THANTHAI HANS ROEVER COLLEGE, PERAMBALUR – 621220
(AUTONOMOUS)
B.Sc. PHYSICS – COURSE STRUCTURE UNDER CBCS
(For the candidates admitted from the academic year 2018-2019 onwards)

SEMESTER	PART	COURSE	COURSE CODE	TITLE OF THE COURSE	Ins. Hours/ Weeks	Credit	Exam Hours	CIA (Max)	ESE (Max)	Total (Max)
I	I	Tamil Language Course – I	18UT1	Tamil I	6	3	3	25	75	100
	II	English Language Course – I	18UE1	English I	6	3	3	25	75	100
	III	Core Course – I	18UPH1CC1	Properties of matter and Acoustics	6	6	3	25	75	100
		Core Practical – I	18UPH12CP1	Practical –I	4	-	-	-	-	-
		First Allied Course – I	18UPH1AC1	Mathematics I– Algebra calculus	6	4	3	25	75	100
	IV	Value Education	18UVE	Value Education	2	2	3	25	75	100
					30	**18**				**500**
II	I	Tamil Language Course-II	18UT2	Tamil II	6	3	3	25	75	100
	II	English Language Course-II	18UE2	English II	6	3	3	25	75	100
	III	Core Practical – I	18UPH12CP1	Practical – I	3	3	3	40	60	100
		Core Course-II	18UPH2CC2	Mechanics and Relativity	4	6	3	25	75	100
		First Allied Course-II	18UPH2AC2	Mathematics II– Analytical Geometry (3D), Trignometry and Fourier Series	5	3	3	25	75	100
		Core Course-III	18UPH2CC3	Electrical Appliances-I	4	4	3	25	75	100
	IV	Environmental Studies	18UES	Environmental Studies	2	2	3	25	75	100
					30	**24**				**700**
III	I	Tamil Language Course-III	18UT3	Tamil III	6	3	3	25	75	100
	II	English Language Course-III	18UE3	English III	6	3	3	25	75	100
	III	Core Course-IV	18UPH3CC4	Heat & Thermodynamics	6	6	3	25	75	100
		Core Practical – II	18UPH34CP2	Practical – II	3	-	-	-	-	-
		Second Allied Course-I	18UPH3AC1	Chemistry I	4	4	3	25	75	100
		Second Allied Course-II (AP)	18UPH34AC2	Chemistry II – Practical	3	-	-	-	-	-
	IV	Non Major Elective I - for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	18UPH3NME1	Chemistry in every day life	2	2	3	25	75	100
					30	**18**				**500**
	I	Tamil Language Course-IV	18UT4	Tamil IV	6	3	3	25	75	100

IV	II	English Language Course-IV	18UE4	English IV	6	3	3	25	75	100
	III	Core Practical – II	18UPH34CP2	Practical – II	3	3	3	40	60	100
		Core Course-V	18UPH4CC5	Electricity, Magnetism and Electromagnetism	5	5	3	25	75	100
		Second Allied Course-II (AP)	18UPH34AC2	Chemistry II – Practical	3	3	3	40	60	100
		Second Allied Course -III	18UPH4AC3	Chemistry III	3	2	3	25	75	100
	IV	Non Major Elective II - for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	18UCH4MNE2	Health chemistry	2	2	3	25	75	100
		Skill based Elective-I	18UPH4SBE1	Desktop Publishing	2	2	3	25	75	100
					30	**23**				**800**
V	III	Core Course-VI	18UPH5CC6	Optics and Spectroscopy	5	5	3	25	75	100
		Core Course-VII	18UPH5CC7	Atomic & Nuclear Physics	5	5	3	25	75	100
		Core Course-VIII	18UPH5CC8	Analog Electronics	5	5	3	25	75	100
		Core Practical – III	18UPH5CP3	Practical III	4	3	3	40	60	100
		Major based Elective-I	18UPH5MBE2	Materials Science	5	5	3	25	75	100
	IV	Skill based Elective-II	18UPH5SBE2	Role of Computer in Physics	2	2	3	25	75	100
		Skill based Elective –III	18UPH5SBE3	Electrical Appliances	2	2	3	25	75	100
		Soft Skills Development	18USSD	Soft Skills Development	2	2	3	25	75	100
					30	**29**				**800**
VI		Core Course-IX	18UPH6CC9	Elements of Classical & Quantum Physics	6	6	3	25	75	100
		Core Course-X	18UPH6CC10	Digital Electronics and Microprocessor	6	6	3	25	75	100
		Core Practical – IV	18UPH6CP4	Practical IV	5	4	3	40	60	100
		Major based Elective-II	18UPH6MBE3	Computer Programming in C	6	6	3	25	75	100
		Major based Elective-III	18UPH6MBE4	Opto electronics & Fiber optic communication	6	6	3	25	75	100
		Extension activities	18UEA		-	1	-	-	-	-
		Gender Studies	18UGS		1	1	3	25	75	100
					30	**30**				**600**
				Total	**180**	**142**				**3900**

