

**PG & RESEARCH DEPARTMENT OF
PHYSICS
NATIONAL COLLEGE (AUTONOMOUS)
TIRUCHIRAPPALLI**

B.Sc. –Major, Allied, Applied and NME

SYLLABUS

FROM JUNE 2022 ONWARDS

B.Sc. (PHYSICS)-SCHEME AND SYLLABUS-CBCS SYSTEM

(Applicable to the candidates admitted from the academic year 2022-23 onwards)

Semester	Part	Course Title	Title	Instr. Hours/ week	Credit	Exam Hours	Marks			Total
							Int	Ext		
								Oral	W	
I	I	Language Course-I(LC-I)	Tamil-I/Hindi-I/Sanskrit-IU22T1,U22H1,U22S1	6	3	3	25		75	100
	II	English Language Course-I(ELC-I)	English-IU22E1	6	3	3	25		75	100
	III	Core Course-I(CC-I)	Properties of Matter, Acoustics and Ultrasonics U22PH1	5	5	3	25		75	100
		Core Course-II(CC-II)	Physics Major Practical-IU22PH2	3	-	-	-		-	-
		First Allied Course-I(1AC-I)	Allied Mathematics I(U22IAC1)	5	3	3	25		75	100
		First Allied Course-II(1AC-II)	Allied Mathematics II(U22IAC2)	3	-	-	-		-	-
	IV	Environmental Studies	Environmental Studies(U22ES)	2	2	3	25		75	100
	Total	Papers:7	30	16					500	
II	I	Language Course-II(LC-II)	Tamil-II/Hindi-II/Sanskrit-IIU22T1,U22H1,U22S1	6	3	3	25		75	100
	II	English Language Course-II(ELC-II)	English-IIU22E2	4	2	3	25		75	100
		Communicative English-I(CEC-I)	Communicative English-IU22CE1	2	1	3	25	5	70	100
	III	Core Course-II(CC-II)	Physics Major Practical-IU22PH2	3	6	3	25	5	70	100
		Core Course-III(CC-III)	Mechanics and Relativity U22PH3	5	5	3	25		75	100
		First Allied Course-II(1AC-II)	Allied Mathematics II(U22IAC2)	3	3	3	25	5	70	100
		First Allied Course-III(1AC-III)	Allied Mathematics III(U22IAC3)	5	3	3	25		75	100
	IV	Skill Based Elective-I(SBE-I)	Office Automation U22SBE:1	2	2	3	25		75	100
	Total	Papers:8	30	25					800	
III	I	Language Course-III(LC-III)	Tamil-III/Hindi-III/Sanskrit-IIIU22T3,U22H3,U22S3	6	3	3	25		75	100
	II	English Language Course-IV(ELC-IV)	English-IIIU22E3	6	3	3	25		75	100
	III	Core Course-IV(CC-IV)	Thermal Physics U22PH4	4	4	3	25		75	100
		Core Course-V(CC-V)	Physics Major Practical-IIU22PH5	3	-	-	-		-	-
		Second Allied Course-I(2AC-I)	Allied Chemistry IU22AC1	4	3	3	25		75	100
		Second Allied Course-II(2AC-II)	Allied Chemistry Practical U22AC2	3	-	-	-		-	-
	IV	Skill Based Elective Course II-(SBEC-II)	Conventional and Non conventional energy sources U22SBE:2	2	2	3	25		75	100
Skill Based Elective Course III-(SBEC-III)		Medical Instrumentation U22SBE:3	2	2	3	25		75	100	
	Total	Papers:8	30	17					600	
IV	I	Language Course-IV(LC-IV)	Tamil-IV/Hindi-IV/Sanskrit-IVU22T4,U22H4,U22S4	6	3	3	25		75	100
	II	English Language Course-IV(ELC-IV)	English-IVU22E4	4	2	3	25		75	100
		Communicative English-V(ELC-V)	Communicative English-IIU22CE2	2	1	3	25	5	70	100
	III	Core Course-V(CC-V)	Physics Major Practical-IIU22PH5	3	5	3	25		75	100
		Core Course-VI(CC-VI)	Basic Electronics U22PH6	4	4	3	25		75	100
		Second Allied Course-II(2AC-II)	Allied Chemistry Practical U22AC2	3	3	3	25	5	70	100
		Second Allied Course-III(2AC-III)	Allied Chemistry IIU22AC3	5	3	3	25		75	100
	IV	Non-Major Elective Course-I(NMEC-I)	U22NME:1	2	2	3	25		75	100
Value Education Course-VEC		Value Education U22VE	1	2	3	25		75	100	
	Total	Papers:9	30	25					900	

V	III	CoreCourse–VII(CC-VII)	Optics U22PH7	5	5	3	25		75	100
		CoreCourse–VIII(CC-VIII)	Electricity, Magnetism and Electromagnetism U22PH8	5	5	3	25		75	100
		Elective Course–I(EC-I)	Digital Electronics and MicroprocessorU22PH9E	5	4	3	25		75	100
		Elective Course–II(EC-II)	Computer Programming–C LanguageU22PH10E	5	4	3	25		75	100
		CoreCourse–IX(CC-IX)	Physics Major Practical–III U22PH11	3	-	-	-		-	-
		CoreCourse–X(CC-X)	Physics Major Practical–IV U22PH12	3	-	-	-		-	-
	IV	Non-Major Elective Course–II (NMEC-II)	U22NME:II	2	2	3	25		75	100
		SoftSkills	U22SS	2	2	3	25		75	100
		Total	Papers:8	30	22					600
VI	III	Core Course–IX(CC-IX)	Physics Major Practical–III U22PH11	3	5	3	25		75	100
		Core Course–X(CC-X)	Physics Major Practical–IV U22PH12	3	6	3	25		75	100
		Core Course–XI(CC-XI)	Atomic and Nuclear Physics U22PH13	6	6	3	25		75	100
		Core Course–XII(CC-XII)	Elements of Theoretical Physics U22PH14	6	6	3	25		75	100
		Core Course–XIII(CC-XIII)	Solid State and Materials Science U22PH15	6	6	3	25		75	100
		Elective Course–III(EC-III)	Opto Electronics and FiberOptic Communication U22PH16E	5	4	3	25		75	100
		Gender Studies	U22GS	1	1	3	25		75	100
		Extension Activities	EA	--	1	--	--	--	--	--
		Total	Papers:8	30	35					700
		Total	Total	180	140					4100

There will be oral test for all practical examinations and Communicative English Course. The oral test will carry 5 marks in the external component.

VISION

- ❖ To be the pinnacle of academic and research excellence in **PHYSICS**
(Learn Physics and Stay as a Physicist)

MISSION

As a Department, We are committed to achieve academic excellence through innovative teaching and learning processes.

- ❖ To prepare the students to be professionally competent to face the challenges in the industry.
- ❖ To promote quality and ethics among the students.

PROGRAMME Specific Outcomes

PSO1: 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.

PSO2: To Analyze the applications of mathematics to solve the problems in physics

PSO3: To prepare the students for a successful career and work with values for social concern.

PSO4: To promote student awareness on the life-long learning and to introduce them to professional ethics and codes of professional practice.

PSO5: To learn and design an experiment (or series of experiments) demonstrating the Principles of the scientific method(s).

PROGRAMMEOUTCOMES

PO1: Choose teaching and research as a career with the skills acquired.

PO2: Create confidence to become an entrepreneur by providing entrepreneurial skills and technical skills.

PO3: Get through successfully in the competitive examinations conducted at the state level and national level for employment.

PO4: 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.

PO5: 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.

CORE COURSE- (CC-I)
PROPERTIES OF MATTER, ACOUSTICS AND ULTRASONICS

Semester-I

Code:U22PH1

Instruction hours/week: 5

Credit:5

Course Objectives:

Enabling the learner to

COB1: Brief about the basics of elasticity.

