PG & RESEARCH DEPARTMENT OF PHYSICS

NATIONAL COLLEGE (AUTONOMOUS),

TIRUCHIRAPPALLI

B.Sc. –Major, Allied, Applied and NME

SYLLABUS

FROM JUNE 2025 ONWARD

ABOUT THE PROGRAMME: B.Sc. in PHYSICS

The B.Sc. program in Physics at National College (Autonomous), affiliated with Bharathidasan University, is designed to provide students with a solid foundation in core areas of physics, including Digital Electronics, C++Programming. It equips them with the analytical and problem-solving skills necessary for higher studies The program also aims to develop practical expertise in Practical Physics techniques through hands-on training in General Physics, Electronics, Digital Electronics, and Micro Processor Programs, preparing students for world applications of theoretical Concepts of Physics. Additionally, the program offers students the opportunity to specialize in thrust areas such as Electronics, Laser-Physics, while satisfying the needs of the students for research-oriented learning Some of the elective courses are inspired by those offered at specialized departments in various state universities, each focusing on specific areas of physics. Students are also encouraged to pursue MOOCs through self-learning initiatives, earning additional credits. Students with a flair for research may Study up to Ph.D. program offered by the department, which is well-supported by a fully-equipped common instrumentation center and a digital library.

List of PO's and PSO's

PO No	Programme outcomes	PSO No	PSO	Related PEO's
1	Disciplinary Knowledge	1	To provide students with a strong foundation in the fundamentals of Physicist formulate, solve and analyze Physics problems and to prepare them for higher learning.	PEO1, PEO2
2	Communication Skills	2	To prepare the students for a successful career and work with values for social concern.	PEO3, PEO4
3	Critical thinking, Problem solving and Analytical Reasoning	3	To Analyze the applications of mathematics to solve the problems in physics	PEO1, PEO5
4	Reflective thinking and scientific reasoning	4	To learn and design an experiment (or series of experiments) demonstrating the Principles of the scientific method(s).	PEO3, PEO6
5	Moral and ethical awareness	5	Create confidence to become an entrepreneur by providing entrepreneurial skills and technical skills.	PEO4, PEO5
6	Multicultural competency and self-directed life-long learning	6	To promote student awareness on the life-long learning and to introduce them to professional ethics and codes of professional practice.	PEO2, PEO6

Program Educational Outcomes (PEO's)

PEO1: Choose teaching and research as a career with the skills acquired.

PEO2: Create confidence to become an entrepreneur by providing entrepreneurial skills and technical skills.

PEO3: Get through successfully in the competitive examinations conducted at the state level and national level for employment.

PEO4: Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

PEO5: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PEO6: To instill societal relevance and professional ethics in students, ensuring they contribute responsibly to scientific advancement while upholding sustainability and conservation principles.

Sem.	S.No	Course Code	Part	Hrs/ Week	Credit	Course type	Course Title	Course Kind	Hours of Exam	Marks		Total Marks
										Int.	Ext.	
I	1	U25T1/U25H1/U25S1	I	6	3	Theory	Tamil-I/Hindi-I /Sanskrit- I	Language	3	25	75	100
	2	U25E1	II	6	3	Theory	English-I	English	3	25	75	100
	3	U25PH1	III	5	5	Theory	Properties of Matter, Acoustics and Ultrasonics	Core-1	3	25	75	100
	*	U25PH2P	III	3	---	Practical	Physics Major Practical–I	Core-2	3	---	---	---
	4	U25AMS1	III	5	5	Theory	Allied mathematics-I	Allied	3	25	75	100
	*	U25AMS2	III	3	---	Theory	Allied mathematics-II	Allied	---	---	---	---
	5	U25ES	IV	2	2	Theory	Environmental Studies		3	25	75	100
				30	**18**							
II	6	U25T2/U25H2/U25S2	I	6	3	Theory	Tamil-II/Hindi-II /Sanskrit- II	Language	3	25	75	100
	7	U25E2	II	6	3	Theory	English-II	English	3	25	75	100
	8*	U25PH2P	III	3	5	Practical	Physics Major Practical–I	Core-2	3	25	75	100
	9	U25PH3	III	5	5	Theory	Mechanics& Relativity	Core-3	3	25	75	100
	10*	U25AMS2	III	5	3	Theory	Allied Mathematics-II	Allied	3	25	75	100
	11	U25AMS3	III	3	3	Theory	Allied Mathematics-III	Allied	3	25	75	100
	12	U25SBE1	IV	2	2	Theory	Office Automation	SBE-I	3	25	75	100
				30	**24**							
III	13	U25T3/U25H3/U25S3	I	6	3	Theory	Tamil-III/Hindi-III /Sanskrit- III	Language	3	25	75	100
	14	U25E3	II	6	3	Theory	English-III	English	3	25	75	100
	15	U25PH4	III	4	4	Theory	Thermal Physics	Core-4	3	25	75	100
	*	U25PH5P	III	3	---	Practical	Physics Major Practical–II	Core-5	3	---	---	---
	16	U25ACH1	III	4	3	Theory	Allied Chemistry-I	Allied	3	25	75	100
	*	U25ACH2P	III	3	---	Practical	Allied Chemistry Practical	Allied	---	---	---	---
	17	U25PHSBE2	IV	2	2	Theory	Non-Conventional Energy Sources	SBE-II	3	25	75	100
	18	U25PHSBE3	IV	2	2	Theory	Bio Medical Instrumentation	SBE-III	3	25	75	100
				30	**17**							
IV	19	U25T4/U25H4/U25S4	I	6	3	Theory	Tamil-IV/Hindi-IV /Sanskrit- IV	Language	3	25	75	100
	20	U25E4	II	6	3	Theory	English-IV	English	3	25	75	100

	21*	U25PH5P	III	3	5	Practical	Physics Major Practical–II	Core-5	3	25	75	100
	22	U25PH6	III	3	4	Theory	Basic Electronics	Core-6	3	25	75	100
	23*	U25ACH2P	III	3	3	Practical	Allied Chemistry Practical	Allied	3	25	75	100
	24	U25ACH3	III	5	3	Theory	Allied Chemistry-III	English	3	25	75	100
	25	U25PHNME1	IV	2	2	Theory	Non-Major Elective-Energy Physics	NME	3	25	75	100
	26	U25VE	IV	2	2	Theory	Value Education		3	25	75	100
				30	**25**							
V	27	U25PH7	III	5	5	Theory	Optics	Core-7	3	25	75	100
	28	U25PH8	III	5	5	Theory	Electricity, Magnetism and Electromagnetism	Core-8	3	25	75	100
	29	U25PH9E	III	5	4	Theory	Digital Electronics and Microprocessor	Core Elective-9	3	25	75	100
	30	U25PH10E	III	5	4	Theory	Computer Programming–C++ Language	Core Elective-10	3	25	75	100
	*	U25PH11P	III	3	---	Practical	Physics Major Practical–III	Core-11	---	---	---	---
	*	U25PH12P	III	3	---	Practical	Physics Major Practical–IV	Core-12	---	---	---	----
	31	U25PHNME2	IV	2	2	Theory	Laser Physics	NME	3	25	75	100
	32	U25SS	IV	2	2	Theory	Soft skills		3	25	75	100
				30	**22**							
VI	33*	U25PH11P	III	3	5	Practical	Physics Major Practical–III	Core-11	3	25	75	100
	34*	U25PH12P	III	3	5	Practical	Physics Major Practical–IV	Core-12	3	25	75	100
	35	U25PH13	III	6	6	Theory	Atomic and Nuclear Physics	Core-13	3	25	75	100
	36	U25PH14	III	6	6	Theory	Elements of Theoretical Physics	Core-14	3	25	75	100
	37	U25PH15	IIII	6	6	Theory	Solid State and Materials Science	Core-15	3	25	75	100
	38	U25PH16E	III	5	4	Theory	Opto Electronics and Fiber Optic Communication	Core Elective-16	3	25	75	100
	39	U25GS	V	1	1	Theory	Gender Studies		3	25	75	100
	40		V		1		Extension Activities	---	---	100	---	100
				30	**34**							
				180	**140**							**4000**

* Examinations at the end of even semesters only.

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CORE COURSE- (CC-I)
PROPERTIES OF MATTER and ACOUSTICS

Semester-I

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH1	Core course	Theory	5	5

Course Description: This course provides a foundational understanding of the physical properties of matter and the principles of acoustics. It explores the behavior and structure of solids, liquids, and gases, emphasizing concepts such as elasticity, viscosity, surface tension, thermal expansion, and phase transitions. The second part of the course introduces the fundamentals of sound, including wave propagation, resonance, speed of sound in various media, and applications of acoustics in real-world systems.

Course Objectives:

Enabling the learner to

- Brief about the basics of elasticity.
- Explain the concept of bending of beams and its various properties.
- Review the elementary ideas and theory of surface tension and its experimental
- determination.
- Have the elementary ideas and theory of viscosity and its experimental method.
- Outline the ideas of production and detection of ultrasonics.
- Explain the ideas of Acoustics

UNIT-I: ELASTICITY (15 Hrs)

Elasticity-Stress-Strain- Hooke's law - Modulus of elasticity- Poisson's ratio- Work done in a strain- Relation between elastic constants and Poisson's ratio-Energy stored- Twisting couple on a cylinder- Torsional pendulum (with and without weights)- Determination of rigidity modulus- Determination of rigidity modulus by Searle's static torsion method(scale and telescope).

UNIT-II: BENDING OF BEAMS (15 Hrs)

Beam-Bending moment- Cantilever- Depression for loaded end of a cantilever-Experiment to find theYoung's modulus by cantilever depression method-Oscillations of a cantilever-Measurement of Young's modulus- Non-uniform bending (pin and microscope method)-Uniform bending(mirror and telescope method)-Non-uniform and uniform bending of a beam-Koenig's method.

UNIT-III: FLUID DYNAMICS(15 Hrs)

Surface tension – Definition – Molecular forces – Explanation of surface tension on kinetic theory – Work done in increasing the area of a surface – Excess pressure inside a curved liquid surface –- Jaegar's method - variation of surface tension with temperature

Viscosity – Coefficient of viscosity – Streamlined and turbulent motion – Critical velocity – Rate of flow of liquid in a capillary tube – Poiseuille's formula and its corrections -Terminal velocity- Stoke's method for coefficient of viscosity

UNIT-IV: WAVES AND OSCILLATIONS (15 Hrs)

Simple harmonic motion differential equation of SHM composition of two simple harmonic motion in a straight line under right angles –free,damped,forced vibrations resonance and sharpness of resonance laws of transverse vibrations in string Sonometer-determination of AC frequency using Sonometer

UNIT-V:ACOUSTICSAND ULTRASONICS (15 Hrs)

Reverberation-Reverberation time-Sabine's formula for reverberation time-Absorption coefficient and Determination of Absorption coefficient-Factors affecting the acoustics of buildings-Sound distribution in auditorium-Requisites for good acoustics.

Ultrasonics-Production of Ultrasonics-Magnetostriction oscillator method-Piezo electric oscillator method- Detection of ultrasonic waves-Applications of Ultrasonics.

BOOKS FOR STUDY:

1.R.Murugeshan,Properties of Matter,S.Chand &Co,New Delhi(2008).
2.Brijlal,N.Subrahmanyam,Textbook of Sound,Vikas Publishing Co,NewDelhi(1983).

BOOKS FOR REFERENCE:

1. BrijlalandN.Subrahmanyam,Properties of Matter,S.ChandandCo.Ltd.New Delhi(1999).
2. SubramaniaIyer,Jeyaraman and Rangarajan,Properties of Matter,S.Chand Publications, NewDelhi(1978).
3. D.S.Mathur,Elements of Properties of Matter,S.Chand and Co.Ltd.,New Delhi(2010).
4. R.C.Brown,Mechanics and Properties of Matter,Longmans Green and company(2005).

Online Resources:

Acoustics: https://youtu.be/yyqhgnc5cWI?si=olEDxMOhASM0DIeN

Properties of matter: https://youtu.be/ZmtOAlvWIjA

Fluid dynamics : https://nptel.ac.in/courses/101103004

CO-PO mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	9	9	9	1
CO-2	9	9	3	3	1	3
CO-3	3	3	1	3	3	1
CO-4	9	1	9	9	9	3
CO-5	3	9	9	1	9	9
CO-6	1	1	3	9	9	9
Weightage	28	26	34	34	40	26
Weightage Percentage of course contribution to PO's	15%	14%	18%	18%	22%	14%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	**Medium**	**Low**	**Zero**
CO-1	**PO-1,PO-2**	**PO-4,PO-5**	**PO-3,PO-6**	**---**
CO-2	**PO-1,PO-4**	**PO-2,PO-3**	**PO-5,PO-6**	**---**
CO-3	**PO-1,PO-3, PO-6**	**PO-2,PO-5**	**PO-4**	**---**
CO-4	**PO-1,PO-2, PO-5**	**PO-4**	**PO-3,PO-6**	**---**
CO-5	**PO-2,PO-6**	**PO-1,PO-4**	**PO-3,PO-5**	**---**
CO-6	**PO-1**	**PO-4,PO-5, PO-6**	**PO-2,PO-3**	**---**

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed **Course Verified** **HOD**

CORECOURSE-(CC-II):Physics Major Practical-I
(At the end of the SECOND Semester-Any Fifteen Experiments)

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH2P	Core course	Practical	3	6

Objectives: Enabling the learner to

- Brief about the basic experiments of elasticity.
- Explain the concept of bending of beams by performing experiment.
- Review the elementary ideas about Specific heat,Wheatstone's bridge.
- To verify experimentally the thermal conductivity of a material.
- Outline the ideas of Sound experimentally.
- Explain the ideas of Light,Lens.

List of Experiments

1. Non-uniform bending–Pin and microscope method.
2. Uniform bending–Optic lever method.
3. Sonometer–Verification of laws of transverse vibrations.
4. Specific heat capacity f a liquid–Newton's law of cooling method.
5. MeterBridge–Specific resistance of a material of a coil.
6. Compound pendulum Determination of acceleration due to gravity(g)&Radius of gyration (k).
7. Sonometer-Determination of A.C frequency.
8. Potentiometer-Internal resistance of a cell.
9. Thermal conductivity of a badc onductor –Lee'sdisc.
10. Long focus convex lens–Determination of focal length(f).
11. Long focus concave lens–Determination of focal length(f).
12. Newton's rings-Determination of radius of curvature of a convex lens(R).
13. Spectrometer –Determination of refractive index(μ)of solid prism.
14. Airwedge–Thickness of insulation of a wire.
15. P.O.Box–Determination of temperature coefficient of a wire.
16. Surface tension and interfacial tension-By drop weight method.
17. Uniform bending-Pin and microscope method.
18. Junction diode characteristics.
19. Meter bridge-series and parallel resistance.
20. Uniform bending-Scale and telescope method.