First Allied Course I **Mathematics**

Second Allied Course II **Chemistry**

Third Applied cource **Computer Science**

List of Non Major Elective (For 2018 – 2019)

Elective	Semester	Course Code	Title of the Course
NME-I	III	18UPH3NME1	Chemistry in every day life
NME-II	V	18UCH4MNE2	Health chemistry

List of Skill Based Elective (For 2018 – 2019)

Elective	Semester	Course Code	Title of the Course
SBE-I	IV	18UPH4SBE1	Desktop Publishing
SBE-II	V	18UPH5SBE2	Role of Computer in Physics
SBE-III	V	18UPH5SBE3	Electrical Appliances-II

List of Major Based Elective (For 2018 – 2019)

Elective	Semester	Course Code	Title of the Course
Elective-I	V	18UPH5MBE2	Materials Science
Elective-II	VI	18UPH6MBE3	Computer Programming in C
Elective-III	VI	18UPH6MBE4	Opto electronics & Fiber optic communication

Paper Details:

- Language Part – I - 4
- Language Part – II - 4
- Core Paper - 10
- Core Practical - 4
- Allied Paper - 4
- Allied Practical - 1
- Non-Major Elective - 2
- Skill Based Elective - 3
- Major Based Elective - 3
- Environmental Studies - 1
- Value Education - 1
- Soft Skill Development - 1
- Gender Studies - 1
- Extension Activities - 1 (Credit only)

1. Mark distribution for Practical:

Aim, Apparatus required, Tabulation - 15 + Experimental work – 15 + Calculation – 15 + Result with accuracy – 05 + Record – 10 + Internal assessment - 25 (Lab Attendance – 10 + Assignment – 05 + Observation Note – 05 + Model Exam – 20)

2. Every student shall undertake an industrial visit as a part of the curriculum once in the course period, to industrial units and R and D centres, to give a stress on the applied aspects. Extension and extracurricular activities should also be carried outside the class hours.

Note:	**Internal Marks**	**External Marks**
1. Theory	25	75
2. Practical	40	60

3. Separate passing minimum is prescribed for Internal and External marks

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for Semester Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]

The passing minimum for Semester Examinations shall be 40% out of 60 marks [i.e. 24 marks]

PROPERTIES OF MATTER AND ACOUSTICS

Core Course: I
Course Code: 18UPH1CC1
Hours / Week: 6
Credit: 6

Semester: I
Max. Marks : 100
Internal Marks : 25
External Marks : 75

Objectives

- To know the basics of elasticity and its importance in beams, girders.
- To understand the concepts of viscosity, surface tension and the various methods to determine the parameters experimentally.
- To study the concept of simple harmonic motion in sound waves.

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 for rubber.

Bending of beams: Cantilever - Expression for bending moment - Expression for depression - Cantilever oscillations - Expression for time period - Experiment to find Young's modulus - Non uniform bending (Pin and microscope) – Uniform Bending – I section girder – Applications.

Unit II: Surface Tension

Definition and dimensions of surface tension – Angle of contact - Excess pressure inside a liquid drop and soap bubble – Excess pressure inside a curved liquid surface - Application to spherical and cylindrical drops and bubbles - Experimental determination of surface tension - Capillary rise method - Variation of surface tension with temperature - Jaegar's Method.

Unit III: Viscosity

Streamline flow – Turbulent flow – Critical velocity - Reynold's number - Co-efficient of viscosity and its dimension - Rate of flow of liquid in a capillary tube - Poiseuilles' formula - Experimental determination of co-efficient of viscosity of a liquid by Poiseuille's method - Stoke's method - Variation of viscosity of a liquid with temperature – Ostwald's viscometer**.**

Unit IV: Diffusion & Osmosis

Diffusion of liquids – Graham's laws of diffusion in liquids – Ficks law of diffusion – Analogy between liquid diffusion and heat conduction – Experimental determination of coefficient of diffusion.

Osmosis and osmotic pressure – Laws of osmotic pressure - Experimental determination of osmotic pressure (Berkeley and Hartley method) — Elevation of the boiling point – Depression of freezing point.

Unit V: Sound

Simple harmonic motion – Differential equation of SHM – Composition of two SHM's in a straight line – Composition of two SHM's at right angles to each other – Lissajou's figures.

Acoustics of buildings: Conditions for good acoustics - Reverberation and Reverberation time - Absorption co-efficient - Determination of reverberation time by Sabine's formula.

Books for Study

1. Murugeshan .R, Properties of Matter, S. Chand & Co Pvt. Ltd., New Delhi, 2012.(Unit - I, II & III)
2. Subrahmanyam .N & Brij Lal, Waves & Oscillations, Vikas Publishing House Pvt. Ltd., New Delhi, 1994 (Unit-IV).
3. Brij Lal & Subramaniam .N, Textbook of Sound, Vikas Publishing House, New Delhi, 1999 (Unit-V).