COB2: Explain the concept of bending of beams and its various properties.

COB3: Review the elementary ideas and theory of surface tension and its experimental determination.

COB4: Have the elementary ideas and theory of viscosity and its experimental method.

UNIT-I: ELASTICITY

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 and moment of inertia - Determination of rigidity modulus by Searle's static torsion method (scale and telescope).

UNIT-II: BENDING OF BEAMS

Bending moment- Cantilever- Depression for loaded end of a cantilever-Experiment to find the Young'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: SURFACE TENSION

Surface tension – Definition – Molecular forces – Explanation of surface tension on kinetic theory – Surface energy – Work done in increasing the area of a surface – Excess pressure inside a curved liquid surface – Excess pressure inside a curved liquid surface - Jaegar's method - variation of surface tension with temperature-Drop weight method-Experiment to determine Interfacial Tension- Capillary rise method.

UNIT-IV: VISCOSITY

Viscosity – Co efficient of viscosity – Streamlined and turbulent motion – Critical velocity –Rate of flow of liquid in a capillary tube – Poiseuille's formula and its corrections –Viscosity of highly viscous liquid-Terminal velocity-Stokes formula Stoke's method for coefficient of viscosity -Viscosity of gas-Mayer's formula- Rankine's method to determine viscosity of a gas.

UNIT-V: ACOUSTICS AND ULTRASONICS

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-Piezoelectric oscillator method- Detection of ultrasonic waves-Applications of ultrasonics.

BOOKS FOR STUDY:

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

BOOKS FOR REFERENCE:

1. Brijlal and N. Subrahmanyam, Properties of Matter, S.Chand and Co .Ltd. New Delhi (1999).
2. SubramaniaIyer , Jeyaraman and Rangarajan ,Properties of Matter, S.Chand Publications, New Delhi(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).

Sl. No.	Course outcomes	PSO's addressed	Cognitive Level
CO1	Brief about the basics of elasticity	PSO1	K1
CO2	Explaining the concept of bending of beams and its various experiments	PSO5	K2,K3
CO3	Review the elementary ideas and theory of surface tension and its experimental determination	PSO3	K1,K4
CO4	Giving the elementary ideas and theory of viscosity and its experimental method	PSO2	K1,K2
CO5	Outline the ideas of acoustics, Production and detection of ultrasonics.	PSO4	K1,K5

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

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	S	L	M	M	M
CO2	S	L	M	M	S
CO3	S	L	M	M	M
CO4	S	M	M	M	M
CO5	S	M	S	S	L

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation

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

Instruction hrs. 3hrs./week

Code: U22PH2

Credit:5

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 of a liquid–Newton’s law of cooling method.
5. Meter Bridge–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 bad conductor –Lee’s disc.
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. Meterbridge –series and parallel resistance.
20. Uniform bending-Scale and telescope method.

CORECOURSE–(CC-III): MECHANICS AND RELATIVITY

Semester-II

Instruction hours/week:5

Code: U22PH3

Credit:5

Course Objectives:

Enabling the learner to

COB1: Study the concept of a projectile, impulse and friction.

COB2: Understand the dynamics of rigid bodies.

COB3: Outline the concept of gravitation and to compute the centre of Gravity of different shaped bodies.

COB4: Explain about hydrodynamics and atmospheric pressure.

COB5: Understand about elementary ideas on relativity.

UNIT-I: PROJECTILE, IMPULSE, IMPACT AND FRICTION

Projectile–Range and time of flight, maximum height–path of a projectile–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 coefficient of friction–Equilibrium of a body on a rough inclined plane acted upon by an external force.

UNIT-II: DYNAMICS OF RIGIDBODIES

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–Parallel and perpendicular axis theorem–Calculation of M.I for–Rectangular lamina about an axis perpendicular to its plane–Uniform solid cylinder–Sphere about a diameter–Moment of inertia of a spherical shell about a diameter.

UNIT-III: GRAVITATION AND CENTRE OF GRAVITY

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

UNIT-IV: HYDROSTATICS AND ATMOSPHERIC PRESSURE

Centre of pressure: 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–Laws of floatation–Determination of the metacentric height of a ship– Atmospheric pressure – Variation of atmospheric pressure with altitude.

UNIT-V: RELATIVITY

Frame of reference—Galilean transformation equation–Michelson Morley experiment–Special theory of relativity- Lorentz transformation equation– Length contraction – Time dilation–Variation of mass with velocity–Einstein’s postulates–Einstein’s mass-energy relation.

BOOKSFORSTUDY

1. R. Murugesan, Mechanics and Mathematical Methods, S.Chand and New Delhi (2008).
2. M. Narayanamurti , Dynamics, National Publishing Company(1996).
3. R.Murugesan,Kiruthiga Sivaprasath, Modern Physics, S.Chand and New Delhi(2007).

BOOKSFORREFERENCE

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

Sl. No.	Course outcomes	PSO's addressed	Cognitive Level
CO1	Understand the concept of projectile, Impulse and friction	PSO1, PSO4	K1,K2
CO2	Understand the dynamics of rigid bodies	PSO2	K2,K5
CO3	Outline gravitation and computer centre of Gravity of different shapes	PSO2	K1,K2
CO4	Explain about hydrodynamics and Atmospheric pressure	PSO4	K2,K3
CO5	Understand about elementary ideas on relativity	PSO5	K2,K4

**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/PO	PO1	PO2	PO3	PO4	PO5
CO1	S	L	M	L	M
CO2	L	M	S	M	M
CO3	S	L	L	M	L
CO4	M	S	M	S	L
CO5	S	L	L	L	M

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation

COMPUTER APPLICATIONS – I - OFFICE AUTOMATION

SEMESTER – II

CODE: U22SBE1

Instruction hours/week: 2

Credit:2

UNIT I:

MS- Word- Introduction to Computers - Hardware - Software, Operating System: Windows XP - MS-Paint, Notepad, WordPad, Introduction to MS-Word, Creating, Editing and Formatting Document - Working with drawing objects - Text Manipulation

UNIT II:

Working with Tables – Columns – Labels - Plotting, editing and Filling drawing objects Bookmark – Header & Footer - Checking and Correcting a document - Creating Labels – Envelops – Mail Merge – Formatted output and Report generation Printing Documents, Working with Internet.

UNIT III:

Ms – Excel - Ms – Excel: Introduction – Data Entry – Cell Formatting - Plotting Graphs – Workbook Features – Library Functions

UNIT IV:

Conditional Functions and Data Sorting – Limit the data on a worksheet - Data Validation –Data consolidation - Chart creation - Checking and Correcting Data - Tracking and Managing Changes Advanced Features

UNIT V:

MS – PowerPoint- Introduction - Creating, Editing and Formatting Presentation – Applying Transition and Animation Effects - Applying Design Templates - Viewing and Setting up a Slide Show - Navigating among Different Views - Ms Outlook: Introduction to Folder List – Address Book.

Sl. No.	Course outcomes	PSO's addressed	Cognitive Level
CO1	Understand the basic ideas of computer and MS office	PSO1, PSO4	K1,K2
CO2	Understand the functions of MS word	PSO2,PSO3	K2,K3
CO3	Outline the concept of MS excel	PSO2	K2,K4
CO4	Explain about various functions of MS excel.	PSO4	K2,K5
CO5	Understand about the power point and its animations	PSO5	K4,K5

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/PO	PO1	PO2	PO3	PO4	PO5
CO1	S	L	L	M	M
CO2	M	L	S	S	M
CO3	S	L	M	M	S
CO4	L	M	M	S	L
CO5	S	L	L	S	M

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation

CORE COURSE–(CC-IV) THERMAL PHYSICS

Semester-III

Code:U22PH4

Instruction hrs./week:4

Credit:4

Course Objectives: **Enabling the learner to**

COB1: Study the idea about laws of thermodynamics

COB2: Understand entropy, relation between temperature-entropy

COB3: Discuss about the concept to flow temperature and its instruments

COB4: Bringing the idea about laws of radiation

COB5: Study about laws of specific heat capacity

UNIT-I: THERMODYNAMICS

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

Second law of thermodynamics - Concept of entropy –Change of entropy in reversible and irreversible processes – Temperature – Entropy diagram (T.S.) – Entropy of a perfect gas –Principle of increase of entropy–Third law of thermodynamics –Zero point energy-Negative temperature –Maxwell’s thermodynamical relations.

