

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

UG COURSES – AFFILIATED COLLEGES

B.Sc. PHYSICS

(Choice Based Credit System)

(with effect from the academic year 2017-2018 onwards)

	Sub. No:	Subject status	Subject Title	Contact Hrs/week	L Hrs/week	T Hrs/week	P Hrs/week	Credits
Part I	1	Language	Tamil/Other Languages	6	6	0	0	4
Part II	2	Language	English	6	6	0	0	4
Part III	3	Core-1	Mechanics and relativity	4	4	0	0	4
	4	Core-2	Properties of matter and acoustics	4	4	0	0	4
	5.	Major .Practical-I	Practical-I	2	0	0	2	2
	6	Allied Paper-1	Allied Physics Paper-1	4	4	0	0	4
	7	Allied.Practical-1-1	AlliedPractical-1	2	0	0	2	2
Part IV	8	Common	Environmental Studies	2	2	0	0	2
			Total	30				26
Part I	9	Language	Tamil/Other Languages	6	6	0	0	4
Part II	10	Language	English	6	6	0	0	4
Part III	11	Core-3	Thermal physics and statistical mechanics	4	4	0	0	4
	12	Core-4	Optics	4	4	0	0	4
	13	Major .Practical-II	Practical-II	2	0	0	2	2
	14	Allied Paper-2	Allied Physics Paper-2	4	4	0	0	4
	15	Allied.Practical-1-2	Practical-2	2	0	0	2	2
Part IV	16	Common	Value Based education	2	2	0	0	2
			Total	30				26

MECHANICS AND RELATIVITY

UNIT-I: VECTORS

Vector analysis - components of a vector - gradient of a scalar point function-divergence and curl of vector point function- angular momentum as a vector-product of two vectors - work as a scalar product of two vectors - line, surface and volume integrals - Gauss divergence, Stoke's and Green's theorems

UNIT-II: CONSERVATION LAWS

Laws of conservation of energy, linear momentum and angular momentum - work energy theorem - work done by gravitational force - work done by spring force - potential energy - conservative and non conservative forces - potential energy curve - centre of mass - Two body problem and reduced mass - central field motion - motion of planets in elliptical orbits - proof of Kepler's second and third laws - Rocket motion - systems of varying mass - multistage rocket.

UNIT-III: DYNAMICS OF RIGID BODIES

Translational and rotational motion - Angular momentum and angular impulse - moment of inertia and radius of gyration - moment of inertia of a thin circular ring, solid sphere, solid cylinder. - parallel axis and perpendicular axis theorem - Compound pendulum - theory - equivalent simple pendulum - reversibility of centres of oscillation and suspension - determination of g and k -Newton's second law for rotation – torque,work, rotational kinetic energy and expression for power during rotation - Kinetic energy of rolling - Acceleration of a uniform body, rolling down an inclined plane. Precessional motion - Gyrostat .

UNIT-IV: HYDROSTATICS AND HYDRODYNAMICS

Pressure and thrust - Thrust on a plane surface immersed in a liquid - centre of pressure - centre of pressure on a rectangular lamina, a triangular lamina. Laws of floatation - determination of meta centric height of a ship - steady and streamline flow - equation of continuity - energy of a fluid - Bernoulli's theorem – proof - pitot's tube and venturimeter.

UNIT-V: RELATIVITY

Introduction - Reference frames-inertial frames - the ether hypothesis - Michelson morley experiment - Postulates of special theory of relativity - Lorentz transformation equations - Lorentz Fitzgerald contraction - time dilation - relativistic addition of velocities - velocity addition theorem - simultaneity - relativistic mass - relativistic momentum - mass energy equivalence. Relation between total energy, rest mass energy and momentum. Accelerated frames and gravity - general theory of relativity (basics) - gravity waves.

Books for study

1. Mechanics - D.S. Mathur - S Chand & Co
2. Mechanics and mathematical physics - R.Murugesan -S Chand & Co. Pvt. Ltd., New Delhi.

Books for Reference

1. Fundamentals of Physics, 6th Edition, by D Halliday, R Resnick and J Walker. Wiley NY 2001.
2. Mechanics - Berkely physics course: Charles Kittel-Tata Mc Graw Hill Publication
3. Mathematical physics - Satya Prakakash- S Chand & Co. Pvt. Ltd.,
4. Mechanics - Narayanamoorthy

PROPERTIES OF MATTER AND ACOUSTICS

UNIT-I: ELASTICITY

Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - experimental determination of poisson's ratio of rubber - Twisting couple on a cylinder -Work done in twisting a wire - Torsional pendulum- Determination of Rigidity modulus and moment of inertia - q , n and σ by Searles method -I - section grids

UNIT-II: BENDING OF BEAMS

Bending of beams - Expression for bending moment - Cantilever - Expression for cantilever depression and oscillations - theory and experiments. Uniform bending and Non-uniform bending - theory and experiments .

UNIT-III: FLUIDS

Surface Tension - Synclastic and anticlastic surfaces - Excess of pressure - application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature - Jaegar's method. Capillary rise - Experimental determination of surface tension by capillary rise - angle of contact of mercury-Quincke's method. Viscosity - Rate flow of liquid in a capillary tube - Poiseuille's formula - Determination of coefficient of viscosity by capillary flow - Variations of viscosity of a liquid with temperature- lubricants.

UNIT-IV: SOUND

Sound - Simple harmonic motion - free, damped, forced vibrations and resonance -Helmholtz resonator-laws of transverse vibration of strings - Sonometer-Determination of AC frequency using sonometer - Determination of frequency using Melde's apparatus. Decibels - Intensity levels - musical notes - musical scale.

UNIT-V: ULTRASONICS

Ultrasonics - production - piezoelectric method-magnetostriction method- detection - properties – applications. Acoustics - Intensity level and loudness

Acoustics of buildings: Reverberation - reverberation time - derivation of Sabine's formula - determination of absorption coefficient - optimum reverberation time-factors affecting acoustics of buildings-sources of noises and its control-sound level meter.

Books for study

1. Properties of matter - Murugesan R, S Chand & Co. Pvt. Ltd., New Delhi
2. Text book of sound - Brij Lal & Subramaniam, N Vikas Publishing House, New Delhi, 1982

Books for Reference

1. Elements of Properties of Matter - Mathur D S, Shyamlal Charitable Trust, New Delhi, 1993
2. Fundamentals of General Properties of Matter - Gulati H R, R Chand & Co. New Delhi, 1982
3. Waves & Oscillations - Subrahmanyam N & Brij Lal, Vikas Publishing House Pvt. Ltd., New Delhi, 1994
4. A Textbook of Sound - Khanna D R & Bedi R S, Atma Ram & Sons, New Delhi 1985
5. Fundamentals of Physics, - D Halliday, R Resnick and J Walker, Wiley NY 2001. 6th Edition
6. The Feynman Lectures on Physics, , - R P Feynman, RB Leighton and M Sands, Narosa, New Delhi, 1998. Vols. I, II and III

PRACTICAL-1

(8 experiments compulsory)

1. Youngs modulus - non uniform bending - pin and microscope
2. Youngs modulus - uniform bending - optic lever and telescope
3. Youngs modulus - cantilever – depression
4. Torsional pendulum -Rigidity modulus and moment of inertia (with & without masses)
6. Co-efficient of viscosity-Stoke's method
6. Surface tension – Capillary rise.
7. Sonometer – Verification of laws
8. Sonometer- determination of AC frequency
9. Compound pendulum - **g** and **I**
10. Melde's string – determination of frequency- transverse and longitudinal modes

ALLIED PHYSICS – I

Unit I : Elasticity and bending moment

Hooke's law – Elastic moduli – Relation between elastic constants – Work done in stretching a wire – Expression for bending moment - uniform bending- Experiment to determine Young's modulus using pin and microscope-Twisting couple of a wire – Expression for couple per unit twist – Work done in twisting – Experimental determination of rigidity modulus of a wire using Torsion pendulum with theory

Unit II: Surface tension and Viscosity

Surface tension – Definition – Examples – Molecular interpretation – Expression for excess of pressure inside a synclastic and anticlastic surface-Application to spherical and cylindrical drops and bubbles

Viscosity: Coefficient of viscosity – Rate of flow of liquid in a capillary tube (Poiseuille's formula) – Analogy between liquid flow and current flow – Stokes' formula for highly viscous liquids (Dimension method) – Experimental determination of viscosity of highly viscous liquid (Stokes' method)

Unit III: Sound

Simple harmonic motion – Free, damped, forced vibrations and resonance – Composition of two SHMs along a straight line and in perpendicular direction – Melde's string experiment – Determination of frequency of tuning fork (both longitudinal and transverse mode)

Unit IV : Thermal physics : Mean free path- Expression for mean free path (Zero order approximation) – Transport phenomena – Expression for viscosity and thermal conductivity – Conduction in solids – coefficient of thermal conductivity – Lee's disc method to determine thermal conductivity of a bad conductor – Wiedmann – Franz's law – Convection : Newton's

law of cooling – Experimental verification – Radiation : Black body radiation – Distribution of energy in black body spectrum – Important features.

Unit V: Optics

Interference: Condition for interference-Air wedge-determination of thickness of a thin wire by air wedge

Diffraction: Fresnel & Fraunhofer diffraction-Plane diffraction grating- theory and experiment to determine wavelength (normal incidence)

Polarization: Double refraction- half wave and quarter wave plate – Production and detection of plane, elliptically and circularly polarized light.

Books for study

1. Optics – Brijlal & Subramanian
2. Properties of matter – R.Murugesan
3. Heat & Thermodynamics – D.S.Mathur

Reference Books

- 1.Heat and thermodynamics - Brijlal & Subramanian, S Chand & Co., New Delhi
- 2.Fundamentals of Optics by Jenkins A Francis and White E Harvey, McGRaw Hill Inc., New Delhi, 1976.
3. Elements of Properties of Matter by Mathur D S, Shyamlal Charitable Trust, New Delhi, 1993

PRACTICAL-1

(8 experiments compulsory)

1. Youngs modulus - non uniform bending - pin and microscope
2. Youngs modulus - uniform bending - optic lever and telescope
3. Torsional pendulum -Rigidity modulus
4. Co-efficient of viscosity-Stoke's method
5. Co-efficient of viscosity-variable pressure head
6. Thermal conductivity of a bad conductor - Lee's disc method.
7. Spectrometer –dispersive power
8. Spectrometer - grating - -normal incidence method.
9. Air wedge - thickness of a wire
- 10, Melde's string-frequency of tuning fork

THERMAL PHYSICS AND STATISTICAL MECHANICS

UNIT-I: LOW TEMPERATURE PHYSICS

Joule - Kelvin effect - liquefaction of hydrogen - liquefaction of helium-Kammerling - Onne's method - Helium I and II - Lambda point - production of low temperatures - adiabatic demagnetization - practical applications of low temperature - refrigerators and air-conditioning machines - super fluidity - application of super fluidity.