Books for References

1. Brij Lal & Subramaniam .N, Properties of Matter, Eurasia Publishing Co., NewDeihi, 1989 (Unit-I, II & III).
2. Mathur .D.S., Elements of Properties of Matter, S. Chand Limited, New Delhi, 2008.(Unit-I, II, III & IV).

PRACTICALS - I

Core Practical - I
Course Code: 18UPH12CP1
Hours / Week: 4 (I) + 3 (II)
Credit: 3

Semester: I & II
Max. Marks : 100
Internal Marks : 40
External Marks : 60

Any **TWELVE** experiments

1. Non-uniform bending – Pin and Microscope method.
2. Uniform bending – Optic lever method.
3. Sonometer – Verification of laws of transverse vibrations.
4. Specific heat capacity of a liquid – Newton's law of cooling method.
5. Meter Bridge – Specific Resistance of a material of a wire.
6. Compound pendulum – Determination of Acceleration due to Gravity (g) and Radius of Gyration (k).
7. Sonometer - Determination of A.C Frequency.
8. Potentiometer - Internal Resistance of a cell.
9. Thermal conductivity of a bad conductor – Lee's disc.
10. Short and Long Focus Convex lens – Determination of Foal Length (f).
11. Deflection magnetometer - Tan C position - Moment of a bar Magnet
12. Newton's Rings - Determination of Radius of Curvature of a Convex Lens(R).
13. Spectrometer – Determination of Refractive Index (μ) of solid prism.
14. Spectrometer – Grating - Normal incidence.
15. P.O. Box – Determination of temperature coefficient of a wire.
16. Surface Tension and Interfacial Tension - by Drop Weight method.

MECHANICS AND RELATIVITY

Core Course: II — Semester: II
Course Code: 18UPH2CC2 — Max. Marks : 100
Hours / Week: 4 — Internal Marks : 25
Credit: 6 — External Marks : 75

Objectives:

- To study and apply the knowledge of gravitation at various situation.
- To understand the concepts of statics, hydrostatics, hydrodynamics and dynamics of charged bodies under various fields and the rigid body dynamics in terms of moment of inertia.
- To understand the concepts of transformations related to relativity theory.

Unit I: Motion of Projectile, Impulse, Impact

Projectile motion – Ranges of horizontal and inclined projectile motions – Impulse – Impact – Impulsive force – Laws of impact – Impact of a smooth sphere on a smooth horizontal plane – Direct and oblique impacts – Loss in kinetic energy – Motion of two interacting bodies – Reduced mass.

Unit II: Dynamics of Rigid Bodies

Kinetic energy of rotation – Theory of compound pendulum – Equivalent simple pendulum – Reversibility of centres of oscillation and suspension – Determination of g and radius of gyration of a bar pendulum – Period of oscillation of a Bifilar pendulum with and without parallel threads - Centre of mass – Velocity and acceleration of centre of mass – Determination of motion of an individual particle – System of variable mass – Equation for a motion of a Rocket – Conservation of linear and angular momenta.

Unit III: Gravitation & Centre of gravity

Gravitation: Kepler's law of Planetary motion – Newton's laws of gravitation – Deduction of Newton's law of gravitation from Kepler's law - Boy's method of determination of G – Poynting's method of determination of G -Variation of 'g' with latitude, altitude and depth.

Centre of Gravity: Centre of gravity of (a) solid tetrahedron, (b) solid hemisphere, (c) hollow hemisphere and (d) solid cone.

Unit IV: Centre of Pressure & Hydrodynamics

Centre of Pressure: Vertical rectangular lamina – Vertical triangular lamina - Vertical circular lamina - Atmospheric pressure and its variations with altitude.

Hydrodynamics: Equation of continuity of flow - Euler's equation for unidirectional flow - Torricelli's theorem - Bernoulli's theorem and applications - Venturimeter - Pitot's tube for liquids - Laws of floatation - Meta centre - Meta centric height of a ship.

Unit V: Relativity

Newtonian relativity - Galilean transformations – Michelson-Morley experiment and its importance – Einstein's special theory of relativity – Lorentz transformations and its interpretation – Consequence of Lorentz transformation – Length contraction, time dilation – Relativistic addition of velocities – Mass energy equivalence – Basic ideas of general theory of relativity.

Books for Study

1. Naryanamoorthy, Mechanics – Part – I & II, S. Chand Publications, New Delhi, 6th Edition, 2008 (Unit I to IV)
2. D.S. Mathur, Mechanics, S.Chand Publications, New Delhi, 2000 (Unit I to IV).
3. R. Murugesan, Modern Physics, S.Chand Publications, New Delhi, 2008 (Unit V).

