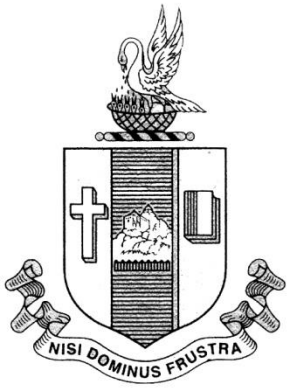
B.Sc. PHYSICS SYLLABUS

(UNDER CHOICE BASED CREDIT SYSTEM)

Applicable to the candidates admitted from 2018 onwards



PG & RESEARCH DEPARTMENT OF PHYSICS

BISHOP HEBER COLLEGE (AUTONOMOUS)

AFFILIATED TO BHARATHIDASAN UNIVERSITY

(NATIONALLY REACCREDITED AT THE 'A' GRADE BY NAAC WITH A CGPA OF 3.58 OUT OF 4)

RECOGNIZED BY UGC AS 'COLLEGE WITH POTENTIAL FOR EXCELLENCE'

TIRUCHIRAPPALLI – 620 017

B.Sc. Physics

Structure of the Curriculum (2018)

Parts of the curriculum	No. of Courses	Credits
Core	**8**	**39**
Elective	**3**	**15**
Project	**1**	**5**
Part I	**4**	**12**
Part II	**4**	**12**
NMEC	**2**	**4**
SBEC	**3**	**6**
Allied	**5**	**19**
Major Practical	**6**	**18**
Allied Practical	**1**	**3**
VLOC	**1**	**2**
Gender Studies	**1**	**1**
Env. Studies	**1**	**2**
Soft Skills	**1**	**1**
Extension Activities	**1**	**1**
Total	**42**	**140**

B. Sc. Physics

For the students admitted from the year 2018 onwards

Sem	Part	Course	Course Title	Course Code	Hours Per Week	Credits	Marks		
							CIA	ESE	Total
I	I	Tamil I /*	செய்யுள்,உரைநடை, மொழிப்பயிற்சி	U15TM1L1	6	3	25	75	100
	II	English	English for Communication and soft skills I	U16EG1L1	6	3	25	75	100
	III	Core I	Properties of Matter and Acoustics	U16PH101	6	5	25	75	100
		Core Prac. I	Major Practical – I	U16PH1P1	3	3	40	60	100
		Allied I	Algebra, Calculus and Analytical Geometry of Three Dimensions	U16MAY11	5	4	25	75	100
	IV	Env. Studies	Environmental Studies	U15EST21	2	2	25	75	100
		Val. Edu.	Value Education (RI / MI)	U14VL1:1/ U14VL1:2	2	2	25	75	100
II	I	Tamil II /*	செய்யுள்,சிறுகதைத்திரட்டு, மொழிப்பயிற்சி	U15TM2L2	6	3	25	75	100
	II	English II	English for Communication and soft skills II	U16EG2L2	6	3	25	75	100
	III	Core II	Mechanics	U16PH202	5	4	25	75	100
		Core Prac. II	Major Practical – II	U16PH2P2	3	3	40	60	100
		Allied II	Vector Calculus and Trigonometry	U16MAY22	4	4	25	75	100
		Allied III	Differential Equations, Laplace Transforms and Fourier Series	U16MAY23	4	4	25	75	100
	IV	SBEC I	Bio Physics and Biomedical Instrumentation	U16PH2S1	2	2	25	75	100
III	I	Tamil III/*	செய்யுள், நாவல், மொழிப்பயிற்சி	U15TM3L3	6	3	25	75	100
	II	English III	English for Competitive Examinations	U15EG3L3	6	3	25	75	100
	III	Core III	Thermal Physics	U16PH303	6	5	25	75	100
		Core Prac. III	Major Practical – III	U16PH3P3	3	3	40	60	100
		Allied IV	Allied Chemistry – I	U16CHY01	4	3	25	75	100
		Allied Prac.	Volumetric and Organic Analysis	U16CHYP1	3	-	-	-	-
	IV	NMEC I	Students have to opt from other major	-	2	2	25	75	100

IV	I	Tamil IV/*	செய்யுள், நாடகம், மொழிப்பியிற்சி	U15TM4L4	6	3	25	75	100
	II	English IV	English through Extensive Reading	U15EG4L4	6	3	25	75	100
	III	Core IV	Optics	U16PH404	6	5	25	75	100
		Core Prac. IV	Major Practical – IV	U16PH4P4	3	3	40	60	100
		Allied V	Chemistry for Physicist	U13CHY03	4	4	25	75	100
		Allied Prac.	Volumetric and Organic Analysis	U16CHYP1	3	3	40	60	100
	IV	NMEC II	Students have to opt from other major	-	2	2	25	75	100
		Soft Skills	Life Skills	U16LFS41	2	1	-	-	100
V	III	Core V	Electricity Magnetism and Electromagnetism	U16PH505	5	5	25	75	100
		Core VI	Basic Electronics	U16PH506	5	5	25	75	100
		Core Prac. V	Major Practical – V	U16PH5P5	6	3	40	60	100
		Core Project	Project	U16PH5PJ	5	5	-	-	100
		Elective I	Atomic Physics/ Communication Systems	U16PH5:1/ U16PH5:2	5	5	25	75	100
	IV	SBEC II	Concepts Through Animations (Theory and Practical)	U16PHPS2	2	2	25	75	100
		SBEC III	Web Designing (Theory and Practical)	U16PHPS3	2	2	25	75	100
VI	III	Core VII	Nuclear Physics, Wave Mechanics and Relativity	U16PH607	6	5	25	75	100
		Core VIII	Solid State Physics	U16PH608	6	5	25	75	100
		Core Prac. VI	Major Practical – VI	U16PH6P6	6	3	40	60	100
		Elective II	Digital Electronics / Crystal Growth and Thinfilm Physics/	U16PH6:1/U16PH6:2	6	5	25	75	100
		Elective III	Programming in C / Spectroscopy and Lasers	U16PH6:3/U16PH6:4	6	5	25	75	100
	V		Extension Activities Gender Studies			2 1			

*** Other Languages**	**Hindi**	**Sanskrit**	**French**		**Hindi**	**Sanskrit**	**French**
Semester I:	U14D1L1	U13SK1L1	U14FR1L1	**Semester III:**	U14HD3L3	U13SK3L3	U14FR3L3
Semester II:	U14D2L2	U13SK2L2	U14FR2L2	**Semester IV:**	U14HD4L4	U13SK4L4	U14FR4L4

Part I: 4	Core Theory: 8	Core Practicals: 6	SBEC: 3	Environemental Studies: 1	Extension Activities: 1	Total Courses: 42
Part II: 4	Elective: 3	Allied Theory: 5	NMEC: 2	Value Education: 1	Gender Studies: 1	
	Project-1	Allied Practicals: 1		Soft Skills: 1		

NMEC offered by the Dept.: 1. Simple Appliances– U16PH3E1		2. Audio and Video Systems – U16PH4E2

SBEC: Skill Based Elective Curses ***NMEC: Non Major Elective Courses*** ***Total credits:140***

CORE PAPER I: PROPERTIES OF MATTER AND ACOUSTICS

SEMESTER: I **CODE: U16PH101**

NO. OF HOURS: 6 **CREDITS: 5**

Objectives:

- To give an introduction to different properties of matter namely elasticity, mass, viscosity, surface tension.
- To introduce the concepts of gravitation and its applications.
- To understand the concepts of sound.

Unit 1: Elasticity

Stress–Strain – Hooke's law – Different modulii of elasticity – Young's modulus (E) – Rigidity modulus(G) – Bulk modulus(K) – Poisson's ratio – work done in linear, shearing and volume strain – Relation connecting elastic constants and Poisson's ratio – Twisting couple - work done in twisting a wire – Torsion – Torsional oscillations of a body – Rigidity modulus by Torsion pendulum – Bending of beams – Bending couple– Plane of bending – Neutral axis – Expression for bending moment – Cantilever depression and oscillation – Measurement of Young's modulus by non-uniform bending, uniform bending.

Unit 2: Gravitation

Newton's law of gravitation – Mass and density of earth – Inertial mass – Gravitational mass – Kepler's laws – Deduction of Newton's law from Kepler's laws – Boys method of finding G – Gravitational field – Intensity of gravitational field – Gravitational potential – Equipotential surface – Gravitational field and potential due to spherical shell – Gravitational field and potential due to solid sphere – Variation of acceleration due to gravity with latitude, altitude and depth – Escape velocity – Orbital velocity – Geostationary orbit – Satellite communication (Basic ideas only).

Unit 3: Viscosity

Viscosity – Streamline flow and Turbulent flow – Critical velocity – Expression for critical velocity – Reynold's number and its significance – Poiseuille's formula for the flow of a liquid through a capillary tube – Poiseuille's method for the determination of co-efficient of viscosity of a liquid (variable pressure head) – Terminal velocity – Stoke's method for the co-efficient of viscosity of a viscous liquid – Variation of viscosity with temperature and pressure – Friction and Lubrication.

Unit 4: Surface Tension

Surface tension – Molecular forces – Explanation of surface tension on the basis of kinetic theory – Work done in increasing the area of a surface – Angle of contact – Pressure difference across a liquid surface – Excess pressure inside a liquid drop, soap bubble and a curved liquid surface – Experimental determination of surface tension – Jaeger's method – Quincke's method – Drop weight method – Capillary rise method.

Unit 5: Acoustics

Composition of two simple harmonic motions along a straight line and at right angles to each other – Lissajou's figures – laws of transverse vibration – verification by sonometer and Melde's experiment.

Ultrasonics and Acoustics: Sound (types) – Production, properties and applications of Ultrasonics – Acoustics of buildings – Reverberation time – Sabine's formula – decibel – Intensity measurements and Doppler effect.

Books for Study:

1. R. Murugeshan, Properties of Matter, S. Chand and Co., New Delhi, 2004.
2. N. Subrahmanyam and Brij Lal, A Text Book of Sound, Vikas Publishing House Pvt. Ltd., New Delhi, 1999.
3. V. Rajendran and A. Marikani, Applied Physics, Tata Mcgraw Hill Publishing Co. Ltd, New Delhi, 2003.