UNIT II: KINETIC THEORY OF GASES

Kinetic theory of gases-Expression for pressure-gas laws-Maxwell's law of distribution of molecular velocities - Transport phenomena - Diffusion , viscosity and thermal conductivity of gases - Vander walls equation of state - Determination of Vander walls constant - Relation between Vander Wall's constant and critical constants.

UNIT-III: THERMODYNAMICS I

Zeroth law, I and II law of thermodynamics - isothermal process-adiabatic process-gas equation during adiabatic process - work done during adiabatic and isothermal process - Carnot's theorem - significance - thermodynamic scale of temperature - perfect gas scale of temperature - Carnot's engine - Otto engine and Diesel engine - working and efficiency.

UNIT-IV: THERMODYNAMICS II

First latent heat equation (Clausius - Clapeyron equation) - effect of pressure on melting point and boiling point - second latent-heat equation - III law of thermodynamics - concept of entropy - temperature entropy diagram - entropy of perfect gas - Maxwell's thermo dynamical relations - derivation - applications - Clausius - Clapeyron equation and specific heat relation

UNIT-V: STATISTICAL MECHANICS

Concept of probability - stirlings formula - microstate - macrostate -thermodynamic probability - phase space - Maxwell-Boltzmann, Bose - Einstein and Fermi-Dirac Statistics distribution law - fermi energy level - bosons and fermions – comparison.

Books for Study

1. Heat and thermodynamics - Brijlal and Subramaniam, S Chand & Co.
2. Thermal Physics - R Murugesan and Kiruthiga Sivaprasad, S Chand & Co., New Delhi.

Books for Reference

1. Heat and thermodynamics - D S Mathur, S Chand & Co., New Delhi
2. Elements of Statistical mechanics - Gupta and Kumar, Pragati Prakashan, Meerut
3. Statistical mechanics - Sathya Prakash and J P Agarwal, Kedar Nath & Ram Nath & Co., Meerut
4. Introduction to Solid State Physics - C Kittel, Prentice Hall of India
5. Thermal Physics – S C Garg, R M Bansal and C K Ghosh, Tata McGraw-Hill
- 6.. Heat and thermodynamics - J B Rajam, S Chand & Co., New Delhi

OPTICS

UNIT-I: GEOMETRICAL OPTICS

Introduction - chromatic and spherical aberration in lenses and their removal - Dispersion of light - Refraction through a thin prism - Dispersive power of a prism - deviation without dispersion - dispersion without deviation - constant deviation spectroscope. Eyepieces - Huygen , Ramsden and Gauss eyepieces - Aplanatic points - oil immersion objective - prism binocular.

UNIT-II: INTERFERENCE

Analytical treatment of interference - theory of interference fringes - interference in thin films due to reflected light - Air wedge - experiment to find thickness of a wire - Testing the plainness of surfaces – newton's rings-theory and experiment- Michaelson's interferometer and applications.

UNIT-III: DIFFRACTION (Fresnel and Fraunhofer)

Diffraction by single slit and determination of intensity distribution by phasor method - Diffraction by circular aperture - plane transmission grating- diffraction at normal and oblique incidence - Limit of resolution and resolving power-Rayleigh Criterion for resolution - Resolving power of a plane diffraction grating and prism - Fresnel wavefront and theory of half period zones - zone plate-comparison with convex lens - comparison between Fresnel and fraunhofer diffraction

UNIT-IV: POLARIZATION AND FIBRE OPTICS

Double refraction - Nicol Prism as polarizer and analyser - production and detection of plane, elliptically and circularly polarized light - Quarter and half wave plates - optical activity-Fresnel's theory of optical activity - Dichroism.

Optical fibre and principles of fibre optics - acceptance angle - numerical aperture expression - step index optical fibre- single mode and multimode step index optical fibres-characteristics.

UNIT-V: LASER AND ITS APPLICATIONS

Principle of laser - spontaneous emission - stimulated emission - threshold condition (Schaw low and townes equations) - rate equation - optical excitation-three and four level lasers. Types of lasers - semiconductor diode lasers - dye laser-nitrogen and carbon - di- oxide lasers - Holography - simple applications.

Books for Study

1. Optics by Subramaniam N & Brij Lal, S Chand & Co. Pvt. Ltd., New Delhi, 1990
2. Laser and nonlinear optics by B.B.Laud 2nd edition Wiley Eastern Ltd., 1991
3. Optic fibre and fibre optic communication systems-Subir kumar sankar-. S Chand & Co. Pvt. Ltd., New Delhi,

Books for Reference

1. Fundamentals of Optics by Jenkins A Francis and White E Harvey, McGraw Hill Inc., New Delhi, 1976.
2. Optical Physics by Lipson. S G, Lipson H and Tannhauser D S, Cambridge University Press (1995)
3. Fundamentals of Optics by Raj M G, Anmol Publications Pvt. Ltd., (1996), New Delhi
4. Fundamentals of Physics, 6th Edition, by D Halliday, R Resnick and J Walker. Wiley NY 2001.
5. Optics and Spectroscopy by Murugesan, S Chand & Co. Pvt. Ltd., New Delhi

PRACTICAL-II

(8 experiments compulsory)

1. Specific heat capacity of liquid - Newtons law of cooling
2. Thermal conductivity of a bad conductor - Lee's disc method.
3. Callender and Barnes continous flow calorimeter- specific heat capacity of liquid
4. Spectrometer – dispersive power of prism
5. Spectrometer – refractive index of liquid
6. Spectrometer - grating - θ and λ -normal incidence
- 7.Spectrometer - grating – **oblique** incidence - dispersive power
8. Air wedge - thickness of a wire and thickness of enamel coating.
- 9.Newtons rings-refractive index
- 10.Thermal conductivity -Searle,s apparatus

ALLIED PHYSICS - II

Unit I: Electricity

Current and current density – Expression for current density – Ohm’s law – Resistors in series and in parallel – I-V characteristic of a resistor – Color coding – Conversion of a galvanometer into an ammeter and voltmeter – Kirchoff’s laws – Application of Kirchoff’s laws in Wheatstone network – sensitiveness of bridge.

Unit II: Electromagnetism

Magnetism: Definition of magnetic induction B, Magnetic field intensity H , Intensity of magnetization M – Relation connecting M, B and H – Magnetic permeability μ and magnetic susceptibility K – Relation between μ and K – Properties of Dia, Para and Ferro magnetic materials. Electromagnetism: Faraday’s law of electromagnetic induction – Lenz’s law – Expression for induced current and charge – Self inductance – Self inductance of a long solenoid – Determination of self inductance by Rayleigh’s method – Mutual inductance – Coefficient of coupling – Determination of mutual inductance using BG.

Unit III: Electronics

Junction diodes-forward and reverse bias-diode characteristics- Zener diode – VI characteristic of a Zener diode – Transistors-Characteristics of a transistor(common emitter mode only). Digital Electronics: Decimal and binary numbers – binary to decimal and decimal to binary- Binary addition – Binary subtraction by 1’s and 2’s complement method – Basic logic gates OR, AND, NOT (Symbol, Boolean equation, truth table, circuit and working) – NAND, NOR, EX-OR(Symbol, Boolean equation , truth table only) – De Morgan’s theorem.

Unit IV: Nuclear physics

Introduction – Classification of nuclei – General properties of nucleus – Nuclear size, Nuclear mass, Nuclear density, Nuclear charge, Nuclear spin & Nuclear magnetic dipole moments – Mass defect – Binding energy - Binding energy curve – Nuclear forces – Properties –

Fundamental laws of radioactivity – Soddy Fajan’s displacement law – Law of radioactive disintegration – Half life period – The mean life.

Unit V: Mechanics and Relativity

Projectiles – Time of flight – Range on the horizontal plane – Greatest height attained by the projectile – Path of the projectile– Range on an inclined plane – Relativity: Frames of references – Postulates of special theory of relativity – Galilean & Lorentz transformation equations – Length contraction – Time dilation.

Books for study

1. Electricity and Magnetism – R.Murugesan
2. Modern physics – R. Murugesan
3. Principle of Electronics – V.K.Mehta
4. Digital principles and applications - Albert Paul Malvino & Donald P.Leach
5. Mechanics – D.S.Mathur

Reference Books

- 1.Modern Physics- Seghal Chopra & Seghal, Sultan chand 1998 Electricity and Magneti - K.K.Tiwari (S.Chand &Co.)
- 2.Electronic fundamentals and applications-John D.Ryder –Prentice Hall
3. Electronic principles-Malvino
4. Electricity and Magnetism – Vasudeva

PRACTICAL-II

(8 experiments compulsory)

- 1.Potentiometre-calibration of volt meter(low range)
2. Potentiometre-calibration of ammeter
- 3.Series resonance circuit
- 4.Parallel resonance circuit
- 5.Basic logic gates using discrete components –AND,OR,NOT
6. Zener diode Diode characteristics
- 7.Transistor characteristics(CE mode)
8. Absolute determination of mutual inductance -BG
- 9.Owen's bridge- Absolute determination of self inductance
- 10.Tangent galvanometer-Horizontal earth's magnetic induction

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**UG COURSES – AFFILIATED COLLEGES
B.Sc. Physics**

(Choice Based Credit System)

(With effect from the academic year 2017 -2018)

S e m e s t e r - I I I	Part I	Tamil/Other Languages	6	4	3	25	75	100	30	40	
	Part II	English	6	4	3	25	75	100	30	40	
	Part III	<u>Core subjects</u> 5.Electricity		4	4	3	25	75	100	30	40
		Practical-III		2	1	3	50	50	100	20	40
		<u>Allied Subject-II</u> (for allied subjects with theory and practicals) 1.Theory- Paper-I		4	3	3	25	75	100	30	40
		2.Practicals-1		2	1	3	50	50	100	20	40
		<u>Allied Subject-II</u> (for allied subjects with theory alone) 1.Theory- Paper-I		6	3	3	25	75	100	30	40
		<u>Skill based subject</u> Any one a. Maintenance of Electrical appliances b. Astrophysics		4	4	3	25	75	100	30	40
		Non-Major Elective Paper-I		2	2	3	25	75	100	30	40
	Part IV	Common-Yoga *	2	2							
	Total		30	23							

Semester IV	Part I	Tamil/Other Languages	6	4	3	25	75	100	30	40	
	Part I	English	6	4	3	25	75	100	30	40	
	Part III	<u>Core subjects</u>		4	4	3	25	75	100	30	40
		6. Electromagnetism Practical-IV		2	1	3	50	50	100	20	40
		<u>Allied Subject-II</u> (for allied subjects with theory and practicals)		4	3	3	25	75	100	30	40
		1.Theory- Paper-II									
		2.Practicals-II		2	1	3	50	50	100	20	40
		<u>Allied Subject-II</u> (for allied subjects with theory alone)		6	3	3	25	75	100	30	40
		1.Theory- Paper-II									
	Part IV	<u>Skill based subject</u> Any one a. Maintanance of Electronic appliances b. Physics of Human Anatomy		4	4	3	25	75	100	30	40
		Non-Major Elective - Paper-II		2	2	3	25	75	100	30	40
	Part V	Common-Computer for Digital Era *		2	2						
	Part V	Extension activity		-	1	-	-	-	-	-	-
		Total		30	24						