Books for References

1. Brijlal Subramaniam, Mechanics and Relativity, S.Chand Publications, New Delhi, 5th Edition, 2010 (Unit I to IV).

ELECTRICAL APPLIANCES-I

Core Course: III	Semester: II
Course Code: 18UPH2CC3	Max. Marks : 100
Hours / Week: 4	Internal Marks : 25
Credit: 4	External Marks : 75

Objective:

- To have an idea about the safety precautions when installing
- To know about the different tools needed for installation and repair

UNIT – I

Resistance and its types – capacitance and its types – Colour codes-inductance and its units – Transformers – Electrical Charge – Current – Electrical Potential

UNIT – II

Ohm's law – Galvanometer, Ammeter, Voltmeter and Multimeter Analog and Digital - Electrical Energy – Power – Watt – kWh – Consumption and electrical power.

UNIT – III

AC and DC – Single phase and three phase connections – RMS and peak values, House wiring – Star and delta connection – overloading – earthing – short circuiting – Fuses – Colour code for insulation wires

UNIT - IV

Inverter – UPS – generator and motor – types – different types of windings – circuit breaker-Electrical switches and its types.

UNIT – V

Electrical bulbs – Fluorescent lamps – Street Lighting – Flood lighting – Electrical Fans – Wet Grinder – Mixer – Water Heater – Storage and Instant types, electric iron box, microwave oven – Stabilizer, fridge.

Books for study:

1. A text book in Electrical Technology – B L Theraja – S chand & Co.
2. A text book in Electrical Technology – A K Theraja.
3. Performance and design of AC machines – M G Say ElBS Edn.

HEAT AND THERMODYNAMICS

Core Course: IV	Semester: III
Course Code: 18UPH3CC4	Max. Marks : 100
Hours / Week: 6	Internal Marks : 25
Credit: 6	External Marks : 75

Objectives:

- To study the fundamental laws of thermodynamics and concept of entropy.
- To brief out the ideas of low temperature Physics and Radiation laws.
- To outline the concept of specific heat of liquids by theories

Unit I: Transmission of heat

Conduction process - Thermal conductivity - Measurement of thermal conductivity by Forbe's method and Lee's disc method for bad conductors - Thermal radiation - Stefan's law - Newton's law from Stefan's law - Experimental determination of Stefan's constant.

Unit II: Specific heat

Specific heat capacity of liquids - Dulong and Petit's law - Variation of specific heat and atomic heat with temperature – Einstein's and Debye's theories - Newton's law of cooling - Specific heat capacity of liquids - Barton's correction.

Unit III: Thermodynamics

Zeroth law of thermodynamics – First law of thermodynamics – Heat engines – Reversible and irreversible process of Carnot's theorem – Second law of thermodynamics - Thermodynamic scale of temperature – Entropy – Change of entropy in reversible and irreversible processes – Temperature – Entropy diagram (T-S) – Law of increase of entropy – Maxwell's thermodynamical relations – Clausius Clapeyron's latent heat equations.

Unit IV: Phase transition

Combined 1st and 2nd law of thermodynamics – Entropy of an ideal gas – Reversible adiabatic process – Temperature – entropy diagrams – Helmholtz and Gibbs functions – Maxwell's equations - Joule-Kelvin inversion curve – Joule- Kelvin coefficient – Phase changes – Ehrenfest's classification of phase transition – Equation of state – Heat transformation – Specific heat capacity of saturated vapours – Experiment for latent heat of vaporization.

Unit V: Statistical Mechanics

Introduction – Phase space - Microstates and macrostates – Thermodynamic probability and entropy – Maxwell Boltzmann statistics to a monoatomic ideal gas – Specific heat capacity of a diatomic gas – Planck's quantum theory – Black body radiation – Bose–Einstein statistics – Fermi-Dirac Statistics.

Books for Study

1. Brijlal and Subramaniyam, Heat, Thermodynamics & Statistical Physics, S.Chand & Co., New Delhi, 2008
(Unit I to V).
2. Brijlal and Subramaniyam, Heat and Thermodynamics, S.Chand & Co., New Delhi, 2007 (Unit I to V).

Books for References

1. J.B. Rajam and C.L. Arora, Heat and Thermodynamics, S. Chand & Co., 1981.
2. Sharma J.K., Sarkar K.K., Thermodynamics and Statistical Physics, Himalaya Publishing House, 1991.

