Liss, New Jersey

Course title	**ADVANCED MATHEMATICAL PHYSICS**		Credit	3	
Course code	23PH5 DSE-II		Total Hours	75	
Part III	Discipline Elective- II	Semester-V	Marks	CIA-25	SE-75
Objective:	The fundamentals of matrices and vector calculus learnt in earlier course will enable students to learn advanced topics and theorems. The special functions and applications of partial differential equations will be of use in research at a later stage.				

Unit-I: MATRICES

Introduction – Special Types of Matrices – Transpose – Conjugate– Conjugate Transpose– Symmetric & Anti Symmetric – Hermitian and Skew Hermitian – Orthogonal And Unitary – Properties – Characteristic Equation – Roots And Characteristic Vectors – Diagonalization– Cayley–Hamilton Theorem –Simple Problems

Unit-II: VECTOR CALCULUS

∇ Operator – Divergence – Second derivative of Vector Functions or Fields – Laplacian Operator – Curl of a Vector – Line Integral – Line Integral of a Vector Field Around An Infinitesimal Rectangle – Curl of Conservative Field – Surface Integral – Volume Integral (Without Problem) – Gauss's Divergence Theorem And Proof – Stoke's Theorem and Proof – Simple Problems.

Unit-III: SPECIAL FUNCTIONS

Definition –Beta function – Gamma function – Evaluation of Beta function – other forms of Beta function – Evaluation of Gamma function – other forms of Gamma function – relation between Beta and Gamma functions – simple problems.

Unit-IV: FROBENIUS METHOD AND SPECIAL FUNCTIONS

Singular points of second order linear differential equations and importance –Singularities of Bessels and Laguerre equations, Frobenius method and applications to differential equations: Legendre and Hermite differential equations – Legendre and Hermite polynomials – Rodrigues formula –generating function – orthogonality

Unit-V: PARTIAL DIFFERENTIAL EQUATIONS

Solutions to partial differential equations using separation of variables - Laplace's equation in problems of rectangular – cylindrical and spherical symmetry – conducting and dielectric sphere in an external uniform electric field – wave equation and its solution for vibrational modes of a stretched string

TEXT BOOKS

1. Mathematical Physics, B.D. Gupta-Vikas Publishing House, 4 th Edition (2006)

2. Mathematical Physics, SatyaPrakash (Sultan Chand)

REFERENCE BOOKS

1. Mathematical Methods for Physicists, G.B.Arfken, H.J.Weber, F.E. Harris (2013, 7th Edn., Elsevier)
2. Mathematical Physics–H. K. Dass, Dr. Rama Verma (S. Chand Publishing)
3. Advanced Engineering Mathematics, Erwin Kreyszig (Wiley India)
4. Mathematical Physics and Special Relativity, M. Das, P.K. Jena and B.K. Dash (Srikrishna Prakashan).

GENERIC ELECTIVE PAPER (ALLIED)

GE IV -ALLIED CHEMISTRY/MATHEMATICS

GE V* - ALLIED CHEMISTRY/MATHEMATICS PRACTICALS

GE-VI -ALLIED CHEMISTRY/MATHEMATICS

DISCIPLINE SPECIFIC ELECTIVE PAPER

S.No.	Part III	CHOICE OF THE PAPER	SELECTED	SEMESTER
1	DSE-I	**Energy Physics (or)** Medical Instrumentation	**Energy Physics**	III
2	DSE-II	**Numerical methods and C programming(or)** Advanced Mathematical physics	**Numerical methods and C programming**	V

NON MAJOR ELECTIVE COURSES FOR UG

Receiving from other departments

Sl. No	Title of the paper		Offering department
1	NME I		**Chemistry**
2	NME II		**Chemistry**

Offered to other Departments.

Sl. No	Title of the paper		Receiving department
1	NME I	Physics for Everyday life	Chemistry
2	NME II	Astro Physics	Chemistry