Semester -V	Part III	<u>Core subjects</u>								
		7.Basic Electronics	4	4	3	25	75	100	30	40
		8.Programming in C++	4	4	3	25	75	100	30	40
		9.Atomic Physics	4	4	3	25	75	100	30	40
		10.Major Elective I (any one) a. Mathematical Physics b. Spectroscopy	4	4	3	25	75	100	30	40
		11.Major ElectiveII (any one) a. Communication Electronics b. Numerical Methods	4	4	3	25	75	100	30	40
		Practical-V-Non Electronics	4	2	3	50	50	100	20	40
	Practical-VI-Electronics	4	2	3	50	50	100	20	40	
	Part IV	Skill based subject(Common) -Personality development/Effective Communication/Youth Leadership	2	2	3	25	75	100	30	40
		Total	30	26						

Semester VI	Part III	Core subjects								
		12. Digital Electronics	5	4	3	25	75	100	30	40
		13. Quantum Mechanics	5	4	3	25	75	100	30	40
		14. Nuclear Physics	4	4	3	25	75	100	30	40
		15 Solid state Physics	4	4	3	25	75	100	30	40
		16. Major Elective (any one) a. Medical Physics b. Energy Physics	4	4	3	25	75	100	30	40
		Practical-VII-	4	2	3	50	50	100	20	40
		Practical-VIII- Computer Programming with C++	4	2	3	50	50	100	20	40
		Total	30	24						

Total credits-141 (including extension activity)

- To be conducted outside class hour
- Credits not included

SEMESTER- III PAPER -V

L	T	P	C
4	0	0	4

ELECTRICITY

Preamble: Objective of the paper is to provide a basic knowledge about electricity and various methods of analyzing electric circuits with d.c. and a.c. sources. This paper does not require any special prerequisite except the basic ideas on electricity at the school level and learners are expected to gain knowledge to design and characterize electric circuits.

UNIT-1: ELETRIC FIELD AND POTENTIAL

Introduction-electric charge- coulomb's law-electric field-lines of force-electric flux-Gauss's law-applications-coulomb's law from Gauss's law- electric field at a point due to point charge-line charge- spherically symmetric charge distribution-sheet of charge. -electric potential- relation connecting electric field and potential- equipotential lines and surfaces -potential at a point due to point charge-collection of charges-dipole and charged spherical shell-electric potential energy (12L)

UNIT-II: THERMO ELECTRICITY

Seebeck effect- laws of thermo e.m.f— measurement of thermo e.m.f using potentiometer-Peltier effect-demonstration—Thomson effect- demonstration - thermodynamics of thermo couple –thermo electric power diagram –uses-applications-thermopile-Boy's radio micrometre –thermo-milli ammeter (11L)

UNIT-III: CHEMICAL EFFECT OF ELECTRIC CURRENT

Introduction -Faradays laws of electrolysis- electrical conductivity of an electrolyte-specific conductivity- Kohlrausch's bridge method of determining the specific conductivity of an electrolyte -Arrhenius theory of electrolytic dissociation- --mobility of ions- Secondary cells- Gibbs –Helmholtz equation for a reversible cell . (10L)

UNIT-IV: STEADY CURRENT AND TRANSIENT CURRENT

Current and current density-ohm's law in vector form-conversion of galvanometer into voltmeter and ammeter-kirchoff's law-application to wheat stone's network

Growth and decay of current in a circuit containing L and R with d.c.voltages - growth and decay of charge in a capacitance ,resistance circuit-determination of high resistance by leakage –growth and decay of charge in LCR circuit-conditions for the discharge to be oscillatory –frequency of oscillation. (15L)

UNIT-V: ALTERNATING CURRENT

Alternating Current- j operator method –use of j operator in the study of AC circuits-Resistance in an AC circuit-Inductance in an AC circuit- Capacitance in an AC circuit-AC through an inductance and resistance in series- capacitance and resistance in series – LCR series resonance circuit -sharpness of resonance-parallel resonance circuit -power in an AC circuit-power factor. (12L)

Books for study

1. Electricity and Magnetism -R. Murugesan (S.Chand &Co.)

Books for Reference

1. Electricity and Magnetism -D.N.Vasudeva (Twelfth revised edition)

2. Electricity and Magnetism - K.K.Tiwari (S.Chand &Co.)

3. Electricity and Magnetism -E.M.Pourcel,Berkley Physics Course, Vol.2 (Mc Graw-Hill)

4. Electricity and Magnetism - Tayal (Himalalaya Publishing Co.)

5. Fundamentals of Physics, 6th Edition, by D Halliday, R Resnick and J Walker. Wiley NY 2001.

SEMESTER- IV

PAPER V

L	T	P	C
4	0	0	4

ELECTROMAGNETISM

Preamble: This course facilitates an understanding of magnetic effects of electric currents and the basics of electromagnetic waves. The paper does not need any special pre requisite except the basic ideas on electricity and magnetism at the school level and the learners are expected to know the device applications of electromagnetic induction.

UNIT-1: ELECTROMAGNETIC INDUCTION

Faraday's laws of electromagnetic induction-self induction –self inductance of a long solenoid –toroidal solenoid-determination of L by Anderson's and Rayleigh's methods-Owen's bridge-mutual induction-experimental determination of mutual inductance between a pair of coils using BG-co efficient of coupling-energy stored in a coil-eddy currents-uses (13L)

UNIT-II: MAGNETIC EFFECT OF ELECTRIC CURRENT

Magnetic flux and magnetic induction-relation between them- Biot Savart law- magnetic induction at a point on the axis of a circular coil carrying current-amperes circuital law-magnetic field inside a long solenoid -toroid- Lorent'z force on a moving charge- direction of force-torque on a current loop in a uniform magnetic field -Moving coil Ballistic galvanometer-theory -experiment to find charge sensitivity and absolute capacity of a capacitor-De sauty bridge. (14L)

UNIT-1III: MAGNETIC FIELDS AND MAXWELL'S EQUATION

The three magnetic vectors M , B , and H –relation between them- permeability and susceptibility- relation between them -B-H curve -Hysteresis- Energy loss-Displacement current-Maxwell's equations-Boundary conditions- Poynting vector-Electromagnetic waves in free space-Hertz experiment for production and detection of EM waves. (12L)

UNIT-1V: ELECROMAGNETIC WAVES

Wave equations for Electric field and Magnetic field-monochromatic plane waves-EM waves in a matter-Reflection and Transmission at normal incidence and oblique incidence-Polarization by reflection. (10L)

UNIT-V: APPLICATIONS OF ELECTROMAGNETISM

Earth inductor-uses of Earth inductor-measurement of horizontal component of the Earth's magnetic field-measurement of vertical component of Earth's Magnetic field-calibration of BG-measurement of intense magnetic field using search coil and BG-induction coil and uses. (11L)

Books for study

1.Electricity and Magnetism -R. Murugesan (S.Chand &Co.)

Books for Reference

1. Electricity and Magnetism -D.N.Vasudeva (Twelfth revised edition)

2. Electricity and Magnetism - K.K.Tiwari (S.Chand &Co.)

3. Electricity and Magnetism -E.M.Pourcel,Berkley Physics Course, Vol.2 (Mc Graw-Hill)

4. Electricity and Magnetism - Tayal (Himalalaya Publishing Co.)

5. Fundamentals of Physics, 6th Edition, by D Halliday, R Resnick and J Walker. Wiley NY 2001.

SEMESTER-V

PAPER VII

L	T	P	C
4	0	0	4

BASIC ELECTRONICS

Preamble: This course facilitates an understanding of circuit analysis semiconductor diode and transistor circuits and the basics of operational amplifier. The paper does not need any special pre-requisite except the basic ideas on Electricity and Electronics at the school level and the learners are expected to gain knowledge to analyse and design electronic circuits

UNIT-I: LINEAR CIRCUIT ANALYSIS

Constant voltage source, constant current source, conversion of voltage source into current source - Maximum power transfer theorem - Thevenin's theorem - Norton's theorem - hybrid parameters - determination of h parameter - equivalent circuit - the h parameters of a transistor. (12L)

UNIT-II: SEMICONDUCTOR DIODES AND DEVICES

PN Junction - V – I characteristics - Crystal diode as a rectifier - Zener diode - V – I characteristics - Tunnel diode - Half wave rectifier - Centre tap full wave rectifier - Full wave bridge rectifier - Comparison of Rectifiers - Filter Circuits - Types (capacitor filter, choke input filter, Π filter) - Zener diode as voltage stabilizer. (11L)

UNIT-III: TRANSISTOR AMPLIFIERS

Transistor action - Transistor connections - common emitter - common base - common collector - analysis of amplifiers using h- parameters - RC coupled amplifier - transformer coupled amplifier - power amplifier - classification of power amplifiers (Class A, Class B and Class C) - Push pull amplifier - FET characteristics - JFET characteristics. (14L)

UNIT-IV: OSCILLATORS AND WAVE SHAPING CIRCUITS

Feedback principle and Barkhausen criterion - Hartley , Colpitt's, and Phase shift oscillators using transistors – Astable - Monostable and Bistable multi vibrators using transistors - Schmitt trigger - clipping and clamping circuits - Differentiating circuit - Integrating circuit. (10L)

UNIT-V: OPERATIONAL AMPLIFIER

Op-Amp - pin diagram- characteristics of ideal Op - Amp - DC and A.C analysis - bandwidth - slew rate - frequency response - Op- Amp with negative feedback - applications - Inverting amplifier - Non inverting amplifier - Voltage follower- Adder - Subtractor - Integrator – Differentiator- Low pass, High pass and Band pass filters -Wien bridge oscillator. (13L)

Books for study

1. Principles of Electronics - V.K.Mehta & Rohit Mehta-S.Chand &Co.

Books for reference

1. Electronic fundamentals and applications - John D. Ryder –Prentice Hall
2. Electronic principles - Malvino
3. Electronic devices and circuits - David Bell- Prentice Hall
4. Basic Electronics - B.Basavaraj, H.N.Shivashankar-2nd edition-University press
5. Physics of semiconductor devices - Dilip K.Roy - University press.

PAPER VIII
COMPUTER PROGRAMMING IN C⁺⁺

L	T	P	C
4	0	0	4

Preamble: Objective of the course is to provide knowledge about the basics of Computer programming in C⁺⁺ and to solve problems by writing programs. The paper does not need any special prerequisite and the learners are expected to come out with the ability to apply the computer language C⁺⁺ to solve problems .