CO-PO mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	9	9	9	1
CO-2	9	9	3	3	1	3
CO-3	3	3	1	3	3	1
CO-4	9	1	9	9	9	3
CO-5	3	9	9	1	9	9
CO-6	1	1	3	9	9	9
Weightage	28	26	34	34	40	26
Weightage Percentage of course contribution to PO's	15%	14%	18%	18%	22%	14%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	Medium	Low	Zero
CO-1	PO-1,PO-2	PO-4,PO-5	PO-3,PO-6	---
CO-2	PO-1,PO-4	PO-2,PO-3	PO-5,PO-6	---
CO-3	PO-1,PO-3, PO-6	PO-2,PO-5	PO-4	---
CO-4	PO-1,PO-2, PO-5	PO-4	PO-3,PO-6	---
CO-5	PO-2,PO-6	PO-1,PO-4	PO-3,PO-5	---
CO-6	PO-1	PO-4,PO-5, PO-6	PO-2,PO-3	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U-Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

Course Designed **Course Verified** **HOD**

CORECOURSE–(CC-III): MECHANICS AND RELATIVITY

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH3	Core course	Theory	5	5

Course Description:
This course offers a comprehensive introduction to classical mechanics and Einstein's theory of special relativity. The first part of the course focuses on Newtonian mechanics, covering motion, forces, energy, momentum, and rotational dynamics. It builds a strong conceptual and mathematical foundation for analyzing physical systems in equilibrium and motion

Objectives: Enabling the learner to

- Study the concept of a projectile,impulse and friction.
- Understand the dynamics of rigid bodies.
- Outline the concept of gravitation and to compute the centre of Gravity of different Shaped bodies.
- Explain about the thermodynamics.
- Explain the ideas of Hydrodynamics.
- Understand about elementary ideas on relativity.

Unit-I: PROJECTILE, IMPULSE, IMPACT AND FRICTION(15 Hrs)

Projectile –flight of the inclined plane, down an inclined plane-Impulse– Impact– Impulsive force– Collision- Fundamental principles of impact - Direct impact of a smooth sphere on a smooth horizontal plane-Loss in kinetic energy due to direct impact-Oblique impact of two smooth spheres. Friction - Laws of static friction-Angle of friction - Experimental method for determining the coefficient of friction

Unit-II:DYNAMICS OF RIGID BODIES(15 Hrs)

Moment of inertia-K.E of a rigid body-Angular momentum of a rotating body-Compound Pendulum-Centre of suspension and centre of oscillation-Centre of percussion-Kater's pendulum- Bessel's modification-Torsion pendulum-determination of M.I -Parallel and perpendicular axis theorem-Calculation of M.I for-Rectangular lamina about an axis perpendicular to its plane– M.I of the uniform circular disc about its diameter

UNIT-III:GRAVITATION AND CENTRE OF GRAVITY(15 Hrs)

Newton's Law of Gravitation-Definition of G-Boy's method of determination of G-Gravitation potential and gravitational field due to spherical shell- -Centre of gravity-C.G of aright circular cone- C.G of a solid hemisphere- C.G of a hollow hemisphere- C.G of a solid tetrahedron.

Unit-IV:HYDRO STATICS AND DYNAMICS (15 Hrs)

Centre of pressure: Definition – CP general case- CP of a rectangular lamina vertically in a liquid with one edge in the surface of the liquid- CP of triangular lamina immersed in a liquid with its vertex in the surface and base horizontal--Experimental determination of the metacentric height of a ship.

Equation of continuity-Bernoulli's theorem and its application- Toricelli's theorem- velocity

UNIT-V:RELATIVITY(15 Hrs)

Frame of reference—Galilean transformation equation-Michelson Morley experiment-Postulates of Special theory of relativity- Lorentz transformation

equation– Length contraction – Time dilation-Variation of mass with velocity-Einstein's postulates-Einstein's mass-energy relation.

BOOKS FOR STUDY

1. R.Murugeshan,Mechanics and Mathematica lMethods,S.Chand and NewDelhi(2008).
2. M.Narayanamurti,Dynamics,National PublishingCompany(1996).
3. R.Murugesan,Kiruthiga Sivaprasath,Modern Physics, S.Chand andNewDelhi(2007).

BOOKS FOR REFERENCE

1. D.S.Mathur,Mechanics–S Chand and Co.,Delhi(2007).
2. BrijlalN.Subrahmanyam,JivanSeshan,MechanicsandElectrodynamics,S.Chand – (2008).
3. M.Narayanamurti, N.Nagaratnam, Statics, Hydrostatics and Hydrodynamics, National Publisher.

Online Resources:

Relativity : https://archive.nptel.ac.in/courses/115/101/115101011/

Dynamics of rigid body: https://www.iitg.ac.in/kd/Lecture%20Notes/ME101-Lecture37-KD.pdf

Projectile, impulse and impact:

https://oms.bdu.ac.in/eccolleges/admin/contents/179_16SCCPH2_2020052605314817.pdf

CO-PO mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	9	3	9	9	9	1
CO-2	3	3	9	3	1	9
CO-3	9	9	3	9	3	3
CO-4	3	1	3	1	3	3
CO-5	1	3	1	9	3	9
CO-6	9	9	9	9	9	3
Weightage	34	25	34	40	34	28
Weightage Percentage of course contribution to PO's	17%	13%	17%	21%	17%	14%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	Medium	Low	Zero
CO-1	PO-2PO-6	PO-1,PO-5	PO-3,PO-4	---
CO-2	PO-1,PO-5	PO-3,PO-6	PO-2,PO-4	---
CO-3	PO-1,PO-2, PO-3	PO-4,PO-5	PO-6	---
CO-4	PO-1,PO-5, PO-6	PO-2	PO-3,PO-4	---
CO-5	PO-2,PO-3	PO-4,PO-5	PO-1,PO-6	---
CO-6	PO-1,PO-6	PO-2,PO-3, PO-5	PO-4	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed Course Verified HOD

CORE COURSE–(CC-IV) THERMAL PHYSICS

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH4	Core course	Theory	4	4

Course Description: This course introduces the fundamental concepts and laws of thermal physics, combining classical thermodynamics with basic statistical mechanics. Students explore the macroscopic behaviour of systems in terms of temperature, heat, work, and internal energy, as well as the microscopic interpretation of thermal phenomena based on particle behaviour and probability.

Course Objective:Enabling the learner to

- Study the idea about laws of thermodynamics
- Understand entropy, relation between temperature-entropy
- Discuss about the concept to low temperature and its instruments
- Bringing the idea about laws of radiation
- Study about laws of specific heat capacity
- Study a broad idea about Thermal Physics

UNIT-I: THERMODYNAMICS(12 Hrs)

Zeroth law of thermodynamics–Concept of heat-Internal energy-First law of thermodynamics–Reversible and irreversible process–Carnot's reversible engine–Otto engine- Mean free path– Viscosity of gases –Thermal conductivity of gases–Transport of thermal energy– Self diffusion.

UNIT-II: ENTROPY(12 Hrs)

Second law of thermodynamics - Concept of entropy –Change of entropy in reversible and irreversible processes – Temperature – Entropy diagram (T.S.) – Entropy of a perfec tgas –Principle of increase of entropy–Third law of thermodynamic sZero point energy-Negative temperature –Maxwell's thermodynamical relations.

UNIT-III:LOW TEMPERATURE PHENOMENA(12 Hrs)

Joule – Thomson effect - Porous plug experiment–Theory of porous plug- Liquefaction of gases –Liquefaction of Helium-Helium I and II- peculiar properties of Helium-II-Adiabatic demagnetization –Air conditioning system-Equipment used-Classification-Criteria of comfort Air conditioning-Summer- Air conditioning system.

UNIT-IV: RADIATION(12 Hrs)

Stefan's law and its derivation-Derivation of Newton's law from Stefan's law-Stefan's constant by laboratory method- Black body radiation – Distribution of energy in black body spectrum-lanck'slaw–RayleighJean'slaw–Pyrometry–Angstrom'spyroheliometer- Solar constant-Temperature of the sun–Some every day applications of solar energy.

UNIT-V: CALORIMETRY(12 Hrs)

Definition-Copper Black Calorimeter-Newton's Law of Cooling-Specific capacity of Liquid-Joule's Electrical Method-Calendar Barne's Method-Calorific Value-Dulong and Petit's Law-Einstein's theory

BOOKFORSTUDY

1)Brijlal,.SubrahmanyamandP.S.Hemne,Heat,Thermodynamics and Statistical Physics, S.Chand and Co., New Delhi (2007).

BOOKSFORREFERENCE

1. J.B Rajam and C.L.Arora, Heat and Thermodynamics, S Chand and Co., New Delhi(2004).
2. Sharma JK, Sarkar K K, Thermodynamics and Statistical Physics, Himalaya Publishing House (1991).
3. Roy. S.K ,Thermal Physics and Statistical Mechanics, Wiley Eastern Publishers, New Delhi Ltd.(2000).
4. R.K.Rajput ,A Textbook of Engineering Thermodynamics, Firewall Media publications (2010).

Online Resources:

Entropy : https://youtu.be/rUB-hpek0NE?si=eZdLvXQQ0ewieKBG
Low temperature physics
https://youtu.be/rUB-hpek0NE?si= eZdLvXQQ0ewieKBG

Thermodynamics:
https://onlinecourses.nptel.ac.in/noc23_me76/preview

CO-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	9	1	3	9	1	3
CO-2	9	1	9	3	3	3
CO-3	9	3	9	3	1	9
CO-4	9	1	9	3	3	9
CO-5	9	3	9	3	1	1
CO-6	9	3	3	1	1	3
Weightage	54	12	42	22	10	28
Weightage Percentage of course contribution to PO's	32%	7%	25%	13%	5%	17%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	**Medium**	**Low**	**Zero**
CO-1	**PO-1,PO-4**	**PO-3,PO-6**	**PO-2,PO-5**	**---**
CO-2	**PO-1,PO-3**	**PO-4,PO-5**	**PO-2,PO-6**	**---**
CO-3	**PO-1,PO-3, PO-6**	**PO-2,PO-4**	**PO-5**	**---**
CO-4	**PO-1,PO-3, PO-6**	**PO-4,PO-5**	**PO-2**	**---**
CO-5	**PO-1,PO-3**	**PO-2,PO-4**	**PO-5,PO-6**	**---**
CO-6	**PO-1**	**PO-2,PO-3, PO-6**	**PO-4,PO-5**	**---**

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed **Course Verified** **HOD**

SBE-II ENERGY PHYSICS

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PHSBE2	Theory	SBE	2	2

Course Description: This course explores the physical principles underlying energy in its various forms, transformations, and applications. It provides a broad overview of mechanical, thermal, electrical, chemical, and nuclear energy, with emphasis on conservation laws, energy efficiency, and real-world technologies.

Course Objectives:

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

- Know the importance of renewable energy sources.
- Understand the importance of solar energy.
- Understand the fundamentals of bio mass energy.
- Get an idea of Geo thermal energy sources.
- TO Understand about wind energy
- Think about energy storage and conservation.

Syllabus

UNIT- I: ENERGY SOURCES(6 Hrs)

Conventional energy sources fossil fuels water power -nuclear power- non conventional energy sources , comparison between conventional and non conventional energy sources.India's production and reserve of commercial sources- Various forms of energy – Applications and merits demerits of coal ,oil and natural gas.

UNIT- II: SOLAR energy(6 Hrs)

Renewable energy sources – Solar energy – structure of the Sun photosphere chromosphere corona -nature of solar radiation- Solar radiation at the earth's atmosphere _ solar water heater Basic elements_domestic type_- advantages and disadvantages of heater_ solar cooker _box type advantages and disadvantages

UNIT- III: BIOMASS ENERGY FUNDAMENTALS(6 Hrs)

Biomass energy – Classification – in traditional solid mass - non traditional mass-biomass fermentation - - gasification gasification down draft gasifier Gobar gas plants Anaerobic digestion Factors affecting bio digestion types of digester KVIC digester Chinese digester – Advantages& disadvantages of biomass as energy source.

UNIT- IV: OTHER FORMS OF ENERGY SOURCES(6 Hrs)

Geothermal energy – Natural of geothermal energy_forms of geothermal energy_Wind energy –Types of wind power plant _ advantage of wind horizontal axis type principle of ocean thermal energy _energy from waves principle energy conversion by floats_ tidal energy (basic ideas only.)

UNIT- V: ENERGY STORAGE AND ITS IMPACT(6 Hrs)

Conservation of energy _energy crisis and possible solutions – Global Warming – Green house effect – Energy options for the developing countries Nuclear powar option and solar energy -option –Factors for Energy storage System-hydrogen storage system--Hydrogen as a fuel .

BOOK FOR STUDY

1. K.Karuppannan and N.Suganthi, Energy Physics, Priya Publications, Karur(2006).

BOOKS FOR REFERENCE

1. S.A. Abbasi and NasemaAbbasi, "Renewable Energy sources and their Environmental
Impact", PHI Learning Pvt. Ltd., New Delhi (2008).
2.P. Kothari, K.C. Singal and Rakesh Ranjan, "Renewable energy sources and Emerging Technologies", Prentice Hall of India Pvt. Ltd., New Delhi (2008).
3. G.D. Rai, Non -Conventional Energy Sources, Khanna Publications (2005).

Online Resources:

Bio mass energy : https://nptel.ac.in/courses/103103207
Energy storage :
https://youtu.be/OmNOQ38Pgsc?si=uRwgf1TERIN57Sm4
https://onlinecourses.nptel.ac.in/noc21_ph33/preview

CO-PO mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	9	9	9	1
CO-2	9	9	3	3	1	3
CO-3	3	3	1	3	3	1
CO-4	9	1	9	9	9	3
CO-5	3	9	9	1	9	9
CO-6	1	1	3	9	9	9
Weightage	28	26	34	34	40	26
Weightage Percentage of course contribution to PO's	15%	14%	18%	18%	22%	14%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	Medium	Low	Zero
CO-1	PO-1,PO-2	PO-4,PO-5	PO-3,PO-6	---
CO-2	PO-1,PO-4	PO-2,PO-3	PO-5,PO-6	---
CO-3	PO-1,PO-3, PO-6	PO-2,PO-5	PO-4	---
CO-4	PO-1,PO-2, PO-5	PO-4	PO-3,PO-6	---
CO-5	PO-2,PO-6	PO-1,PO-4	PO-3,PO-5	---
CO-6	PO-1	PO-4,PO-5, PO-6	PO-2,PO-3	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Coursed Designed **Course verified** **HOD**

SBE – III BIO MEDICAL INSTRUMENTATION

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PHSBE3	SBE	Theory	2	2

Course Description:

This course introduces the principles, design, and application of biomedical instruments used in the diagnosis, monitoring, and treatment of medical conditions. It focuses on the interface between electronic devices and biological systems, with an emphasis on understanding physiological signals and how they are measured, processed, and interpreted.

Course Outcome:

At the end of this course, students will be able to

- Identify the Basic Ideas of Cell and different systems of Human body.
- Understand the theory and construction of instrument intended for diagnosis and therapy.
- Understand the basic concept of Laser and to apply newer technology to treat the diseases.
- Learn the knowledge of ultrasound to detect the diseases.
- Acquire a scientific awareness on the disease prevention and treatments.
- To Understand an idea of Instrumentation in medical field.

Unit – I:Human Physiological Systems(6 Hrs)

Introduction-Structure of a cell-Nature of cells-Transport of Ions through a membrane-Resting potential-Different systems of Human Body-Skeletal-Circulatory-Respiratory-Digestive system-Central Nervous system.

Unit – II: Diagnostic Devices(6 Hrs)

X-ray machine – Comparison between radiography and fluoroscopy – Angiography-Thermography: Theory and instrumentation – MRI: Theory and instrumentation.

Unit – III: Therapeutic Devices(6 Hrs)

Pace maker – Comparison between external and internal pace maker – Defibrillators: Internal and external defibrillators – Different types of defibrillator: A.C. and D.C. defibrillator.

Unit – IV: Laser in Medicine(6 Hrs)

Laser – Properties – Principle of Laser action: Spontaneous and Stimulated emission – Population inversion – Applications: LASIK (Laser in-situ keratomileusis) Eye Surgery – Advantages of Laser surgery – Laser blood cell counter.