UNIT-III:LOW TEMPERATURE PHENOMENA

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

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 – Planck’s law –Rayleigh Jean’s law – Pyrometry – Angstrom’s pyro heliometer –Solar constant-Temperature of the sun–Some every day applications of solar energy.

UNIT-V: SPECIFIC HEATS OF MATTER

Specific heat of solids – Dulong and Petit’s law – Atomic heat of solids- Einstein’s theory of specific heat – Debye’s theory of specific heat – Newton’s law of cooling - Calorific value of fuels-Bomb calorimeter- Bell calorimeter- Atomicity of gases.

BOOKFORSTUDY

1. Brijlal, N.Subrahmanyam and P.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).

OBE Mapping

Sl.No.	Course outcomes	PSO's addressed	Cognitive Level
CO1	Study the idea about laws of thermodynamics	PSO1	K1,K2
CO2	Understand entropy, relation between temperature-entropy	PSO2	K3,K4
CO3	Discuss about the concept of low temperature and its instruments	PSO5	K1,K5
CO4	Bringing the idea about laws of radiation	PSO3	K1,K2
CO5	Study about laws of specific heat capacity	PSO4	K2,K3

**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-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CO-1	S	L	M	S	L
CO-2	S	L	S	M	M
CO-3	S	M	S	M	L
CO-4	S	L	S	M	M
CO-5	S	M	S	M	S

S-Strong Correlation, M-Medium Correlation ,L-Lesser Correlation

CORE COURSE–(CC-V):Physics Major Practical-II
(At the end of the FOURTH Semester-Any Fifteen experiments.)

Semester-III, IV
Instruction hrs. 3hrs./week

Code: U22PH5P
Credit: 5

Course Objectives:

Enabling the learner to

COB1: Study the concept of Rigidity modulus of a given material experimentally.

COB2: Understand the viscosity, surface tension of a given liquid experimentally

COB3: Study the calibration of a Voltmeter and Ammeter using potentiometer.

COB4: Study about idea of zener diode characteristics.

COB5: Understand about spectrometer, Table galvanometer, Rectifier

List of Experiments

1. Static torsion–Determination of rigidity modulus (n).
2. Torsional pendulum-Determination of rigidity modulus (n) and moment of inertia(I).
3. Coefficient of viscosity of a liquid-Poiseuille's method.
4. Stoke's method–Viscosity of highly viscous liquid.
5. Characteristics of a zener 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. Figure of merit–Table galvanometer.
14. Transistor characteristics –CE– configuration.
15. Transistor characteristics –CB–configuration.
16. Spectrometer–Refractive index (μ)of a liquid.
17. Spectrometer–i-d curve.
18. CRO–Study of waveforms –Lissajou's figures–Frequency determination.
19. Construction of a full wave rectifier.
20. Surface tension of a liquid-Capillary rise method.

SBE – II CONVENTIONAL AND NON-CONVENTIONAL ENERGY SOURCES

Instruction hours/week: 2

Credit: 2

Course Objectives:

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

CO1: Know the importance of renewable energy sources.

CO2: Understand the importance of solar energy.

CO3: Understand the fundamentals of bio mass energy.

CO4: Get an idea of different energy sources.

CO5: Think about energy storage and conservation.

Syllabus

UNIT- I: CONVENTIONAL ENERGY SOURCES

World's reserve - Commercial energy sources and their availability - Various forms of energy - Renewable and conventional energy system.

UNIT- II: NON CONVENTIONAL ENERGY

Renewable energy sources – Solar energy – nature of solar radiation Solar radiation outside the earth's atmosphere -solar water heater -domestic type- commercial type- advantages and disadvantages of heater-solar cooker -box type.

UNIT- III: BIOMASS ENERGY FUNDAMENTALS

Biomass energy – Classification – Biomass conversion process. - gasification 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: VARIOUS FORMS OF ENERGY SOURCES

Geothermal energy – Natural of geothermal energy forms of geothermal energy Wind energy –Types of wind power plant -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

Conservation of energy -energy crisis and possible solutions – Global Warming – Green house effect – Energy options for the developing countries – Energy storage System Hydrogen as a fuel -hydrogen storage

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).

OBE Mapping with Bloom's Taxonomy

CO	Outcome	PSO ADDRESSED	Cognitive level
CO1	Explains about various conventional energy sources	PSO1	K1,K2
CO2	Describes about concept Solar energy and Solar components	PSO3	K2,K3
CO3	Understand about Bio mass energy	PSO4	K2,K3
CO4	Discuss about the ideas about other energy sources	PSO2	K4,K5
CO5	Explains about Energy storages	PSO5	K1,K2

**R-REMEMBER (K1);U-UNDERSTANDING(K2);AP-APPLY(K3);
AN-ANALYZE(K4);E-EVALUATE(K5)**

CO-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CO-1	S	L	M	S	M
CO-2	S	M	L	S	S
CO-3	S	S	M	M	M
CO-4	S	S	M	S	S
CO-5	S	M	S	M	L

SBE – III MEDICAL INSTRUMENTATION

Instruction hours/week: 2

Credit: 2

Course Outcome:

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

1. Identify the symptoms related to the pressure in various parts of the body to be measured by medical indicators.
2. Understand the theory and construction of instrument intended for diagnosis and therapy.
3. Understand the basic concept of Laser and to apply newer technology to treat the diseases.
4. Learn the knowledge of ultrasound to detect the diseases.
5. Acquire a scientific awareness on the disease prevention and treatments.

Unit – I: Pressure measurement

Eye pressure measurement – Schiotz Tonometer – Goldmann Tonometer – Comparison between Schiotz and Goldmann Tonometers – Urinary bladder pressure – Direct measurement – Catheter method.

Unit – II: Diagnostic Devices

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

Unit – III: Therapeutic Devices

#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

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

Ultrasonics – Ultrasonic diathermy – Ultrasonic propagation through tissues – B-mode ultrascan – Applications of diagnostic ultrasound.

Self study

Text Books:

- 1) **Medical Physics, John R. Cameron**, University of Wisconsin, Madison & James G. Skofronick, Florida State university, Tallahassee, A wiley-Interscience Publication, John Wiley & sons, Singapore.
- 2) **Biomedical Instrumentation Dr. M. Arumugam**, Second Edition, Reprint-2010, Anuradha Publications PVT, Kumbakonam, 2010.

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.

Web References:

Catheter method:

https://www.rch.org.au/rchcp/hospital_clinical_guideline_index/Intraabdominal_PressureMonitoring/

Angiography:

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

LASIK Eye Surgery:

<https://www.webmd.com/eye-health/lasik-laser-eye-surgery#1-1>
https://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

OBE Mapping with Bloom's Taxonomy

Course outcome		PSO's addressed	Cognitive Level
CO1	Identify the symptoms related to the pressure in various parts of the body to be measured by medical indicators.	PSO-1	K1
CO2	Understand the theory and construction of instrument intended for diagnosis and therapy.	PSO-5	K2,K3
CO3	Understand the basic concept of Laser and to apply newer technology to treat the diseases.	PSO-3	K1,K4
CO4	Learn the knowledge of ultrasound to detect the diseases.	PSO-2	K1,K2
CO5	Acquire a scientific awareness on the disease prevention and treatments.	PSO-4	K1,K5

R-REMEMBER (K1);U-UNDERSTANDING(K2);AP-APPLY(K3); AN-ANALYZE(K4); E-EVALUATE(K5)

CO-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CO-1	S	L	M	S	M
CO-2	S	M	L	S	S
CO-3	S	S	M	M	M
CO-4	S	S	M	S	S
CO-5	S	M	S	M	L

CORECOURSE – (CC-VI): BASIC ELECTRONICS

Semester-IV

Code: U22PH6

Instruction hrs. /week:4

Credit:5

Course Objectives:

Enabling the learner to

COB1: Bring out the ideas of semi conductors, diodes and its various types.