UNIT-I: WHAT IS C⁺⁺

Introduction - 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 (11L)

UNIT-II: ARRAYS AND FUNCTIONS IN C⁺⁺

Introduction - 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. (13L)

UNIT-III: CLASSES AND OBJECTS

Introduction - 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. (15L)

UNIT-IV: OPERATOR OVERLOADING, INHERITANCE AND POINTERS

Introduction -defining operator overloading - overloading unary operators - binary operators.

Inheritance - single inheritance - multiple inheritance - multilevel inheritance - hybrid inheritance - hierarchial inheritance-virtual base class-abstract class

Pointers- definition-declaration- arithmetic operations. (12L)

UNIT-V: MANAGING CONSOLE I/O OPERATIONS

Introduction - 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. (9L)

Books for study

1. Object oriented Programming with C⁺⁺ - E.Balagurusamy, Tata Mc Graw-Hill publishing company Ltd. New Delhi

Books for reference

1. Programming with C⁺⁺ - D.Ravichandran, Tata Mc Graw-Hill publishing company Ltd. New Delhi .
2. Object oriented Programming in C⁺⁺-4th Edn.Robert Lafore-Macmilan publishing company Ltd.
3. Fundamentals of Programming with C⁺⁺ -Richardl.Halterman

PAPER - IX (4X15=60 hours)

ATOMIC PHYSICS

L	T	P	C
4	0	0	4

Preamble: The course provides an introductory account about the atomic structure and the impact of X-rays. This paper does not need any special prerequisite except the basic understanding of materials at the school level and the learners are expected to know the various atom models and the importance of X-rays in exploring the atomic structure

Unit I: **BAND THEORY OF SOLIDS**

The free electron theory of metals – expressions for electrical conductivity – thermal conductivity – Wiedman-Franz's law-Hall effect-magnetoresistance-determination of electronic charge – Millikan's oil drop method – electron microscope – Band theory of solids – classification of solids on the basis of band theory. (10L)

Unit II: **POSITIVE RAYS:**

Discovery-properties- analysis – Thomson's parabola method – Aston's mass spectrograph – Bainbridge's mass spectrograph – Dempster's mass spectrograph – Dunnington's method of determining e/m . (11L)

Unit III : **ATOMIC STRUCTURE-1**

Early atomic spectra-Thomson model-Alpha particle scattering-Rutherford 's nuclear model-drawbacks-Bohr atom model –Bohr's interpretation of the Hydrogen spectrum-correction for nuclear motion-evidences in favour of Bohr's theory-Ritz combination principle-correspondence principle-Sommerfield's relativistic atom model-drawbacks- the vector atom model – Quantum numbers associated with the vector atom model — the Pauli's exclusion principle – periodic classification of elements (14L)

Unit IV: ATOMIC STRUCTURE-II

Coupling schemes-L-S Coupling-j-j Coupling-Hund rules- magnetic dipole moment due to orbital motion of the electron-due to spin of the electron -Stern and Gerlach experiment-spin-orbit coupling-optical spectra-spectral terms-spectral notation-selection rules-intensity rules-interval rule-fine structure of sodium D line-hyperfine structure-Normal Zeeman effect-theory and experiment- quantum mechanical explanation -Larmor's theorem- Anomalous Zeeman effect-Paschen – Bach effect-Stark effect. (13L)

Unit V: X-Rays:

Production of X-rays – properties-absorption of X-rays – X-ray absorption edges- Bragg's law – Bragg's X-ray spectrometer –the powder crystal method – Laue's method – Rotating crystal method –X-ray spectra- continuous spectra-characteristic spectra-Moseley's law -importance–width of spectral lines-Doppler broadening-collision broadening-X-ray Detectors-scintillation detector-semiconductor detectors (12L)

Books for study

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

Books for Reference

1.Modern Physics - R.Murugesan and Kiruthiga Sivaprasath, S. Chand & Co Ltd, New Delhi.

2.Modern Physics - B.S.Agarwal, Kedarnath Ramnath, Meerut, Delhi.

3.Atomic and Nuclear Physics - N.Subrahmanyam Brijal, S. Chand & Co Ltd, New Delhi

4.Modern Physics - B.V.N Rao, Wiley Eastern Ltd, New Delhi

5. Modern Physics-G.Aruldas and P.Rajagopal-PHI L

PAPER X .MAJOR ELECTIVE

(Any one)

a.MATHEMATICAL PHYSICS

L	T	P	C
4	0	0	4

Preamble: This course enable the students to understand the various mathematical methods used in Physics. The paper need a basic knowledge in mathematics and the learners are expected to come out with the ability to apply mathematics to solve problems in physics

UNIT I: VECTORS

Vectors and scalars-Vector algebra-The scalar product-The vector (cross or outer) product-The triple scalar product-The triple vector product-The linear vector space V_n - Vector differentiation -Space curves - Motion in a plane - A vector treatment of classical orbit theory - Vector differential of a scalar field and the gradient - Conservative vector field - The vector differential operator - Vector differentiation of a vector field - The divergence of a vector - The operator ∇^2 , the Laplacian - The curl of a vector. (11L)

UNIT II: DIFFERENTIAL EQUATION

First-order differential equations - Separable variables -Exact equations- Integrating factors -Bernoulli's equation- Second-order equations with constant coefficients - Nature of the solution of linear equations - General solutions of the second-order equations - Finding the complementary function - Finding the particular integral - Rules for D operators - The Euler linear equation - Solutions in power series. (12L)

UNIT III: MATRIX

Definition of a matrix - Four basic algebra operations for matrices - Equality of matrices - Addition of matrices - Multiplication of a matrix by a number - Matrix multiplication - The commutator - Powers of a matrix - Functions of matrices - transpose of a matrix - Symmetric and skew-symmetric matrices - The matrix representation of a vector product - The inverse of a matrix - A method for finding A^{-1} - Systems of linear equations and the inverse of a matrix - Complex conjugate of a matrix - Hermitian conjugation - Hermitian/anti-Hermitian matrix - Orthogonal matrix (real) - Unitary matrix - Rotation matrices - Trace of a matrix.

(14L)

UNIT IV: LAPLACE TRANSFORMATION

Definition of the Laplace transform - Existence of Laplace transforms - Laplace transforms of some elementary functions - Shifting (or translation) theorems - The first shifting theorem - The second shifting theorem - The unit step function - Laplace transform of a periodic function - Laplace transforms of derivatives - Laplace transforms of functions defined by integrals - A note on integral transformations.

(13L)

UNIT V: PARTIAL DIFFERENTIAL EQUATIONS

Linear second-order partial differential equations - Solutions of Laplace's equation- separation of variables - Solutions of the wave equation: separation of variables - Solution of Poisson's equation. Green's functions - Laplace transform solutions of boundary-value problems

(10L)

Books for study

1. Mathematical Methods for Physicists: A concise introduction, - TAI L. CHOW -CAMBRIDGE UNIVERSITY PRESS.

Books for Reference

- 1. Mathematical physics-** Piyoosh kumar tyagi , RBSA Publishers
- 2. Mathematical physics-** Satya prakash-Sultan Chand & Co:
- 3. Mechanics and mathematical physics -R.Murugesan-** Sultan Chand & Co:4.
- Mathematical physics-Gupta-** Sultan Chand & Co:

b.SPECTROSCOPY

L	T	P	C
4	0	0	4

Preamble: This course facilitates an understanding of atomic and molecular spectra and the instrumentations. The paper needs a basic knowledge about atomic structure and the learners are expected to gain knowledge to identify materials with the help of various spectra

UNIT I: MICROWAVE SPECTROSCOPY

Rotation of molecules – Classification of molecules – Rotation spectra of diatomic molecules – Intensities of spectral lines – Effect of isotopic substitution – Non-rigid rotator – Spectrum of a non-rigid rotator – Polyatomic molecules – Symmetric top molecules – Asymmetric top molecules – Techniques and Instrumentation – Chemical analysis by microwave spectroscopy. (14L)

UNIT II: INFRARED SPECTROSCOPY

I.R. spectroscopy – Vibrating diatomic molecules – Simple Harmonic Oscillator - Anharmonic oscillator – Diatomic vibrating rotator – IR spectrum of carbon monoxide - Interaction of rotations and vibrations – Vibration of polyatomic molecules – Analysis by IR techniques. (12L)

UNIT III : RAMAN SPECTROSCOPY

Raman effect-discovery – Quantum theory of Raman effect – Classical theory of Raman Effect – Pure rotational Raman spectra- Linear molecules – Raman spectrum of symmetric top molecules - Vibrational Raman spectra – Rule of mutual exclusion – Overtone and combinational vibrations - Rotational fine structure – Polarization of light and the Raman Effect - Structure determination from IR and Raman spectroscopy. (13L)

UNIT IV: ELECTRONIC SPECTROSCOPY

Born - Oppenheimer approximation – vibrational coarse structure- Progressions – Frank-Condon principle – Dissociation energy and Dissociation products – Rotational fine structure -Electronic vibration transitions - Fortrat diagram - Predissociation – Diatomic molecules. (11L)

UNIT V : INSTRUMENTATION

Instrumentation and techniques in Infrared spectroscopy – Sources – Monochromators – Sample cells – Detectors – Single beam Infra red spectrometer – Double beam Infra red spectrometer (10L)

Book For Study

1.Fundamentals Of Molecular Spectroscopy - Colin N Banwell Elaine- M Mccash
Fifth Edition

Book For Reference

- 1.Molecular structure and spectroscopy - G. Aruldas, PHI Learning Pvt. Ltd, India.
- 2.Hand book of Analytical Instruments -R.S. Khandpur, Tata MC Grow Hill Ltd.
- 3.Spectroscopy -G.R. Chatwal and S.K. Anand, Himalaya publishing House, New Delhi.

PAPER XI .MAJOR ELECTIVE-II

(Any one)

a. COMMUNICATION ELECTRONICS

L	T	P	C
4	0	0	4

Preamble: This course enable the students to understand various modulation and demodulation techniques used for communication. The paper needs a basic knowledge in electronics and mathematics and the learners are expected to come out with the ability to choose proper modulation techniques .