Unit – V: Ultrasonics in Medicine(6 Hrs)

Ultrasonics – Ultrasonic diathermy – Ultrasonic propagation through tissues –A-mode- B-mode ultra scan – Applications of diagnostic ultrasound.

Text Books:

1) **Biomedical Instrumentation Dr. M. Arumugam,** Second Edition, Reprint-2010, Anuradha Publications PVT, Kumbakonam.

Book for Reference:

1. Biomedical Instrumentation and Measurements, Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Second Edition, Prentice Hall of India, PVT, New Delhi,2005.

Online Resources:

Angiography:

https://www.news-medical.net/health/What-is-Angiography.aspx

LASIK Eye Surgery:

https://www.webmd.com/eye-health/lasik-laser-eye-surgery#1-1https://www.allaboutvision.com/visionsurgery/lasik_laser.htm

On-line Course: https://swayam.gov.in/nd1_noc20_cy17/preview

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

CO-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	9	1	3	9	3	3
CO-2	9	9	1	9	3	1
CO-3	9	9	3	1	3	3
CO-4	9	9	3	9	1	9
CO-5	3	3	9	3	1	9
CO-6	3	9	3	1	3	1

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	**Medium**	**Low**	**Zero**
CO-1	**PO-1,PO-4**	**PO-3,PO-5,PO-6**	**PO-2**	**---**
CO-2	**PO-1,PO-2, PO-4**	**PO-5**	**PO-3,PO-6**	**---**
CO-3	**PO-1,PO-2**	**PO-3,PO-5,PO-6**	**PO-4**	**---**
CO-4	**PO-1,PO-2,PO-4, PO-6**	**PO-3**	**PO-5**	**---**
CO-5	**PO-3,PO-6**	**PO-1,PO-2,PO-4**	**PO-5**	**---**
CO-6	**PO-2**	**PO-1,PO-3,PO-5**	**PO-6**	**---**

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed **Course Verified** **HOD**

SEMESTER: IV **Instruction hrs.3 hrs./week**

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH5P	Core course	Practicals	3	5

CORE COURSE –V MAJOR PRACTICALS-II

(At the end of the FOURTH Semester-Any Fifteen expts.)

- To perform experiment on Rigidity modulus,highly viscous liquid.
- To study the characteristics of Zener diode,Transistor.
- To do experiment on calibration of voltmeter, ammeter using Potentiometer.
- To perform experiment on Spectrometer.
- To understand the idea of CRO and its uses.
- To perform experiment using Table Galvanometer.

1. Static Torsion – Determination of Rigidity Modulus (n).
2. Torsional pendulum - Determination of Rigidity Modulus (n) andMoment of Inertia (I).
3. Coefficient of viscosity of highly viscous liquid
4. Stoke's method – Viscosity of highly viscous liquid
5. Characteristics of junction diode.
6. Emissive power of a surface – Spherical calorimeter
7. Joule's calorimeter – Specific heat capacity of liquid (Barton's correction)
8. Carey Foster's Bridge-determination of resistance(R) and Specific Resistance(ρ).
9. Potentiometer – Ammeter calibration.
10. Potentiometer – Temperature coefficient (α).
11. Potentiometer – Calibration of low range voltmeter
12. Figure of merit – Mirror Galvanometer
13. Transistor Characteristics – CE – configuration
14. Spectrometer – Refractive Index (μ) of a liquid
15. Spectrometer – I-d curve
16. CRO – Study of wave forms – Lissajous figures – Frequency determination
17. Construction of Full wave rectifier
18. Zener Diode Characteristics.

CO-PO mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	9	9	9	1
CO-2	9	9	3	3	1	3
CO-3	3	3	1	3	3	1
CO-4	9	1	9	9	9	3
CO-5	3	9	9	1	9	9
CO-6	1	1	3	9	9	9
Weightage	28	26	34	34	40	26
Weightage Percentage of course contribution to PO's	15%	14%	18%	18%	22%	14%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	Medium	Low	Zero
CO-1	PO-1,PO-2	PO-4,PO-5	PO-3,PO-6	---
CO-2	PO-1,PO-4	PO-2,PO-3	PO-5,PO-6	---
CO-3	PO-1,PO-3, PO-6	PO-2,PO-5	PO-4	---
CO-4	PO-1,PO-2, PO-5	PO-4	PO-3,PO-6	---
CO-5	PO-2,PO-6	PO-1,PO-4	PO-3,PO-5	---
CO-6	PO-1	PO-4,PO-5, PO-6	PO-2,PO-3	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U-Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

Course Designed **Course Verified** **HOD**

Course Course(CC-VI) : BASIC ELECTRONICS

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH6	Core	Theory	4	4

Course Description: This course introduces students to the fundamental principles and applications of electronics. Topics include basic electrical concepts, circuit theory, semiconductors, diodes, transistors, operational amplifiers. Students will learn how to analyze, design, and build simple electronic circuits through hands-on lab work and simulation tools.

Course Objectives: The course intends to facilitate the learner to

- Bring out the ideas of semi-conductors, diodes and its various types.
- Explaining the working of transistor by various characteristics and methods of biasing.
- Explaining the concept of amplifier, oscillator.
- To understand the concept of other Semiconductor devices
- Inculcate the concept of modulation, its types and demodulation.
- Out line the idea about OPAMP, its characteristics and its application.

UNIT- I: SEMICONDUCTORS AND DIODES(12 Hrs)

Intrinsic and extrinsic semiconductor-V-I characteristics of P-N junction diode-Resistance of a crystal Diode-applications of Diode-Clipper-Positive-Biased-Combination clipper-Positive and negative clamper-Half wave rectifier-Full wave bridge rectifier and its efficiency- Zener diode characteristics- Zener diode as a voltage stabilizer.

UNIT-II: TRANSISTORS(12 Hrs)

Transistor terminals-Transistor action-Characteristic curves of transistor: CB, CE and CC mode – Comparison of transistor connections -Transistor as an Amplifier–Single stage CE amplifier –RC coupled transistor amplifier - Load line -operating point-Faithful amplification-Transistor biasing-Feedback resistor-Voltage divider method of transistor biasing.

UNIT-III: OSCILLATORS AND SPECIAL SEMICONDUCTOR DEVICES(12 Hrs)

Essentials of transistor oscillator-Barkhausen criterion-Types of transistor oscillators—Hartley Oscillator- Weinbridge oscillator-JFET-Working and characteristics- Difference between JFET and bipolar transistor-JFET parameters- V-I characteristics of UJT-UJT as relaxation oscillator.

UNIT-IV: MODULATION AND DEMODULATION(12 Hrs)

Modulation-Need for modulation-Amplitude modulation-Modulation factor-Analysis of modulated wave-Power in AM wave-Limitations of AM-Frequency modulation-Theory of FM-Comparison between FM and AM-Demodulation and its essentials-AM diode detector-Superhetrodyne radio receiver and its advantages-FM receiver.

UNIT-V: OPERATIONAL AMPLIFIERS(12 Hrs)

Symbol of Op-Amp- Parameters of Op-Amp - CMRR- Slew rate- Inverting amplifier-Non- inverting amplifier- Applications: Inverting adder and Non-inverting adder- Subtractor- Integrator-Differentiator- Voltage follower- Schmitt trigger.

Text Books:

1.V.K Mehta,Rohit Mehta, Principles of Electronics ,S.Chand and company Ltd(2011).

2.B.L .Theraja ,Basic Electronics solid state ,S.Chand and Company Ltd(2005).

Reference Books:

1.R.S.Sedha,AtextbookofAppliedElectronics,S.ChandandcompanyLtd(2009).
2.Subramanyam.A,App1iedElectronics,Nationa1PublishingCompany(1999).
3.Garg ,Rakesh Kumar, Basic Electronics, New Delhi(2009)
4.Muthu Subramanian. R, Basic Electronics Engineering ,TMH ,New Delhi(2000).

Online Resources:

1. https://www.electronics-tutorials.ws/opamp/opamp_1.html
2.https://www.tutorialspoint.com/basic_electronics/basic_electronics_transistors.htm
3. https://www.elprocus.com/different-types-of-oscillator-circuits-its-applications/
4. https://nptel.ac.in/courses/122106025.

CO-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	9	1	3	9	1	3
CO-2	9	1	9	3	3	3
CO-3	9	3	9	3	1	9
CO-4	1	9	9	1	3	9
CO-5	3	3	1	9	9	1
CO-6	9	3	3	1	9	3
Weightage	40	20	34	26	26	28
Weightage Percentage of course contribution to PO's	23%	11%	20%	15%	15%	16%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	Medium	Low	Zero
CO-1	PO-1,PO-4	PO-2,PO-6	PO-3,PO-5	---
CO-2	PO-1,PO-6	PO-2,PO-5	PO-3,PO-4	---
CO-3	PO-1,PO-2, PO-6	PO-3,PO-5	PO-4	---
CO-4	PO-1,PO-3, PO-5	PO-2	PO-4,PO-6	---
CO-5	PO-1,PO-2	PO-3,PO-5	PO-4,PO-6	---
CO-6	PO-1	PO-2,PO-3, PO-4	PO-5,PO-6	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed **Course Verified** **HOD**

CORECOURSE–(CC-VII)OPTICS

Semester-V Code:U25PH7 Instruction hrs./week:5 Credit:6

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH7	Core course	Theory	5	5

Course Description: This course explores the fundamental principles of optics, including the behavior and properties of light. Topics include reflection, refraction, diffraction, interference, polarization, geometrical optics (lenses and mirrors), and wave optics. Students will gain a deeper understanding of how light interacts with matter and how optical instruments such as microscopes, telescopes, and lasers work.

Course Objectives: Enabling the learner to

- Discuss the concept of aberrations and their types.
- Outline the idea about Interference,its experimental method to determine the wavelength of source.
- Give the elementary ideas and theory about diffraction
- Explain the construction of eyepiece and its types
- Brief about the basics of polarization of light,its generation and detection.
- Explain about the determination of the resolving power of Various instruments

UNIT-I:ABERRATIONS(15 Hrs)

Aberration-Spherical aberration in a lens-Reducing spherical aberration- Curvature of The field - Distortion- Dispersion by a prism –coma- Chromatic aberration - Achromatic lenses and condition for achromatism when two lenses are in contact – Achromatism of a cameraLens.

UNIT-II:INTERFERENCE(15 Hrs)

Colour of thin films-Air wedge-Testing the plainness of the surface- Theory of Newton'srings -Wavelength of monochromatic light using Newton's rings– Haidinger fringes-Michelson interferometer working -Determination of wavelength and determination of neighboring wavelength using Michelson interferometer-Interference filter.

UNIT-III:DIFFRACTION(15 Hrs)

Fresnel's d iffraction–Diffraction at a (i)circular aperture (ii)Opaque circular disc-Fraunhofer diffraction at a single slit –Double slit-Narrow slit-missing orders in a doublet

Grating with theory–Oblique incidence–Determination of wavelength using grating.

UNIT-IV:EYE PIECE AND RESOLVING POWER OF OPTICAL INSTRUMENTS (15 Hrs)

Fieldlens-Ramsden's eyepiece-Huygen's eyepiece and its cardinal points–Comparison between Hygen's and Ramsden Eyepiece-Resolving power–. Resolving power of a Telescope, Prism and Grating – Dispersive power of a prism and grating-Rainbow.

UNIT-V:POLARIZATION(15 Hrs)

Nicol prism – Nicol prism as an analyzer and polarizer –Babinet compensator– Huygens's explanation of double refraction in uniaxial crystals- Quarter wave and half wave plate-Production and detection of elliptical,circular and plane polarized light-Optical activity-Specific rotation-Laurent's half shade polarimeter.

BOOKS FOR STUDY

1. Brijlal,N.Subrahmanyam,Optics,S.Chand and Co.,NewDelhi(2006).

2. R.Murugesan,Optics,S.Chand and Co.,New Delhi(2011).

BOOKS FOR REFERENCE

1. Khanna and Gulati-Optics.R.Chand and Co.New Delhi(2007).

2. Ajoy Ghatak,Optics,TataMcGraw Hill Publications (2004).

3. R.Murugesan, E,Kiruthiga Sivaprasath, Optics and Sectroscopy

S.Chand and Co.,New Delhi(2011).

4. S.K.Aggarwal,A textbook of Optics,Wisdom Press (2008).

Online Resources:

Plolarization : https://archive.nptel.ac.in/content/storage2/courses/115105083/lec-26.pdf

Optics : https://youtu.be/GQ5XpeS3e3U

Interference : https://archive.nptel.ac.in/content/storage2/courses/115105083/lec-13.pdf

CO-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	9	1	9	9	1	3
CO-2	9	3	9	3	3	9
CO-3	3	3	9	9	9	9
CO-4	1	9	3	1	3	9
CO-5	9	9	1	9	9	1
CO-6	3	9	9	9	9	3
Weightage	34	34	40	40	34	34
Weightage Percentage of course contribution to PO's	17%	17%	19%	19%	17%	17%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	**Medium**	**Low**	**Zero**
CO-1	**PO-1,PO-2**	**PO-3,PO-6**	**PO-4,PO-5**	**---**
CO-2	**PO-1,PO-4**	**PO-2,PO-3**	**PO-5,PO-6**	**---**
CO-3	**PO-1,PO-2, PO-3**	**PO-4,PO-5**	**PO-6**	**---**
CO-4	**PO-1,PO-3, PO-5**	**PO-4**	**PO-2,PO-6**	**---**
CO-5	**PO-1,PO-2,PO-5**	**PO-3,PO-4**	**PO-6**	**---**
CO-6	**PO-1, PO-3, PO-4**	**PO-2**	**PO-5,PO-6**	**---**

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed **Course Verified** **HOD**

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH8	Core course	Theory	5	5

Course Description:

It covers the relationship between electric charges and magnetic fields.They explore the principles of electromagnets, electric circuits, and the generation and transmission of electricity.

Course Objectives: The course intends to facilitate the learner to

- Discuss Gauss law and its applications, Electric potential and capacitance, which are essential for understanding electricity in general
- Understand the basic concept of current electricity
- Study the basic properties of magnetism and magnetic effect.
- Remember the basic ideas of electromagnetism and determination of self-inductance and mutual inductance.
- Review the AC circuits and its power factor.
- To Review about chemical effect of current.

UNIT-I: ELECTROSTATICS(15 Hrs)

Gauss law and its applications- Electric field due to uniformly charged non-conducting sphere- Conducting sphere- Coulomb's Law - Electric potential-due to a point charge-due to a uniformly charged conducting sphere-non conducting sphere-Principle of a capacitor – Capacity of a spherical and cylindrical capacitors – Capacitance in series and parallel-Types of capacitors(Guard ring, Mica, Electrolytic)-Energy stored in a capacitor – Loss of energy due to sharing of charge.

UNIT-II:CURRENT ELECTRICITY(15 Hrs)

Kirchoff'slaw-Wheatstone condition for bridge balance–CareyFoster'sBridge–Determination of temperature coefficient of resistance - Potentiometer principle- Calibration of ammeter and voltmeter-Thermo-Electric diagrams and Uses(total emf,Peltier emf, Thomson emf, general couple)- Chemical effect: Electrical conductivity of an electrolyte- Kohrrausch Bridge-Theory of moving coil ballistic galvanometer- Correction for damping–Figure of merit.