COB2: Explaining the working of transistor by various characteristics and methods of biasing

COB3: Explaining the concept of amplifier, oscillator and various semi conductor devices.

COB4: Inculcate the concept of modulation, its types and demodulation

COB5: Out line the idea about OPAMP, its characteristics and its applications

UNIT- I: SEMICONDUCTORS AND DIODES

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 stabiliser.

UNIT-II: TRANSISTORS

Transistor terminals- Transistor action- Transistor as an amplifier-Characteristic curves of transistor-CB, CE and CC mode-Comparison of transistor connections-Load line-operating point-Faithful simplification-Transistor biasing-Feedback resistor-Voltage divider method of transistor biasing.

UNIT-III: AMPLIFIER, OSCILLATORS AND SPECIAL SEMICONDUCTOR DEVICES

Single stage CE amplifier-RC coupled transistor amplifier-Power amplifier-classification of power amplifier- -Essentials of transistor oscillator-Barkhausen criterion-Types of transistor oscillators--Hartley-and Wein bridge 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

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-Super hetrodyne radio receiver and its advantages-FM receiver.

UNITV: OPERATIONAL AMPLIFIERS

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.

BOOKFORSTUDY:

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

BOOKSFORREFERENCE:

1. B.L .Theraja ,Basic Electronics solid state ,S.Chand and Company Ltd(2005).
2. R.S.Sedha,AtextbookofAppliedElectronics,S.ChandandcompanyLtd(2009).
3. Subramanyam.A,AppliedElectronics,NationalPublishingCompany(1999).
4. Garg ,Rakesh Kumar, Basic Electronics, New Delhi(2009)
5. Muthu Subramanian. R, Basic Electronics Engineering ,TMH ,New Delhi(2000).

OBEMapping

Sl. No.	Course outcomes	PSO's addressed	Cognitive Level
CO1	Bring out the ideas of semiconductors ,diodes and its various types.	PSO1	K1,K2
CO2	Explaining the working of transistor by various Characteristics and methods of biasing	PSO2	K2,K3
CO3	Explaining the concept of amplifier ,oscillator and various semiconductor devices.	PSO5	K1,K4
CO4	Inculcate the concept of modulation, its types and demodulation	PSO3	K2,K3
CO5	Outline the idea about OP amp its characteristics and its applications	PSO4	K2,K5

**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-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5
CO-1	S	M	S	M	L
CO-2	S	L	S	S	M
CO-3	S	L	M	S	L
CO-4	M	L	L	M	M
CO-5	S	M	M	L	S

S-Strong Correlation, M- Medium Correlation, L- Lesser Correlation

CORECOURSE–(CC-VII) OPTICS

Semester-V

Code: U22PH7

Instruction hrs./week:5

Credit:6

Course Objectives:

Enabling the learner to

COB1: Discuss the concept of aberrations and their types.

COB2: Outline the idea about Interference, its experimental method to determine the wavelength of source.

COB3: Give the elementary ideas and theory about diffraction

COB4: Explain the construction of eyepiece and its types and to determine the resolving power of various instruments

COB5: Brief about the basics of polarization of light ,its generation and detection.

UNIT-I: ABERRATIONS

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

UNIT-II: INTERFERENCE

Colour of thin films-Air wedge-Testing the plainness of the surface- Theory of Newton's rings -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

Fresnel's diffraction–Diffraction at a (i)circular aperture (ii)Opaque circular disc. Fraunhofer diffraction at a single slit –Double slit-missing orders in a doublet grating with theory–Oblique incidence–Determination of wavelength using grating.

UNIT-IV: EYEPIECE AND RESOLVING POWER OF OPTICAL INSTRUMENTS

Fieldlens-Ramsden's eye piece-Huygen's eye piece and its cardinal points–Comparison between Hygen's and Ramsden Eye piece-Resolving power–Rayleigh's criterion of resolution-. Resolving power of a Telescope, Prism and Grating – Dispersive power of a prism and grating.

UNIT-V: POLARIZATION

Nicol prism – Nicol prism as an analyzer and polarizer – 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.

BOOKFORSTUDY

1. Brijlal, N.Subrahmanyam, Optics, S.ChandandCo., NewDelhi(2006).
2. R.Murugesan, Optics, S.Chand and Co., New Delhi(2011).

BOOKSFORREFERENCE

1. Khanna and Gulati- Optics. R.Chand and Co. New Delhi(2007).
2. Ajoy Ghatak, Optics, Tata Mc Graw Hill Publications (2004).
3. R. Murugesan, E, Kiruthiga Sivaprasath, Optics and Spectroscopy – S.Chand and Co.,New Delhi(2011).
4. S.K. Aggarwal, A text book of Optics, Wisdom Press (2008).

OBEMapping

Sl.No.	Course out comes	PSO's addressed	Cognitive Level
CO1	Discuss the concept of aberration sand its type	PS O1	K1
CO2	Outline the idea about interference, its experimental method to determine the wavelength of Source	PS O5	K3, K5
CO3	Giving the elementary ideas and theory about diffraction	PS O3	K1, K4
CO4	Explaining the construction of eyepiece and its type and also determine there solving power of optical instruments	PS O3	K2,K3
CO5	Brief about the basic idea of polarization, optical Activity	PS O4	K2

**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– PO mapping

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	S	L	M	M	M
CO2	S	M	S	M	S
CO3	S	L	M	L	M
CO4	M	L	M	M	M
CO5	S	M	M	S	L

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation

CORECOURSE- (CC-VIII)
ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM

Semester: V

Instruction hrs./week:5

Credit:6

Course Objectives:

Enabling the learner to

COB1: Discuss Gauss law and its applications, types of capacitors, capacity of different capacitors.

COB2: Understand the basic concept of current electricity.

COB3: Study the basic properties of magnetism and magnetic effect.

COB4: Remember the basic ideas of electromagnetism and determination of self-inductance and mutual inductance.

COB5: Review the AC circuits and its power factor.

UNIT-I: ELECTROSTATICS

Gauss law and its applications- Electric field due to uniformly charged non-conducting sphere- Conducting sphere - Electric field due to uniform cylindrical charge-Electric field due to an infinite line of charge-Electric field due to infinite plane sheet of charge-Coulomb's theorem- Mechanical force experienced by unit area of a charge conductor-Deduction of Coulomb's law of Gauss law-Principle of a capacitor – Capacity of a spherical and cylindrical capacitors – Energy stored in a capacitor – Loss of energy due to sharing of charge.

UNIT-II: CURRENT ELECTRICITY

Kirchoff's law-Wheatstone condition for bridge balance–Carey Foster's Bridge–Temperature coefficient of resistance - Potentiometer principle- Calibration of ammeter and voltmeter-Seebeck effect- Measurement of thermo emf using potentiometer – Peltier effect – Thomson effect – Thermodynamic of thermocouple- Theory of moving coil ballistic galvanometer- Correction for: damping–Figure of merit.