UNIT I: AMPLITUDE MODULATION AND TRANSMISSION

Introduction – amplitude Modulation – AM envelop – AM frequency spectrum and bandwidth – Phasor representation of AM with carrier – coefficient of modulation or percentage modulation or modulation index – degrees of modulation – AM power distribution – AM Current relation and efficiency - modulation by complex information signal - doubleside band suppressed carrier AM - single side band suppressed carrier AM – Vestigal side band amplitude modulation – AM modulator circuits – emitter modulations or low power AM – collector modulator or medium and high power AM modulator - AM transmitters – Broadcast AM transmitters – Low level of AM transmitter – High level AM transmitter. (15L)

UNIT II: AMPLITUDE MODULATION -RECEPTION

Comparison of AM system – Quadrature amplitude modulation – principles of AM detection – AM receivers – receiver parameters – Tuned radio frequency (TRF) receiver or straight receiver – principles of superhetrodyne –double frequency conversion AM receiver. (11L)

UNIT III: ANGLE MODULATION – TRANSMISSION

Introduction – Frequency modulation – Phase modulation – Phase deviation and modulation index – Multitone modulation – Transmission band width of FM – conversion of PM to FM or frequency modulator – conversion of FM to PM / phase modulators – commercial broadcast FM – phasor representation of an FM and PM – average power of an AM/FM wave – generation of FM – direct method of FM generation – reactance tube modulator – indirect method of FM wave generation – FM transmitters – indirect method – Comparison of AM and FM. (13L)

UNIT IV: FM RECEPTION

FM detectors – Balanced slope detector – Foster seely discriminator – ratio detector – FM super heterodyne receiver – FM noise suppression – threshold extension by FMFB technique. (11L)

UNIT – V: DIGITAL MODULATION TECHNIQUES

Introduction – BFSK – Binary phase shift keying – Quadrature PSK – Differential PSK – Performance comparison of digital modulation schemes - M ary FSK – correlative coding – Duobinary encoding. (10L)

Book For Study

1.Principles Of Communication Engineering-Dr. K.S. Srinivasan, Second Edition : 2010.

Book For Reference

1.Electronic communication systems – George Kennedy & Bernard Davis, Tata Mcgraw Hills, 4th edition, 2008

2.Electronic communication Systems – Blake, Joseph J. Adams ki, Sun Yifeng, Delamer publication, 2nd edition, 2012 (Rupa Publication, India).

3.Fundamentals of Electrical engineering – Wayne tomasi

b.NUMERICAL METHODS

L	T	P	C
4	0	0	4

Preamble: This course facilitates an understanding of various approximation methods. The paper needs knowledge in mathematics and the learners are expected to come out with the ability to use approximation methods to find solution to problems which do not have exact solutions.

UNIT-I: ERRORS AND ROOT OF EQUATIONS

What is Numerical analysis-numbers and their accuracy-errors-measurement of errors-round off error-truncation error-absolute error-relative error-percentage error-inherent error-accumulated error-general error formulae -convergence

Roots of equations-Iteration method-Maclaurin's series method-Newton-Raphson method-Von-Moises formula-Bisection method (12L)

UNIT-II: MATRIX AND LINEAR EQUATIONS

Introduction- pivotal condensation method- system of linear equations-Gauss Elimination method-Gauss Seidal Iteration method-Gauss Jordan elimination method- Matrix Inversion method (10L)

UNIT-III: INTERPOLATION AND APPROXIMATION

Linear Interpolation –Quadratic Interpolation - Lagrange's Interpolation – Richardson's Extrapolation –Aitken's iterated Interpolation (13L)

UNIT-IV:NUMERICAL DIFFERENTIATION AND INTEGRATION

Numerical differentiation-approximation of derivatives using interpolation polynomials-Taylor series method

Numerical Integration - trapezoidal rule-simpson's 1/3 and 3/8 rules (14L)

UNIT –V: DIFFERENTIAL EQUATIONS

Introduction-Euler's method (Adams Bashforth first order method)- backward Euler method- Taylor's series method- Runge-kutta method - predictor corrector methods(11L)

Books for study and Reference:

1. Introductory methods of numerical analysis – S.S. Sastry, Prentice Hall of India, New Delhi (2000)
2. Numerical methods – A. Singaravelu, Meenakshi Agency, Chennai (2001).
3. Numerical method in Science and Engineering – M.K. Venkataraman, PHI – New Delhi (1997).
4. Mechanics and Mathematical methods, R. Murugesan, S. Chand & Co, New Delhi (1999).

SEMESTER-VI

PAPER XII

DIGITAL ELECTRONICS

L	T	P	C
3	2	0	4

Preamble: This course provides an understanding of Boolean algebra and digital circuits. The paper need a basic knowledge in solid state electronics and the learners are expected to gain knowledge to design electronic circuits

UNIT I: NUMBER SYSTEMS, BINARY ARITHMETIC AND CODES

Decimal, binary, octal and hexadecimal number systems and their inter-conversions -binary arithmetic-binary addition-subtraction-1's and 2's complements- BCD codes, ASCII code, Excess-3code, Gray code. (7L+5T)

UNIT II: BOOLEAN ALGEBRA AND LOGIC GATES

Boolean algebra-De Morgan's theorem –Positive logic and negative logic systems-Basic logic gates, OR, AND, NOT (symbol, Boolean equation, truth table, circuit diagram and working)-NAND, NOR, EX-OR (symbol, Boolean equation, truth table only)-NAND and NOR as universal building blocks. (8L+6T)

UNIT III: ARITHMETIC CIRCUITS, FLIP-FLOPS AND MULTIVIBRATORS

Half and full adders- Half and full subtractors-RS Flip-flop-clocked RS Flip-flop, JK Flip-flop, JK master slave Flip-flop, D Flip-flop, T Flip-flop

555 timer-Astable multivibrator, monostable multivibrator-Frequency divider(11L+7T)

UNIT IV: KARNAUGH MAP AND COMBINATIONAL CIRCUIT APPLICATIONS

Karnaugh map - 2,3 and 4 variables –simplification-SOP and POS form of Boolean functions - Don't care conditions-Multiplexer, Demultiplexer, Encoder, Decoder, parity generator and checker. (10L+6T)

UNIT V : SHIFT REGISTERS AND COUNTERS

Types of registers- Serial in –Serial out-Serial in-Parallel out- Parallel in- Serial out- Parallel in- Parallel out-Asynchronous and Synchronous counters- Ring counter- Binary counter- Up- Down counter- Mod-5 counter- Mod-10 counter (decade counter)-A/D and D/A converters(9L+6T)

Books for study

1.Digital principles and applications - Albert Paul Malvino & Donald P.Leach

Books for reference

1.Digital logic and computer design-Morris Mano-Prentice Hall of India,Pvt.Ltd.

2.Gothmann W.H.,Digital Electronics- Prentice Hall of India,Pvt.Ltd.

3.Metha V.K.Mehtha.R.Principles of electronics,S.Chand &Co.

4.Fundamentals of Digital Electronics and Microprocessors - Anokh singh, A.K.Chhabra, S.Chand &Co.

PAPER XIII

QUANTUM MECHANICS

L	T	P	C
3	2	0	4

Preamble: Objective of this course is to introduce wave- particle duality of matter and the formation of Quantum mechanics. The paper need a basic knowledge in Mathematics and Modern physics and the learners are expected to know the application of basic equations in quantum mechanics to various states

UNIT I: DEVELOPMENT OF QUANTUM MECHANICS

Inadequacy of classical mechanics-Black body radiation – Theoretical laws of Black body radiation (Wein’s displacement law –Wein’s Radiation formula – Rayleigh Jeans law) – Planck’s Quantum hypothesis – photoelectric effect-Einstein’s explanation for photoelectric effect-Compton effect – Einstein’s quantum theory of specific heat-Quantum states of energy. (8L+5T)

UNIT II : WAVE PROPERTIES OF MATTER

Wave particle duality-Phase and Group Velocity – Analytical expression for a Group of waves – Wave packets formed by Superposition of Number of Plane waves – De Broglie Hypothesis – Derivation of De Broglie relation – Phase velocity of De Broglie Waves – Relation between De Broglie wave and Phase velocity – Davision and Germer’s experiment on electron diffraction-Diffraction of Atoms and Molecules (9L+6T)

UNIT III : HEISENBERG UNCERTAINTY PRINCIPLE

Uncertainty Principle - Elementary Proof of Heisenberg’s Uncertainty Relation and its Physical significance –Illustration by Thought experiments-consequences .(8L+5T)

UNIT IV: SCHRODINGER'S WAVE EQUATION:

Basic postulates of Quantum mechanics –Schrodinger's equation – 1D and 3D wave equation into the Time-dependent and Time-independent part – Physical Interpretation of the Wave Function ψ – Operators in quantum Mechanics, Eigen Function, Eigen value and Eigen Value equation – Expectation values – Orthogonality of Energy Eigen function - Schrodinger's Wave equation for the Complex Conjugate Wave function $\psi^*(x, y, z, t)$ – Probability current Density – Ehrenfest's Theorem – Momentum wave function for free particle – Momentum Eigen function – Exact statement and proof of Uncertainty principle for one dimensional wave packet (11L+8T)

UNIT V: APPLICATIONS OF QUANTUM MECHANICS

Free particle – Potential step – Rectangular Potential barrier- Tunnel effect – emission of α particles from Radioactive element - Square well potential- free states-Particle in 1D box – Particle in 3D box – Simple harmonic oscillator – 1D simple harmonic oscillator in quantum mechanics – Particle in 1 D square well potential of finite Depth. (9L+6T)

Books for Study

1. Elements of Quantum Mechanics, Kamal Singh & S P Singh-Chand &Co;

Books for Reference

- 1.Mathews P.M. and Venkatesh k. Quantum Mechanics Tata McGraw Hill Publishing Ltd.
- 2.Gipta,Kumar,Sharma -Quantum Mechanics-JaiPrakash Nath Company
3. Quantum Mechanics-G.Arul Das-PHI Private Learning Ltd.
4. Quantum Mechanics-V.Murugan-Pearson publication
5. Quantum Mechanics-Mahesh C.Jain- PHI Private Learning Ltd

PAPER XIV

L	T	P	C
4	0	0	4

NUCLEAR PHYSICS

Preamble: Objective of this course is to provide the basics of atomic nucleus and nuclear reactions. The paper needs a basic knowledge in modern physics and the learners are expected to know the impact of nuclear reactions to the environment.

UNIT I: ATOMIC NUCLEUS

General properties of the nucleus- binding energy –mass defect -packing fraction— BE/A curve and its significance -proton electron hypothesis- proton neutron hypothesis -Nuclear forces –characteristics –Meson theory of nuclear forces –Nuclear models – Liquid drop model –Binding Energy formulae– Shell Model –magic numbers(12L)

UNIT II RADIO ACTIVITY

Natural radio activity –alpha,beta and gamma rays-properties- radioactive series-laws of radioactive disintegration-half life period –mean life period –Radio carbon dating-law of successive disintegration– range of α particle – Geiger Nuttal law- α decay- theory- β - decay –neutrino theory of β decay-neutrino and its properties-electron capture. γ decay- nuclear isomers- Mossabauer effect - applications-radio isotopes - uses. (14L)

UNIT III: NUCLEAR REACTIONS

Kinematics of nuclear reaction-conservation of momentum - Q value of nuclear reaction-compound nucleus - nuclear energy level-Nuclear fission –energy released in fission-. Nuclear reactor-uses - Nuclear fusion –Thermo nuclear reactions-controlled thermo nuclear reaction-Principle and action of atom bomb - hydrogen bomb-fusion reactor –plasma confinement (11L)

UNIT IV: NUCLEAR DETECTORS AND PARTICLE ACCELERATORS

Detectors-G.M.Counter-scintillation counter-bubble chamber-wilson cloud chamber-Accelerators-cyclotron-synchrocyclotron-betatron-synchrotrons (10L)

UNIT V: COSMIC RAYS AND ELEMENTARY PARTICLES

Cosmic rays-introduction-discovery-latitude, altitude and azimuth effects-longitudinal effect-north –south effect-seasonal and diurnal changes-primary and secondary cosmic rays-nature of cosmic rays- cosmic ray showers-Van Allen belt-origin of cosmic radiation.