Books for Reference:

1. Brij Lal and N. Subrahmanyam, Properties of Matter, Eurasia Publishing House Ltd., New Delhi,1993.
2. R.L. Saigal, Text book of Sound, S.Chand and Co., New Delhi, 1990.
3. D. S. Mathur, Elements of Properties of Matter, S. Chand & Co., New Delhi, 2008.
4. R.P. Feynman, Feynman Lectures on Physics, Vol-I, Pearson, New Delhi, 2009.
5. D. Halliday, R. Resnick and J. Walker, Fundamentals of Physics 6e, John Wiley & Sons, 2006.
6. Paul A. Tipler and G. Mosca, Physics for Scientist and Engineers, W.H.Freeman, New York, 2003.

CORE PAPER II: MECHANICS

SEMESTER: II **CODE: U16PH202**

NO. OF HOURS: 5 **CREDITS: 4**

Objectives:

- To understand various concepts of statics and hydrostatics.
- To study the projectile, dynamics of rigid bodies and simple harmonic oscillators.

Unit 1: Statics

Center of gravity – C.G. of solid hemisphere; hollow hemisphere; tetrahedron, hollow cone and solid cone - Friction – laws of friction – cone of friction – angle of friction – static and dynamic friction – equilibrium of a body on a rough inclined plane with and without the application of external force – friction clutch.

Unit 2: Dynamics

Projectile – Horizontal projection – Oblique projection – Path of a projectile – Resultant velocity – Time of flight – Vertical height – Range – Impulse and Impact – Laws of Impact – Direct and Oblique impact – Loss of kinetic energy due to direct impact and oblique impact – Motion of two interacting bodies - reduced mass.

Unit 3: Dynamics of Rigid Bodies

Moment of Inertia – Kinetic energy of rotating body and Angular momentum – Parallel and Perpendicular axes theorems – Moment of inertia of a thin uniform rod, rectangular lamina, sphere, shell, cylinder and fly wheel – Kinetic energy of a rolling body – body rolling down an inclined plane.

Unit 4: Simple Harmonic Motion

Definition – Theory of free vibrations - damped vibrations - forced vibrations – Resonance – Power dissipation and quality factor – Simple and Compound pendulum – reversibility of centre of oscillation and suspension – Determination of 'g' and radius of gyration of a compound pendulum – Kater's pendulum – Bessel's Modification.

Unit 5: Hydrostatics and Hydrodynamics

Fluid pressure and its properties – Thrust on plane and curved surfaces – Centre of pressure – Centre of pressure of irregular , rectangular and circular lamina – Equations of continuity of flow – Euler's equation for unidirectional flow –Bernoulli's theorem – Venturimeter- Pitot's tube - Torricelli's theorem.

Books for Study:

1. M. Narayanamoorthy and N. Nagarathnam, Statics, Hydrostatics and Hydrodynamics, The National Publishing Company, Chennai, 1989.
2. M. Narayanamoorthy and N. Nagaratnam, Dynamics, The National Publishing Company, Chennai, 2002.

Books for Reference:

1. D.S. Mathur, Mechanics, S. Chand and Co., Ltd., New Delhi, 2000.
2. R.P. Feynman, Feynman Lectures on Physics, Vol- I, Pearson, New Delhi, 2009.
3. D. Halliday, R. Resnick and J. Walker, Fundamentals of Physics 6e, John Wiley & Sons, 2006.
4. Paul A. Tipler and G. Mosca, Physics for Scientist and Engineers, W.H. Freeman, New York, 2003.

CORE PAPER III : THERMAL PHYSICS

SEMESTER III **CODE : U16PH303**

NO. OF HOURS: 6 **CREDITS: 5**

Objectives:

- To introduce the laws of thermodynamics
- To study the production and applications of low temperature physics
- To acquire knowledge about classical and quantum theory of Radiation
- To introduce the theory of specific heat
- To understand the basics of statistical Mechanics

Unit 1: Thermodynamics

Thermodynamic system – Zeroth law – Concept of heat and work –Internal energy- First law of thermodynamics – Applications – Gas equation during adiabatic process – Work done during an isothermal process – Work done during an adiabatic process – Reversible process – Irreversible process – Second law of thermodynamics – Carnot's theorem – Internal Combustion engine (Petrol Engine)-Concept of entropy - Change of entropy in reversible process – Irreversible process – Third law of thermodynamics - Temperature entropy diagram.

Unit 2 : Low Temperature Physics

Joule Thomson (Kelvin) effect – Production of low temperature –Theory of Porous plug experiment – Liquefaction of gases (LPG) – Adiabatic expansion process - Linde's air liquefier – Liquefaction of Helium and Hydrogen – adiabatic demagnetization – Practical application of low temperature – Refrigeration machine – Electrolux refrigerator – Air conditioning machines.

Unit 3: Radiation

Radiation – Stefan's Boltzmann law – Experimental determination of Stefan's constant - Blackbody radiation – Distribution of energy in Black body spectrum - Rayleigh Jean's law – Wien's Displacement Law - Planck's law derivation – Bolometer - Disappearing filament optical Pyrometer – Solar constant – Angstrom's Pyrheliometer.

Unit 4: Specific Heat

Specific heat of solids – Dulong and Petit's law– Einstein's theory of specific heat – Debye's theory – Specific heat of gases – Determination of C_P by Ragnault's method - Variation of specific heat of diatomic gases with temperature – Newton's law of cooling – Specific heat of liquid – Joule's method.

Unit 5 : Statistical Mechanics

Phase space – Microstates – Macrostates – Statistical Equilibrium - Probability theorems in statistical thermodynamics – Maxwell-Boltzmann distribution - Ideal gas – Fermi-Dirac distribution – Electron gas – Bose-Einstein distribution – Photon gas.

Books for Study:

1. Brij Lal, N. Subrahmanyam and P.S. Hemne, Heat, Thermodynamics and Statistical Physics, S. Chand and Co., New Delhi, 2014.

Books for Reference:

1. D.S. Mathur, Heat and Thermodynamics, S. Chand and Co., New Delhi, 2007.
2. Sathya Prakash and J.P. Agarwal, Statistical Mechanics, Kedarnath Ramnath & Co., Meerut, 2003.
3. D. Halliday, R. Resnick and J. Walker, Fundamentals of Physics 6e, John Wiley & Sons, 2006.

CORE PAPER IV : OPTICS

SEMESTER IV **CODE :U16PH404**

NO. OF HOURS: 6 **CREDITS: 5**

Objectives:

- To study the aberration in lenses.
- To study in detail about interference, diffraction, polarization.
- To study the working of optical instruments.

Unit 1: Interference

Principle of Superposition – Interference – Theory of interference - Young's Double slit experiments – Fresnel biprism – Experimental arrangement – Determination of wavelength of light - plane parallel film - Interference due to reflected light - Variable thickness film (Air wedge) - Theory of Newton's Rings - Michelson interferometer and its applications – Determination of wavelength and thickness of thin transparent sheet – Fabry-Perot interferometer - Determination of wavelength and difference in wavelength.

Unit 2: Diffraction

Huygen – Fresnel's theory - Half period zones – Types of diffraction - Fresnel's diffraction – Diffraction at a circular aperture - straight edge – Fraunhofer diffraction at a single slit (calculus method) – Double slit – Missing order in a double slit - diffraction pattern – N slits (calculus method)- Plane diffraction grating with theory-Standardization of the grating and Determination of wavelength.

Unit 3: Polarization

Polarization - Plane of polarization and vibration-Superposition of linearly polarized waves at right angles - Types of polarization - Double refraction – Huygen's explanation – Nicol prism – Double image polarizing prism - Production and Detection of plane, partially, elliptically and circularly polarized lights – Quarter wave plate – Half wave plate – Babinet's compensator – Optical activity – Laurents half shade polarimeter – Specific rotatory power.

Unit 4: Lens Aberrations

Aberrations - First order theory - Types of Aberrations – Spherical aberration–Methods of reducing spherical aberration - Coma – Aplanatic points – Astigmatism – Curvature of the field – Meniscus lens – Distortion – Chromatic aberration – Gradient index lens (GRIN).

Unit 5: Optical Instruments

Objective and Eye piece - Huygens's eyepiece - Ramsden's eyepiece - Resolving power – Rayleigh's criterion of resolution – Resolving power of a telescope, microscope, prism – Dispersive power and resolving power of a grating – the Echelon grating.

Books for Study:

1. Brij Lal, Avadhanulu and N. Subrahmanyam, A Text Book of Optics, S. Chand and Co., New Delhi, 2012.
2. Ajoy Ghatak, Optics 5e, Mcgraw Hill Education, New Delhi, 2012.

Books for Reference:

1. Singh Devraj, Fundamentals of Optics, Prentice Hall India, New Delhi, 2010.
2. E. Hecht, Optics 4e, Addison Wesley Publishing, CA, 2016.

CORE PAPER - V: ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM

SEMESTER: V **CODE: U16PH505**

NO. OF HOURS: 5 **CREDITS: 5**

Objectives:

- To enable the students to understand the fundamentals of electricity, magnetism and electromagnetism.
- To give an introduction to electromagnetic theory based on Maxwell's equations.

Unit 1: Electrostatics

Coulomb's inverse square law – Gauss theorem & its applications - intensity at a point due to a charged sphere and cylinder – Principle of a capacitor – Capacity of spherical and cylindrical capacitors – Parallel plate capacitor – Effect of introduction of a dielectric - Energy stored in a capacitor – Loss of energy due to sharing of charges.

Unit 2: Magnetic effect of current

Magnetic flux, magnetic induction – relation – Ampere's force law – Biot Savart's law – direction of magnetic field – magnetic induction on the axis of a circular coil carrying current – magnetic field inside a long solenoid, toroid – Lorentz force on a moving charge – direction of force – torque on a current loop in a uniform magnetic field – moving coil Ballistic Galvanometer (BG) – theory – experiment to find the figure of merit

Unit 3: Electromagnetic induction

Laws of electromagnetic induction – self induction – self induction of a solenoid – determination of self inductance – Anderson's method – mutual induction– coefficient of coupling – determination of mutual inductance using B.G –Magnetisation – permeability and susceptibility – relation between M, B and H – Theory of Hysteresis – B–H curve by Ballistic method – Energy dissipation.