UNIT-III: MAGNETISM AND MAGNETIC EFFECT

Basic definitions – Relation between permeability and Susceptibility –Properties of para, dia and ferro magnetic materials–Experiment to draw B-H curve by ballistic method–Energy loss due to hysteresis-Importance of hysteresis – Maxwell's screw rule-Fleming's left hand rule-Biot-Savart law-Magnetic induction at a point due to a straight conductor-Magnetic induction 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

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

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.

BOOKSFORSTUDY

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

BOOKSFORREFERENCE

1. Narayanamoorthy and Nagaratnam, Electricity and Magnetism National Publishing Company, 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).

OBE Mapping

Sl. No.	Course outcomes	PSO's addressed	Cognitive Level
CO1	Discuss Gauss law and its applications, types of capacitors, capacity of different capacitors.	PSO1	K1
CO2	Understand the basic concept of current electricity.	PSO5	K2,K5
CO3	Study the basic properties of magnetism and magnetic effect.	PSO3	K1,K3
CO4	Remember the basic ideas of electromagnetism and determination of self-inductance and mutual inductance.	PSO2	K1,K2
CO5	Review the AC circuits and its power factor.	PSO4	K1,K4

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

CO-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CO-1	S	L	M	M	M
CO-2	S	L	M	M	S
CO-3	S	L	M	M	M
CO-4	S	M	M	M	M
CO-5	S	M	S	S	L

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation

**ELECTIVE COURSE– (EC-I):
DIGITAL ELECTRONICS AND MICROPROCESSOR**

Semester-V

Instruction hrs./week:4

Code: U22PH9E

Credit:4

Course Objectives: Enabling the learner to

COB1: Study the Concept of number system and basic gates

COB2: Understand De-Morgan's theorem, Boolean expressions and its simplification

COB3: Study the concept of combinational circuits

COB4: Understand the concept of flip flop and counters

COB5: Study the basic ideas about assembly language programming and simple programming.

UNIT-I: NUMBER SYSTEMS AND LOGIC GATES

Number Systems and Conversions - BCD Code - 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- XOR and XNOR Gates and application as Parity Checkers.

UNIT- II: BOOLEAN ALGEBRA AND SIMPLIFICATION OF LOGIC EXPRESSIONS

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-Quine Mc Cluskey Tabulation method.

UNIT-III: COMBINATIONAL DIGITAL SYSTEMS

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

UNIT-IV: SEQUENTIAL DIGITAL SYSTEMS

Flip flop – RS – clocked RS – T and D flip flops – JK and master slave flip flops – Shift registers – SISO and SIPO shift registers –Universal shift register- Ring counter –Johnson's counter – Four bit asynchronous counter – Mod-2 and Mod-4 counter –Synchronous counter-IC555:block diagram and applications :A stable multi vibrator and Mono stable multi vibrator.

UNIT-V: MICROPROCESSOR (8085)

Introduction to microprocessor – Basic components of a microcomputer –Memory – ROM – RAM – Architecture of 8085 – Address bus – Data bus – Control bus– Pin configuration –Registers- Arithmetic and logic unit – Flags – Instruction format –Types of instructions –Addressing modes – Assembly language programming –Programmes for 8-bit addition and 16-bit result, 8-bit subtraction and 16-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).

BOOKS FOR REFERENCE

1. W.H. Gothmann , Digital Electronics ,Prentice Hall of India, Pvt, New Delhi(1996).
2. Anokh Singh, A.K. Chhabra, Fundamentals of Digital Electronics and Microprocessors,S. Chand and Co., New Delhi(2003).
3. A.P.Malvino, D.P.Leach, Digital Principles and Application, IV Edition, Tata Mc Graw Hill, New Delhi(1968).
4. V.Vijayendran, Fundamentals of Microprocessor–8085, S.Viswanathan Printers and Publishers Private Ltd., Chennai, (2004).

OBE Mapping

Sl. No.	Course outcomes	PSO's addressed	Cognitive Level
CO1	Study the Concept of number system and basic gates	PSO1	K1,K2
CO2	Understand De-Morgan's theorem, Boolean expressions and its simplification	PSO5	K3,K5
CO3	Study the concept of combinational circuits	PSO3	K3,K4
CO4	Understand the concept of flip flop and counters	PSO2	K3,K4
CO5	Study the basic ideas about assembly language programming and simple programming	PSO4	K2,K3

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

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	S	L	M	M	M
CO2	S	L	M	M	S
CO3	S	L	M	M	M
CO4	S	M	M	M	M
CO5	S	M	S	S	L

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation

**ELECTIVE COURSE–(EC-II):
C++PROGRAMMING AND APPLICATIONS**

Semester-V

Instruction hrs./week:4

Code: U22PH10E

Credit:4

Course Objectives:

Enabling the learner to

COB1: Understand the basic concepts and structure of a C++program.

COB2: Learn and implement the concepts of arrays and functions in a program.

COB3: Understand the significance of object-oriented programming.

COB4: Use and apply the concepts of operators, pointers and inheritance.

COB5: Apply the learnt concepts in writing simple C++ coding to solve Physics problems.

UNIT -I: Fundamentals of C++

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

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

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 ANDPOINTERS

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

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

Applications: C++programming for solving Physics problems.

BOOKSFORSTUDY

1. E. Balagurusamy, Object-Oriented Programming with C++, 8th Edition, Mc GrawHill 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)

BOOKSFORREFERENCE

1. E .Balagurusamy , Programming inANSIC,6/e, Mc Graw Hill, Education(India)PrivateLimited, New Delhi(2012).
2. ByronS.Gottfried,Schaum'sOutlines:ProgrammingwithC,5/e,TataMcGrawHillPub.Co Ltd., New Delhi, (2007).
3. Steve Oualline, Practical C++Programming,2/e,O'Reilly Media, Inc .CA,USA(2002).

OBE Mapping

Course Outcomes: The learner will be able to

Sl. No.	Course outcomes	PSO's addressed	Cognitive Level
CO1	Understand the basic concept sand control structures of C++programming.	PSO1	K1, K2
CO2	Write and implement the concepts of array sand functions in a program.	PSO2	K2, K3,K4
CO3	Understand the significance of object-oriented programming concepts viz. classes and objects.	PSO1, PSO3	K2
CO4	Use and apply the concepts of operators, pointers and inheritance.	PSO2, PSO4	K2, K3,K4
CO5	Solve simple Physics problems with C++Program codes.	PSO5	K3, K4,K5

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

CO-PO Mapping

Course Outcome	Programme Outcome				
	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	M	S	M	M	L
CO3	S	M	S	M	L
CO4	S	S	M	S	M
CO5	S	S	M	M	S

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation

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

(Evaluation at the end of the Sixth Semester-Any 15 experiments choosing a minimum of 6 from each section)

Semesters: V and VI
Instruction hrs. 3hrs./week

Code:U22PH11
Credit:6

General and Electronics Experiments **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 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 to 7segmentdecoder–7segmentLED display
15. FET characteristics.
16. Study of Shift Register.

CORECOURSE –(CC-X):Physics Major Practical–IV

(Evaluation at the end of the Sixth Semester- Any 15 experiments choosing a minimum of 6 from each section)

Semesters: V and VI
Instructionhrs.3hrs./week

Code:U22PH12
Credit:6

C++/C- Programming and Assembly language programming

SECTION– A

C-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.

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.
12. Conversion from decimal to octal system.
13. Conversion from octal to decimal system.

CORECOURSE-(CC-XI): ATOMIC AND NUCLEAR PHYSICS

Semester-VI
Instruction hrs./week:6

Code:U22PH13
Credit:6

Course Objectives:

Enabling the learner to

COB1: Understand the properties of cathode rays, positive rays and its experimental arrangement

COB2: Explain the vector atom model, coupling schemes.

COB3: Describe the fine structure of spectral lines by various effects.

COB4: Understand the basic properties of nuclei and explain the working of particle counters.