PRACTICALS - II

Core Practical - II — Semester: III & IV
Course Code: 18UPH34CP2 — Max. Marks : 100
Hours / Week: 3 (III) + 3 (IV) — Internal Marks : 40
Credit: 3 — External Marks : 60

Any **TWELVE** experiments

1. Static Torsion – Determination of η
2. Torsional pendulum – η and I
3. Coefficient of viscosity of highly viscous liquid
4. Stoke's method – Viscosity of highly viscous liquid
5. Characteristics of junction and Zener diodes
6. Emissive power of a surface – Spherical calorimeter
7. Joule's calorimeter – Specific heat capacity of liquid (Barton's correction)
8. Carey Foster's Bridge – R and ρ
9. Potentiometer – Ammeter calibration
10. Potentiometer – Temperature coefficient of R
11. Potentiometer – Calibration of low range voltmeter
12. Figure of merit – Mirror Galvanometer
13. Transistor Characteristics – CE – configuration
14. Spectrometer - μ of a liquid
15. Spectrometer – I-d curve
16. CRO – Study of wave forms – Lissajous figures – f determination
17. Construction of Full wave rectifier
18. Construction of a temperature controller using Pt 100 senor

ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM

Core Course: V | Semester: IV
Course Code: 18UPH4CC5 | Max. Marks : 100
Hours / Week: 5 | Internal Marks : 25
Credit: 5 | External Marks : 75

Objectives:

- To study the fundamental ideas of electrostatics and current electricity
- To know about the classification of magnetism depending upon their properties
- To understand the concept of series and parallel resonance circuit

Unit I: Electrostatics and Condensers

Fundamentals of electrostatics – Electric field – Electric potential - Coulomb's law - Lines of forces - Properties – Gauss theorem - Electric intensity due to a charged sphere and cylinder – Mechanical force on unit area of a charged surface - Principle of a capacitor – Capacity of a spherical capacitor – Energy stored in a charged conductor – Loss of energy due to sharing of charges between two charged conductors.

Unit II: Magnetic properties of materials

Magnetic field – Magnetic induction – Intensity of Magnetization – Magnetic permeability – Susceptibility – Properties of para, dia, and ferromagnetic materials – Curie point - Curie temperature - Hysteresis – Retentivity – Coercivity – Experiment to draw B-H curve by magnetometer method – Loss of energy per cycle.

Unit III: Electric current and electrical measurements

Biot-Savart's law – Magnetic intensity at a point due to a current carrying straight conductor - Axis of a circular coil and solenoid – Moving coil ballistic galvanometer – Damping correction - Ampere's circuital law - Carey Foster's bridge – Specific resistance – Potentiometer – Principle – Ammeter calibration – Calibration of low range and high range voltmeter using potentiometer.

Unit IV: Electromagnetic induction

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

Unit V: AC circuits

Alternating EMF – Alternating EMF applied to circuits containing L and R, C and R – Alternating EMF applied to circuits containing L, C and R – Series and Parallel resonance circuits – Sharpness of resonance – Q factor – Power in AC circuits – Power factor – Wattless current – Transformer - Choke.

Books for Study

1. R. Murugesan, Electricity and Magnetism, S.Chand & Co., New Delhi, 2008 (Unit I to V).
2. Brijlal and Subramaniyam, Electricity and Magnetism, S. Chand & Co., New Delhi, 1983 (Unit I to V).

References

1. Edward M. Purcell & David J. Morin, Cambridge University Press, 3rd Edition, 2013.

OPTICS AND SPECTROSCOPY

Core Course: VI | Semester: V
Course Code: 18UPH5CC6 | Max. Marks : 100
Hours / Week: 5 | Internal Marks : 25
Credit: 5 | External Marks : 75

Objectives:

- To study the dispersive power of light using various lenses
- To identify the transmittance and reflection of light through various medium
- To know about the optical instruments and their resolving power

Unit I: Geometrical optics

Fermat's principle - Dispersion of light - Dispersive power - Deviation without dispersion - Dispersion without deviation - Constant deviation prism - Constant deviation spectroscope – Aberration - Spherical aberration - Methods of minimizing spherical aberration - Chromatic aberration of a lens – Lateral chromatic aberration.

Unit II: Interference

Colour of thin films - Fresnel's biprism - Fresnel's mirrors and Lloyd's single mirror experiments - Achromatic fringes - Interference in thin films (from reflected and transmitted light) - Fringes in wedge shaped films - Reflective and antireflective coatings - Theory of Newton's rings - Wavelength of monochromatic light using Newton's rings - Michelson's interferometer - Determination of wavelength and refractive index - Fabry Perrot etalon (qualitative).

Unit III: Diffraction

Rectilinear propagation of light - Zone plate - Fresnel diffraction - Diffraction at circular aperture, circular disc and a straight edge - Fraunhofer diffraction - Diffraction at a single and double slit - Missing orders in double slit - Theory of diffraction grating.

Unit IV: Polarization

Polarization - Double refraction - Nicol prism - Polarizer & Analyzer - Theory of production and detection of elliptically and circularly polarized light – Babinet compensator - Quarter wave plate - Half-wave plate - Optical activity – Laurent's Half shade polarimeter.

Unit V: Spectroscopy

Microwave spectroscopy - The Rotation of Molecules - Rotational Spectra - The Rigid Diatomic Molecule - IR Spectroscopy - Vibrating Diatomic Molecule as a Harmonic Oscillator - The Anharmonic Oscillator - The Diatomic Vibrating Rotator - The Vibration-Rotation Spectrum of Carbon Monoxide.