UNIT-III:MAGNETISM AND MAGNETIC EFFECTS(15 Hrs)

Basic definitions – Relation between permeability and Susceptibility –Properties of Dia,para and ferro magnetic materials–Experiment to draw B-H curve by ballistic method–Energy loss due to hysterisis-Importance of hysterisis – Maxwell's screw rule-Fleming's left hand rule-Biot-Savartlaw-Magneticinductionatapointduetoastraightconductor-Magneticinduction at a point on the axis of circular coil-Force on a current carrying conductor in a magnetic field-Force between two parallel current carrying conductors.

UNIT-IV:ELECTROMAGNETIC INDUCTION(15 Hrs)

Faraday's Law– Self-inductance – Self-inductance of a long solenoid – Self-inductance of a toroid-Determination of self-inductance by Rayleigh's method- Mutual inductance- Mutual inductance between two co-axial solenoids–Experimental determination of mutual inductance-Coefficient of coupling–Earth inductor-Determination of B_H.

UNIT-V:AC CIRCUITS(15 Hrs)

EMF induced in a coil-Peak value and r.m.s value of an AC – AC circuit containing L, C and R in series– Q factor– Series and parallel resonance circuits-Comparison – Sharpness of resonance– Power factor – Growth decay of current in circuit containing L and R- Charging and discharging of capacitor through R-High resistance by leakage.

Text Books:

1.R.Murugesan,Electricitya nd Magnetism,S.Chand and Co.(2008).

Reference Books:

1.Narayanamoorthy and Nagaratnam, Electricity and Magnetism National Publishing Comp. Chennai
(2005).

2. Brijlal, N.Subrahmanyam, Electricity and Magnetism, S.Chand and Co. (2004).
3. S.K.Chatterjee, Fundamentals of Electricity and Magnetism, PHI, India(2008).
4. K .K.Tewari,Electricity and Magnetism,S.Chand and Co.(2006).

Online Resources:

Electric and magnetic circuits: https://youtu.be/s5QBa74TL_8
Electromagnetism: https://youtu.be/yzgGHAoN_68
AC circuits: https://youtu.be/UzrisWhvjV0?si=DfL70n3hyroNgMLm

CO-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	9	1	9	9	9	3
CO-2	9	3	9	3	1	9
CO-3	1	9	9	3	9	9
CO-4	3	9	1	1	9	9
CO-5	9	9	9	9	9	3
CO-6	9	3	9	9	9	1
Weightage	40	34	46	34	46	34
Weightage Percentage of course contribution to PO's	17%	15%	20%	15%	20%	15%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	**Medium**	**Low**	**Zero**
CO-1	**PO-1,PO-6**	**PO-3,PO-5**	**PO-2,PO-3**	**---**
CO-2	**PO-1,PO-2**	**PO-3,PO-4**	**PO-5,PO-6**	**---**
CO-3	**PO-1,PO-2, PO-3**	**PO-4,PO-6**	**PO-5**	**---**
CO-4	**PO-1,PO-3, PO-4**	**PO-6**	**PO-2,PO-5**	**---**
CO-5	**PO-1,PO-2,PO-6**	**PO-3,PO-5**	**PO-4**	**---**
CO-6	**PO-1, PO-2, PO-4**	**PO-5**	**PO-2,PO-6**	**---**

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed **Course Verified** **HOD**

ELECTIVECOURSE– (EC-I):DIGITAL ELECTRONICS AND MICROPROCESSOR

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH9E	Elective course	Theory	5	4

Course Description: This course provides an introduction to the principles and applications of digital electronics. Students will study the fundamentals of digital systems, including number systems, logic gates, Boolean algebra, combinational and sequential logic, flip-flops, counters, registers, and memory devices.

Course Objectives: Enabling the learner to

- Study the Concept of number system and basic gates
- Understand De-Morgan's theorem, Boolean expressions and its simplification
- Study the concept of combinational circuits
- Understand the concept of flip flop and counters
- Study the basic ideas about assembly language programming and simple programming.
- To understand about Digital Electronics and Assembly language programming

UNIT-I: NUMBER SYSTEMS AND LOGIC GATES(15 Hrs)

Number Systems and Conversions - BCD Code –BCD addition-Conversion of Gray code to Binary-Conversion of Binary to Gray code Simple binary arithmetic operations – Addition, subtraction, multiplication and division – Binary subtraction using one's and two's complements–Positive and negative logic–Logic gates AND, OR, NOT, NAND, NOR and EX-OR gates - NAND and NOR as Universal Building blocks.

UNIT-II:BOOLEAN ALGEBRA AND SIMPLIFICATION OF LOGIC EXPRESSIONS(15 Hrs)

Boolean algebra–Basic laws of Boolean algebra–De-Morgan's theorems-Reducing Boolean expressions using Boolean laws – SOP and POS forms of expressions min terms and max terms – Karnaugh map simplification for 2,3,4 variable-K Map with Don't care condition-Quine Mc Cluskey Tabulation method.

UNIT-III: COMBINATIONAL DIGITAL SYSTEMS(15 Hrs)

Half and full adders-Half and full subtractor -Four bit binary adder /subtractor-BCD adder -Multiplexer-Demultiplexer-Decoder-2 to 4 and 3 to 8 decoder-Encoder-Octal to binary encoder.

UNITIV: SEQUENTIAL DIGITAL SYSTEMS(15 Hrs)

Flip flop – RS – clocked RS – T and D flip flops – JK and master slave flip flops –Shift Register-Shift Left Shift Right Register-Ring Counter-RippleCounter-Mod-2,Mod-4,Mod-8,Mod-16counters-4-bit Asynchronous counter

UNIT-V: MICROPROCESSOR (8085) (15 Hrs)

Introduction to microprocessor – Basic components of a microcomputer –Memory – ROM –RAM – Architecture of 8085-Accumulator-Stack Pointer-Flags-Address Bus-General Purpose Register-Pin configuration-Instruction Set-Data Transfer-Arithmetic-Logical-Branch Control Group–Addressing modes – Assembly language programming – Programmes for 8- bit addition with 8-bit&16 bit result-16 bit addition-8 bit subtraction with 8-bit result.

BOOKS FOR STUDY

1. V.Vijayendran, Digital Fundamentals, S.Viswanathan, Printers and Publishers Private Ltd, Chennai,) (2004) (Unit- I to Unit-IV).
2. B.Ram, Fundamentals of Microprocessor and Micro computers, Dhanpat Rai Publications, New Delhi, 2008. (For Unit-V only).

BOOKSFORREFERENCE

1. A.P.Malvino, D.P.Leach, Digital Principles and Application, IV Edition, Tata Mc Graw Hill, New Delhi(1968).
2. V.Vijayendran, Fundamentals of Microprocessor–8085, S.Viswanathan Printers and Publishers Private Ltd., Chennai, (2004).

Online Resources:

Number system: https://nptel.ac.in/courses/106108099
Microprocessor: https://youtu.be/MqWeH3zp5GY?si=stxCLajPF9GE3fg5
Sequential circuits: https://youtu.be/ibQBb5yEDlQ?si=fHHEcXU3s54tAJjf

CO-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	9	1	3	9	3	3
CO-2	9	3	1	9	9	1
CO-3	9	9	3	3	1	3
CO-4	9	9	3	1	9	9
CO-5	3	3	9	3	3	9
CO-6	3	3	9	3	9	3
Weightage	42	28	28	28	35	28
Weightage Percentage of course contribution to PO's	22%	15%	15%	15%	19%	15%

9-Strong Correlation, 3-Medium Correlation , 1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	**Medium**	**Low**	**Zero**
CO-1	**PO-1,PO-4,**	**PO-3,PO-5,PO-6**	**PO-2**	**---**
CO-2	**PO-1,PO-4,PO-5**	**PO-2**	**PO-3,PO-6**	
CO-3	**PO-1,PO-2**	**PO-3,PO-4,PO-6**	**PO-5**	**---**
CO-4	**PO-1,PO-2,PO-5, PO-6**	**PO-3**	**PO-4**	**---**
CO-5	**PO-3,PO-6**	**PO-1,PO-2**	**PO-4,PO-5**	**---**
CO-6	**PO-3,PO-5**	**PO-1,PO-2,PO-6**	**PO-4**	**---**

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed **Course Verified** **HOD**

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH10E	Elective course	Theory	5	4

Course Description:

This undergraduate course in C++ Programming and Applications introduces students to the fundamentals of C++, including data types, functions, classes, and object-oriented programming. Students will learn to implement basic console I/O operations and apply C++ to solve physics-related problems, equipping them with essential programming skills.

Course Objectives: The course intends to facilitate the learner to

- To grasp the fundamental concepts of C++, including data types, operators, and control structures necessary for programming.
- To develop proficiency in using arrays and functions, including function overloading and parameter passing methods.
- To understand and implement object-oriented programming concepts, such as classes, objects, and constructors.
- To explore advanced C++ features like operator overloading, inheritance to enhance programming capabilities.
- To Understand the concept of Pointers in detail.
- To apply C++ programming skills to solve practical problems, particularly in the field of physics, through hands-on projects and exercises.

UNIT -I: Fundamentals of C++(15 Hrs)

Review of basic concepts: tokens - keywords - identifiers and constants - declaration of variables - basic data types - user defined data types-derived data types - symbolic constants - operators in C++ -expressions and their type-hierarchy of arithmetic operators- scope resolution operator – declaring, initializing and modifying variables-special assignment operators - all control structures-structure of a simple C ++ program.

UNIT- II: ARRAYS AND FUNCTIONS(15 Hrs)

Arrays: one dimensional and two dimensional arrays-initialization of arrays-array of strings. Functions: Introduction-function with no argument and no return values- function with no argument but return value - function with argument and no return values- function with argument and return values- call by reference-return by reference- function prototyping - inline functions - local, -global and static variables- -function overloading - virtual functions-main function-math library functions.

UNIT -III: CLASSES AND OBJECTS(15 Hrs)

Classes: Specifying a class - defining member functions-C++ program with class - nesting of member functions - private member functions - objects as function arguments - arrays within a class-array of objects-static class members-friend functions-constructors - parameterized constructors-multiple constructors - constructors with default arguments - copy constructor.

UNIT- IV: OPERATOR OVERLOADING, INHERITANCE AND POINTERS(15 Hrs)

Defining operator overloading - overloading unary operators - binary operators. Inheritance - single inheritance - multiple inheritance - multilevel inheritance - hybrid inheritance - hierarchical inheritance-virtual base class-abstract class Pointers- definition-declaration- arithmetic operations

UNIT- V: BASIC CONSOLE I/O OPERATIONS AND PROGRAMMING(15 Hrs)

C++ stream - C++ stream classes - unformatted I/O Operations -formatted console I/O operations - working with files - classes for file steam operations - opening and closing a file - file pointers and their manipulations.

Applications: C++ programming for solving Physics problems.

Text Books:

1. E. Balagurusamy, Object-Oriented Programming with C++, 8th Edition, McGraw Hill Education (India) Private Limited, (2020).
2. C++ programming for solving Physics Problems. Lecture Notes- prepared by PG and Research Department of Physics, National College (Autonomous), Tiruchirappalli (For Unit-V)

Reference Books:

1. E. Balagurusamy, Programming in ANSI C, 6/e, McGraw Hill, Education (India) Private Limited, New Delhi (2012).
2. Byron S. Gottfried, Schaum's Outlines: Programming with C, 5/e, Tata McGraw Hill Pub. Co Ltd., New Delhi, (2007).
3. Steve Oualline, Practical C++ Programming, 2/e, O'Reilly Media, Inc. CA, USA (2002).

Online Resources:

1. https://cplusplus.com/
2. https://www.geeksforgeeks.org/c-plus-plus/
3. https://researchcomputing.princeton.edu/education/external-online-resources/cplusplus
4. https://www.educative.io/courses/learn-cpp-from-scratch

Course Articulation Matrix (Maps COs consistency with POs)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	9	9	3	1	9	9
CO2	9	3	1	3	9	3
CO3	3	1	9	9	9	9
CO4	1	9	9	3	9	3
CO5	9	3	3	9	1	1
CO6	9	9	3	9	3	1
Weightage	40	34	28	34	40	26
Weightage percentage of Course contribution to POs	20%	17%	14%	17%	20%	13%

R- Remember(K1); U- Understand (K2); Ap- Apply(K3); An- Analyze(K4);E- Evaluate(K5); C-Create(K6)

Mapping COs with Knowledge levels and POs:

CO/K-Level	Level of Correlation			
	High	Medium	Low	Zero
CO1/K1	PO-1,PO-2	PO-3,PO-4,PO-6	PO-5	---
CO2/K2	PO-1,PO-2,PO-6	PO-4	PO-3,PO-5	
CO3/K3	PO-1,PO-3	PO-2,PO-4	PO-5,PO-6	---
CO4/K4	PO-1,PO-2,PO-5, PO-6	PO-3	PO-4	---
CO5/K5	PO-1,PO-6	PO-3,PO-5	PO-2,PO-4	---
CO6/K6	PO-3,PO-4,PO-6	PO-1,PO-2	PO-5	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed **Course Verified** **HOD**

COURSE-(CC-IX): Physics Major Practical-III

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH11P	Core course	Practical	3	5

Course Objectives:

- To Perform experiments on Spectrometer.
- To make understand the concept of Potentiometer,B.G
- To explain the concept of Magnetism.
- To perfom experiment on Y.Modulus.
- To understand C++ Basic Programs
- To do experiments on Factorial using recursion ,Alphabetical order.

(Evaluation at the end of the Sixth Semester-Any 15 experiments choosing a minimum of 3 from each section)

General and Electronics SECTION–A: Analog Experiments

1. Koenig's method –Uniform bending –Young's Modulus(Y).
2. Spectrometer i-i' curve.
3. Spectrometer–Small angle prism.
4. Spectrometer–Grating–Normal incidence.
5. Spectrometer–Grating minimum deviation and dispersive power.
6. Spectrometer–Cauchy's constants.
7. Spectrometer–Fraunhofer lines.
8. Field along the axis of a coil –Determination of magnetic moment (m).
9. M and H–Absolute determination using deflection and vibration magnetometer.
10. Potentiometer-High range voltmeter calibration
11. Potentiometer-Temperature coefficient of resistance
12. Anderson's bridge-Self inductance of a coil (L).
13. De-Sauty's bridge-Self inductance of coil (L).
14. B.G.–Determination of mutual Inductance.

SECTION– B: C++/C- Programming Programming

1. Average of a set of numbers.
2. Conversion of Fahrenheit to Celsius.
3. Solving quadratic equation.
4. Finding the factorial using recursion.
5. Add and subtract two matrices.
6. Find the smallest and largest element in an array.
7. Sorting a set of numbers in ascending/descending order.
8. Arrange the names in alphabetical order.
9. Multiplicationoftwo3x3matrices.
10. Fibonacci Series.
11. Check for palindrome.

CO-PO mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	9	9	9	1
CO-2	9	9	3	3	1	3
CO-3	3	3	1	3	3	1
CO-4	9	1	9	9	9	3
CO-5	3	9	9	1	9	9
CO-6	1	1	3	9	9	9
Weightage	28	26	34	34	40	26
Weightage Percentage of course contribution to PO's	15%	14%	18%	18%	22%	14%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	Medium	Low	Zero
CO-1	PO-1,PO-2	PO-4,PO-5	PO-3,PO-6	---
CO-2	PO-1,PO-4	PO-2,PO-3	PO-5,PO-6	---
CO-3	PO-1,PO-3, PO-6	PO-2,PO-5	PO-4	---
CO-4	PO-1,PO-2, PO-5	PO-4	PO-3,PO-6	---
CO-5	PO-2,PO-6	PO-1,PO-4	PO-3,PO-5	---
CO-6	PO-1	PO-4,PO-5, PO-6	PO-2,PO-3	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

Course Designed **Course Verified** **HOD**

CORECOURSE –(CC-X):Physics Major Practical–IV
(Evaluation at the end of the Sixth Semester- Any 15 experiments choosing a minimum of 3 from each section)

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH12P	Core course	Practical	3	6

Instructionhrs.3hrs./week

Course Objectives:

COB1:To do experiments on series,parallel circuit.
COB2:To perform Oscillator experiments
COB3:To do experiments on Gates using IC's.
COB4: to make understand on applications of Op-amp
COB5: To perform experiments on flipflop,shiftregister
COB6:To make understand the assembly language programming.