Unit 4: AC Circuits

AC – average and rms value – AC through L and R in series vector diagram method – AC through C and R in series vector diagram method – AC through L and C in series vector diagram method – LCR series and parallel circuit – sharpness of resonance – Q factor, Power factor, choke coil.

Unit 5: Maxwell's equation and electromagnetic waves

Fundamentals of electromagnetism – Modification of Ampere's circuital law – The concept of displacement current – Maxwell's equations – Electromagnetic wave equation in free space and dielectric – Plane wave solutions - Energy in electromagnetic waves – Poynting vector - Energy transport.

Books for Study:

1. Brij Lal and N. Subrahmanyam, Electricity and Magnetism, Ratan Prakashan Mandir, Agra, 1995.
2. R. Murugeshan, Electricity and Magnetism, S. Chand and Co., New Delhi, 2005.

Books for References:

1. D. N. Vasudeva, Fundamentals of Magnetism and Electricity, S. Chand & Co, 2007.
2. N.K. Sehgal, K.L. Chopra and D.L. Sehgal, Electricity and Magnetism, Sultan Chand and Sons, New Delhi, 2004.
3. K.K. Tiwari, Electricity and Magnetism, S. Chand and Company, New Delhi, 2002.
4. David J. Griffith, Introduction to Electrodynamics, Prentice Hall of India, 1999.
5. Paul A. Tipler and G. Mosca, Physics for Scientist and Engineers, W.H.Freeman, New York, 2003.

CORE PAPER VI: ELECTRONIC DEVICES

SEMESTER : V **CODE : U16PH506**

NO. OF HOURS: 5 **CREDITS: 5**

Objectives

- To study the construction and working of electronic devices.
- To study the applications of electronic devices.

Unit 1: Semiconductors and Diodes:

Metals, Insulators and semiconductors – Intrinsic and Extrinsic semiconductors – PN Junction – Junction theory – V-I characteristics of a PN Junction diode – Use of Diode – Half wave – full wave and Bridge Rectifier – Performance of Half wave and full wave rectifier - filter – Shunt capacitor filter – π filter – LC filter.

Unit 2: Transistor (BJT & FET)

Junction transistor structure – Action of a transistor – working of a transistor – Three configuration of transistors (CB, CE and CC) - CE amplifier circuit – Biasing and DC load line – JFET – Structure – Characteristics – Parameters.

Unit 3: Small – Single Amplifiers and Power Amplifiers (BJT)

Single stage transistor Amplifier – Graphical Method - Equivalent Circuit Method - Need for Power Amplifier – Voltage Amplifier Vs Power Amplifier - Power loss – Push Pull Amplifier – Distortion – Advantages.

Unit 4: Feedback in Amplifier and Oscillator (BJT)

Feed back in Amplifier – types of feedback – Voltage feedback Amplifier – Barkhausen criterion - Negative feedback – RC Coupled Amplifier – classification of oscillators - positive feedback - amplifier as an oscillator – LC, Tuned collector, Hartley, Colpitt's , Phase shift and Wien bridge Oscillators.

Unit 5: Operational Amplifier

Op – Amp characteristics - concept of virtual ground – Inverting – Non Inverting Amplifiers – Scalar – Adder – Subtractor – Integrator – differentiator – Comparator – D/A Conversion – Binary weighted and R-2R Ladder Method - A/D Successive Approximation Method – Active Filters (First order low pass and high pass).

Books for Study:

1. N.N. Bhargava, D.C. Kulshreshtha and S.C. Gupta, Basic Electronics and Linear Circuits, McGraw Hill Education (India) Private Limited, New Delhi, 2015.
2. V.K. Mehta, Rohit Mehta, Principles of Electronics 7e, S Chand, New Delhi, 2005.

Books for References:

1. M.C. Gupta, Principles of Electronics, Dhanpat Rai and Sons, New Delhi, 1997.
2. T. L. Floyd, Electronic Devices, Pearson Education, New York, 2004.
3. David A. Bell, Electronic Devices and Circuits, Oxford University Press, New Delhi, 2008.

CORE PAPER VII: NUCLEAR PHYSICS, WAVE MECHANICS AND RELATIVITY

SEMESTER: VI **CODE : U16PH607**

NO. OF HOURS: 6 **CREDITS: 5**

Objectives:

- To deal with the fundamental properties of nucleus and their models.
- To give an introduction to particle physics.
- To introduce the basic concepts of quantum mechanics.
- To introduce the basic concepts of relativity.

Unit 1: Properties of nucleus and elementary particles

Basic properties of nucleus – Classification of nuclei - Properties of nuclei - Binding energy – Stability of nuclei - GM counter – Wilson's cloud chamber - Photographic emulsion techniques - Classification of subatomic particles– Antiparticles – Strangeness – Isospin – Hypercharge - quarks and their quantum numbers.

Unit 2: Nuclear models and energy

Liquid drop model– Shell model – Magic numbers - Nuclear reaction– Types of nuclear reaction – Nuclear fission – Bohr and Wheeler's theory of nuclear fission – Energy released in fission – Q value – Nuclear reactor (basic ideas only) – Atom bomb – Nuclear fusion - Thermonuclear reactions – Source of stellar energy.

Unit 3 : Dual nature of matter

Planck's hypothesis – Derivation of Planck's law of radiation – de–Broglie waves (Duality) – Wave packet, phase and group velocities – Davisson and Germer experiment – G.P. Thomson experiment – Uncertainty principle – Gamma ray microscope – Electron microscope.

Unit 4: Schrödinger equation and its applications

Postulates of wave mechanics – Derivation of Schrödinger wave equation (time dependent and time independent forms) – Significance of wave function – conservation of total probability - Particle in an infinite one dimensional square well potential –One dimensional harmonic oscillator – Zero point energy.

Unit 5: Relativity

Newton's laws and their limitations – Concept of space, time and mass - Inertial frames – Galilean transformations – Michelson-Morley experiment and its importance – Einstein's postulates – Lorentz transformations – Addition of velocities - Length contraction – Time dilation - Variation of mass with velocity – Einstein's mass energy relation.

Books for Study:

1. R. Murugeshan and Kiruthiga Sivaprasath, Modern Physics, S. Chand & Co. Ltd, New Delhi, 2014.
2. Arthur Beiser and Shobit Mahajan, Concepts of Modern Physics, Tata McGraw Hill, 2009.

Books for References:

1. J.B. Rajam, Modern Physics, S. Chand & Co. Ltd, New Delhi, 1967.
2. D.C. Tayal, Nuclear Physics, Himalaya Publication, Mumbai, 1998.

3. P.M. Mathews and K. Venkatesan, Quantum Mechanics, Tata McGraw Hill, 2009.
4. Paul A. Tipler and G. Mosca, Physics for Scientist and Engineers, W.H. Freeman, New York, 2003.

CORE VIII: SOLID STATE PHYSICS

SEMESTER: VI **CODE : U16PH608**

NO. OF HOURS: 6 **CREDITS: 5**

Objectives:

- To introduce the concepts of Crystallography, bonding, structure and properties of crystals.
- To impart knowledge on semiconductor, super conductivity and their applications.

UNIT 1: Crystal Structure

Crystalline and amorphous solids – Basis and crystal structure – Crystal translation vectors – Symmetry operations – Unit cell and primitive lattice cell – Symmetry elements – Point groups and space groups – Bravais lattices – Miller indices - Number of atoms per unit cell – Coordination number – Atomic packing – Atomic radius – Simple cubic structure – Body centered cubic structure – Face centered cubic structure – Hexagonal close packed structure – Structure of NaCl and Diamond.

UNIT 2: Bonding in Solids

Ionic Bonding – Energy of formation of NaCl molecule – Potential energy diagram of ionic molecules – Born-Haber cycle – Characteristics of ionic bond – Covalent bond – Characteristics of covalent bond – Metallic Bond – Characteristics of metallic crystals – Cohesive energy of metals – Molecular bond – Types – van der Waal's bond – Dipole bond – Hydrogen bond – Characteristics of molecular bond – Comparison of bonds.

UNIT 3: Electron Theory of Metals

Free electron theory – Effect of impurity and temperature on electrical resistivity - Limitations of the free electron model - Fermi-Dirac distribution - Fermion – Free

electron gas - Drude-Lorentz electron theory – Electrical conductivity – Thermal conductivity – Wiedemann and Franz law – Electrical resistivity versus temperature – Sommerfeld model.

UNIT 4: Semiconductors

Semiconductors – Chemical bonds – Mechanism of current flow – Forbidden, valence & conduction bands – Intrinsic and extrinsic semiconductors - carrier concentration for intrinsic and extrinsic semiconductors –Impurity states - Energy band diagram – Fermi level - Mobility, drift velocity, conductivity in semiconductors – Drift and diffusion current – Hall effect.

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UNIT 5: Superconductivity

Experimental survey – Critical field – Properties of superconductors – Meissner effect – Type-I and type-II superconductors – Thermodynamic effects (Qualitative study) – Energy gap – London equations – BCS theory – High temperature superconductors – Application of superconductors.

Books for Study:

1. S.L. Gupta and V. Kumar, Solid State Physics, K. Nath & Co., Meerut, 2013.
2. S.O. Pillai, Solid State Physics 8e, New Age International, 2018.

Books for References:

1. Charles Kittel, Introduction to Solid State Physics 8e, Wiley India Pvt. Ltd., New Delhi, 2012.
2. R. L. Singhal, Solid State Physics, Kedar Nath Ram Nath & Co., Meerut, 2012.
3. Neil W. Ashcroft and N. David Mermin, Basic Solid State Physics, Brooks/Cole Publishing Company, CA, USA, 1976.
4. A. Raychaudhuri, Basic Solid State Physics, Sarat Book House, Kolkata, 2014.
5. V. Rajendran and A. Marikani, Applied Physics, Tata Mcgraw Hill Publishing Co. Ltd, New Delhi, 2003.
6. S. O. Kasap, Principles of Electronic Materials and Devices, Mcgraw-Hill Education, Dubuque, 2017.