Book for study

1. R. Murugesan, Kiruthiga Sivaprasath, Optics and Spectroscopy, S. Chand & Company Ltd., New Delhi, 25th Revised Edition, 2005 (Unit I to V).
2. Subrahmanyam, Brijlal and M. N. Avadhanulu, A Text Book of Optics, S. Chand, New Delhi, 23rd Edition, 2004 (Unit I to V).

References

1. H.R. Gulati, Fundamentals of Optics, S. Chand & Co., New Delhi, 1984.
2. Ajoy Chatak, Optics, Tata-McGraw-Hill publications, 2009.

ATOMIC AND NUCLEAR PHYSICS

Core Course: VII | Semester: V
Course Code: 18UPH5CC7 | Max. Marks : 100
Hours / Week: 5 | Internal Marks : 25
Credit: 5 | External Marks : 75

Objectives:

- To understand about the cathode and anode rays by means of different methods
- To know about the vector atom and nuclear models
- To study the classification of various quantum numbers

Unit I: Cathode Rays and positive rays

Cathode rays – Properties – e/m of cathode rays – Millikan's oil drop method – Positive rays – Properties – e/m of Positive rays: Thomson's parabola method – Aston's, Bain bridge's mass spectrograph - Determination of critical Potential – Franck and Hertz's experiment - Davis and Goucher's method.

Unit II: Vector Atom model

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

Unit III: Fine structure of spectral lines

Special terms and notations – Selection rules - Intensity rule and interval rule – Fine structure of sodium D lines – Alkali spectra – Fine structure in Alkali spectra – Spectrum of Helium – Zeeman effect – Larmor's theorem – Debye's quantum mechanical explanation of the normal Zeeman effect – Anamolous Zeeman effect – Lande'g factor and explanation of splitting of D1 and D2 lines of sodium.

Unit IV: Nuclear models

Review of basic properties of nuclei – Size, Mass, Density, Charge - Binding energy - Nuclear stability – Models of nuclear structure – Liquid drop model – Shell model – Magic numbers – Collective model.

Unit V: Nuclear radiation detectors and accelerators

Interaction between energetic particles and matter – Photoelectric effect, Pair production, Compton effect - Ionization chamber – Geiger Muller counter – Cloud chamber – Cyclotron - Synchrocyclotron – Betatron - Bevatron.

Books for Study

1. Murughesan, R., Modern Physics, S. Chand & Co., New Delhi, 2006 (Unit I to V).

Books for References

1. Arthus Beiser, Concept of Modern Physics, Mc Graw Hill Ed., 2003 (Unit I to V).

ANALOG ELECTRONICS

Core Course: VIII	Semester: V
Course Code: 18UPH5CC8	Max. Marks : 100
Hours / Week: 6	Internal Marks : 25
Credit: 5	External Marks : 75

Objectives:

- To know about the intrinsic and extrinsic semiconductors
- To understand the transistor circuit configuration
- To know about the characteristics of operational amplifiers.

Unit I: Semiconductors and diodes

Intrinsic and extrinsic semiconductor – PN junction diode – Biasing of PN junction – V-I Characteristics of diode – Rectifiers – Half wave – Full wave and bridge rectifiers – Break down mechanisms – Zener diode:Characteristics – Zener diode as voltage regulator.

Unit II: Transistors

Introduction – npn - pnp transistors – Transistor action – Transistor configurations – Common base configuration – CB characteristics – CE characteristics – Relation between α and β – Voltage divider biasing - Transistor as an amplifier – Transistor as a two part network – h parameters.

Unit III: Amplifiers and Oscillators

Single stage CE amplifier – Analysis of hybrid equivalent circuit – Power amplifiers – Efficiency of class β power amplifier – Push–pull amplifier - General theory of feedback – Properties of negative feedback – Criterion for oscillations – Hartley oscillator – Colpitt's oscillator.

Unit IV: Special semiconductor devices

Field effect transistors – Characteristics of FET – Parameters - JFET- Working & Characteristics of JFET - Difference between JFET and Bipolar Transistor - Working &V-I characteristics of SCR, UJT - UJT as relaxation oscillator.

Unit V: Operational amplifiers

Differential amplifier - Common mode rejection ratio – Characteristics of an ideal op-amp – Virtual ground – Inverting amplifier – Non inverting amplifier – Applications - Adder – Subtractor – Integrator – Differentiator – Unity gain buffer.