SECTION– A Digital Experiments

1. Series and Parallel resonance circuits(CRO can be used).
2. Regulated power supply using Zener, Percentage of regulation.
3. Hartley oscillator using transistor.
4. Colpitt's oscillator using transistor.
5. Study of logic gates using suitable IC's.
6. Logic gates–AND , OR and NOT gates using discrete components–Truth table.
7. Universal gates NAND/NOR and basic gates from universal gates.
8. Adder–Half and Full adder.
9. Subtractor-Half and Full subtractor.
10. De Morgan's theorem and Boolean algebra.
11. Op–Amp–Adder and subtractor.
12. Op–Amp–integrator and differentiator.
13. Study of Flip Flops.
14. BCD to7segmentdecoder–7segmentLED display
15. FET characteristics.
16. Study of Shift Register.

Section –B–Microprocessor 8085

1. 8-bitadditionand8-bitsubtraction.
2. 8-bitmultiplicationanddivision.
3. Conversion from decimal to hexadecimal system.
4. Conversion from hexadecimal to decimal system.
5. 16-bitaddition.
6. 1'scomplementand2'scomplementsubtraction.
7. Find the smallest number in a given array.
8. Find the largest number in a given array.
9. Find the Square of a given number from the lookup table.
10. Find the sum of series of 8-bitnumbers (sum16-bit).
11. Display a 6 letter word.

CO-PO mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	9	9	9	1
CO-2	9	9	3	3	1	3
CO-3	3	3	1	3	3	1
CO-4	9	1	9	9	9	3
CO-5	3	9	9	1	9	9
CO-6	1	1	3	9	9	9
Weightage	28	26	34	34	40	26
Weightage Percentage of course contribution to PO's	15%	14%	18%	18%	22%	14%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	Medium	Low	Zero
CO-1	PO-1,PO-2	PO-4,PO-5	PO-3,PO-6	---
CO-2	PO-1,PO-4	PO-2,PO-3	PO-5,PO-6	---
CO-3	PO-1,PO-3, PO-6	PO-2,PO-5	PO-4	---
CO-4	PO-1,PO-2, PO-5	PO-4	PO-3,PO-6	---
CO-5	PO-2,PO-6	PO-1,PO-4	PO-3,PO-5	---
CO-6	PO-1	PO-4,PO-5, PO-6	PO-2,PO-3	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

Course Designed **Course Verified** **HOD**

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH13	Core course	Theory	6	6

Course Title: ATOMIC AND NUCLEAR PHYSICS

Course Description:

This undergraduate course in *Atomic and Nuclear Physics* explores the fundamental principles governing atomic structure, radiation, and nuclear phenomena. Topics include cathode and positive rays, vector atom models, spectral fine structures, nuclear properties, instrumentation, nuclear models, and elementary particles. Emphasis is placed on experimental investigations and practical applications in modern physics.

Course Objectives: The course intends to facilitate the learner to

- **Understand the fundamentals of atomic and nuclear physics** by exploring cathode rays, positive rays, and their experimental investigations.
- **Analyze atomic structure and electron interactions** through the vector atom model, quantum numbers, and spin-orbit coupling.
- **Examine fine structures in atomic spectra** with a focus on the Zeeman effect, Stark effect, and their quantum mechanical explanations.
- **Study nuclear properties and detection instruments** to comprehend isotopes, radioactivity, accelerators, and nuclear reaction mechanisms.
- **Explore nuclear models** including nuclear fission, fusion, chain reactions.
- To explain about Elementary particles and classifications of subatomic particles.

Unit-I:CATHODE RAYS AND POSITIVE RAYS(18 Hrs)

Richardson and Compton experiment – Experimental investigation – Photoelectric effect-Photo electric cell-Application of Photo electric cell-Photo Multiplier-Cathode rays- Properties of cathode rays – Millikan's oil drop-method – Positive rays – Properties of positive rays: Thomson's parabola method– Dempster's - Bainbridge's mass spectrograph - Determination of critical potential–Franck and Hertz's experiment.

Unit-II:VECTOR ATOM MODEL(18 Hrs)

Vector atom model-Various quantum numbers, L-S and j- j Couplings – Pauli's exclusion principle - Electronic configuration of elements and periodic classification -Magnetic dipole moment of electron due to orbital and spin motion – Bohr magnetron- Stern and Gerlach experiment– Spin orbit coupling.

Unit-III: FINE STRUCTURE OF SPECTRAL LINES(18 Hrs)

Optical spectra–Zeeman effect-Experimental verification of normal Zeeman effect-Zeeman Shift - Fine structure of sodium D lines – Larmor's theorem - Quantum mechanical explanation of the normal Zeeman effect – Anamolous Zeeman effect – Paschen Back effect -Stark effect.

Unit-IV:PROPERTIES OF NUCLEUI AND INSTRUMENTS(18 Hrs)

Review of basic properties of nuclei – Mass, radius, binding energy, nuclear moments –Isotopes-Isobars – Radioactivity-The Liner Accelerator- Cyclotron –The Synchrotons- Proton Synchrotron-Geiger - Muller counter -Wilson cloud chamber -Nuclear reactions - Q value of nuclear reaction.

Unit-V:NUCLEAR MODELS AND ELEMENTARY PARTICLES(18 Hrs)

Nuclear fission–Nuclear fusion-Liquid drop model-Shell model -magic numbers-Natural uranium and chain reaction – Source of stellar energy – Atom bomb-Nuclear reactor-Uses of Nuclear reactor-Hydrogen bomb-Basic classification of subatomic particles: Photons- Leptons– Meson – Baryons.

Text Books:

1. R.Murugheshan,Modern Physics, S.Chand & Co.(2010).
2. G.Aruldhas and P.Rajagopal,Modern Physics, PHI Learning Private Limited New Delhi(2009).

Reference Books:

1. Arthur Beiser,Concept of Modern Physics:McGrawHill,Ed.VI(1999).
2. Brijlal ,N. Subrahmanyam, Nuclear and Particle Physics, S.Chand & Co, New Delhi(2005).
3. Brijlal, N.Subrahmanyam, Nookala Subhadra Devi, S.Chand & Co, New Delhi(2005).
4. V.Devananthan,NuclearPhysics,Narosa Publications(2012).
5. S.N.Goshal,Atomic Physics,S.Chand&Co,NewDelhi(2010).

Online Resources:

https://archive.nptel.ac.in/courses/115/106/115106057/
https://onlinecourses.nptel.ac.in/noc23_ph16/preview
https://archive.nptel.ac.in/courses/115/103/115103101/
https://onlinecourses.nptel.ac.in/noc24_ph41/preview.

Course Articulation Matrix (Maps COs consistency with POs)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	9	9	1	1	9	9
CO2	9	1	9	3	9	3
CO3	1	3	9	9	9	9
CO4	3	9	9	3	9	3
CO5	9	9	3	9	1	9
CO6	3	9	3	9	3	1
Weightage	34	40	34	34	40	34
Weightage percentage of Course contribution to POs	16%	19%	16%	16%	19%	16%

R- Remember(K1); U- Understand (K2); Ap- Apply(K3); An- Analyze(K4);E- Evaluate(K5); C-Create(K6)

Mapping COs with Knowledge levels and POs:

CO/K-Level	Level of Correlation			
	High	Medium	Low	Zero
CO1/K1	PO-1,PO-2,PO-5	PO-3,PO-4	PO-6	---
CO2/K2	PO-1,PO-2	PO-4,PO-6	PO-3,PO-5	
CO3/K3	PO-1,PO-3	PO-2,PO-5	PO-4,PO-6	---
CO4/K4	PO-1,PO-2,PO-5	PO-3	PO-4, PO-6	---
CO5/K5	PO-1,PO-3	PO-2,PO-5	PO-4,PO-6	---
CO6/K6	PO-3,PO-4,PO-6	PO-1,PO-5	PO-2	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed **Course Verified** **HOD**

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH14	Core course	Theory	6	6

ELEMENTS OF THEORITICAL PHYSICS

Course Description: This undergraduate course on Elements of theoretical physics exposes the students to all fundamental mechanics like classical, wave , quantum , statistical and relative mechanics. Foundation has been laid in terms of derivations for higher mathematical understanding during their post graduate programs.

Course Objectives:

- Understand the fundamentals of Lagrangian's equation and its application.
- Understand the wave nature of the electron through definite experiments.
- Explain the fundamentals of Schrodinger's equation and its application to ground Energy calculations.
- Understand the three distribution laws, and different types of particle nature.
- Explain the fundamentals of relativity.
- This explains about the basic ideas of Astrophysics.

UNIT -I: CLASSICAL MECHANICS(18 Hrs)

Cartesian co-ordinates–Principle of virtual work–Virtual force–Generalized-co-ordinatesGeneralized momentum-Generalized kinetic–energy– D'Alembert's principle (D.A.P) – Lagrangian's equation of motion from D.A.P - Application of Lagrangian formalism to: Atwood's machine and Simple pendulum - Hamilton as total energy operator.

UNIT-II: WAVE MECHANICS (18 Hrs)

De Broglie concept of matter waves – De Broglie wavelength – Wave velocity and group velocity for the De Broglie waves-wave packets –Heisenberg's uncertainty relations – G.P.Thomon's experiment for verifying De Broglie relation – Photo electric effect - laws of photoelectric emission-Einstein's photo electric equation.

UNIT-III: SCHRODINGER's EQUATION(18 Hrs)

Wave functions-Properties-Operator formalism–Total energy, momentum, kinetic and potential energy operators – Eigen function and its properties - Derivation of Schrodinger's equation: Time dependent and time independent equations– Particle in a 1-D box.

UNIT-IV: STATISTICAL MECHANICS(18 Hrs)

Phase space- Fundamental postulates of statistical mechanics- Thermo dynamic probability-Boltzmann's theorem on entropy and probability-Maxwell-Boltzmann distribution law–Bose-Einstein distribution law–Fermi Dirac distribution Law-Comparison of M.B,B.E,F.D Statistics.

UNIT-V: ASTROPHYSICS(18 Hrs)

Classification of stars-White Dwarfs-Electrons in a white Dwarf star-Chandrasekharlimit–Neutron star-Black holes-Super nova explosion-Photon diffusion time-Gravitational potential energy of a star.

TEXT BOOKS

1. R. Murugesan, Mechanics and Mathematical Physics, S.Chand publications (2008).
2. R.Murugesan and KiruthigaSivaprasath, Modern Physics, S.ChandPublications(2008).

REFERENCE BOOKS

1. Arthur Beiser, Modern Physics, Tata McGraw Hill Publications (1998).
2. K.D. Abhyankar, Astrophysics of the Solar System, University Press (India) Private Limited (2012).
3. Ajit Kumar, Fundamentals of Quantum Mechanics, Cambridge press(2005).

Online Resources:

Wave mechanics https://youtu.be/oGdmicMYSJY?si=DVT0kTedi0ulwScs

Astro Physics: https://youtu.be/Dr9nlMoQ4Do

Statistical mechanics: https://youtu.be/iud7fzXPJUs

Course Articulation Matrix (Maps COs consistency with POs)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	9	1	1	1	9	1
CO2	9	9	3	3	9	3
CO3	3	9	9	3	9	9
CO4	3	9	9	9	1	3
CO5	9	9	3	9	9	9
CO6	3	9	9	9	9	9
Weightage	36	46	40	34	46	34
Weightage percentage of Course contribution to POs	15%	19%	17%	14%	19%	14%

R- Remember(K1); U- Understand (K2); Ap- Apply(K3); An- Analyze(K4);E- Evaluate(K5); C-

Create(K6)Mapping COs with Knowledge levels and POs:

CO/K-Level	Level of Correlation			
	High	Medium	Low	Zero
CO1/K1	PO-1,PO-2,PO-3	PO-4,PO-5	PO-6	---
CO2/K2	PO-1,PO-6	PO-4,PO-5	PO-2,PO-3	
CO3/K3	PO-1,PO-4	PO-2,PO-5	PO-3,PO-6	---
CO4/K4	PO-1,PO-2	PO-3,PO-4	PO-5, PO-6	---
CO5/K5	PO-1,PO-3	PO-2,PO-4	PO-3,PO-6	---
CO6/K6	PO-3,PO-4	PO-1,PO-5	PO-2,PO-6	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed **Course Verified** **HOD**

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH15	Theory	Core Course	6	6

Course Title:SOLID STATE PHYSICS AND MATERIALS SCIENCE

Course Description:

This theory course in Solid State Physics and Materials Science delves into the principles of crystal structures, material imperfections, electrical and magnetic properties, advanced materials, and superconductivity. Through theoretical study and practical applications, students will gain a comprehensive understanding of how these concepts drive innovations in materials science and technology.

Course Objectives: The course intends to facilitate the learner to

1. To understand and analyze crystal structures and imperfections, including their impact on material properties.
2. To explore the electrical characteristics of conducting materials, emphasizing their applications in technology.
3. To investigate various types of magnetic materials and the underlying theories governing their magnetic behavior.
4. To examine emerging materials and their innovative applications in modern technology and industry.
5. To comprehend the principles of superconductivity, including its mechanisms and potential technological applications.
6. To understand about dielectrics and its response

UNIT-I:CRYSTALSTRUCTURE AND CRYSTAL IMPERFECTIONS(18 Hrs)

Crystal periodicity – lattice- Unit cell - Symmetry elements - Point group- Space group – Bravais lattices –Miller indices – X-ray diffraction – Bragg's law- Diffractometer –Crystal Imperfections: Line, plane and point defects(definitions and examples only)

UNIT-II: CONDUCTING AND DIELECTRIC MATERIALS(18 Hrs)

Interpretation of Ohm's law – Relaxation types and electrical conductivity – Wiedmann-Franzlaw–Dielectrics–Definitions-Typesofelectricpolarization–Frequencyandtemperature effects on polarization – Dielectric losses – Local field - Clausius-Mosotti relation - Determination of dielectric constant - Schering bridge – Properties of insulating materials.

UNIT-III: MAGNETIC MATERIALS(18 Hrs)

Different types of magnetic materials - Classical theory of dia and para magnetism – Weiss theory of paramagnetism - Molecular field theory of ferro magnetism – Domain theory of ferromagnetism– Hard and soft magnetic materials.

UNIT-IV: NEW MATERIALS(18 Hrs)

Metallic glasses – Fiber reinforced plastics - Fiber reinforced metals – Surface acoustic wavematerials-Biomaterials–Ceramics–Cermets–Electrets-Nanophasematerials-Intermetalliccompounds–Shapememoryalloys-SMARTmaterials-Conductingpolymers.

UNIT-V: SUPERCONDUCTORS(18 Hrs)

Introduction to superconductivity- Meissner effect –Thermal properties- Energy gap-Isotope effect- penetration depth- Type I and Type II super conductors – BCS theory - Josephson tunneling- Theory of D.C. Josephson effect-A.C. Josephson effect- New superconductors-Potential applications of superconductivity.