Elementary particles-introduction-particles and antiparticles-antimatter-the fundamental interaction-elementary particle quantum numbers-conservation laws and symmetry-the quark model (13L)

Book for study

1. Modern Physics- R.Murugesan, S. Chand & Co

Reference Books

1. Modern Physics- Seghal Chopra & Seghal, Sultan Chand 1998

2. Perspective of Modern Physics-Arther Beiser –Tata-Mc Graw Hill Publishing Company

3. Atomic and Nuclear Physics-Shatendra Sharma-Pearson Publications

4. Atomic Physics-Gupta and Kumar

5. Fundamental Physics-Halliday and Resnick

PAPER XV (4X15=60 hours)

L	T	P	C
4	0	0	4

SOLID STATE PHYSICS

Preamble: Objective of this paper is to introduce crystals and nanoparticles and to provide an understanding about different types of materials. The paper needs a basic knowledge of elements of modern physics and the learners are expected to get some ideas on Materials Research.

UNIT-I: CRYSTAL LATTICES

Introduction-seven classes of crystals - Bravais lattice in three dimensions - crystal structure - Simple cubic, Face centered cubic, Body centered cubic and Hexagonal close packed structure - Sodium Chloride, Zinc Blende and Diamond Structures.

Miller Indices and crystal planes - procedure for finding Miller Indices - interplanar spacing - Diffraction of X-Rays - Bragg's Law - reciprocal lattices - reciprocal lattice to SCC, BCC and FCC lattices. (13L)

UNIT-II: TYPES OF MAGNETIC MATERIALS

Introduction -classical theory of Diamagnetism - Langevin's theory of Paramagnetism - Weiss Theory of Para magnetism - Ferromagnetism - Explanation of Heisenberg's internal field and quantum theory of ferromagnetism - Domain theory of ferromagnetism - Anti ferromagnetism - ferrites - Fundamental Definitions of Dielectrics - Different types of Electric Polarizations- electronic, ionic, orientation and space charge Polarizations - Dielectric Loss - Internal Field - Clausius – Mosotti Relation(12L)

UNIT-III: **BONDING IN SOLIDS**

Types of bonds in crystals - Ionic, covalent, Metallic, Vander waal's and Hydrogen Bonding - Bond energy of sodium chloride molecule - Comparison between ionic and covalent solids - variation of inter atomic force with inter atomic spacing - cohesive energy - cohesive energy of ionic solids - application to sodium chloride crystal - evaluation of Madelung constant for sodium chloride. (11L)

UNIT-IV: **SUPER CONDUCTIVITY**

Introduction - General Properties of Superconductors - effect of magnetic field - Meissner effect - effect of current - thermal properties - entropy - specific heat - energy gap - isotope effect - London equations - AC & DC Josephson effects - applications - Type-I and Type-II Superconductors - Explanation for the Occurrence of Super Conductivity - BCS theory - Application of Superconductors - High T_C superconductors. (14L)

UNIT-V: **NANOTECHNOLOGY**

Nanomaterials-synthesis and classification --techniques used in synthesis of nanomaterials-chemical vapour deposition-sol-gel technique-electro deposition method-ball milling method- characterisation - properties and applications of nanomaterials- fullerene, graphene and carbon nanotubes (10L)

Books for Study

1. Solid State Physics - P.K.Palanisamy - SCITECH Publications pvt Ltd.Chennai
2. Nano-essentials and understanding - Pradeep.T.Mc-Graw-Hill Ltd.

Books for reference

1. Introduction to Solid State Physics - Kittel - Wiley and Sons, New Delhi
2. Material Science and Engineering - V. Raghavan - PHI
3. Introduction to Solids - Azaroff - TMH
4. Material Science - M.Arumugam - Anuradha Publishers
5. Solid State Physics - H.C.Gupta - Vikas publishing house pvt.Ltd.
6. Principles of Nanoscience and technology - Shah M.A.Ahmed, Narosha publishing house pvt.Ltd.

PAPER XVI: MAJOR ELECTIVE (Any one)

- **a.ENERGY PHYSICS**

L	T	P	C
4	0	0	4

Preamble: Objective of the course is to provide an understanding of the present energy crisis and various available energy sources .The paper does not need require any special prerequisite and the learners are expected to know the use of alternate energy sources

UNIT I : INTRODUCTION TO ENERGY SOURCES

World's reserve of Commercial energy sources and their availability-India's production and reserves-Conventional and non-conventional sources of energy, comparison – Coal- Oil and natural gas –applications - merits and demerits (10L)

UNIT II : SOLAR THERMAL ENERGY

Solar constant -Solar spectrum-Solar radiations outside earth's atmosphere – at the earth surface- on tilted surfaces -Solar Radiation geometry-Basic Principles of Liquid flat plate collector –Materials for flat plate collector -Construction and working- Solar distillation–Solar disinfection - Solar drying-Solar cooker(box type)-Solar water heating systems – Swimming pool heating. (12L)

UNIT III : PHOTOVOLTAIC SYSTEMS

Introduction-Photovoltaic principle-Basic Silicon Solar cell- Power output and conversion efficiency-Limitation to photovoltaic efficiency-Basic photovoltaic system for power generation-Advantages and disadvantages-Types of solar cells- Application of solar photovoltaic systems - PV Powered fan – PV powered area lighting system – A Hybrid System. (13L)

UNIT IV: BIOMASS ENERGY

Introduction-Biomass classification- Biomass conversion technologies-Bio-gas generation-Factors affecting bio-digestion -Working of biogas plant- floating and fixed dome type plant -advantages and disadvantage of -Bio-gas from plant wastes-Methods for obtaining energy from biomass- Thermal gasification of biomass-Working of downdraft gasifier- Advantages and disadvantages of biological conversion of solar energy. (11L)

UNIT V : WIND ENERGY AND OTHER ENERGY SOURCES

Wind Energy Conversion-Classification and description of wind machines, wind energy collectors-Energy storage-- Energy from Oceans and Chemical energy resources-Ocean thermal energy conversion-tidal power, advantages and limitations of tidal power generation-Energy and power from waves- wave energy conversion devices- Fuel cells- and application of fuel cells- batteries- advantages of battery for bulk energy storage- Hydrogen as alternative fuel for motor vehicles. (14L)

Books for study

1. Kothari D.P., K.C. Singal and Rakesh Ranjan, Renewable energy sources and emerging Technologies, Prentice Hall of India, 2008.
- 2.Solar Energy-principles of thermal collection and storage-S.P.SUKHAME-tata-McGraw-Hill publishing company ltd.

Books for References

1. Chetan Singh Solanki, Solar Photovoltaics Fundamentals, Technologies and Applications, 2ndEdition, PHI Learning Private Limited, 2011.
2. Rai G. D, Non conventional Energy sources, 4th Edition, Khanna Publishers, 2010.
3. Jeffrey M. Gordon, Solar Energy: The State of the Art, Earthscan, 2013.
4. Kalogirou S.A., Solar Energy Engineering: Processes and Systems , 2nd Edition, Academic Press, 2013.
5. Zobaa A.F.and Ramesh Bansal, Handbook of Renewable Energy Technology, World Scientific, 2011.

***b.MEDICAL PHYSICS**

L	T	P	C
4	0	0	4

Preamble: This course facilitates an understanding of the basic concepts in Bio medical instrumentation and awareness regarding radiation hazards and safety.

UNIT-I: X-RAYS

Electromagnetic spectrum - production of x-rays - x-ray spectra - Brehmsstrahlung process- Characteristic x-ray - X-ray tubes - Coolidge tube - X-ray tube design - tube cooling - stationary mode - Rotating anode X-ray tubes - Tube rating - quality and intensity of X-ray. X-ray generator circuits - half wave and full wave rectification - filament circuit - kilo voltage circuit - high frequency generator - exposure timers - HT cables. (12L)

UNIT –II: RADIATION SAFETY AND HEALTH PHYSICS

Introduction to Radioactivity-Artificial and natural - radioactivity -Physical features of radiation-units of radiation- conventional sources of radiation, Interaction of different types of radiation with matter -penetration power in living cells-radiation damage to the cell-effect of radiation on cells-measurement of ionizing radiation- measurement of biological damage-Linear energy transfer(LET)-radiation risk-radiation dosimetry-security of radio active material-radio active waste management (14L)

UNIT –III: BIO MEDICAL INSTRUMENTATION

Development of biomedical instrumentation-biometrics-introduction to the man-instrument system-components of man-instrument system-transducers for biomedical applications-biomedical computer applications-computer analysis of ECG-computerized axial tomography(CAT) Scanners (11L)

UNIT-IV: MEDICAL IMAGING PHYSICS

Radiological imaging - Radiography - Filters - grids - cassette - X-ray film - film processing - fluoroscopy - computed tomography scanner - principle function -display - generations – mammography- ultrasound imaging - magnetic resonance imaging - thyroid uptake system - Gamma camera (Only Principle, function and display) (11L)

UNIT-V LASERS IN MEDICINE

Introduction to laser-principle and production of laser- effects of laser radiation on tissues - photo thermal effects- photochemical effects –photodynamic therapy-Laser applications in therapy and diagnosis-opthalmology-Fibreoptic endoscopy and dentistry-Laser as a beautician's tool-laser hazards-biological effects. (12L)

Books for study and Reference

1. Basic Radiological Physics Dr. K. Thayalan - Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi (2003)
2. The essential physics of Medical Imaging: Bushberg, Seibert, Leidholdt and Boone Lippincot Williams and Wilkins, Second Edition (2002)
- 3..Biomedical instrumentation-Leslie Cromwell,Fred J.Weibel-Erich A.Pfeiffer-Pearson Publications
- 4.Lasers in Medicine-R W Wayanant, Plenum Publishing Co
- 5.Nuclear medicine physics: Chandra - Lippincot Williams and Wilkins (1998)

*** A visit to the related places is preferred for better understanding of these two papers.**

PRACTICAL-III

L	T	P	C
0	0	2	1

Preamble: To learn physical concepts through experiments

(8 experiments compulsory)