COB5: Discuss the basic ideas of nuclear models and elementary particles.

UNIT-I: CATHODE RAYS AND POSITIVE RAYS

Photoelectric effect – Richardson and Compton experiment – Experimental investigation –Durnington method-Cathode rays – Properties – e/m of cathode rays – Millikan's oil drop method – Positive rays – Properties – e/m of positive rays: Thomson's parabola method–Aston's-Bain's-bridge-Determination of critical potential– Franck and Hertz's experiment-Compton's effect.

UNIT-II: VECTOR ATOM MODEL

Vector atom model-Variation of 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 magneton- Stern and Gerlach experiment– Spin orbit coupling.

UNIT-III: FINE STRUCTURE OF SPECTRAL LINES

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 – Anomalous Zeeman effect –Paschen Back effect –Stark effect.

UNIT-IV: PROPERTIES OF NUCLEI AND INSTRUMENTS

Review of basic properties of nuclei – Mass, radius, binding energy, nuclear moments –Isotopes-Isobars – Radioactivity-Cyclotron – Betatron- Geiger - Muller counter –Wilson cloud chamber –Q value of nuclear reaction–Discovery of neutron, positron.

UNIT-V: NUCLEAR MODELS AND ELEMENTARY PARTICLES

Nuclear fission–Nuclear fusion-Liquid drop model–Shell model-magic numbers-Collective model - Neutrons in fission process– Nuclear energy – Thermo nuclear reactions –Atom bomb- Basic ideas of a nuclear reactor-Hydrogen bomb. Basic classification of subatomic particles: Photons- Leptons– Meson – Baryons.

BOOK FOR STUDY

1. R.Murugesan, Modern Physics, S.Chand&Co.(2010).

BOOKS FOR REFERENCE

1. Arthur Beiser, Concept of Modern Physics: Mc Graw Hill, 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. Devanathan, Nuclear Physics, Narosa Publications(2012).
5. S.N.Goshal, Atomic Physics, S.Chand&Co, New Delhi(2010).

OBEMapping

Sl. No.	Course outcomes	PSO	COGNITIVE LEVEL
CO1	Understand the properties of cathode rays, positive rays and its experimental arrangement.	PSO1, PSO4	K1,K2
CO2	Understand the vector atom model, coupling schemes.	PSO2	K2, K5
CO3	Understand the fine structure of spectral lines by various effects	PSO3	K1,K4
CO4	Understand and apply the basic property of nuclei and counters.	PSO2	K2,K3
CO5	Understand the basic ideas of nuclear models and Elementary particles	PSO5	K2,K3

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

CO-PO Mapping

CONo.	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	M
CO2	M	L	S	L	M
CO3	L	L	L	M	S
CO4	S	M	L	L	M
CO5	M	L	S	M	S

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation

CORECOURSE – (CC-XII): ELEMENTS OF THEORETICAL PHYSICS

Semester-VI
Instruction hrs./week:6

Code:U22PH14
Credit:6

Course Objectives:

Enabling the learner to

COB1: Understand the fundamentals of Lagrangian's equation and its application.

COB2: Understand the wave nature of the electron through definite experiments.

COB3: Explain the fundamentals of Schrodinger's equation and its application to ground. Energy calculations.

COB4: Understand the three distribution laws, and different types of particle nature.

COB5: Explain the fundamentals of astronomy, Chandrasekar limit.

UNIT -I: CLASSICAL MECHANICS

Cartesian co-ordinates–Principle of virtual work–Virtual force–Generalized-co-ordinates–Generalized 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 – Hamilton's variational principle.

UNIT-II: WAVE MECHANICS

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

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 box1-D.

UNIT-IV: STATISTICAL MECHANICS

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.

UNIT-V: ASTROPHYSICS

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

BOOKSFORSTUDY

1. R. Murugesan, Mechanics and Mathematical Physics, S.Chand publications (2008).
2. R.Murugesan and Kiruthiga Sivaprasath, Modern Physics, S.Chand Publications(2008).

BOOKFORREFERENCE

1. Arthur Beiser, Modern Physics, Tata Mc Graw 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).
4. Salinas, Introduction to Statistical Physics, Springer(2004).

OBE Mapping

Sl.No.	Course outcomes	PSO's addressed	Cognitive Level
CO1	Understand the fundamentals of Lagrangian's equation and its application	PSO1, PSO4	K1,K2
CO2	Understand the wave nature of the electron through Definite experiments	PSO2	K2
CO3	Explain the fundamentals of Schrodinger's equation and its application to ground energy calculations	PSO2	K1,K2
CO4	Understand the three distribution laws, and different Types of particle nature	PSO2	K2
CO5	Explain the fundamentals of astronomy , Chandrasekar limit	PSO5	K2,K3

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

CO-PO Mapping

CONo.	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	L	L
CO2	S	S	S	L	M
CO3	S	S	M	L	L
CO4	S	S	S	M	L
CO5	S	S	S	M	L

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation

CORE COURSE – (CC-XIII)
SOLID STATE PHYSICS AND MATERIALS SCIENCE

Semester-VI
Instruction hrs./week:6

Code:U22PH15
Credit:6

Course Objectives:

Enabling the learner to

CO1: Understand about crystal structure, bonding crystal imperfections

CO2: Study about conducting, di-electric and insulating materials and its properties

CO3: Discuss about different types of magnetic materials and its theories

CO4: Bringing the ideas of smart-fiber and new materials

CO5: Understand the brief ideas of super conductors and its theories.

UNIT-I: CRYSTAL STRUCTURE, BONDING IN SOLIDS AND CRYSTAL IMPERFECTIONS

Crystal periodicity – lattice- Unit cell - Symmetry elements - Point group – Bravais lattices – Miller indices – Inter planar spacing – X-ray diffraction – Bragg's law – Atomic bonding: Ionic bond – Bond dissociation energy – Cohesive energy – Madlung constant – Covalent bond – Metallic bond – Hydrogen bond – Van der Waals bond – Atomic packing factors of bcc, fcc and sc lattices.

UNIT-II: CONDUCTING AND DIELECTRIC MATERIALS

Interpretation of Ohm's law – Relaxation types and electrical conductivity – Wiedmann-Franz law – Dielectrics – Definitions – Types of electric polarization – Frequency and temperature - Effects of polarization – Dielectric losses – Local field - Clausius- Mosotti relation - Determination of dielectric constant - Schering bridge – Properties of insulating materials.

UNIT-III: MAGNETIC MATERIALS

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

UNIT-IV: NEW MATERIALS

Metallic glasses – Fiber reinforced plastics - Fiber reinforced metals – Surface acoustic wave materials - Biomaterials – Ceramics – Cermets – Electrets - Nanophase materials - Inter metallic compounds – Shape memory alloys - SMART materials - Conducting polymers.

UNIT-V: SUPER CONDUCTORS

Meissner effect – Thermal properties - Energy gap - Isotope effect – Type I and Type II super conductors – BCS theory - Josephson tunneling - Theory of D.C. Josephson effect - A.C. Josephson effect - SQUID – Applications.

BOOKS FOR STUDY

1. M. Arumugam- Materials Science – Anuradha Publications – 3rd Edition (2008).
2. S.O. Pillai – Solid State Physics – New Age International (P) Limited, Publishers, 7th Edition (2015).

BOOKS FOR REFERENCE

1. R.K. Puri, V.K. Babbar, Solid State Physics, S.Chand(2005).
2. C.Kittel, Introduction to Solid State Physics–Wiley India, 7th Edition (2010).
3. P.K. Palanisamy, Material Science –Sci tech Publication (2005).
4. M.A. Wahab, Solid State Physics-Narosa publications (2006).