ELECTIVE I: ATOMIC PHYSICS

SEMESTER: V **CODE : U16PH5:1**

NO. OF HOURS: 5 **CREDITS: 5**

Objectives:

- To study the concepts of positive rays
- To study atomic models, spectral lines and X ray spectra
- To understand the concept of photo electric effect and its applications.

Unit 1: Positive ray analysis

Properties– e/m of positive rays – Thomson's parabola method - Aston's Mass spectrograph, Bain bridge mass spectrograph – Excitation and Ionisation Potential - Atomic Excitation – Experimental Determination of critical potential – Frank and Hertz experiment.

Unit 2: Atom models

Bohr's atom model – Hydrogen spectra - Sommerfeld's relativistic atom model – Elliptical orbits – Relativistic variation of electronic mass – Vector atom model – Spatial quantization – Spinning electron hypothesis – Quantum numbers – electronic configuration and classification of elements – Magnetic dipole moment of electron – Stern and Gerlach experiment.

Unit 3: Fine structure and spectral lines

Spectral terms and notation – selection rules – fine structure of D lines – explanation for splitting of D_1 and D_2 lines – alkali spectra – fine structure – Zeeman effect – Larmor's theorem – Debye's quantum mechanical explanation of normal Zeeman effect – Anomalous Zeeman effect – theoretical explanation – Lande's g factor– Paschen Back effect.

Unit 4: Photo electricity

Photo electric effect – Lenard's experiment – Richardson and Compton experiment – Einstein's photoelectric equation – Verification by Millikan's experiment –

Determination of Planck's constant – Photo voltaic cells – Photo conductive cells – Photo emissive cells - Photo multiplier – Applications.

Unit 5: X–Rays

X-ray Spectra - Continuous and characteristic X–ray spectrum – Moseley's law and its importance - Bragg's law – Bragg's X–ray diffractometer - Powder crystal method – Laue Method - Rotating Crystal Method – Compton effect – Derivation of expression for change in wavelength – Experimental verification.

Books for Study:

1. R. Murugesan, Modern Physics, S. Chand & Co. Ltd., New Delhi, 2003.
2. Arthur Beiser and Shobit Mahajan, Concepts of Modern Physics, Tata McGraw Hill, 2009.

Books for References:

1. Brij Lal, N. Subrahmanyam and Jivan Seshan, Atomic and Nuclear Physics, S. Chand, New Delhi, 2006.
2. J.B. Rajam, Atomic Physics 7e, S. Chand and Co., New Delhi, 2004.

ELECTIVE I: COMMUNICATION SYSTEM

SEMESTER: V **CODE: U16PH5:2**

NO. OF HOURS: 5 **CREDITS: 5**

Objectives:

- To give an introduction to different aspects of communication.
- To make the students familiar with fiber optical communication.

Unit 1: Basics of Communication

Communication systems – modulation - need for modulation - bandwidth requirements- noise - thermal noise - noise calculations - signal to noise Ratio - noise figure - calculation of noise figure - measurement of noise figure.

Unit 2: **Analog Communication**

Amplitude modulation - frequency spectrum of AM wave - power relations in the AM wave - frequency modulation - mathematical representation of FM - frequency spectrum - phase modulation - comparisons: frequency and phase modulation, frequency and amplitude modulations.

Unit 3: **Pulse Communication**

Importance of pulses in Digital communication – Pulse communication – pulse modulation types: pulse amplitude modulation – pulse width modulation – pulse position modulation – pulse code modulation – telegraphy - telemetry.

Unit 4: Data Communication

Data communication systems - data transmission circuits - error detection and correction - interconnection requirements - modern classification- network and control considerations.

Unit 5 : Fiber Optical Communication

Optical fiber cables – types - losses in fibers - measurements of fiber characteristics - analog and digital modulation schemes - fiber optical communication systems - operating wavelength - emitter design - detector design - fiber choice.

Books for study:

1. George Kennedy, Electronic Communication System, McGraw-Hill International Editions, 1987.
2. G. Jose Robin and A. Ubald Raj, Communication Electronics, Indira Publications, Martandam, 2002.

Books for reference:

1. John Gowar, Optical Communication Systems, Prentice Hall India, New Delhi, 1993.
2. Gerd Keiser, Optical Fiber Communications, McGraw Hill, Singapore, 2000.
3. Joseph C. Palais, Fiber Optic Communications, Prentice Hall International, USA, 2001.
4. B. P. Lathi, Communication systems, Wiley Eastern Ltd, New Delhi, 1968.
5. J.F.B. Hawkes, Optoelectronics: An Introduction, J. Wilson, Prentice Hall of India, 1992.

ELECTIVE II : DIGITAL ELECTRONICS

SEMESTER: VI **CODE: U16PH6:1**

NO. OF HOURS: 6 **CREDITS: 5**

Objectives:

- To introduce the different number system and to give a description on logic gates and Boolean algebra.
- To give a detailed description of combinational and sequential logic systems and their application to microprocessor.

Unit 1: Number System and Logic Gates

Binary, octal, decimal and hexadecimal number system – conversion from one number system to another–BCD code – Excess 3 code – Gray code – subtraction by 1's and 2's complement - Boolean algebra – Basic laws of Boolean algebra – Duality theorem - De Morgan's theorems – Basic logic gates using IC components & discrete components – NAND & NOR as universal gates.

Unit 2: Simplification of Boolean Expressions

Introduction to combinational logic circuits – sum of product (SOP) and product of sum (POS) forms of expressions – Minterms and Maxterms - Reducing Boolean expressions using Boolean laws – Karnaugh map – pairs, quads, octets – 2,3 and 4 variables — SOP and POS methods.

Unit 3: Combinational Logic

Half adder – Full adder – Half subtractor – Full subtractor – BCD adder – BCD subtractor - Encoder – 8 line to 3 line encoder – 16 line to 4 line encoder - Decoder – 3 line to 8 line decoder – 4 line to 16 line decoder - Multiplexer – 4 input data multiplexer – 8 input data multiplexer – Demultiplexer – 1 line to 2 line demultiplexer – 1 line to 4 line demultiplexer.

Unit 4: Sequential Logic

R-S flip-flop using universal gates – Clocked R-S flip-flop - D flip-flop – T flip-flop – J-K flip flop - Master Slave J-K flip-flop - 4 bit register using flip-flop – Controlled Shift Register – Counters – Up Counters – Down Counters – Ring Counters – Johnson counter – Decade, Mod-N Counter.

Unit 5: 8085 Microprocessor

Architecture – Instruction set – Addressing modes – Types of instruction - Assembly language programming – Programs for 8-bit addition, subtraction, multiplication, division – sum of N numbers – biggest and smallest number in an array - ascending and descending order of numbers.

Books for Study:

1. V. Vijayendran, Introduction to Integrated Electronics: Digital and Analog, S. Viswanathan Printers & Publishers Pvt. Ltd., 2008.
2. D. Leach and A. Malvino, Digital Principles and Applications, Tata McGraw Hill, New Delhi, 1991.
3. William H. Gothmann, Digital Electronics, Prentice Hall of India, New Delhi, 2006.
4. B. Ram, Fundamentals of Microprocessors and Microcontrollers, Dhanpat Rai, New Delhi, 2012.
5. A. Gaonkar, Microprocessor Architecture Programming and Application with 8085/8085, Wiley Eastern Ltd, London, 2000.

Books for References:

1. M. Morris Mano, Digital Logic and Computer Design, Prentice Hall, New Delhi, 1999.
2. Albert Paul Malvino, Digital Computer Electronics, McGraw Hill, New Delhi, 2000.

ELECTIVE II : CRYSTAL GROWTH AND THIN FILM PHYSICS

SEMESTER: VI **CODE: U16PH6:2**

NO. OF HOURS: 6 **CREDITS: 5**

Objective

- To acquire knowledge about basics of growing crystals and preparing thin films by different techniques.

Unit 1: Basics of Crystal Growth

Types of crystals - Nucleation – Different types of nucleation - Concept of formation of critical nuclei – Significance of single crystals – Oxide materials and its applications – Semiconducting materials and its applications – nonlinear materials and their applications

Unit 2: Crystal Growth Techniques

Low Temperature solution growth technique

Solution - Solubility and super solubility – Expression of super saturation – Miers T-C diagram - Constant temperature bath and crystallizer - Seed preparation and mounting - Slow cooling and solvent evaporation methods (Basic concept only).

Gel Growth Technique:

Principle – Various types – Structure of gel (SMS: sodium metasilicate) – Importance of Gel – Experimental procedure – Advantages of gel method.

Unit 3: Other Crystal Growth Techniques

Melt technique:

Bridgman technique - Basic process – Various crucibles design - Czochralski technique – Experimental arrangement – Growth process.

Vapour technique:

Physical vapour deposition – Chemical vapour deposition (CVD) – Chemical Vapour Transport (Basic concept only).

Unit 4 : Thin Film Deposition Techniques

Introduction to Thin Film Deposition Techniques – Classification – Physical Methods – Electron Beam Evaporation - Reactive Sputtering – pulsed laser deposition - Chemical Methods – Chemical bath deposition - Spray Pyrolysis – Electro Deposition.

Unit 5: Applications

Thin film – Thermodynamics and nucleation - Growth Kinetics of Thin Films – Crystal Growth process in thin films – Epitaxial growth of thin films (Basic concepts only) – Applications – Discrete resistive components – Resistors – Carbon thin films – Oxide and Nitride films – metal films – thermistor – strain gauge element – capacitor – Hall probe element – Active devices – micro electronics – Integrated circuits and other applications.

Books for Study:

1. P. Santhana Ragavan and P. Ramasamy, Crystal Growth Processes and Methods, KRU Publications, Kumbakonam (2001).
2. Milton Ohring, Material Science of thin films,
3. A. Goswami, Thin Film Fundamentals, New Age International (P) Limited, New Delhi (2006).

Books for References:

1. J.C. Brice, Crystal Growth Processes, John Wiley and Sons, New York (1986)
2. Kasturi L. Chopra, Thin film Phenomena, McGraw Hill Book Company(1969)

ELECTIVE III : PROGRAMMING IN C

SEMESTER: VI **CODE: U16PH6:3**

NO. OF HOURS: 6 **CREDITS: 5**

Objectives:

- To acquire knowledge about the computer language C and its functions.
- To enable the students to develop C program on their own.