Text Books:

1. M.Arumugam-MaterialsScience–AnuradhaPublications–3rdEdition(2008). (For Units, II, III and IV)
2. S.O. Pillai – Solid State Physics – New Age International (P) Limited, Publishers, 9thEdition (2021). (For Units I and V).

Reference Books:

1. R.K.Puri,V.K.Babbar,SolidStatePhysics,S.Chand(2005).
2. C.Kittel,IntroductiontoSolidStatePhysics–WileyIndia,7thEdition(2010).
3. P.K.Palanisamy,MaterialScience–ScitechPublication(2005).
4. M.A.Wahab,SolidStatePhysics-Narosapublications (2006).

Online Resources:

1. NPTEL resource: https://www.youtube.com/watch?v=XxcjKOKYtuw
2. NPTEL resource: https://www.youtube.com/watch?v=JFf6nxeYVgM
3. Online: https://www.youtube.com/watch?v=mWXTRFhi8UI

Course Articulation Matrix (Maps COs consistency with POs)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	9	3	3	9	1	1
CO2	9	9	3	1	9	3
CO3	3	9	9	3	9	9
CO4	3	9	1	9	3	3
CO5	9	1	3	9	9	9
CO6	1	9	9	9	9	9
Weightage	34	40	25	40	40	34
Weightage percentage of Course contribution to POs	16%	19%	12%	19%	19%	16%

R- Remember(K1); U- Understand (K2); Ap- Apply(K3); An- Analyze(K4);E- Evaluate(K5); C-Create(K6)

Mapping COs with Knowledge levels and POs:

CO/K-Level	Level of Correlation			
	High	Medium	Low	Zero
CO1/K1	PO-1,PO-2	PO-4,PO-5	,PO-3,PO-6	---
CO2/K2	PO-1,PO-4	PO-2,PO-5	PO-3,PO-6	
CO3/K3	PO-1,PO-3	PO-2,PO-6	PO-3,PO-4	---
CO4/K4	PO-1,PO-5	PO-3,PO-6	PO-2, PO-4	---
CO5/K5	PO-1,PO-2,PO-6	PO-3,PO-4	PO-5	---
CO6/K6	PO-3,PO-4	PO-1,PO-2	PO-5,PO-6	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed **Course Verified** **HOD**

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PH16E	Theory	Elective Course	5	4

OPTO ELECTRONICS, LASER AND FIBRE OPTICS

Course Description: This course provides a comprehensive introduction to the principles and applications of optoelectronics and fiber optics. It covers the fundamentals of light generation, transmission, detection, and modulation using semiconductor and photonic devices. Topics include the physics of light, optical waveguides, laser diodes, photodetectors, optical fibers, and various components used in optical communication systems. Emphasis is placed on understanding the operation of light-emitting diodes (LEDs), laser diodes, photodiodes, modulators, and amplifiers, as well as the principles of signal propagation through optical fibers, including dispersion and attenuation.

Course Objectives:

Enabling the learner to

- Understand the idea about interaction of light with matter
- Discuss the working and applications of various opto electronic materials
- Study about the principle of laser and its types
- Discuss the basic principle of optical fiber
- Enhancing ideas about applications of Laser and hologram
- To enhance the ideas of applications of Fiber Optics

UNIT-I:INTERACTION OF LIGHT WITH MATTER(15 Hrs)

Optical materials- optical absorption in metals - optical absorption in semiconductor and insulators –colour centres- Non linear optical materials -second & third harmonic generation and optical rectification-opticals Gratings -optical phase conjugation (OPC) Uses of OPC-properties of Lithium niobate - Acoustooptic modulators -Braag angle Acoustooptic modulators- Advantages and Disadvantages.

UNIT-II:OPTO ELECTRONIC MATERIALS AND DEVICES(15 Hrs)

Opto electronic materials-Characteristics-Liquid crystal display-Types of display-Light emitting diode-LED materials-LED displays.

Photo detectors:Photo conductor-Photo diode-Photot ransistor-Solarcell and its applications.

UNIT-III: LASERS(15 Hrs)

Basic principle-Laser characteristics-Absorption-Spontaneous emission–Stimulated absorption-Stimulated emission-Einstein Coefficients–Population inversion–Pumping action–Nd-YAG laser-Helium – Neon –CO_2laser –Semiconductor laser.

UNIT-IV:FIBEROPTICCOMMUNICATION(15 Hrs)

Principle of Opticfibre-Propagation of optical signal through fibre-Acceptance angle-Numerical aperture- Single and multi-mode fibres-Characteristics of step index and graded index fibres- types of Fiber losses- Light source: Laser diode-Light detectors: Avalanche photo diode.

UNIT-V:APPLICATIONS OF FIBRES AND LASERS(15 Hrs)

Optic fiber communication link (block diagram)-Advantages of fiber optics communication.–Sensors-Fibre optic endoscopes, Industrial applications of Lasers: Laser cutting, welding andlasersurfacealloying-Medical applications of lasers: eye surgery,Neurosurgery and Dermatology-Holographic storage-Construction and reconstruction of a hologram.

BOOKS FOR STUDY

1. S.Jayakumar,Material Science,R.K Publishers,Coimbatore(2002).
2. P. Mani, Text Book of Engineering Physics-I, Dhanam publications(2013)10thedition.
3. P.K.Palanisamy,Semiconductor Physics and Opto Electronics,Scitech publications,(2004).

BOOKSFORREFERENCE

1. M.N.Avadhanalu,P.S.Hemne,AnIntroduction toLasers,S.Chand,(2005).
2. S.Mohan,V,Arjunan,M.Selvarani,M.Kanchana Mala,Laser Physics,MJP Publishers(2008).
3. Spana Katiyar,Optical Fiber Communication,Kats on books (2012).
4. JohnM.Senior,Optical Fiber Communications,Pearson,India(2010).

Online Resources:

Fibre optic communication: https://youtu.be/DpSJbtt5V7E

Laser and its application: https://youtu.be/D1ljFpX084s

Optoelectronic devices: https://youtu.be/WWjldCmRteg?si=guukQC-lSKH7DbEz

Course Articulation Matrix (Maps COs consistency with POs)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	9	3	9	9	1	9
CO2	9	9	3	1	9	1
CO3	1	9	9	9	9	9
CO4	3	1	1	9	3	3
CO5	9	9	9	9	9	9
CO6	9	3	9	9	9	3
Weightage	40	34	40	46	40	34
Weightage percentage of Course contribution to POs	17%	15%	17%	20%	17%	15%

R- Remember(K1); U- Understand (K2); Ap- Apply(K3); An- Analyze(K4);E- Evaluate(K5); C-Create(K6)

Mapping COs with Knowledge levels and POs:

CO/K-Level	Level of Correlation			
	High	Medium	Low	Zero
CO1/K1	PO-1,PO-2,PO-5	PO-6	,PO-3,PO-4	---
CO2/K2	PO-1,PO-4	PO-2,PO-6	PO-3,PO-5	
CO3/K3	PO-1,PO-6	PO-2,PO-5	PO-3,PO-4	---
CO4/K4	PO-1,PO-3	PO-2,PO-6	PO-3, PO-4	---
CO5/K5	PO-1,PO-2	PO-3,PO-4,PO-6	PO-5	---
CO6/K6	PO-3,PO-5	PO-1,PO-6	PO-2,PO-4	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Coursed Designed **Course verified** **HOD**

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PHNME1	Theory	NME	2	2

NME-I ENERGY PHYSICS

Course Description: This course explores the physical principles underlying energy in its various forms, transformations, and applications. It provides a broad overview of mechanical, thermal, electrical, chemical, and nuclear energy, with emphasis on conservation laws, energy efficiency, and real-world technologies.

Course Objectives:

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

- Know the importance of renewable energy sources.
- Understand the importance of solar energy.
- Understand the fundamentals of bio mass energy.
- Get an idea of Geo thermal energy sources.
- TO Understand about wind energy
- Think about energy storage and conservation.

Syllabus

UNIT- I: ENERGY SOURCES(6 Hrs)

Conventional energy sources fossil fuels water power -nuclear power- non conventional energy sources , comparison between conventional and non conventional energy sources.India's production and reserve of commercial sources- Various forms of energy – Applications and merits demerits of coal ,oil and natural gas.

UNIT- II: SOLAR energy(6 Hrs)

Renewable energy sources – Solar energy – structure of the Sun photosphere chromosphere corona -nature of solar radiation- Solar radiation at the earth's atmosphere _ solar water heater Basic elements_domestic type_- advantages and disadvantages of heater_ solar cooker _box type advantages and disadvantages

UNIT- III: BIOMASS ENERGY FUNDAMENTALS(6 Hrs)

Biomass energy – Classification – in traditional solid mass - non traditional mass- biomass fermentation - - gasification gasification down draft gasifier Gobar gas plants Anaerobic digestion Factors affecting bio digestion types of digester KVIC digester Chinese digester – Advantages& disadvantages of biomass as energy source.

UNIT- IV: OTHER FORMS OF ENERGY SOURCES(6 Hrs)

Geothermal energy – Natural of geothermal energy_forms of geothermal energy_Windenergy –Types of wind power plant _ advantage of wind horizontal axis type principle of ocean thermal energy _energy from waves principle _energy conversion by floats_ tidal energy (basic ideas only.)

UNIT- V: ENERGY STORAGE AND ITS IMPACT(6 Hrs)

Conservation of energy _energy crisis and possible solutions – Global Warming – Green house effect – Energy options for the developing countries Nuclear powar option and solar energy -option –Factors for Energy storage System- hydrogen storage system--Hydrogen as a fuel .

BOOK FOR STUDY

1. K.Karuppannan and N.Suganthi, Energy Physics, Priya Publications, Karur(2006).

BOOKS FOR REFERENCE

1. S.A. Abbasi and NasemaAbbasi, "Renewable Energy sources and their Environmental
Impact", PHI Learning Pvt. Ltd., New Delhi (2008).
2.P. Kothari, K.C. Singal and Rakesh Ranjan, "Renewable energy sources and Emerging Technologies", Prentice Hall of India Pvt. Ltd., New Delhi (2008).

2. G.D. Rai, Non -Conventional Energy Sources, Khanna Publications (2005).

Online Resources:

Bio mass energy : https://nptel.ac.in/courses/103103207

Energy storage : https://youtu.be/OmNOQ38Pgsc?si=uRwgf1TERIN57Sm4

Renewable energy system : https://onlinecourses.nptel.ac.in/noc21_ph33/preview

CO-PO mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	9	9	9	1
CO-2	9	9	3	3	1	3
CO-3	3	3	1	3	3	1
CO-4	9	1	9	9	9	3
CO-5	3	9	9	1	9	9
CO-6	1	1	3	9	9	9
Weightage	28	26	34	34	40	26
Weightage Percentage of course contribution to PO's	15%	14%	18%	18%	22%	14%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	Medium	Low	Zero
CO-1	PO-1,PO-2	PO-4,PO-5	PO-3,PO-6	---
CO-2	PO-1,PO-4	PO-2,PO-3	PO-5,PO-6	---
CO-3	PO-1,PO-3, PO-6	PO-2,PO-5	PO-4	---
CO-4	PO-1,PO-2, PO-5	PO-4	PO-3,PO-6	---
CO-5	PO-2,PO-6	PO-1,PO-4	PO-3,PO-5	---
CO-6	PO-1	PO-4,PO-5, PO-6	PO-2,PO-3	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Coursed Designed **Course verified** **HOD**

NMEC–II: LASER PHYSICS

Programme Code(UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25PHNME2	Theory	NME	2	2

Course Description: This course provides a comprehensive introduction to the fundamental principles and applications of laser physics. Students will explore the physical mechanisms behind the generation, amplification, and propagation of laser light. Topics include the interaction of light with matter, stimulated emission, population inversion, optical resonators, laser rate equations, and the characteristics of various types of lasers such as gas, solid-state, semiconductor, and fiber lasers.

Course Objectives:

Enabling the learner to

- Understand the fundamentals of Laser.
- Know the production of different types of Laser light.
- Describe the applications of Laser in Industry.
- Explain the use of Laser in medicine.
- Know the Principles in Fiber Optics
- To understand about fiber communication system.

UNIT-I: FUNDAMENTALS OF LASER(6 Hrs)

Principle of Spontaneous emission-Stimulated emission–Einstein co-efficients-Population inversion- Pumping action –Optical Pumping-electrical discharge method-Laser characteristics

UNIT-II: PRODUCTION OF LASER(6 Hrs)

Ruby Laser-Nd-YAG laser-Helium-Neon laser- CO_2 laser- Semi conductor diode laser.

UNIT-III: INDUSTRIAL APPLICATIONS OF LASER(6 Hrs)

Material processing- Welding - Laser cutting- Hologram -Recording and reconstruction of hologram -Applications of holography.

UNIT-IV: LASERS IN MEDICINE(6 Hrs)

Applications of laser in medicine - Types of laser medical applications-Photo thermal applications- Laser surgery and its advantages-Argon Ion coagulator.

UNIT-V: FIBER OPTICS(6 Hrs)

Principle of light in fibre optics- propagation of light in optical fibres - Numerical aperture and acceptance angle-Characteristics of Step Index, Characteristics of Graded Index fiber - Light source-LED- detector-Avalanche Photo diode-Optic fibre communication system-Advantages of optic fibre communication.

BOOKFORSTUDY

1.P.Mani, Text Book of Engineering Physics-I, Dhanam publications-5thedition(2009).

BOOKS FOR REFERENCE

1. N.Avadhanulu, An introduction to LASERS, S.Chand & Company (2001).
2. William T Silfvast, Laser fundamentals, Cambridge University Press, Published in South Asia by foundation books, New Delhi (2004).

Online Resources:

Laser: http://www.digimat.in/nptel/courses/video/104104085/L01.html

Fibre optic communication: https://youtu.be/DpSJbtt5V7E

Laser and its application: https://youtu.be/D1ljFpX084s

CO-PO mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	9	1	3	9	1	3
CO-2	9	1	3	9	1	9
CO-3	9	3	9	1	9	3
CO-4	9	3	9	1	9	1
CO-5	9	9	1	9	9	3
CO-6	1	9	3	3	3	9

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	Medium	Low	Zero
CO-1	PO-1,PO-4,	PO-3,PO-6	PO-2,PO-5	---
CO-2	PO-1,PO-4,PO-6	PO-3	PO-1,PO-5	---
CO-3	PO-1,PO-3,PO-5	PO-2, PO-6	PO-4	---
CO-4	PO-1,PO-3,PO-5	PO-2	PO-4,PO-6	---
CO-5	PO-1,PO-2,PO-4,PO-5	PO-6	PO-3	---
CO-6	PO-2,PO-6	PO-3,PO-4,PO-5	PO-4	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed **Course Verified** **HOD**

Programme Code (UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25APH1	Allied	Theory	4	3
Course Title:**ALLIED PHYSICS-I**					

Course Description: This course introduces the fundamental principles of physics with a focus on concepts and applications relevant to the allied technology fields. Topics include mechanics, properties of matter, heat and thermodynamics, sound, optics, electricity and magnetism, and basic nuclear physics. The course is designed to provide students with a working knowledge of physics as it applies to human physiology, diagnostics, and healthcare technologies.

Course Objectives: The course intends to facilitate the learner to

- Understand the Basic concept of elasticity determination of
- To Study about experimental Young's modulus of a material.
- Have knowledge about simple harmonic motions and reverberation time.
- Explain the theory of surface tension,viscosity and their experimental determination.
- Gain knowledge about electromagnetic radiation, Raman effect .
- To Understand about Optical fiber and its communication system.