1. Ballistic Galvanometer- Figure of merit
2. Ballistic Galvanometer – Comparison of Capacitance (C1/C2)
3. Field along the axis of a coil carrying current– Deflection magnetometer- dipole moment of a bar magnet
4. Comparison of Magnetic Moments – Deflection Magnetometer (Tan A and Tan B position)
5. Series Resonance Circuit
6. De Sauty Bridge
7. Potentiometer- Calibration of Ammeter
8. Potentiometer-Calibration of low range Voltmeter
9. Carey Foster's Bridge – Specific Resistance
10. Spectrometer- i-d curve

PRACTICAL-IV

L	T	P	C
0	0	2	1

(8 experiments compulsory)

1. Field along the axis of a coil carrying current– Vibration magnetometer
2. Potentiometer – Specific resistance
3. Potentiometer – EMF of a thermocouple
4. Ballistic Galvanometer – Comparison of EMF's – E1/E2
5. Ballistic Galvanometer – High resistance by leakage
6. Magnetic Moment of a bar Magnet – Tan C Position
7. Parallel Resonance Circuit
8. Owen's Bridge-inductance in series and parallel
9. M and B_H-Deflection and Vibration magnetometer
10. Spectrometer- critical angle of the prism and refractive index

PRACTICAL-V

NON ELECTRONICS

(8 experiments compulsory)

L	T	P	C
0	0	4	2

1. Conversion of Galvanometer into Voltmeter and Ammeter
2. Ballistic Galvanometer – Absolute Capacity of a Condenser
3. Ballistic Galvanometer – Absolute Determination & Comparison of Mutual Inductance.
4. Spectrometer – Cauchy's Constants
5. Young's Modulus and Poisson's ratio of glass – Elliptic Fringes
6. Potentiometer - Calibration of Volt meter (High Range)
7. Potentiometer-Temperature Coefficient of Resistance
8. Spectrometre- Biprism
9. Thevanin's and Nortan's theorem – Verification
10. Self inductance-Rayleigh's DC bridge method

PRACTICAL-VI

L	T	P	C
0	0	4	2

ELECTRONICS

(8 experiments compulsory)

1. V-I Characteristics of Junction diode and Zener diode
2. Transistor characteristics
3. Colpitt's and Hartley Oscillator
4. Single stage amplifier-with and without feedback
5. Full wave rectifier with filters and regulated using zener diode (Study the variation of output voltage without filter, with filter and with zener diode)
6. Astable multivibrator using transistor
7. OPAMP-Adder&Subtractor
8. OPAMP-Differentiator & Integrator
9. OPAMP -Low Pass And High Pass Filter
10. FET charecteristics

PRACTICAL- VII

(8 experiments compulsory)

L	T	P	C
0	0	4	2

1. Spectrometre-Hartmann's interpolation formula
2. Spectrometre- i_1 - i_2 curve
3. Mirror Galvanometer -Thermo EMF
4. Anderson's bridge-self inductance
5. Hyperbolic fringes
6. Arithmetic and Logic Units (ALU)
 - i. Half Adder
 - ii. Full Adder
 - iii. 4-bit Binary Adder.
7. Astable and Monostable multivibrator using 555 Timer
8. Combinational Logic
 - a) To design a combinational logic system for a specified Truth Table.
 - b) To convert a Boolean Expression into Logic Gate Circuit and assemble it using logic gate IC's
9. Analog/Digital Conversion
 - a) To design an analog to digital converter of given specifications.
 - b) To design a digital to analog converter of given specification
10. To build Flip-Flop Circuits using elementary gates (RS, Clocked RS, D-type, and JK Flip-Flop).

PRACTICAL – VIII

L	T	P	C
0	0	4	2

COMPUTER PROGRAMMING WITH C++

1. a. Arithmetic operations--use do while loop

b. To test the validity of any entered character whether it belongs to the alphabetical set or a number or a special character.

2. To find the sum of series using for loop.

a. $\text{Sum} = 1+3+5+\dots+n.$

b. $\text{Sum} = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots + \frac{x^n}{n!}$

c. $\text{Sum} = 1^2+2^2+4^2+\dots+n^2$

3. To find the factorial of a number by using function declaration with/without using the return statement.

4. To read a set of numbers from a standard input device and to find out the largest number in the given array using function declaration. Also sort them in the ascending or the descending order.

5. To read the elements of the given two matrices of order m*n and to perform the matrix addition and display the transpose of the result.

6.a. To display the name of the day in a week depending upon the number entered through key board using Switch-Case statement

b. To read the data variables (such as Day, Month and Year) of the class by the member function and display the contents of class objects on the screen in the format DD/MM/YYYY.

7. To generate a series of Fibonacci numbers using constructor

8. To read the following information from the keyboard in which basic class consists of Name, Roll No. and Sex. The derived class contains the data members Height and weight. Display the contents of the class. Use inheritance concept.

9. a. An OOP to find the period of a pendulum of given length L , in a gravitational field. Accept the required values using the keyboard. Also display the results.

b. Develop a program in C++ to calculate the Young's modulus of a material from the data obtained from uniform bending method.

10. Solve Quadratic equation.

11. Matrix multiplication

12. Define a class to represent a bank account details

Data members

1. Name of the depositor

2. Account name

3. Type of account

4. Balance amount in the account

Member function

1. To assign initial values

3. To withdraw an amount

4. To display name and balance

**SKILLED BASED ELECTIVE
SEMESTER-III
(For Physics major students only)
(Any one)**

**PAPER 1.a
MAINTANANCE OF ELECTRICAL APPLIANCES**

L	T	P	C
4	0	0	4

Preamble: This course enable the students to understand the operations and safety handling of certain commonly used domestic appliances. The paper needs a basic knowledge in electricity and magnetism and the learners are expected to gain knowledge to design and trouble shoot electrical circuits .

UNIT-I:

Resistance - capacitance - inductance and its units - electrical charge - current - potential - units and measuring meters - Ohm's law - Galvanometer, ammeter, voltmeter and multimeter. Electrical energy - power - watt - kWh - consumption of electrical power. (12L)

UNIT-II:

Transformer - principle and working - classification of transformers - testing of transformers - Core, Shell and Berry types, auto transformer - construction and uses. Cooling of transformers - Losses in transformer.(10)

Unit-III:

Electric bulbs – Fluorescent lamps - Street Lighting - Electric Fans - Wet Grinder - Mixer - Water Heater - Storage and Instant types-electric iron box-microwave oven - Washing Machine - Stabilizer, Fridge and Air conditioner. (13L)

UNIT-IV:

AC and DC- Single phase and three phase connections - RMS and peak values-house wiring - Star and delta connection - overloading - earthing - short circuiting - colour code for insulation wires (13L)

UNIT-V:

Electrical protection - Relays - Fuses - Electrical switches - Circuit breakers-ELCB - overload devices - ground fault protection - Inverter - UPS - generator and motor(12L)

Books for study and Reference

1. A text book in Electrical Technology - B L Theraja - S Chand & Co.
2. A text book of Electrical Technology - A K Theraja
3. Performance and design of AC machines - M G Say ELBS Edn.
4. Semi conductor physics and opto electronics by P K Palanichamy
5. Basic Electronics - B L Theraja - S Chand & Co.
6. Principles of Communication Engineering - Arokh Singh and A K Chhabra - S Chand & Co.

PAPER1.b.

ASTROPHYSICS

L	T	P	C
4	0	0	4

Preamble: This course provides an understanding of Astrophysics, Astronomical instruments and the Origin of the universe.. The paper needs a basic knowledge in optics and modern physics and the learners are expected to know celestial objects.

UNIT-I : ASTRONOMICAL INSTRUMENTS

Optical telescope - reflecting telescope - types of reflecting telescope - advantages of reflecting telescope - Radio telescopes - astronomical spectrographs – photographic- photometry - photo electric photometry - detectors and image processing. (12L)

UNIT-II: SOLAR SYSTEM

The sun-physical and orbital data - Photosphere - Chromosphere - corona - solar prominences - sunspot - sunspot cycle - theory of sunspots - solar flare - mass of the sun - solar constant - temperature of the sun - source of solar energy - solar wind. other members of the solar system - Mercury - Venus - Earth - Mars - Jupiter - Saturn - Uranus - Neptune - Pluto - Moon - Bode's law - asteroids - comets - meteors. (14L)

UNIT-III: STELLAR EVOLUTION, BINARY AND VARIABLE STARS

Birth of a star - Death of a star - Chandrasekhar limit - white dwarfs - Neutron stars - black holes - Quasars - Nebulae - Supernovae
Binary stars - Origin of binary stars-variable stars - cepheid variables - RV Tauri variables - long period variables - irregular variables - flare stars. (10L)

UNIT-IV: MAGNITUDES, DISTANCE AND SPECTRAL CLASSIFICATION OF STARS

Magnitude and brightness - apparent magnitude of stars - absolute magnitude of stars - relation between apparent magnitude and absolute magnitude of stars - Luminosities of stars - measurement of stellar distance - Geometrical parallax method - distance from red shift measurement - Harvard system of spectral classification . (11L)

UNIT-V: THEORIES OF THE UNIVERSE, GALAXIES AND STAR CLUSTERS

Origin of the universe - the big bang theory - the steady state theory - the oscillating universe theory - Hubble's law.

Galaxies - types of galaxies - Milky Way - star clusters - open clusters - globular clusters. (13L)

Books for study and reference:

1. K.S. Krishnasamy, 'Astro Physics a modern perspective,' Reprint, New Age International (p) Ltd, New Delhi,2002.
2. Baidyanath Basu, 'An introduction to Astro physics', second printing, prentice - Hall of India Private limited, New Delhi,2001.
3. R. Murugesan, ' Modern Physics', Eleventh revised edition, S. Chand & Company Ltd, New Delhi, 2003.
4. S. Kumaravelu, 'Astronomy, Janki calendar corporation, Sivakasi, 1993
5. Baker and Fredrick, 'Astronomy, ninth edition, Van No strand Rein hold, Co, New York - 1964.
6. Illustrated World of Science Encyclopedia - Vol I and Vol VIII - Creative world publication - Chicago.

SKILLED BASED ELECTIVE
SEMESTER-IV
(Any one)
PAPER 2.a
MAINTANANCE OF ELECTRONIC EQUIPMENTS(4x15=60 hours)

L	T	P	C
4	0	0	4

Preamble: Objective of this course is to provide a basic understanding of the commonly used electronic equipments .