Unit 1: Introduction to C

Importance of C – Basic structure of C Programs – Character set, Keywords and Identifiers – Constants – Variables – Data Types – Declarations of Variables – Assigning values of variables.

Operators and Expressions: Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional, Bitwise, Comma Operators – Arithmetic expressions – Precedence and Associativity.

Unit 2: Control Structures

Input Output Operator: getchar, putchar, formatted output (printf) and formatted input (scanf).

Control Structure: Simple if statement – if else – Nesting of if else – if else ladder– switch - the break and continue statements – goto – while statement – do-while statement – for – Nesting – Jump in loops.

Unit 3: Arrays and Structures

Introduction – one dimensional array – two dimensional arrays – declaring arrays, storing arrays in memory – initializing arrays.

Structure definition – structure initialization – arrays within structure – structure within structure – structures and functions – unions.

Unit 4: Functions

Introduction– need for function–form of function– return values and their types – calling a function– category of functions– No argument no return values – arguments

but no return values – arguments with return values - Nesting of functions– recursion – function with arrays.

Unit 5: Pointers and Files

Introduction to pointers – declaring pointer variables – initialization of pointer variables.

Files – definition, opening and closing of files -input/ output operations on files.

To write C programs for the following:

1. Arranging words in Alphabetical order
2. Percentage of marks for five subjects.
3. Conversion of Fahrenheit to Celsius.
4. Solving quadratic equation.
5. Finding factorial using recursion.
6. Addition / Multiplication / Subtraction of two matrices.
7. Smallest and largest element in an array.
8. Sorting a set of numbers in ascending/descending order.

Book for Study:

1. E. Balagurusamy, Programming in ANSI C, Tata McGraw Hill, New Delhi, 2016.

Books for Reference:

1. Byron S. Gottifried, Schaum's Outline of Theory and Problems of Programming with C, McGraw Hill, New Delhi, 2010.
2. Kr. Venugopal and Sudeep R. Prasath, Programming with C, Tata McGraw Hill Publishing, New Delhi, 2016.

ELECTIVE III: SPECTROSCOPY AND LASERS

SEMESTER: VI **CODE: U16PH6:4**

NO. OF HOURS: 6 **CREDITS: 5**

Objectives:

- To understand the basic concepts of microwave, IR and Raman spectroscopy and the associated measurement techniques.
- To study the fundamentals of laser and its applications.

Unit 1: Introduction to Spectroscopy and Microwave Spectroscopy

Electromagnetic spectrum - Characteristics of electromagnetic radiation — Basic elements of practical spectroscopy – Width of spectral lines- Intensity of spectral lines –Rotation of molecules – Rotational Spectra – The rigid diatomic molecule – The intensities of spectral lines – Techniques and Instrumentation (outline)- Chemical analysis by microwave spectroscopy.

Unit 2: Infrared spectroscopy

The energy of a diatomic molecule – The simple harmonic oscillator – The diatomic vibrating rotator – The vibration – rotation spectrum of CO and CO_2 – The interaction of rotations and vibrations – Techniques and instrumentation (outline) – Double and single beam operation.

Unit 3: Raman Spectroscopy

Raman effect - molecular polarizability – Pure rotational Raman spectra of linear molecules – Vibrational Raman spectra – Structure determination from Raman and IR spectroscopy - Techniques and instrumentation (outline)

Unit 4: Fundamentals of Laser

Basics of laser – Importance of Energy levels – Absorption and emission of light – Einstein's coefficients - Population inversion – Pumping methods – Active medium – Metastable states – two and three level lasers – optical amplifier and resonator.

Unit 5: Types of lasers and applications

He-Ne Laser – Carbon-di-oxide Laser – Excimer lasers - ND:YAG laser – Semiconductor lasers – Holography (construction and deconstruction) – Fibre optics.

Books for study:

1. C.N. Banwell, Fundamentals of Molecular Spectroscopy, Tata McGraw Hill, New Delhi, 1993.

Books for Reference:

1. A. K. Ghatak and K. Thyagarajan, Lasers Theory and Applications, Macmillan, Chennai, 1981.
2. William T. Silfvast, Laser Fundamentals 2e, Cambridge University Press, London, 2004.

SBEC – I: BIOPHYSICS AND BIOMEDICAL INSTRUMENTATION

SEMESTER: II **CODE: U16PH2S1**

NO. OF HOURS: 2 **CREDITS: 2**

Objectives

- To understand the underlying physical principles of the biological phenomena
- To gain the knowledge about the design and functioning of various Biomedical instruments

Unit 1: Introduction to Biophysics

Macromolecules: Introduction – Nucleic acid and chemical structure – Conformational possibilities of monomers and polymers – The double helical structure of DNA – Polymorphism of DNA – Amino acids and primary structures of proteins – The peptide bond and secondary structure of proteins

Unit 2: Bio-potential Sensors (Electrodes and Transducers)

Basic design of medical instruments - Components of biomedical instrument system - Electrodes – Transducers

Unit 3: Biosignal Acquision

Introduction – Physiological signal amplifier – Isolation amplifier – Medical amplifier– Bridge amplifier – Current amplifier – Chopper amplifier – Biosignal analysis – Signal analysis and data acquisition

Unit 4: Bio-potential Recorders

Introduction - Characteristic of recording system - ECG, EEG, EMG, ERG, and EOG - block diagram, construction, working, application and limitations - Accuracy and analysis medical instruments

Unit 5: Physiological assist devices

Introduction – Pacemaker - Artificial heart valves – Defibrillators – Nerves and muscular stimulators – Heart- lung machine - Kidney machines

Books for Study

1. M. Arumugam, Biomedical Instrumentation, Anuradha Publications, 2006.
2. Vasantha Pattabhi and N. Gautham, Biophysics, Kluwer Academic Publishers, New York, 2002.

Books for References

1. Joseph J. Carr and John M. Brown, Introduction to Biomedical Equipment Technology, Pearson Education, 2001.
2. Thomas E. Creighton, Proteins: Structures and Molecular properties, W.H. Freeman Publisher, 1993.
3. D. Kipke, Biomedical Instrumentation and Design Winter (Revised from M.O'Donnell), 2002.
4. Leonard Banaszak, Foundations of Structural Biology, Academic Press, 2000.

SBEC II: CONCEPTS THROUGH ANIMATIONS
(THEORY AND PRACTICAL)

SEMESTER: V **CODE: U16PHPS2**

NO. OF HOURS: 2 **CREDITS: 2**

Objectives:

- To introduce flash package and to explain flash oriented physics animations.
- To expose Photoshop tools to prepare physics oriented objects.
- To describe the premier package for editing and publishing a movie.

Unit 1: Animations with Flash

Creating a new animation file – insertion of content in frames – add and delete frames and key frames – creating frame by frame animation – preview and testing of animation – create motion and path animations – usage of layers.

Unit 2: Enhancing animations

Recording a sound file – editing a sound file – importing sound into an animation program – adding sound and text to animation – animating text - adding buttons to animation – action scripts to control an animation.

Unit 3: Introducing Photoshop 7.0

Introduction – opening and finding images – creating a new file – the tool box – options bar - Layers - Exploring layers - creating layers - deleting layers - renaming layers - linking layers – adjustment and merging layers – creating a type layer

Unit 4: Creating images for web page with Photoshop

Image dimensions – converting images – rotating and flipping the canvas – cropping using marquee - Drawing and Painting – Fore and background colour – lifting – using shape and line tools – using brush tool – using pencil tool – using paint bucket tool – using eraser tool.

Unit 5: Working with video using premier

Capturing video from a camera – importing video from other digital sources – editing a video – adding effects – adding transitions – adding titles – adding audio tracks.

Practicals: Physics based experiments will be given on which the practicals has to be done.

1. Create and animate a new project file.
2. Sizing the stage and adding background.
3. Recording and importing a sound file.
4. Insertion of sound files into an animation program.
5. Capturing and importing a video file. (Basic physics laws)
6. Editing and adding effects to a video file.
7. Editing a picture.
8. Draw and paint – Simple circuits.

Book for Study:

1. Daven Brown and et.al., Adobe – Web Development for the Designer, Macmillan, 1997.
2. S. Weixel, J. Fulton, K. Barkslade, C. B. Morse and B. Morse, Multimedia Basics, Eswar Press, Chennai, 2004.

SBEC III: WEB DESIGNING

(THEORY AND PRACTICAL)

SEMESTER: V **CODE: U16PHPS3**

NO. OF HOURS: 2 **CREDITS: 2**

Objectives:

- To develop computer knowledge and to impart designing skill through the webpage.
- To publish physics related concepts through the webpage.

Unit 1: Creating a webpage

Web organization – finding websites and webpages – display HTML source code – create HTML web site folders – view a webpage – modify a webpage – format text with HTML tags

Unit 2: Formatting and linking web site pages

Structure of website – centre text – add horizontal line to a webpage - changing font face – create hyperlinks on webpages – create a bulleted list – create a numbered list – create multi pages for a website

Unit 3: Animating webpages

Change text colour – change background colour – experiment with website colours – change hyperlink colours – acquire and insert graphics – allign graphics relative to text – format a graphic as a hyperlink – change graphic border

Unit 4: Working in a website programme

Exploring the interface of website design and management software – design a new website – view a website – add pages to website – format web pages – link pages in a linear structure.

Unit 5: Publishing the website

Presentation, interaction and information design – change background graphics and other properties of pages in a website – create a random axes navigation system – test hyperlinks and page properties – prepare and publish website.

Practical: Physics based experiments will be given on which the practicals have to be done.

1. HTML program to print the detail of solar system using tables.
2. Webpage for form filling
3. Webpage to explain concepts using hyperlinks.
4. Webpage to explain concepts using animated picture, movie and sound.

Book for Study:

1. C. Xavier, World Wide Web Design with HTML, McGraw Hill, 2001.

2. C. Xavier, Web Technology and Design, New Age International, 2007.

NMEC-I: SIMPLE APPLIANCES

SEMESTER: III **CODE: U16PH3E1**

NO. OF HOURS: 2 **CREDITS: 2**

Objectives:

- To introduce basic ideas behind electrical appliances and its applications for domestic usage.