Unit-I:PROPERTIES OF MATTER(12 Hrs)

Stress – Strain, Hooke's law – Elastic behavior of a material –Different moduli of elasticity-Relation between elastic constants – Work done per unit volume in longitudinal strain -Poisson ratio –Beam -Expression for bending moment – Determination of Young's modulus by non-uniform bending and uniform bending(pin and microscope method).

Unit-II:ACOUSTICS AND ULTRASONICS(12 Hrs)

Acoustics of buildings- Reverberation – Reverberation time – Sabine's formula- Conditions for good acoustics – Law of vibration of stretched strings – Sonometer- factors affecting architectural acoustics.

Ultrasonics- Piezo electric effect- Detection of ultrasonics- Applications.

Unit-III: SURFACE TENSION AND VISCOSITY(12 Hrs)
SURFACETENSION

Definition and dimension of surface tension – Variation of surface tension with temperature –Experiment to determine the surface tension of given liquid by drop weight method-interfacial tension between water and liquid.

VISCOSITY

Co-efficient of viscosity–Streamline flow and turbulent flow-Expression for critical velocity-Significance of Reynold's number-Poiseuille's formula – Experiment to determine the co-efficient of viscosity (Poiseuilles method)-Stoke's method.

Unit-IV:THERMAL PHYSICS(12 Hrs)

Newton's law of cooling – Verification – Specific heat capacity of liquid by cooling – Bomb calorimeter-Bell Calorimeter-Thermal conductivity of a bad conductor-Lee's disc method-Reversible and Irreversible process-Carnot's Cycle.

Unit-V:OPTICS(12 Hrs)

Electromagnetic Spectrum –Raman Effect – Experimental arrangement – Applications of Raman effect-Diffraction-Fresnel and fraunhofer diffraction-Experiment to determine the wavelength by normal incidence method.Fiber Optic communication: Introduction – Optic fiber – Numerical aperture-Single mode and multimode fibers– Coherent bundle – Fiber optic communication system and its advantages .

Text Books:

1. BrijLal and N.Subrahmanyam,Text book of Sound,Vikas Publications Pvt.Limited,(2000).
2. R.Murugeshan, Properties of Matter S.Chand and Co.New Delhi (1999).
3. BrijLal and N.Subrahmanyam,Heat and Thermodynamics, S.Chand (1999).
4. BrijLal and N.Subrahmanyam,Text Book of Optics, S.Chand and Co.Delhi (2010).

Reference Books:

1. R.Murugeshan,ModernPhysics,S.Chand and company Ltd.,NewDelhi (2006).
2. D.S.Mathur,Elements of Properties of matter, Shyam Lal Charitable Trust, NewDelhi(2005).
3. AjoyGhatak,Optics, Tata McGrawHill,Delhi,2nd Edi.(2004).
4. A.Sundaravelusamy, AlliedPhysics–I,Priya Publications.

Online Resources:

1. https://archive.nptel.ac.in/courses/115/107/115107095/
2. https://archive.nptel.ac.in/courses/115/105/115105129/

CO-PO mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	9	3	9	9	9	1
CO-2	9	9	9	9	1	9
CO-3	3	9	3	9	3	3
CO-4	9	1	9	3	3	9
CO-5	1	9	1	9	9	9
CO-6	9	3	9	9	9	9
Weightage	40	34	40	48	34	40
Weightage Percentage of course contribution to PO's	17%	14%	17%	20%	14%	17%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	Medium	Low	Zero
CO-1	PO-1,PO-6	PO-3,PO-5	PO-2,PO-4	---
CO-2	PO-1,PO-5	PO-3,PO-4	PO-2,PO-6	---
CO-3	PO-1,PO-2, PO-3	PO-4,PO-5	PO-6	---
CO-4	PO-1,PO-4, PO-6	PO-2,PO-4	PO-3	---
CO-5	PO-2,PO-3,PO-5	PO-4,	PO-1,PO-6	---
CO-6	PO-1,PO-3,PO-6	PO-2, PO-4	PO-5	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed **Course Verified** **HOD**

Allied(2AC-II): ALLIED PHYSICS PRACTICALS

Programme Code (UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25APH2P	Allied	Theory	3	3
Course Title: **ALLIED PHYSICS Practicals**					

Course Objectives: The course intends to facilitate the learner to

1. To Understand the experimental determination ofthe concept of elasticity
2. To Understand Experimentally the Laws of Transverse Vibrations.
3. To Explain the Experiment of surface tension,viscosity
4. To Differentiate the concepts of heat,thermal conductivity and their experimental determination.
5. To Gain knowledge about electromagnetic radiation Practically.
6. To Understand about Electronics, Gates experimentally.

List of Experiments

(Evaluation at the end of the Even Semester- Any Fifteen experiments)

1. Non-uniform bending– Pin and microscope method.
2. Uniform bending– Pin and microscope method.
3. Sonometer– Verification of laws of transverse vibrations.
4. Specific heat capacity of a liquid– Newton's law of cooling method.
5. Thermal conductivity of a bad conductor–Lee's disc method.
6. Meter bridge– Specific resistance of a material of a coil.
7. Carey Foster bridge- Specific resistance of a material of a coil.
8. Newton's rings – Determination of radius of curvature(R).
9. Spectrometer–Refractive index of a(μ) of solid prism.
10. Spectrometer-Determination of wavelength using grating.
11. Air wedge –Thickness of insulation of a wire.
12. Characteristics of a junction diode.
13. Co-efficient of viscosity a liquid-Poiseuille's method.
14. Surface tension and interfacial tension of a liquid-Drop weight method.
15. Construction of full wave rectifier.
16. Study of logic gates-using ICs.
17. Figure of merit-Table galvanometer.
18. EMF of a thermocouple.
19. Study of logic gates (AND, OR, NOT) using discrete components.
20. Meter bridge- Verification of laws of resistance.

CO-PO mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	9	9	9	1
CO-2	9	9	3	3	1	3
CO-3	3	3	1	3	3	1
CO-4	9	1	9	9	9	3
CO-5	3	9	9	1	9	9
CO-6	1	1	3	9	9	9
Weightage	28	26	34	34	40	26
Weightage Percentage of course contribution to PO's	15%	14%	18%	18%	22%	14%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	Medium	Low	Zero
CO-1	PO-1,PO-2	PO-4,PO-5	PO-3,PO-6	---
CO-2	PO-1,PO-4	PO-2,PO-3	PO-5,PO-6	---
CO-3	PO-1,PO-3, PO-6	PO-2,PO-5	PO-4	---
CO-4	PO-1,PO-2, PO-5	PO-4	PO-3,PO-6	---
CO-5	PO-2,PO-6	PO-1,PO-4	PO-3,PO-5	---
CO-6	PO-1	PO-4,PO-5, PO-6	PO-2,PO-3	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

Course Designed **Course Verified** **HOD**

Programme Code (UG)	Course Code	Course Type	Category	Hrs/Week	Credits
PHYUG1959	U25APH3	Allied	Theory	5	3

Course Title:	**ALLIED PHYSICS - II**

Course Description:

This course provides an in-depth introduction to the principles of electrostatics, atomic structure, and nuclear physics. It is designed to build a strong conceptual and mathematical understanding of electric forces and fields, the behavior of atoms, and the fundamental properties of atomic nuclei. The course emphasizes both theoretical foundations and practical applications across science and engineering disciplines.

Course Objectives: The course intends to facilitate the learner to

- Understand the basics of electrostatics.
- Understand the concepts about electricity and electromagnetic induction.
- Get idea about the atom models, X —rays and crystal structure determination
- Acquire knowledge about the functioning of nuclear particle detectors.
- Understand the importance and basics of digital electronics.
- To Study the concept of Boolean algebra.

UNIT—I: ELECTROSTATICS(15 Hrs)

Coulomb's law- Gauss law and its applications- Intensity at a point due to charged sphere and cylinder-Principle of capacitor- Capacity of the spherical and cylindrical condensers —Energy of a charged capacitor- Sharing of charges and loss of energy.

UNIT-II: CURRENT ELECTRICITY(15 Hrs)

Kirchoff's law-Applications- Wheatstone bridge-Carey Foster's bridge-Laws of electromagnetic induction- Expression for induced E.M.F- Self-inductance- Determination of coefficient of self-inductance- Rayleigh's method-Mutual inductance-Mutual inductance of solenoid-Experimental determination of mutual inductance.

UNIT-III: ATOMIC PHYSICS(15 Hrs)

Somerfield and Vector atom models-Quantum numbers associated with vector atom model-Pauli's exclusion principle - Continuous and characteristics of X-Rays-Moseley's law and its importance- Bragg's law-Miller indices- Determination of crystal structure-Powder crystal method.

UNIT—IV: NUCLEAR PHYSICS(15 Hrs)

Nuclear properties: (Nuclear Size-Charge -Mass- Spin)- Nuclear fission- fusion- Nuclear models-Liquid drop model-Shell model-Particle detectors-Cloud chamber-Bubble chamber-Photographic emulsion technique-Elementary particles(fundamental ideas only).

UNIT-V: DIGITAL ELECTRONICS(15 Hrs)

Number systems-Decimal, binary, octal, hexadecimal and their mutual conversions-Binary arithmetic operations: Addition,Subtraction,Multiplication and Division-Basic logic gates-AND, OR, NOT, NOR, NAND — NOR and NAND gate as universal gates, Laws of Boolean algebra- De- Morgan's theorems.

Text Books:

1. BrijLal and N.Subrahmanyam, Textbook of Electricity and Magnetism, Pragati Prakasan Publisher (1997).

2. R.Murugesan, Modern Physics, S.Chand & Co, New Delhi (2010).

Reference Books:

1. B.L.Theraja, Basic Electronics, S.Chand & Co, New Delhi(2008).

2. Anokh Singh, A.K.Chhabra, Fundamentals of Digital Electronics and Microprocessors, S.Chand and Co., New Delhi (2003).

Online Resources:

1.https://www.geeksforgeeks.org/electrostatics/
2.https://www.techtarget.com/whatis/definition/logic-gate-AND-OR-XOR-NOT-NAND-NOR-and-XNOR
3.https://phys.libretexts.org/Bookshelves/University_Physics/University_Physics_(OpenStax)/University_Physics_II_Thermodynamics_Electricity_and_Magnetism_(OpenStax)/08%3A_Capacitance/8.02%3A_Capacitors_and_Capacitance
4.https://www.quantamagazine.org/a-new-map-of-the-standard-model-of-particle-physics-20201022/

CO-PO mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	9	3	9	9	9	1
CO-2	9	9	9	9	1	9
CO-3	1	9	3	9	9	3
CO-4	9	3	9	9	3	9
CO-5	3	9	1	1	9	9
CO-6	9	3	9	1	9	3
Weightage	40	34	40	46	40	34
Weightage Percentage of course contribution to PO's	17%	15%	17%	20%	17%	15%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	Medium	Low	Zero
CO-1	PO-1,PO-4	PO-3,PO-6	PO-2,PO-5	---
CO-2	PO-1,PO-3	PO-4,PO-5	PO-2,PO-6	---
CO-3	PO-1,PO-2, PO-3	PO-4,PO-6	PO-5	---
CO-4	PO-1,PO-4, PO-6	PO-2,PO-3	PO-5	---
CO-5	PO-2,PO-3,PO-4	PO-6,	PO-1,PO-5	---
CO-6	PO-1,PO-3,PO-6	PO-2,	PO-4,PO-5	---

Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U- Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

CO Attainment and Assessment Table Evaluation Procedure

K Levels	C1	C2	C3 Assignment	Total scholastic marks	Non Scholastic Attendance	CIA Total	% of Assessment
	4 marks	10 marks	6 marks	20 Marks	5 marks	25 marks	
K1	01	03	03	07			35%
K2	01	03	03	07			35%
K3	01	02	---	03			15%
K4	01	02	---	03			15%
K5	---	---	---	---			
K6	---	---	---	---			
Non-Scholastic	---	---	---	---			
Total	4	10	6	20	5	25	100%

Course Designed **Course Verified** **HOD**

Second Allied Course: 1		Semester: 3
APPLIED PHYSICS FOR COMPUTER SCIENCE I		
Course Code: U25APH1C	Instruction Hours/Week: 5	Credit: 5
CIA: 25 Marks	ESE: 75 Marks	Total: 100 Marks

COURSE DESCRIPTION

This course delves into electrostatics, semiconductor physics, electronic circuits, operational amplifiers, number systems, Boolean algebra, logic gates, sequential circuits and registers. It emphasizes practical applications including number system conversions and the design of combinational and sequential circuits to enhance student's understanding and skills in applied physics within computer science.

COURSE OBJECTIVES

- To understand the principles of electrostatics and semiconductor physics, including charge distribution, energy bands, and diode characteristics.
- To explore the design and applications of electronic switching circuits, including relays, TRIACs, and DIACs.
- To analyze and implement operational amplifier circuits, including inverting, non-inverting, summing, and differentiator configurations.
- To develop proficiency in number system conversions, Boolean algebra, and logic gate operations for digital circuit design.
- To study the working principles of sequential circuits, including flip-flops, registers, counters, Multiplexers, and Demultiplexers.

UNIT I – ELECTROSTATICS ANDSEMICONDUCTOR PHYSICS (15 Hrs)

Fundamentals of electrostatics – Coulomb's law – Gauss theorem and its application – Intensity due to a charged sphere – Principles of a capacitor – Cylindrical capacitor – Energy of a charged capacitor. Electric Current and its units — Definitions of important parameters (Ampere – Voltage and Resistance).Theory of energy bands in solids – distinction between conductors, insulators and semiconductors – Intrinsic and extrinsic semiconductors – pn junction diode – biasing – V-I Characteristics

UNIT II- ELECTRONICS CIRCUITS

(15Hrs) Introduction to switching circuits – Solid state switching circuits: mechanical switch – electrochemical switch (Relay) - Electronic switch - Switching applications using relay – Triac – construction and operation – Triac characteristics – applications – high power lamp switch - electronic changeover of transformer taps - Diac – construction and operation- application – Lamp dimmer.

UNIT III – OPERATIONAL AMPLIFIERS (15 Hrs)

The basic operational amplifier – Inverting and non-inverting operational amplifier – inverting and non-inverting summing amplifier - voltage follower — Differential operational amplifier – CMRR –Op Amp as integrator and differentiator.

UNIT IV – NUMBER SYSTEMS, BOOLEAN ALGEBRA AND LOGIC GATES (15 Hrs)

Introduction to number System – types – Decimal, Binary, Octal, Hexadecimal – Conversion from one number system to others - The Grey Code - The ASCII Code – Boolean Algebra -Rules and Laws only.

AND, OR, NOT, NAND, NOR, EX-OR gates – operation and truth tables– DeMorgan's theorems – NAND and NOR as Universal gates.

UNIT V – SEQUENTIAL CIRCUITS AND REGISTERS (15 Hrs)

Flip Flops- SR Flip Flop - D Flip Flop - JK Flip Flop - T Flip Flop - Registers - Shift registers – Shift Left and Shift Right registers – Counters - Synchronous counters – Multiplexers and Demultiplexers.