UNIT-I: ELECTRONIC COMPONENTS

Study of electronic components - resistors - types - characteristics - colour coding – wattage rating-potential divider arrangement-capacitors - type - characteristics --working voltage-star and delta connection of resistors and capacitors -soldering and desoldering techniques-Groove board,bread board and printed circuit board (11L)

UNIT-II: MEASURING INSTRUMENTS

Practical uses of Multimeter (analog and digital) - CRO - Block Diagram - measurement of voltage, frequency and phase - waveforms and Lissajoue's figures- Digital Storage Oscilloscopes-LCD display for instruments -A/F and R/F oscillators. (10L)

UNIT-III: TRANSDUCERS

Classification of transducers-basic requirements/characteristics of Transducers-active and passive transducers, resistive (Potentiometer -Theory, temperature compensation &applications), Capacitive (variable air gap type), Inductive (LVDT) &piezoelectric transducers.
Measurement of temperature (RTD, semiconductor IC sensors)-Light transducers (photo resistors & photovoltaic cells). (13L)

UNIT-IV: COMMUNICATION DEVICES

Basic concepts of radio transmitter and receiver - TV antennas-resonance antennas and their characteristics - Dipole antenna - Folded dipole - Yagi antenna - Yagi antenna design - Dish antenna - DTH system - Mobile communication system - MODEM.

Telephone systems-cellular Telephone systems-mobile phone-principle of operation-integrated services-digital networks(ISDN) (15L)

UNIT-V: Photography

Introduction to cameras-parts of camera and accessories—lens shutter-aperture-flash photography-filters-battery-tele and wide angle lens
Digital formats-data transfer to computer-ISO speed-resolution(11L)

Books for Study and Reference

1. Principles of Electronics by V K Mehta, S Chand & Co., 5th edition 2001.
2. Functional Electronics by Ramanan.
3. Elements of Electronics by Bagde and Singh
4. Monochrome and Colour TV by Gulati
5. Basic Electronics, 6th edition by B Grob, McGraw Hill NY 1
6. Integrated electronics-Millman and Halkias
7. Electronic principles-Malvino 6th edition
8. Operational amplifier-Gyakwar
9. Basic electronics-B.Basavaraj,H.N.Shivasankar-University press

PAPER 2.b

PHYSICS OF HUMAN ANATOMY(4x15=60 hours)

L	T	P	C
4	0	0	4

Preamble: Objective of this course is to provide an understanding of the physics of human anatomy

UNIT-I: PHYSICS OF LIGHT AND ITS MEDICAL APPLICATION TO HUMAN BODY

Properties of light – Measurement of Light – Energy of light – medical Application of Visible light, UV, IR and Laser in Human body. (12L)

UNIT-II: PHYSICS OF BREATHING:

Pressure – Typical pressure in Normal body – Gas transport in respiratory system – Definition of pressure-Volume in Lung-Thorax system – Resistance of air passage – Timing of breathing process – Work required for Breathing(14L)

UNIT-III: ENERGY OF HUMAN BODY

Heat loss of the body due to conduction, convection, evaporation, radiation-Wind chill – Mechanism to decrease body temperature – Medical implication of high temperature. (13L)

UNIT-IV:THE ACOUSTICS OF BODY

Sound – unit – wave equation – Unit of sound intensities for auditory system – production of speech – Physics of ear – outer ear – inner ear – ear drum – middle ear (10L)

UNIT-V: PHYSICS OF EYE

Optical system of the body structure of Eye – Refraction focusing of the eye system – Geometrical optics of the Eye – Structure of receptor system – Diffraction effects of Eye – Eye defects. (11L)

REFERENCES:

1. web.khu.ac.kr/~bil/lecture/MedicalPhysics/Ch14.PDF
2. http://www.edb.utexas.edu/petrosino/Legacy_Cycle/mf_jm/Challenge2/physicsbreathing.pdf
3. <http://web.khu.ac.kr/~bil/lecture/MedicalPhysics/Ch8.PDF>
4. <https://www3.nd.edu/~nsl/Lectures/mphysics/Medical%20Physics/Part%20I.%20Physics%20of%20the%20Body/Chapter%203.%20Pressure%20System%20of%20the%20Body/Chapter%203.%20Pressure%20System%20of%20the%20Body.pdf>
5. <https://www3.nd.edu/~nsl/Lectures/mphysics/Medical%20Physics/Part%20I.%20Physics%20of%20the%20Body/Chapter%204.%20Acoustics%20of%20the%20Body/Chapter%204.%20Acoustics%20of%20the%20Body.pdf>
6. <https://www3.nd.edu/~nsl/Lectures/mphysics/Medical%20Physics/Part%20I.%20Physics%20of%20the%20Body/Chapter%205.%20Optical%20System%20of%20the%20Body/Chapter%205.%20Optical%20System%20of%20the%20Body.pdf>
7. <https://www3.nd.edu/~nsl/Lectures/mphysics/Medical%20Physics/Part%20I.%20Physics%20of%20the%20Body/Chapter%202.%20Energy%20Household%20of%20the%20Body/2.3%20Heat%20losses%20of%20the%20body/Heat%20losses%20of%20the%20body.pdf>
8. <https://www3.nd.edu/~nsl/Lectures/mphysics/Medical%20Physics>

NONMAJOR ELECTIVE

(for those who do not study Physics as Major/Allied Subject)

L	T	P	C
2	0	0	2

SEMESTER-III

(Any one)

PAPER 1.a

BASICPHYSICS-1

Preamble: Objective of the paper is to provide a basic knowledge in Physics for students who do not study physics as major/allied subject

UNIT I: MECHANICS

Motion-speed, velocity, acceleration- force –equations of motion- Newton's laws - momentum - work, power and energy -conservation of energy and momentum. (5L)

UNIT II: PROPERTIES OF MATTER

Three states of matter - binding forces - fluid pressure and thrust - applications - Pascal law - Archimedes principle – surface tension-capillary action - Bernoulli's principle – Viscosity-venturimeter-pitot's tube. (7L)

UNIT III: HEAT AND SOUND

Measurement of heat and temperature - clinical thermometer - heat transfer - thermos flask - change of state - effect of pressure on boiling point and melting point - heat engines - steam engine and diesel engine-sound and music - reverberation - acoustics of building - recording and reproduction of sound in film. (7L)

UNIT IV: OPTICS

Reflection and refraction-concave and convex mirrors and lenses-dispersion-spectra- rainbow- interference-diffraction-polarization-concepts with examples-uses-double refraction-optical activity-quartz crystal(6L)

UNIT V: ELECTRICITY

Electric field - potential - Ohm's law - electrical energy and power - resistance - types of resistance - fixed resistance - variable resistance.- resistance in series and parallel -Kirchoff's laws(5L)

Books for study and Reference

1. Properties of matter by Murugesan R, S Chand & Co. Pvt. Ltd., New Delhi
2. Text book of sound by Brij Lal & Subramaniam, Vikas Publishing House, New Delhi, 1982
3. Electricity and Magnetism - R. Murugesan. (S.Chand &Co.)
4. Heat and thermodynamics - Brijlal and Subramaniam, S Chand & Co.
5. Optics by Subramaniam N & Brij Lal, S Chand & Co. Pvt. Ltd., New Delhi, 1990

PAPER 1.b.

APPLIED PHYSICS(2x15=30 hours)

Preamble: This paper enables the students to understand variable energy sources and the need for finding alternate energy source.

L	T	P	C
2	0	0	2

UNIT-I: Conventional energy sources

Conventional energy sources –world’s reserve of conventional energy sources–various forms of energy-renewable and conventional energy systems-comparison (5L)

UNIT-II: Fossil fuels

Fossil fuels – coal, oil and natural gas-availability-statistical details-applications-merits and demerits(7L)

UNIT-III: Biomass energy: Biomass energy-biomass classification-biomass conversion process-biogas plants-Deena bandhu model gas plant-wood gasification-advantages and disadvantages of biomass (6L)

UNIT-IV: Renewable energy sources

Renewable energy sources-solar energy - importance - storage of solar energy - applications of solar energy -solar pond - solar water heater-solar crop dryers-solar cookers- solar green house - solar cell (7L)

UNIT-V: Geothermal energy

Geothermal energy-Geothermal power plant-wind energy and wind farms-wind mills - types – ocean thermal energy conversion - energy from tides-energy from waves(5L)

Books for study and Reference

1. Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi
2. Solar energy - M P Agarwal - S Chand & Co. Ltd.
3. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd., New Delhi.

PAPER 2.a

Preamble: Objective of the paper is to gain knowledge on Basic principles of Physics

L	T	P	C
2	0	0	2

BASICPHYSICS-II

UNIT I: Nuclear Physics

Introduction-nuclear structure-properties of nucleus-packing fraction-binding energy-nuclear forces- Radio activity-properties of alpha, beta and gamma rays-radio carbon dating-nuclear fission-nuclear fusion (7L)

UNIT II: Magnetic Materials

Classification of magnetic materials-para-dia and ferromagnetic materials-properties –applications-crystalline and amorphous materials-conductors-insulators-superconductors- properties –applications (5L)

UNIT III: Lasers

Introduction-absorption-spontaneous emission-stimulated emission-population inversion-general laser system-He-Ne laser-CO₂ laser-applications. (6L)

UNIT IV: Relativity

Introduction -reference frames-postulates of the special theory of relativity-length contraction-time dilation(no derivation)

Quantum mechanics-dual nature of wave and radiation-de-Broglie waves(5L)

UNIT V: Number Systems

Number systems in digital electronics-binary, decimal and hexadecimal numbers –inter conversions- binary addition and subtraction—binary coded decimal-logic gates(7L)

Books for study and Reference

1. Modern Physics- R.Murugesan, S. Chand & Co
2. Electricity and Magnetism -R. Murugesan (S.Chand &Co.)
3. Digital principles and applications - Albert Paul Malvino & Donald P.Leach
4. Mechanics and mathematical physics- R.Murugesan-S Chand & Co. Pvt. Ltd., New Delhi

PAPER 2.b

L	T	P	C
2	0	0	2

SPACE PHYSICS

Preamble: This course provides an understanding of celestial objects.

UNIT I : Universe

Planets - interior planets - exterior planets - crust, mantle and core of the earth - different region of earth's atmosphere - rotation of the earth - magnetosphere - Van Allen belts - Aurora. (7L)

UNIT II: Comets, Meteors, Asteroids

Composition and structure of comets - periodic comets - salient features of asteroids, meteors and its use. (5L)

UNIT III : Sun

Structure of photosphere, chromosphere, corona - sunspots - solar flares - solar prominence - solar plages - satellites of planets - structure, phases and their features of moon. (6L)

UNIT IV : Stars

Constellations - binary stars - their origin and types star clusters –

Globular clusters - types of variable stars - types of galaxies. (7L)

UNIT V: Origin of Universe

Big bang theory - pulsating theory - steady state theory - composition of universe expansion(5L)

Books for study and Reference

1. K.D. Abhyankar, Astrophysics of the solar system, University press, India.
2. Baidyanath Basu, An introduction to Astrophysics, Prentice Hall of India, New Delhi.
3. Prof. P. Devadas, The fascinating Astronomy, Published by Devadas Telescopes, 2, Charkrapani Road, Guindy, Chennai.
4. Elements of Space Physics – R.P. Singhal, PHI.