Unit 1: Safety Precaution

Electricity – Basic principles - Practical unit of electricity - International system (S.I) of units – Electric shock – Precautions to avoid electric shock – Rescue steps in electric Shock – methods of resuscitation - Electric Line Circuit Breaker (ELCB).

Unit 2: Wiring

Wiring system – Electric supply to house and factories – Types of wiring – ISI Rules – Megger testing – Earthing.

Electricity in house: Design for heating element – Electric iron, Table heater, Hot plate and Room heater.

Unit 3: Electrical Measuring instruments

Moving coil instruments – Voltmeter – Ammeter – Wattmeter – Kilowatt meter – Frequency meter – Multimeter.

Unit 4: Electrical appliances

Cooling appliances – Electric fan – Refrigerator – Air Conditioner – Air cooler.
Other electrical appliances: Electric bell – Buzzer – Incandescent lamp – Fluorescent lamp – LED lamp – Halogen lamp – Reverse osmosis purifier – Washing machine – Solar powered street lights.

Unit 5: Electromagnetic application

Basics of Electromagnetic theory – Solenoid – Electric motor (AC& DC) – Electric generator – transformer – Backup power suppliers (UPS, Invertors) - Induction stove.

Books for Study:

1. M.L. Anwani, Basic Electrical Engineering, Dhanpat Rai Co. Ltd., Delhi, 2003.
2. William D. Cooper, Electrical Instruments and Measurement Techniques, Prentice Hall India, New Delhi, 1997.

Books for reference:

1. S.P. Bali, Consumer Electronics, Pearson Education, New Delhi, 2008.
2. B. L. Theraja and A. K. Theraja, A Textbook of Electrical Technology, S. Chand & Co., 2014.

NMEC – II: AUDIO AND VIDEO SYSTEMS

SEMESTER: IV **CODE: U16PH4E2**

NO OF HOURS: 2 **CREDITS: 2**

Objective:

- To give students an in depth knowledge of audio and video systems
- To introduce the working principles and main features of audio and video devices

Unit I – Characteristics of Sound

Nature of sound – Pressure and intensities of sound waves – Sensitivity of human ear for sound – Loudness and Phon – Frequency of sound waves – Pitch – Production of audio waveforms.

Unit II – Audio System

Microphones: Characteristics of microphones – Requisites of a good microphone – Types of microphones – Moving coil microphone – Crystal microphone – Carbon microphone – Special microphone.

Loudspeakers: Characteristics of loudspeakers – Types of loudspeakers – Moving coil cone loudspeaker – Electrodynamic loudspeaker – Horn type loudspeaker – Multi – Way speaker system (Woofers and Tweeters).

Unit – III Television

Monochrome Television: Introduction to television – Basic monochrome television system – Transmitter – Receiver – Television systems and standards – Television camera tubes – Videocon camera tube.

Colour Television: Colour Transmission and Reception – Colour combination – Three colour theory – Colour TV transmitter and receiver – Colour picture tube – CCTV.

Unit – IV Digital Television

Digital Television-Transmission and Reception: Digital system hardware, Signal quantizing and encoding, digital satellite television, Direct –To – Home (DTH) satellite

television, Digital TV receiver, Merits of digital TV receivers, Digital Terrestrial Television (DTT), CCTV.

Unit – V Liquid Crystal Screen Television

LCD technology - LCD matrix types and operation - LCD screens for television - LED TV -Edge LEDs, Differences between LED and LCD displays.

Books for study:

1. R. G. Gupta, Audio and Video Systems (Principles, Maintenance and Troubleshooting), Tata McGraw-Hill Publishing Company Limited, New Delhi, 2002.
2. George Kennedy, Bernard Davis and S.R.M. Prasanna, Electronic Communication Systems, Tata McGraw Hill Publishing Company Limited, New Delhi, 2012.
3. R.R. Gulati, Colour Television: Principles & Practice, New Age International Publisher, 2007.

Books for References:

1. R.R. Gulati, Modern Television Practice, New Age International Publishers, 2007.
2. A.M. Dhake, Television and Video Engineering 2e, McGraw Hill education Limited, 1999.
3. S.P. Bali and R. Bali, Audio Video Systems Principles, Practices and Troubleshooting, Khanna Publishing Company, 2014.
4. S.P. Bali, Consumer Electronics, Pearson Education, 2007.

ALLIED PHYSICS I (FOR MATHS)
MECHANICS, SOUND, THERMAL PHYSICS AND OPTICS

SEMESTER : I **CODE: U18PHY01**

NO. OF HOURS: 4 **CREDITS: 4**

Objectives:

- To give the students an overview of important branches of physics, particularly to make the students understand the basic concepts in mechanics, sound, thermal physics and Optics.

Unit 1: Mechanics

Centre of gravity – General formula- centre of gravity of a solid hemisphere – hollow hemisphere– solid cone – tetrahedron - stability of floating bodies – Meta centre – metacentric height – determination of metacentric height of a ship.

Unit 2: Sound, Ultrasonics and Acoustics

Simple harmonic motion – composition of two simple harmonic motions along a straight line and at right angles to each other – Lissajou's figures and their applications.

Ultrasonics – production – Magnetostriction oscillator- properties– applications– Acoustics of buildings – Reverberation and Reverberation time - Sabine's formula – Factors affecting the acoustics of buildings.

Unit 3: Properties of Matter

Stress – Strain – Hooke's law – Different modulii of elasticity – Young's modulus (E) – Rigidity modulus(G) – Bulk modulus(K) – Poisson's ratio – work done in linear, shearing and volume strain – Relation connecting elastic constants and Poisson's ratio – Bending of beams-bending moment-Measurement of Young's modulus by non-uniform bending and Rigidity modulus by static torsion (Searle's apparatus) scale and telescope method.

Unit 4: Thermal Physics

Newton's law of cooling – verification of Newton's law of cooling – specific heat capacity of a liquid by cooling – Bomb calorimeter – Conduction – coefficient of thermal conductivity – good and bad conductors – Lee's disc method for bad conductors – Stefan's law of radiation – Solar constant – Angstrom's Pyrheliometer – Temperature of the Sun.

Unit 5: Optics and Spectroscopy

Electromagnetic spectrum – spectral response to human eye – UV and IR Spectroscopy – Raman Effect – Explanation on the basis of quantum theory – Experimental arrangement – application of Raman Effect – Fibre Optic communication– Introduction– optical fibre – numerical aperture – coherent bundle – fibre optic communication systems and their advantages.

Books for Study:

1. R. Murugeshan, Properties of Matter, S. Chand and Co., New Delhi, 2004.
2. A. Sundaravelusamy, Allied Physics Paper – I, Priya Publications, 2012.

Books for Reference:

1. R. Murugeshan, Mechanics and Mathematical Methods, S. Chand & Co., 2014.

ALLIED PHYSICS II (FOR MATHS)

ELECTRICITY, ATOMIC AND NUCLEAR PHYSICS AND ELECTRONICS

SEMESTER : II **CODE: U18PHY02**

NO. OF HOURS: 4 **CREDITS: 4**

Objectives:

- To give the students an overview about the important branches of physics.
- To study the basic concepts of electrostatics and electricity.
- To give the students a brief introduction about Atomic physics and Nuclear Physics.
- To study the basics of electronics and digital electronics

Unit 1: Electrostatics

Coloumb's theorem– Mechanical force on the surface of a charged conductor– Capacitors– Expression for capacitance of a capacitor–Principle of a capacitor– Energy of a charged capacitor– Loss of energy due to sharing of charges-Cylindrical capacitor-Spherical capacitor

Unit 2: Electricity

Kirchoff's Laws - Wheatstone bridge - Carey Foster's bridge – Determination of specific resistance – Laws of electromagnetic induction – expression for induced emf – self and mutual induction – Rayleigh's method of finding self inductance of a coil – Determination of mutual inductance using BG - Coefficient of coupling – Eddy currents and its applications.

Unit 3: Atomic Physics

Vector atom model – Pauli's exclusion principle– various quantum numbers – quantization of orbits - X–rays – continuous and characteristic X–rays–Moseley's law and its importance - Bragg's Law - Miller indices – Estimation of cell dimension using Laue method (basic concepts only).

Unit 4 : Nuclear Physics

Particle detectors – cloud chamber – Bubble chamber – Photographic emulsion technique – Binding energy-nucleus size, charge, mass, spin – nuclear models– liquid drop model– shell model

Unit 5: Electronics and Digital Electronics

Band theory of solids-Types of Semiconductor-Intrinsic and Extrinsic-P-N junction diode-Biasing- Zener diode

Basic logic gates– AND, OR, NOT, NOR and NAND gates– Boolean algebra – Laws of Boolean algebra– De–Morgan's theorems– Verification using truth tables-Decimal, Binary, Octal, Hexadecimal number systems and their mutual conversion.

Books for Study:

1. Brij Lal and N. Subrahmanyam, Electricity and Magnetism, Palaniyappa, Chennai, 1974.
2. R. Murugeshan and Kiruthiga Sivaprasath, Modern Physics 18e, S. Chand and Co., 2014.
3. V.K. Mehta and Rohit Mehta, Principles of Electronics 7e, S. Chand, New Delhi, 2005.

Books for Reference:

1. S.L. Gupta and V. Kumar, Hand Book of Electronics, Pragati Prakashan, Meerut, 1970.
2. R.P. Jain, Modern Digital Electronics, Tata McGraw Hill, New Delhi, 1984.

ALLIED PHYSICS I (FOR CHEMISTRY)

MECHANICS, SOUND, THERMAL PHYSICS AND OPTICS

SEMESTER : III **CODE: U18PHY33**

NO. OF HOURS: 4 **CREDITS: 4**

Objectives:

- To give the students an overview of important branches of physics, particularly to make the students understand the basic concepts in mechanics, sound, thermal physics and Optics.

Unit 1: Mechanics

Centre of gravity – General formula- centre of gravity of a solid hemisphere – hollow hemisphere– solid cone – tetrahedron - stability of floating bodies – Meta centre – metacentric height – determination of metacentric height of a ship.

Unit 2: Sound, Ultrasonics and Acoustics

Simple harmonic motion – composition of two simple harmonic motions along a straight line and at right angles to each other – Lissajou's figures and their applications.