OBE Mapping

Sl.No.	Course outcomes	PSO's addressed	Cognitive Level
CO1	Understand about crystal structure, bonding crystal imperfections	PSO1	K1,K2
CO2	Study about conducting, dielectric and insulating materials and its properties	PSO2	K3,K4
CO3	Discuss about different types of magnetic materials and its theories	PSO4	K1,K2
CO4	Bringing the ideas of smart-fiber and new materials	PSO5	K1,K3
CO5	Understand the brief ideas of superconductors and its theories.	PSO3	K4,K5

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

CO-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CO-1	S	S	M	M	M
CO-2	M	L	M	L	M
CO-3	S	L	S	S	S
CO-4	L	S	M	M	M
CO-5	M	M	S	S	S

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation

ELECTIVE COURSE- (EC-III)
OPTO ELECTRONICS, LASER AND FIBRE OPTICS

SEMESTER- VI

Code:U22PH16E

Instruction hrs./week:5

Credit:4

Course Objectives:

Enabling the learner to

COB1: Understand the idea about interaction of light with matter

COB2: Discuss the working and applications of various optoelectronic materials

COB3: Study about the principle of laser and its types

COB4: Discuss the basic principle of optical fiber

COB5: Enhancing ideas about applications of Laser and fibre optics and hologram

UNIT-I: INTERACTION OF LIGHT WITH MATTER

Optical constants- Basic principle-Extinction coefficient- Absorption coefficient-Reflectivity and transmissivity-Light absorption in metals, semi conductor-Excitons-Franz Keldysh effect-Salient features of optical absorption in metals, semiconductor and insulator.

UNIT-II: OPTOELECTRONIC MATERIALS AND DEVICES

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

Photo detectors: Photo conductor-Photodiode-Photo transistor-Solar cell and its applications.

UNIT-III: LASERS

Basic principle-Laser characteristics -Absorption -Spontaneous emission-Stimulated absorption-Stimulated emission-Einstein Coefficients-Population inversion-Pumping action-Nd-YAG laser-Helium - Neon -CO₂ laser -Semiconductor laser.

UNIT-IV: FIBEROPTIC COMMUNICATION

Principle of Optic fibre-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

Optic fiber communication link (block diagram)-Advantages of fiber optics communication. Sensors-Fibre optic endoscopes, Industrial applications of Lasers: Laser cutting, welding and laser surface alloying-Medical applications of lasers: eye surgery, Neuro surgery 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) 10th edition.

3.P.K.Palanisamy, Semiconductor Physics and Opto Electronics, Scitech publications,(2004).

BOOKS FOR REFERENCE

1. M.N.Avadhanalu , P.S.Hemne , An Introduction to Lasers, S.Chand,(2005).
2. S.Mohan,V,Arjunan, M.Selvarani, M.Kanchana Mala, Laser Physics, MJP Publishers(2008).
3. Spana Katiyar, Optical Fiber Communication, Katson books (2012).
4. John M. Senior, Optical Fiber Communications, Pearson, India (2010).

OBE Mapping

Sl.No.	Course outcomes	PSO's addressed	Cognitive Level
CO1	Understand the idea about interaction of light with matter	PSO1	K1,K2
CO2	Discuss the working and applications of various opto electronic materials	PSO4	K3,K4,K5
CO3	Study about the principle of laser and its types	PSO3	K1,K2
CO4	Discuss the basic principle of optical fiber	PSO2	K1,K2
CO5	Enhancing the ideas on applications of laser and fibre optics and hologram	PSO5	K3,K4,K5

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-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CO-1	S	S	M	M	M
CO-2	M	L	M	L	M
CO-3	S	L	S	S	S
CO-4	L	S	M	M	M
CO-5	M	M	S	S	S

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation

B. Sc. -ALLIED PHYSICS SYLLABUS

Allied (2AC-I): ALLIED PHYSICS-I

Semester: III

Instruction Hours/Week:5

Code: U22APH:1

Credit:3

Course Objectives:

Enabling the learner to

COB1: Understand the concept of elasticity and the experimental determination of Young's modulus of a material.

COB2: Have knowledge about simple harmonic motions and reverberation time.

COB3: Explain the theory of surface tension, viscosity and their experimental determination.

COB4: Differentiate the concepts of heat, thermal conductivity and their experimental determinations.

COB5: Gain knowledge about electromagnetic radiation, Raman Effect and basics of fiber optics.

UNIT-I: PROPERTIES OF MATTER

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 - Expression for bending moment – Determination of Young's modulus by non-uniform bending and uniform bending(pin and microscope method).

UNIT-II: SOUND

Simple Harmonic Motion – Composition of two simple harmonic motion - Along a straight line and at right angles to each other .

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

UNIT-III: SURFACETENSION AND VISCOSITY

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.

Co-efficient of viscosity and its dimension –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

Newton's law of cooling – Verification – Specific heat capacity of liquid by cooling – Bomb calorimeter-Thermal conductivity of a bad conductor-Lee's disc method-Conduction-Coefficient of thermal conductivity – Good and bad conductor. Stefan's law of radiation –Solar constant–Angstrom's pyroheliometer- Temperature of the sun.

UNIT-V: OPTICS

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 – Coherent bundle – Fiber optic communication system and its advantages –Single mode and multimode fibers.

BOOKS FOR STUDY

1. Brij Lal and N.Subrahmanyam, Textbook of Sound, Vikas Publications Pvt. Limited,(2000).
2. R.Murugesan, 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).

BOOKS FOR REFERENCE

1. R.Murugesan,ModernPhysics,S.ChandandcompanyLtd.,NewDelhi(2006).
2. D.S.Mathur, Elements of Properties of matter, Shyam Lal Charitable Trust, New Delhi(2005).
3. AjoyGhatak, Optics, Tata McGraw Hill, Delhi,2ndEdition(2004).
4. A.Sundaravelusamy ,Allied Physics– I,Priya Publications.

OBE Mapping

Sl.No.	Course outcomes	PSO's addressed	Cognitive Level
CO1	Understand the concept of elasticity and the experimental determination of Young's modulus Of a material.	PSO1	K1,K2
CO2	Have knowledge about simple harmonic motions and reverberation time.	PSO5	K1,K3
CO3	Explain the theory of surface tension, viscosity and their experimental determination.	PSO3	K1,K4
CO4	Differentiate the concepts of heat, thermal conductivity and their experimental determinations.	PSO2	K1,K2
CO5	Gain knowledge about electromagnetic radiation, Raman effect and basics of fiber optics.	PSO4	K1,K2,K5

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

CO-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CO-1	M	S	S	M	S
CO-2	L	L	M	M	S
CO-3	M	L	M	S	M
CO-4	M	M	M	M	M
CO-5	M	M	S	S	L

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation

Allied (2AC-II): ALLIED PHYSICS PRACTICALS

Semester: III and IV
Instruction Hours/Week: 3

Code: U22APH:2P
Credit: 3

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. Airwedge–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.

Allied (2AC-I): ALLIED PHYSICS–II

Semester: IV

Instruction Hours/Week: 5

Code: U22APH:3

Credit: 3

Course Objectives:

Enabling the learner to

COB1: Understand the basics of electrostatics.

COB2: Understand the concepts about electricity and electromagnetic induction

COB3: Get idea about the atom models, X –rays and crystal structure determination

COB4: Acquire knowledge about the functioning of nuclear particle detectors.

COB5: Understand the importance of semi conductors and basics of digital electronics.

UNIT–I: ELECTROSTATIC

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

Kirchoff’s law-Applications-Wheatstonebridge-CareyFoster’sbridge-Laws of electromagnetic induction- Expression for induced E.M.F- Self-inductance- Determination of coefficient of self-inductance–Rayleigh’s method-Mutual inductance of solenoid-Experimental determination of mutual inductance.