Books for Study

1. V.K. Mehtha, Principle of Electronics, S.Chand Publictions, NewDelhi, 3rd Edition , 2008 (Unit I to V).

Books for References

1. B.L.Theraja, Basic Electronics solid state physics, S.Chand and company Ltd., 2002 (Unit I to V).

PRACTICAL III

Core Practical – III	Semester: V
Course Code: 18UPH5CP3	Max. Marks : 100
Hours / Week: 4	Internal Marks : 40
Credit: 3	External Marks : 60

Any TEN experiments

1. Koenig's method – Uniform bending – Y.
2. Spectrometer i-i' curve.
3. Spectrometer – Small angle prism.
4. Spectrometer – Grating – Normal incidence.
5. Spectrometer – Grating minimum deviation and dispersive power.
6. Spectrometer – Cauchy's constants.
7. Spectrometer – Fraunhofer lines.
8. Spectrometer – Hartmann's Formula.
9. Field along the axis of a coil – determination of M.
10. M and H – Absolute determination using deflection and vibration magnetometer.
11. Potentiometer – EMF of a thermocouple.
12. Potentiometer x of thermistor.
13. Potentiometer - High range voltmeter calibration.
14. Ballistic Galvanometer – Figure of merit.
15. Anderson's bridge – AC self inductance of a coil.

MATERIAL SCIENCE

Major Based Elective: I — Semester: V
Course Code: 18UPH5MBE1 — Max. Marks : 100
Hours / Week: 5 — Internal Marks : 25
Credit: 5 — External Marks : 75

Objectives:

- To know about the different types of material and their behavior
- To appreciate the application of superconducvity in the daily life
- To summarize the factors affecting the mechanical properties of a material

Unit I: Crystal Structure

Types of crystal - Space lattice – Basis - Unit cell and lattice parameters – Bravais lattices - Lattice planes and Miller indices - Inter planar spacing in a cubic lattice – Crystal structure: SC, BCC, FCC, Sodium Chloride and Diamond crystal structure – Bonding of solids (Ionic, Covalent , Metallic , Hydrogen and Van der Waal).

Unit II: Superconducting Materials

Superconductivity – Properties - Meissner's effect - London equations - Types of superconductors: Type I and Type II – High temperature superconductors - Applications of superconductor - Josephson effects and its applications – SQUIDS – Levitation – Maglev train – Cryo applications.

Unit III: Nanomaterials

Nanoscience and nanotechnology – Nanomaterials - Properties of nanomaterials (size dependent) - Synthesis of nanomaterials – Fullerenes - Application of nanomaterials – Carbon nanotubes - Fabrication and structure of carbon nanotubes - Properties of carbon nanotubes (Mechanical and Electrical) - Applications of CNT's.

Unit IV: Smart Materials

Metallic glass and its applications — Fiber reinforced metals – SAW Materials and its applications – Biomaterials – Ceramic - Nuclear engineering materials - Nanophase materials - SMART materials - Conducting polymers- Optical materials - Fiber optic materials and their applications.

Unit V: Mechanical Behavior of Materials

Different mechanical properties of Engineering materials – Factors affecting mechanical properties of a material – Types of mechanical tests – Deformation of metals – Bauschinger effect – Elastic after effect – Deformation of crystals and polycrystalline materials.

Book for study

1. G. Senthil kumar, Engineering Physics – II, VRB Publishers Pvt. Ltd., 2015 (Unit I, II & III)
2. G. Cao, Nanostructures and Nanomaterials, World Scientific Publishing Co. Pvt.Ltd., Singapore, 2nd Edition,
2011 (Unit III).
3. M. Arumugam, Material Science, Anuradha puplishers, 1990 (Unit I, IV & V).

Book for References

1. S. O. Pillai, Solid State Physics, New Age International, New Delhi, 2006.
2. Dr. M.N. Avadhanulu, Material Science, S.Chand & Company, New Delhi, 2014.
3. V. Raghavan, Material Science and Engineering, Printice Hall, New Delhi, 2004.
4. V. Rajendran, Material Science, Tata McGraw Hill Ltd, New Delhi, 2001.

ELEMENTS OF CLASSICAL & QUANTUM PHYSICS

Core Course: IX	Semester: VI
Course Code: 18UPH6CC9	Max. Marks : 100
Hours / Week: 6	Internal Marks : 25
Credit: 6	External Marks : 75

Objectives:

- To understand about the basics of classical and quantum ideas
- To explain photoelectric effect with experiments
- To differentiate the Hamilton's equation from the Langrage's equation

Unit I: Lagrangian formalism

Mechanics for a system of particle – Constraints – Generalized co-ordinates – Transformation equations – Configuration space – Principle of virtue work – D' Alemberts principle – Lagrange's Equation – Applications of Lagrange's equation – Atwood machine – Simple pendulum.

Unit II: Hamiltonian formalism

Hamilton equations - Phase space – Generalized momentum – Cyclic co-ordinates – Conservation theorem for generalized momentum – Conservation theorem for energy.

Unit III: Photo electric effects

Photo electric effect – Lenard, Richardson and Compton experiments – Laws of photoelectric emission – Einstein's photoelectric equation – Millikan's experiment - Determination of Planck's constant – Photo emissive cell – Photo – voltaic cell – Photo conductive cell – Photo multiplier.