Ultrasonics – production – Magnetostriction oscillator- properties– applications– Acoustics of buildings – Reverberation and Reverberation time - Sabine's formula – Factors affecting the acoustics of buildings.

Unit 3: Properties of Matter

Stress – Strain – Hooke's law – Different modulii of elasticity – Young's modulus (E) – Rigidity modulus(G) – Bulk modulus(K) – Poisson's ratio – work done in linear, shearing and volume strain – Relation connecting elastic constants and Poisson's ratio – Bending of beams-bending moment-Measurement of Young's modulus by non-uniform bending and Rigidity modulus by static torsion (Searle's apparatus) scale and telescope method.

Unit 4: Thermal Physics

Newton's law of cooling – verification of Newton's law of cooling – specific heat capacity of a liquid by cooling – Bomb calorimeter – Conduction – coefficient of thermal conductivity – good and bad conductors – Lee's disc method for bad conductors – Stefan's law of radiation – Solar constant – Angstrom's Pyrheliometer – Temperature of the Sun.

Unit 5: Optics and Spectroscopy

Electromagnetic spectrum – spectral response to human eye – UV and IR Spectroscopy – Raman Effect – Explanation on the basis of quantum theory – Experimental arrangement – application of Raman Effect – Fibre Optic communication– Introduction– optical fibre – numerical aperture – coherent bundle – fibre optic communication systems and their advantages.

Books for Study:

1. R. Murugeshan, Properties of Matter, S. Chand and Co., New Delhi, 2004.
2. A. Sundaravelusamy, Allied Physics Paper – I, Priya Publications, 2012.

Books for Reference:

1. R. Murugeshan, Mechanics and Mathematical Methods, S. Chand & Co., 2014.

ALLIED PHYSICS II (FOR CHEMISTRY)

ELECTRICITY, ATOMIC AND NUCLEAR PHYSICS AND ELECTRONICS

SEMESTER : IV **CODE: U18PHY44**

NO. OF HOURS: 4 **CREDITS: 4**

Objectives:

- To give the students an overview about the important branches of physics.
- To study the basic concepts of electrostatics and electricity.
- To give the students a brief introduction about Atomic physics and Nuclear Physics.
- To study the basics of electronics and digital electronics

Unit 1: Electrostatics

Coloumb's theorem– Mechanical force on the surface of a charged conductor– Capacitors– Expression for capacitance of a capacitor–Principle of a capacitor– Energy of a charged capacitor– Loss of energy due to sharing of charges-Cylindrical capacitor-Spherical capacitor

Unit 2: Electricity

Kirchoff's Laws - Wheatstone bridge - Carey Foster's bridge – Determination of specific resistance – Laws of electromagnetic induction – expression for induced emf – self and mutual induction – Rayleigh's method of finding self inductance of a coil – Determination of mutual inductance using BG - Coefficient of coupling – Eddy currents and its applications.

Unit 3: Atomic Physics

Vector atom model – Pauli's exclusion principle– various quantum numbers – quantization of orbits - X–rays – continuous and characteristic X–rays–Moseley's law and its importance - Bragg's Law - Miller indices – Estimation of cell dimension using Laue method (basic concepts only).

Unit 4 : Nuclear Physics

Particle detectors – cloud chamber – Bubble chamber – Photographic emulsion technique – Binding energy-nucleus size, charge, mass, spin – nuclear models– liquid drop model– shell model

Unit 5: Electronics and Digital Electronics

Band theory of solids-Types of Semiconductor-Intrinsic and Extrinsic-P-N junction diode-Biasing- Zener diode

Basic logic gates– AND, OR, NOT, NOR and NAND gates– Boolean algebra – Laws of Boolean algebra– De–Morgan's theorems– Verification using truth tables-Decimal, Binary, Octal, Hexadecimal number systems and their mutual conversion.

Books for Study:

1. Brij Lal and N. Subrahmanyam, Electricity and Magnetism, Palaniyappa, Chennai, 1974.
2. R. Murugeshan and Kiruthiga Sivaprasath, Modern Physics 18e, S. Chand and Co., 2014.
3. V.K. Mehta and Rohit Mehta, Principles of Electronics 7e, S. Chand, New Delhi, 2005.

Books for Reference:

1. S.L. Gupta and V. Kumar, Hand Book of Electronics, Pragati Prakashan, Meerut, 1970.
2. R.P. Jain, Modern Digital Electronics, Tata McGraw Hill, New Delhi, 1984.

APPLIED PHYSICS I (FOR COMP. SC)
ELECTRICITY, MAGNETISM AND ELETROMAGNETISM

SEMESTER : III **CODE: U13PHZ34**

NO. OF HOURS: 4 **CREDITS: 3**

Objective:

- To enable the students to understand the fundamentals of Electricity and Magnetism.

Unit I: Electrostatics

Fundamentals of electrostatics – Gauss theorem - Applications – Intensity at a point between two charged parallel plane conductors – Intensity at a point due to uniformly charged cylinder – Action of points – Capacitance – Principle of a capacitor – Spherical and cylindrical capacitors – Energy of a charged capacitor – Energy loss due to sharing of charges – Types of capacitors.

Unit II: Magnetostatics

Magnetic field – Magnetic flux density – Magnetization – Intensity of magnetization – Permeability – Susceptibility – Relation – Magnetic materials – Properties of dia, para and ferro magnetic materials – Hysteresis – Magnetometer method – Finding coercivity, retentivity and energy loss from hysteresis loop (BH Curve).

Unit III: Current Electricity

Current – Definition of Ampere – Units of voltage and resistance – Ohm's law – Kirchoff's law – Wheatstone's bridge – Carey Foster's bridge – Potentiometer – Measurement of current and resistance – Force between two parallel conductors carrying current – Fleming's left hand rule – Theory of ballistic galvanometer – conversion of galvanometer into and ammeter and voltmeter.

Unit IV: Electromagnetic Induction

Laws of electromagnetic induction – Self-induction - Determination of self-inductance by Anderson's method – Mutual induction – Determination of mutual inductance by

absolute method - Relation between induced emf and mutual inductance –Coefficient of coupling - Eddy current and its applications.

Unit V: Alternating Current

AC Circuits with single components – Double components – Measurement of current and voltage – Power in AC Circuit – Power factor derivation – Wattless current – Choke-series and parallel resonance circuits – Impedance – Q factor – Selectivity and Sharpness of resonance – Oscillatory discharge of a condenser.

Books for Study:

1. Brij Lal and N. Subrahmanyam, Electricity and Magnetism, Ratan Prakashan Mandir, New Delhi, 1995.
2. R. Murugeshan, Electricity and Magnetism 4e, S. Chand and Company Ltd, 2002.

Books for Reference:

1. D.N. Vasudeva, Fundamentals of Magnetism and Electricity, S. Chand & Co, 2007.
2. N.K. Sehgal, K.L. Chopra and D.L. Sehgal, Electricity and Magnetism 6e, Sultan Chand and Sons, 2004.

APPLIED PHYSICS II (FOR COMP. SC)

SOLID STATE DEVICES AND MICROPROCESSOR

SEMESTER : IV **CODE: U13PHZ45**

NO. OF HOURS: 4 **CREDITS: 4**

Objectives:

- To introduce the knowledge about diodes, transistors and FET.
- To give introduction about op-amp and its various modes of operations.
- To study Intel 8085 microprocessor, instruction set and to write programs using Intel 8085 assembly languages.

Unit 1: Diodes and Transistors

Semiconductors – Types – diode characteristics – Zener Diode – characteristics – regulated power supply – Transistor – types – DC characteristics of CE configuration (PNP) – Transistor as an amplifier – FET – n-Channel FET characteristics – FET parameters – FET amplifiers.

Unit 2: Operational Amplifier

Introduction – differential amplifier – CMRR – Offset Balance – Inverting and Non inverting amplifier – Sign changer – Unit gain follower – Adder – Subtractor – Differentiator – Integrator – D/A conversion – Binary weighted method

Unit 3: Architecture of Microprocessor 8085

Evolution of Microprocessors – Introduction to Intel 8085 – Architecture – Pin configuration – Registers – Data and Address Bus – Status flags.

Unit 4: Instruction Set of Intel 8085

Introduction – Op code – Operand - Addressing Modes - Data Formats - Instruction Set of Intel 8085 instructions - Data transfer group, Arithmetic group, Logical group, Branch group - Stack-I/O and Machine control group.

Unit 5: Examples of Assembly language programs

Block transfer – 8-bit addition, subtraction, multiplication and division – Sum of a series of numbers – Ascending and descending order – Largest and smallest number in a series of numbers – Multibyte addition and subtraction.

Books for Study:

1. A. Malvino, Electronic Principles 5e, Tata McGraw Hill Ltd., New Delhi, 1995.
2. V.K. Mehta and Rohit Mehta, Principles of Electronics 11e, S. Chand & Co. Ltd., New Delhi, 2008.
3. B. Ram, Fundamentals of Microprocessors and Micro Computers, Dhanpat Rai and Sons, New Delhi, 1995.

Books for Reference:

1. T. L. Floyd, Electronic Devices, Pearson Education, New York, 2004.
2. R. Gaonkar, Microprocessor Architecture Programming and Applications, Wiley Eastern Ltd., New Delhi, 1985.

MAJOR PRACTICALS - I

SEMESTER : I **CODE: U16PH1P1**

NO. OF HOURS: 3 **CREDITS: 3**

Any eight experiments

1. Non-uniform bending – Microscope method.
2. Compound pendulum – g and K.
3. Surface tension and interfacial tension – drop weight method.
4. Sonometer-verification of laws.
5. Long focus convex lens-f, R, μ.
6. Characteristics of junction diode.
7. Static torsion – Determination of n.
8. Spectrometer-refractive index of the prism.
9. Digital Screw Gauge - Basic measurements
10. Digital Vernier Callipers – Dimensions of materials
11. Mega Ohm meter – Measurement of High Resistance
12. Cantilever depression – scale and telescope.
13. Melde's string arrangement-Transverse and longitudinal mode.
14. Spectrometer-refractive index of liquid.