BOOKS FOR STUDY

1. Electricity and Magnetism – R. Murugeshan, 10th Edition (2011).
2. Principles of Electronics – V.K. Mehta and Rohit Mehta, Revised edition (2016).
3. Introduction to integrated electronics: Digital and Analog – V. Vijayendran (2011)

BOOKS FOR REFERENCE

1. 2. Electronic devices and Circuits – Millman and Halkias – TMH(1991).
2. Basic Electronics Solid state – B.L. Theraja (2008).
3. Malvino. A and Leach, Digital Principles and Applications, Mc-Graw Hill, New York, 8th Edition (2015).
3. Modern Physics – R. Murugeshan and KiruthigaSivaprasath (2014)

Unit	Book	Section
I	1	1.1, 1.2, 2.2, 2.5, 4.1, 4.4, 4.9, 6.1
	2	4.4, 4.5, 5.8, 5.9, 5.18
II	2	18.1, 18.2, 18.3, 18.4, 18.5, 21.2, 21.3, 21.5, 21.6, 21.8, 21.9, 21.10
III	3	14.3, 14.4, 14.5, 14.6, 14.7, 14.8, 14.9, 14.10
IV	3	1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12, 1.13, 1.14, 3.4, 3.5, 5.1, 4.3, 4.7, 4.8, 5.2, 5.3, 5.5
V	3	9.3, 9.4, 9.5, 9.6, 10.1, 10.2, 10.6, 8.1, 8.2

Online Resources

Swayam Course	➢ https://onlinecourses.nptel.ac.in/noc24_ee02/preview Fundamentals of semiconductor devices, By Prof. Digbijoy N. Nath, IISc Bangalore
E - Content	➢ https://www.youtube.com/watch?v=X7M3rUxUpOc&list=PLbRMhDVUMngePP5JcezxImF-FzOC9wstz Digital Circuits by Prof. Santanu Chattopadhyay, IIT Kharagpur ➢ https://archive.nptel.ac.in/courses/108/101/108101091/

	A Brief History Of Electronics, By Prof. Mahesh Patil, IIT, Mumbai
Other online resources	➢ https://www.electronics-tutorials.ws/power/triac.html *Electronics Tutorials*: Detailed explanations on various switching devices, including relays, TRIACs, and DIACs, along with their applications. ➢ https://www.geeksforgeeks.org/number-system-and-base-conversions/ Articles covering number systems, Boolean algebra, logic gates, and DeMorgan's theorems.

CONo.	COURSEOUTCOMES	KNOWLEDGE LEVEL
CO 1	Understand the fundamental concepts of electrostatics, including Coulomb's law, Gauss's theorem, and the principles of capacitors.	**K1,K2,K3**
CO 2	Analyze the energy band structure of solids and distinguish between conductors, insulators, and semiconductors.	**K1,K2,K3**
CO 3	Design and understand the operation of basic switching circuits, including relays, TRIAC, and DIAC applications.	**K1,K4,K5**
CO 4	Apply operational amplifiers for various applications such as integration, differentiation, and summing amplifiers.	**K2, K3**
CO 5	Convert numbers between different number systems and apply Boolean algebra to solve logical operations and simplify expressions.	**K3, K6**
CO 6	Explain and construct sequential circuits like flip-flops, registers, and counters, along with their applications.	**K3, K4**

Course Outcome	Programme Outcome					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3	1	3	3
CO2	3	3	9	3	1	9
CO3	3	0	3	9	0	1
CO4	3	9	9	9	0	0
CO5	9	9	9	9	9	9
CO6	1	3	9	1	3	9

WEIGHTAGE	22	27	42	32	16	31
Weighted percentage of Course contribution to POs	12.9%	15.9%	24.7%	18.8%	9.5%	18.2%

CourseOutcomesmappedwithKnowledgelevel(RevisedBloom'sTaxonomy)andPOs

CO / K– Level	Levelof Correlation			
	High	Medium	Low	Zero
CO1 / K1,K2,K3	-	PO1, PO2, PO3, PO5, PO6	PO4	-
CO2 / K1,K2,K3	PO3, PO6	PO1, PO2, PO4	PO5	-
CO3 / K1,K4,K5	PO4	PO1, PO3	PO6	PO2, PO5
CO4 / K2,K3	PO2, PO3, PO4,	PO1	-	PO5, PO6
CO5 / K3,K6	PO1, PO2, PO3, PO4, PO5, PO6	-	-	-
CO 6 / K3,K4	PO3, PO6	PO2, PO5	PO1, PO4	-

CourseOutcome (CO) AttainmentAssessmentTools&Evaluation Procedure

KLevels	C1	C2	C3	Total Scholastic marks	Non Scholastic Marks C4	CIA Total	% of Assessment
	T1 4 Marks	T2 10 Marks	Assignment 6 Marks	20 Marks	5 Marks	25 Marks	
K1	1	2	1	4	--	4	16%
K2	2	2	1	5	--	5	20%
K3	1	2	1	4	--	4	16%
K4	--	2	1	3	--	3	12%
K5	--	1	1	2	--	2	8%
K6	--	1	1	2	--	2	8%
Non Scholastic	--	--	--	--	5	5	20%
Total	4	10	6	20	5	25	100%

The COS and POS for the Applied Physics for Computer Science-I course in the B.Sc. Computer ScienceProgrammeis effectively attached by the Course In-charge.

Signature of the Course In-charge Signature of the HoD

APPLIED PHYSICS PRACTICALS – III		
Course Code: U25APH3CP	Instruction Hrs: 2	Credit: 5
CIA: 25 Marks	ESE: 75 Marks	Total: 100 Marks

(At the end of the Fourth Semester-Minimum of Fourteen experiments)

1. Semiconductor diode – V-I Characteristics
2. Zener Diode – V-I Characteristics
3. Inverting and non-inverting summing amplifier using Op-Amp
4. Mathematical operators – Addition, subtraction using Op-Amp
5. Study of basic logic gates using suitable IC's.
6. Study of universal IC gates- NAND and NOR.
7. Use of logic gates for arithmetic operations – Half adder and Full adder.
8. Use of logic gates for arithmetic operations – Half subtractor and Full subtractor.
9. Study the function of Shift registers – IC – 7495.
10. Study the function of Multiplexers and Demultiplexers – IC 74153, 74154
11. Study of Flip flops
12. 8 bit addition and subtraction using microprocessor 8085
13. 8 bit multiplication using microprocessor 8085
14. 8 bit division using microprocessor 8085
15. Find the smallest number in the given array using microprocessor 8085
16. Find the largest number in the given array using microprocessor 8085
17. Verification of DeMorgan's Laws.
18. Construction of full wave rectifier.

CO-PO mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	9	9	9	1
CO-2	9	9	3	3	1	3
CO-3	3	3	1	3	3	1
CO-4	9	1	9	9	9	3
CO-5	3	9	9	1	9	9
CO-6	1	1	3	9	9	9
Weightage	28	26	34	34	40	26
Weightage Percentage of course contribution to PO's	15%	14%	18%	18%	22%	14%

9-Strong Correlation, 3-Medium Correlation ,1-Lesser Correlation

Level of Correlation

Co's	Level of Correlation			
	High	Medium	Low	Zero
CO-1	PO-1,PO-2	PO-4,PO-5	PO-3,PO-6	---
CO-2	PO-1,PO-4	PO-2,PO-3	PO-5,PO-6	---
CO-3	PO-1,PO-3, PO-6	PO-2,PO-5	PO-4	---
CO-4	PO-1,PO-2, PO-5	PO-4	PO-3,PO-6	---
CO-5	PO-2,PO-6	PO-1,PO-4	PO-3,PO-5	---
CO-6	PO-1	PO-4,PO-5, PO-6	PO-2,PO-3	---

PO–Programme Outcomes ;CO–Course Outcome; PSO–Programme specific outcome R-Remember(K1);U-Understand (K2); Ap(K3)–Apply; An (K4)–Analyze;E-Evaluate (K5)and C–Create(K6)

Second Allied Course: 2		Semester: 3
APPLIED PHYSICS FOR COMPUTER SCIENCE II		
Course Code: U25APH2C	Instruction Hours/Week: 5	Credit: 5
CIA: 25 Marks	ESE: 75 Marks	Total: 100 Marks

COURSE DESCRIPTION

This course introduces the foundational concepts and applications of modern electronics and optoelectronics. It begins with the principles of lasers and holography, covering different types of lasers and their operation. Then explores the basics of fiber optics, optical signal propagationand the role of sensors and transducers in measurement systems.Students will gain insight into semiconductor memory technologies, and a detailed study of the Intel 8085 microprocessor architecture and its instruction sets. The course concludes with hands-on programming in 8085 assembly language that enables the students to implement basic arithmetic and data manipulation tasks.

COURSE OBJECTIVES

- To comprehend the fundamental principles of lasers and holography, including the working mechanisms of various lasers.
- To understand the principles of optical fiber communication and their advantages.
- To gain knowledge of semiconductor memories, including the types and characteristics of ROM and RAM, and their applications in computer systems.
- To understand the architecture and instruction set of the Intel 8085 microprocessor, including its pin configuration, instruction formats, addressing modes, and various instruction groups.
- To develop skills in programming the Intel 8085 microprocessor using assembly language, including performing arithmetic operations and manipulating data arrays.

UNIT I – LASERS AND HOLOGRAPHY (15 Hrs)

Basic concepts of stimulated emission – Population inversion and Meta stable state –Ruby laser – He Ne laser – Semiconductor Laser production – Advantages – applications of lasers – Holography – Working principle.

UNIT II – FIBER OPTICS AND SENSORS (15 Hrs)

Introduction-Principle and structure of optic fiber-Propagation of optical signal through fiber-Acceptance Angle - Numerical Aperture - Optic fiber communication Link (block diagram) - Advantages of fiber optics communication.

Sensors and Transducers - Transducers-Resistive transducers-capacitive transducers, Inductive transducers- Tachometer – Electromagnetic flowmeter - Linear variable differential transformer (LVDT) – Resistance temperature detectors.

UNIT III – SEMICONDUCTOR MEMORIES (15 Hrs)

Introduction to Memories- Read only Memory (ROM): PROM, EPROM, EEROM – Random Access Memory (RAM) - Static Random Access Memories- Dynamic Random Access Memories – Memory parameters.

UNIT IV – ARCHITECTURE AND INSTRUCTION SET OF INTEL 8085 (15 Hrs)

General Architecture of microcomputer-Architecture of INTEL 8085–Pin configuration– Instruction word size -Instruction and data formats – Addressing modes - Instructions set - Opcodes –Data transfer group-Arithmetic group- Logical group- Branch group –Stack, I/O and machine control group.

UNIT V – PROGRAMMING OF MICROPROCESSOR (15 Hrs)

Assembly language – Subroutine- Addition of two 8bit numbers – Subtraction of two 8 bit numbers – 8 bit multiplication – 8 bit division – Finding smallest / largest element of an integer array- Arranging an integer array in ascending and descending order.

BOOKS FOR STUDY

1. Modern Physics – R. Murugeshan and KiruthigaSivaprasath (2014).
2. Basic Electronics Solid state – B.L. Theraja (2008)
3. Introduction to integrated electronics: Digital and Analog – V. Vijayendran (2011).
4. Ram B, Fundamentals of microprocessors and microcomputer – 8th Edition, Dhanapat Rai Publications (P) Ltd, New Delhi (2013).

BOOKS FOR REFERENCE

1. Engineering Physics - I – Dr.P.Mani- Dhanam Publications (2019)-16thEdition.
2. NagoorKani A., Microprocessors and Microcontrollers, 1st Edition, RBA Publications, Chennai (2017).

Unit	Book	Section
I	1	19.1, 19.2, 19.3, 19.4
II	2	38.1, 38.2, 38.8, 38.9, 38.17, 38.18, 38.26, 38.27, 36.2, 36.5, 36.6, 36.7, 36.836.9, 36.13
III	3	12.1, 12.2, 12.3, 12.4, 12.6
IV	4	3.1, 4.1, 4.2, 4.3, 4.6
V	4	5.2, 6.3, 6.4, 6.21, 6.22, 6.24, 6.25, 6.29, 6.30

Online Resources

Swayam Course	➢ https://onlinecourses.nptel.ac.in/noc24_ee23/preview\ Optical Fiber SensorsBy Prof. Balaji Srinivasan | IIT Madras
E - Content	➢ https://onlinecourses.nptel.ac.in/noc23_ee06/preview Microprocessors and Interfacing By Prof. Shaik Rafi ahamed, IIT Guwahati ➢ https://archive.nptel.ac.in/courses/108/101/108101091/ A Brief History Of Electronics, By Prof. Mahesh Patil, IIT, Mumbai
Other online resources	➢ https://www.udemy.com/course/8085-microprocessor-everything-you-need-to-know/ This Udemy course delves into assembly language programming for the 8085 microprocessor. ➢ https://www.electronics-tutorials.ws/io/semiconductor-memory.html An in-depth look at different types of semiconductor memories, including ROM, RAM, and their various subtypes.

CONo.	COURSEOUTCOMES	KNOWLEDGELEVEL
CO 1	Comprehend the working principles of lasers and holography, along with their applications.	**K1,K2,K3**
CO 2	Understand the principles, structures, and communication mechanisms of optical fibers, along with applications of sensors and transducers.	**K1,K2,K3**
CO 3	Analyze different types of semiconductor memories, their parameters, and functionalities.	**K1,K4,K5**
CO 4	Describe the architecture and instruction set of the Intel 8085 microprocessor.	**K2, K3**
CO 5	Develop assembly language programs for arithmetic operations, sorting arrays, and finding elements using the Intel 8085 microprocessor.	**K3, K6**
CO 6	Apply the knowledge of microprocessor programming to solve real-world computational problems.	**K3, K4**

Course Outcome	Programme Outcome					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	9	3	3	1	1	1
CO2	9	9	3	9	3	0
CO3	0	1	1	9	9	9
CO4	1	3	3	3	9	3
CO5	3	3	9	0	1	3
CO6	3	9	9	1	0	1
WEIGHTAGE	25	28	28	23	23	17
Weighted percentage of Course contribution to POs	17.4%	19.4%	19.4%	16%	16%	11.8%

CourseOutcomes mappedwith Knowledge level(Revised Bloom's Taxonomy)and POs

CO / K– Level	Levelof Correlation			
	High	Medium	Low	Zero
CO1 / K1,K2,K3	PO1	PO2, PO3	PO4, PO5, PO6	-
CO2 / K1,K2,K3	PO1, PO2, PO4	PO3, PO5	-	PO6
CO3 / K1,K4,K5	PO4, PO5, PO6	-	PO2, PO3	PO1
CO4 / K2,K3	PO5	PO2, PO3, PO4, PO6	PO1	-
CO5 / K3,K6	PO3	PO1, PO2, PO6	PO5	PO4
CO 6 / K3,K4	PO2, PO3	PO1	PO4, PO6	PO5

CourseOutcome (CO) AttainmentAssessmentTools&Evaluation Procedure

KLevels	C1	C2	C3	Total Scholastic marks	Non Scholastic Marks C4	CIA Total	% of Assessment
	T1 4 Marks	T2 10 Marks	Assignment 6 Marks	20 Marks	5 Marks	25 Marks	
K1	1	2	1	4	--	4	16%
K2	2	2	1	5	--	5	20%
K3	1	2	1	4	--	4	16%
K4	--	2	1	3	--	3	12%
K5	--	1	1	2	--	2	8%
K6	--	1	1	2	--	2	8%
Non Scholastic	--	--	--	--	5	5	20%
Total	4	10	6	20	5	25	100%

The COS and POS for the Applied Physics for Computer Science-II course in the B.Sc. Computer Science Programme is effectively attached by the Course In-charge.

Signature of the Course In-charge

Signature of the HoD