UNIT-III: ATOMIC PHYSICS:

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

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: ELECTRONICS AND DIGITAL ELECTRONICS

Semiconductors - Properties- Junction diode- Forward and reverse bias-V-I characteristics Number systems–Decimal, binary, octal, hexadecimal and their mutual conversions-Binary arithmetic operations. Basic logic gates-AND, OR, NOT, NOR, NAND – NOR and NAND gate as universal gates, Laws of Boolean algebra- De- Morgan’s theorems.

BOOKSFORSTUDY

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).

BOOKSFOR REFERENCE

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).

OBE Mapping

Sl.No.	Course outcomes	PSO's addressed	Cognitive Level
CO1	Understand the basics of electrostatics.	PSO-1	(K1,K2)
CO2	Understand the concepts about electricity and electromagnetic induction	PSO-3	(K1,K2,K3)
CO3	.Get idea about the atom models, X - rays and crystal structure determination	PSO-2	(K1,K4)
CO4	Acquire knowledge about the functioning of nuclear Particle detectors.	PSO-5	(K1,K3)
CO5	Understand the importance of semiconductors and basics of digital electronics.	PSO-4	(K1,K2,K5)

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

CO-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CO-1	M	M	S	L	S
CO-2	L	S	M	S	S
CO-3	M	L	M	S	L
CO-4	L	M	S	L	M
CO-5	M	M	S	S	L

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation

Applied Physics Course-(APC-1): DIGITAL ELECTRONICS

Semester III

Allied Paper: 1(U22APH1C)

Hours/Week: 5

Credit: 3

Course Objectives

- The student should learn fundamental components used in a Digital Computer which is essential for the programme.

Course Outcomes

After completing the course the learner would be able to

CO1: Perform Number Conversions from one System to another System.

CO2: Identify the logic gates and their functionality.

CO3: Analyze the fundamentals of Boolean functions using various mapping and Mathematical methods.

CO4: Design basic electronic Circuits (Combinational Circuits).

CO5: Understand the concepts flip-flops, Counters and Registers.

UNIT-I: Number Systems and Codes: Introduction to Number Systems-Types-Decimal, Binary, Octal, Hexa decimal-Conversion from one number system to others-Binary arithmetic operations: Binary Addition- Binary subtraction-Binary multiplication and division-1's complement and 2's complement, The 9's and 10's Complements-Binary Codes:BCD codes-Excess-3 code-Gray code, Weighted Binary codes-ASCII code.

UNIT-II: Logic Gates and Circuits: Boolean algebra and Logic gates - AND, OR, NOT , NAND and NOR gate-The Exclusive-OR gate–Application of XOR gate.

UNIT-III: Boolean algebra: Fundamentals of Boolean Algebra- Boolean functions- Laws and Theorems of Boolean Algebra- DeMorgan's theorems-Sum-of-Products-Karnaugh Map–Product-of-Sums simplification.

UNIT-IV: Combinational Logic Circuits: Introduction to combinational Circuits-Adders-Half-Adder and Full-Adder- Subtractors - Half and Full Subtractor-BCD Adder- Decoders and Encoders.

UNIT-V: Sequential Circuits: Introduction-Flip-Flops: -RS Flip-Flop, D Flip-Flop, JK Flip-Flop, T Flip-Flop - Master-Slave Flip Flop- Counters – Asynchronous or Ripple Counter –Ring Counter – Shift Register.

Text Book:

“Principles of Digital Electronics”-Dr, K.Meena, PHI Learning Private Limited, 2012.

Reference Books:

1. Morris Mano “Digital Design”, 4th Edition, Prentice Hall of India Ltd, 2008.
2. Thomas C. Bartee “Digital Computer Fundamentals”, 6th Edition, Tata Mc Graw Hill, New Delhi, 2011

NMEC–I: ENERGY PHYSICS

Semester: IV

Instruction hours/week: 2

Code: U22NME:1

Credit: 2

Course Objectives:

Enabling the learner to

CO1: Know the importance of renewable energy sources.

CO2: Understand the importance of solar energy.

CO3: Understand the fundamentals of bio mass energy.

CO4: Get an idea of different energy sources.

CO5: Think about energy storage and conservation.

Syllabus

UNIT-I: CONVENTIONAL ENERGY SOURCES

World's reserve-Commercial energy sources and their availability-Variety of forms of energy -Renewable and conventional energy system.

UNIT-II: non-conventional energy

Renewable energy sources – Solar energy – nature of solar radiation solar radiation outside the earth's atmosphere -solar water heater -domestic type- commercial type-advantages and disadvantages of heater- solar cooker-box type.

UNIT-III: BIOMASS ENERGY FUNDAMENTALS

Biomass energy – Classification – Biomass conversion process. - Gasification 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: VARIOUS FORMS OF ENERGY SOURCES

Geothermal energy–Nature of geothermal energy-forms of geothermal energy-Wind energy –Types of wind power plant -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

Conservation of energy- energy crisis and possible solutions–Global Warming–Green house effect-Energy options for the developing countries–Energy storage System- Hydrogen as a fuel- Hydrogen storage

BOOK FOR STUDY

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

BOOKS FOR REFERENCE

1.S.A. Abbasi and Nasema Abbasi, “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).

OBE Mapping

Sl. No.	Course outcomes	PSO ADDRESSED	Cognitive level
CO1	Explains about various conventional energy sources	PSO1	K1,K2
CO2	Describes about concept Solar energy and Solar components	PSO3	K2,K3
CO3	Understand about Biomass energy	PSO4	K2,K3
CO4	Discuss about the ideas about other energy sources	PSO2	K4,K5
CO5	Explains about Energy storages	PSO5	K1,K2

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

CO-PO Mapping

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CO-1	S	L	M	S	M
CO-2	S	M	L	S	S
CO-3	S	S	M	M	M
CO-4	S	S	M	S	S
CO-5	S	M	S	M	L

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation

NMEC–II: LASER PHYSICS

Semester: V

Instruction hours/week:2

Code: U22NME:2

Credit:2

Course Objectives:

Enabling the learner to

COB1: Understand the fundamentals of Laser.

COB2: Know the production of different types of Laser light.

COB3: Describe the applications of Laser in Industry.

COB4: Explain the use of Laser in medicine.

COB5: Know the use of lasers in Fiber Optics communication system.

UNIT-I: FUNDAMENTALS OF LASER

Spontaneous emission-Stimulated emission–Einstein co-efficients-Population inversion-Pumping action –Laser characteristics.

UNIT-II: PRODUCTION OF LASER

Nd-YAG laser-Helium-Neon laser- CO₂ laser- Semi conductor diode laser.

UNIT-III: INDUSTRIAL APPLICATIONS OF LASER

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

UNIT-IV: LASERS IN MEDICINE

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

UNIT-V: FIBER OPTICS

Principle of light in fibre optics- propagation of light in optical fibres - Numerical aperture and acceptance angle- Light sources and detectors of optic fibres- 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).
3. S. Mohan, V, Arjunan, M. Selvarani, M. Kanchana Mala, Laser Physics, MJP Publishers (2008).
4. Sapna Katiyar, Optical Fiber Communication, Katson books (2012).

OBE Mapping

Sl.No.	Course outcomes	PSO's addressed	Cognitive Level
CO1	Understand the fundamentals of Laser.	PSO-2	K1,K2
CO2	Know the production of different types of Laser light.	PSO-1	K1,K2,K3
CO3	Describe the applications of Laser in Industry.	PSO-3	K3,K4
CO4	Explain the use of Laser in medicine.	PSO-5	K3,K4
CO5	Know the use of lasers in Fiber Optics communication system.	PSO-4	K1,K2,K5

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-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	M	L	S	M	M
CO2	M	S	M	M	M
CO3	S	L	S	S	L
CO4	L	S	L	M	M
CO5	M	M	S	L	L

S-Strong Correlation, M-Medium Correlation, L-Lesser Correlation