MAJOR PRACTICALS - II

SEMESTER : II **CODE: U16PH2P2**

NO. OF HOURS: 3 **CREDITS : 3**

Any eight experiments

1. Torsional pendulum – n and I.
2. Co-efficient of viscosity – Graduated burette.
3. Sonometer-Determination of A.C. frequency.
4. Uniform bending – optic lever.
5. Viscosity of highly viscous liquid – Stoke's method
6. Long focus concave lens-f, R, μ.
7. Characteristics of zener diode.
8. P.O.box – energy gap of a thermistor.
9. Surface tension-capillary rise method.
10. CRO/DSO – Study of frequency resonant circuit/ Lissajou's figures
11. Ultrasonic Interferometer – Acoustics studies of fluids
12. AFO – Source of Sinusoidal , Square, Saw tooth and Triangular waves
13. Multimeter – Basic electric measurements
14. Viscosity of a liquid – Ostwald viscometer

MAJOR PRACTICALS - III

SEMESTER : III **CODE: U16PH3P3**

NO. OF HOURS: 3 **CREDITS: 3**

Any eight experiments

1. Specific heat of a liquid- Newton's law of cooling.
2. Specific heat capacity of a liquid - Joule's calorimeter.
3. Thermal capacity of a bad conductor Lee's disc method.
4. Determination of R of the lens - Newton's rings.
5. Spectrometer-i-d curve
6. Full wave rectifier-Percentage of regulation.
7. Ammeter calibration – Potentiometer.
8. Figure of merit - B.G.
9. Spectrometer – Spectral distribution of solar radiation - Dispersive characteristics of biomaterials
10. Polarimeter – Optical activities of liquids
11. Bomb Calorimeter – Calorific values of different bio masses
12. Transistor Characteristics-CE configuration.
13. Telescope (High Range) – Determination of Focal length of long focus lens

MAJOR PRACTICALS - IV

SEMESTER : IV **CODE: U16PH4P4**

NO. OF HOURS: 3 **CREDITS: 3**

Any eight experiments

1. Emissive power of the surface –spherical calorimeter.
2. Thickness of wire and insulation - Air wedge.
3. E.M.F. of a Thermocouple direct deflection method.
4. Specific resistance - Carey Foster's bridge.
5. Potentiometer-calibration of low range voltmeter.
6. Temperature Coefficient of resistance – Potentiometer.
7. Spectrometer-Grating- Oblique incidence.
8. Study of logic gates – discrete components.
9. Optical Microscope – Microstructural analysis of samples
10. Travelling Microscope with micrometer screw – thickness of films forming air wedge and edge cutting
11. Spectrometer-Grating- Normal incidence
12. P.O. Box - Temperature Co-efficient of thermistor.
13. P.O. Box – Temperature Co-efficient of resistance.

MAJOR PRACTICALS - V

SEMESTER : V **CODE: U16PH5P5**

NO. OF HOURS: 6 **CREDITS: 3**

Any 16 experiments

1. Spectrometer – i-i' curve.
2. Spectrometer-Cauchy's constants.
3. Spectrometer-Dispersive power of grating.
4. Potentiometer – Temperature coefficient of thermistor.
5. Potentiometer – Calibration of high range voltmeter.
6. Ballistic galvanometer – Charge Sensitivity
7. Ballistic galvanometer –Absolute capacity of a condenser.
8. Ballistic galvanometer –Mutual inductance.
9. Ballistic galvanometer -High resistance by leakage.
10. Conversion of galvanometer into ammeter.
11. Conversion of galvanometer into voltmeter.
12. Anderson's bridge – AC self-inductance of the coil.
13. Field along the axis of a coil-Determination of M & H.
14. Spectrometer-Small angle prism.
15. P.O Box – Temperature coefficient of resistance.
16. Deflection and vibration magnetometer – Absolute value of M & H.
17. Potentiometer – Measurement of EMF
18. GM Counter – Calculation of Radiation in atmosphere, Characteristics of GM tube, Gamma Radiation and study of isotopes
19. Four Probe Set Up- Resistivity of materials
20. Hall Effect measurement Set Up – Mobility and Carrier Concentration of materials

21. IR Source – Study on the effect of sterilization using IR radiation on Micro organism

C Programming

22. Conversion of Celsius into Fahrenheit and Fahrenheit into Celsius.

23. Biggest and smallest of a set of numbers.

24. Solving quadratic equation.

25. Arranging the numbers in ascending and descending order.

26. Arranging the words in alphabetical order.

MAJOR PRACTICALS - VI

SEMESTER : VI **CODE : U16PH6P6**

NO. OF HOURS: 6 **CREDITS: 3**

Any 16 experiments

1. Transistor characteristics (FET or BJT)
2. FET amplifier.
3. Hartley oscillator – Determination of frequency by beats.
4. Colpitt's oscillator – Determination of frequency by Lissajou's figures.
5. Tuned collector oscillator – Determination of frequency by CRO.
6. Astable multivibrator.
7. Half Adder and Full Adder.
8. Half Subtractor and Full Subtractor
9. Universal Gates – Basic gates using universal gates.
10. Series resonance circuit
11. Parallel resonance circuit.
12. OP-AMP – Inverting amplifier – Non-inverting amplifier – Differential amplifier
13. OP-AMP adder and subtractor.
14. OP-AMP-High pass filter.
15. OP-AMP-Low pass filter.
16. OP-AMP- integrator.
17. OP-AMP-differentiator.
18. Single stage R-C coupled amplifier.
19. μP:8-bit addition and subtraction.
20. μP:8-bit multiplication and division.
21. Regulated Power supply using Zener diode – percentage of regulation.
22. Dielectric study kit - Dielectric properties of liquids (Hydrated biomolecules, amino acids and proteins)
23. LCZ Meter – Impedance analysis of materials
24. Electromagnets with power supply and Gauss Meter – Study of Zeeman Shift
25. Potentiometer – Measurement of EMF
26. Reduction of Boolean expression using K-map.

ALLIED PHYSICS PRACTICAL (FOR MATHS)

SEMESTER : I & II **CODE : U16PHYP1**

NO. OF HOURS: 3 **CREDITS: 4**

Any 16 experiments

1. Young's modulus - Non-uniform bending – pin and microscope.
2. Coefficient of viscosity of liquid- graduated burette.
3. Specific heat capacity of liquid-Method of cooling.
4. Thermal conductivity of bad conductor-Lee's disc.
5. Field along the axis of a coil-determination of M.
6. Field along the axis of a coil-determination of H.
7. Newton's rings-Radius of curvature of convex lens.
8. Sonometer-Verification of laws.
9. Refractive index of prism-Spectrometer.
10. Grating-Spectrometer.
11. Meter bridge-Specific resistance.
12. Meter bridge-Resistance in series and in parallel
13. Carey-Foster's bridge-Specific resistance
14. E.M.F.of a thermocouple-Direct deflection method.
15. Junction diode characteristics.
16. AND, OR and NOT logic gates.
17. Construction of full wave rectifier.
18. Surface Tension – Drop Weight Method
19. Focal length of a long focus convex lens
20. Sonometer – AC frequency

ALLIED PHYSICS PRACTICAL (FOR CHEMISTRY)

SEMESTER : III & IV **CODE : U16PHYP1**

NO. OF HOURS: 3 **CREDITS: 4**

Any 16 experiments

1. Young's modulus - Non-uniform bending – pin and microscope.
2. Coefficient of viscosity of liquid- graduated burette.
3. Specific heat capacity of liquid-Method of cooling.
4. Thermal conductivity of bad conductor-Lee's disc.
5. Field along the axis of a coil-determination of M.
6. Field along the axis of a coil-determination of H.
7. Newton's rings-Radius of curvature of convex lens.
8. Sonometer-Verification of laws.
9. Refractive index of prism-Spectrometer.
10. Grating-Spectrometer.
11. Meter bridge-Specific resistance.
12. Meter bridge-Resistance in series and in parallel
13. Carey-Foster's bridge-Specific resistance
14. E.M.F. of a thermocouple-Direct deflection method.
15. Junction diode characteristics.
16. AND, OR and NOT logic gates.
17. Construction of full wave rectifier.
18. Surface Tension – Drop Weight Method
19. Focal length of a long focus convex lens
20. Sonometer – AC frequency

APPLIED PHYSICS PRACTICAL (FOR COMP. SC.)

SEMESTER : III & IV **CODE: U13PHZP1**

NO. OF HOURS: 3 & 3 **CREDITS: 3**

All experiments

1. Semiconductor diode characteristics.
2. Zener diode characteristics.
3. Transistor Characteristics - CE configuration
4. Series resonance circuit.
5. Parallel resonance circuit
6. FET characteristics
7. Regulated Power supply using Zener diode – percentage of regulation.
8. OP-AMP adder.
9. OP-AMP subtractor.
10. Carey-Foster's bridge-Specific resistance.
11. Logic gates AND, OR, NOT using discrete components.
12. Field along the axis of a coil-determination of M.
13. Field along the axis of a coil-determination of H
14. Potentiometer-Ammeter calibration.
15. Potentiometer-determination of Specific resistance
16. Thermistor-determination of energy gap

DIGITAL ELECTRONICS AND MICRO PROCESSORS LAB

FOR III B.SC. COMPUTER SCIENCE

SEMESTER : V & VI **CODE : U18CS6P6**

NO. OF HOURS: 6 **CREDITS: 5**

1 Study of Universal gate – NAND – construction of AND, OR, NOT, EXOR gates.

2 Half Adder and Full Adder.

3 Karnaugh map –Reduction of Boolean expressions.

4 Study of DAC – Binary Weighted method / R – 2R Ladder Method.

5 Shift Register using IC-7495.

6 Study of Universal gate – NOR-construction of AND, OR, NOT, EXOR gates.

7 Half Subtractor and Full Subtractor.

8 Study of ADC.

9 Up and Down counters.

10 μP: 8-bit addition and multiplication.

11 μP: 8-bit subtraction and division.

12 μP: sum of series.

13 μP: Ascending and descending order.

14 μP: Maximum and Minimum of a set of data.

15 μP: Multibyte addition and subtraction.

16 μP : Conversion- Hexadecimal to decimal and decimal to hexadecimal.

17 μP : program to dis-assemble a data stored in a memory location M and to store the results in (M+1) and (M+2).

18 μP: program to transfer an array of data from one part of the memory to another part.