Unit IV: Dual nature of matter

De Broglie concept of matter waves – De Broglie wavelength – Wave velocity and group velocity for the De Broglie waves – Experimental study of matter waves – Davison and Germer experiment – G.P. Thomon's experiment for verifying De Broglie relation – Heisenberg's uncertainty principle.

Unit V: Schrodinger's wave mechanics

Basic postulates of wave mechanics – Development of Schrodinger wave equation – Time independent and dependent forms of equations – Properties of wave function – Orthogonal and normalized wave function - Eigen function and eigen values – Applications of Schrodinger equation – Particle in a box - Linear harmonic oscillator – The barrier penetration problem.

Books for Study

1. S.L. Gupta, V. Kumar & H.V. Sharma, Classical Mechanics, Pragati Prakashan, Meerut, 2010 (Unit I & II).
2. R. Murugesan, Modern Physics, 17th Edition, S. Chand Pvt. Ltd., New Delhi, 2013 (Unit III, IV & V).

Books for References

1. H. Goldstein, Classical Mechanics, Addison Wesley, London, 2002.
2. P.M. Mathews & K.Venkatesan, A Text Book of Quantum Mechanics, Tata McGraw Hill, New Delhi, 37th Reprint, 2007.
3. Gupta, Kumar & Sharma, Quantum Mechanics, 23rd Edition, 2003-2004.
4. Satyaprakash, Quantum Mechanics, Pragati Prakashan.
5. L.I. Schiff, Quantum Mechanics, McGraw Hill Education Pvt. Ltd., New Delhi, 3rd Edition, 2010.

DIGITAL ELECTRONICS AND MICROPROCESSOR

Core Course: X | Semester: VI
Course Code: 18UPH6CC10 | Max. Marks : 100
Hours / Week: 6 | Internal Marks : 25
Credit: 6 | External Marks : 75

Objectives

- To study various number systems, logical circuits and their implementation.
- To study the fundamentals of architecture and instruction set of an 8-bit microprocessor.
- To write Assembly Language Programs for an 8-bit microprocessor INTEL - 8085.

Unit I: Number systems, Logic gates

Different number systems - Binary, Octal and Hexa-decimal - Conversion between the number systems - Different digital codes - ASCII, BCD, gray codes - Basic logic gates: AND, OR and NOT gates - Realization using diodes and transistor - Universal gates: NAND, NOR - Conversion into Basic gates, Special Gates - Ex-OR, Ex-NOR.

Unit II: Boolean algebra and K-maps

Boolean laws - De-Morgan's theorems - Simplification of logical expression using Boolean algebra - Fundamental products - Minterms and Maxterms - Implementation of truth table into an equivalent logic circuit by Boolean algebra and Karnaugh maps – 4 variables.

Unit III: Combinational and arithmetic digital circuits

Basic idea of multiplexers 2:1, 4:1 - Demultiplexers 1:2, 1:4 – Decoders - Encoders - Decimal to BCD conversion - Parity generator and checker: odd & even - Arithmetic circuits: Binary addition, Binary subtraction using 2's complement method, Half adder, Half subtractor, Full adder and Full subtractor - Memories: Read-only memories (ROM), PROM, EPROM and RAM.

Unit IV: Sequential circuits

RS, D, JK and T flip-flops - Level clocked and edge triggered flip-flops - Preset and clear operations - Race-around conditions in JK flip-flops - Master-slave JK flip-flop - Counters: Asynchronous and Synchronous counters - Decade counter, Up-Down counters, Ring counter - Shift registers: Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only upto 4 bits).

Unit V: Microprocessor and its Programming:

Architecture of 8085 - Block diagram, buses, registers, ALU - Interfacing devices - Timing states - Instruction cycle Interrupts and Interrupt control - Machine Language - Assembly Language - Instruction set and format – Data transfer, Arithmetic, Logical, Branching and Machine Control Operations - Microprocessor Programming: Algorithm and flowcharts - Simple programming exercises: Addition - sum of two 8-bit data with & without carry, decimal addition, sum of a string of data, subtraction of two 8-bit data, 8 bit multiplication - using successive addition and 8 bit division - using successive subtraction.

Books for Study

1. A.P. Godse & D.A. Godse, Digital Electronics - A Text Book - 2008 (Unit I to IV).
2. B. Ram, Fundamentals of Microprocessor and Microcomputers, Dhanpat Rai Publications, New Delhi, 2005 (Unit V).

Book for References

1. V. Vijayendran, Digital Fundamentals, S.Viswanathan Printers & Publishers Private Ltd, Chennai, 2004.
(Unit I to IV)

2. Donald P. Leach & Albert Paul Malvino, Digital principles and Applications, Glencoe, 1993. (Unit I to IV)
3. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Prentice
Hall, 2002. (Unit V)

PRACTICAL IV

Core Practical – IV	Semester: VI
Course Code: 18UPH6CP4	Max. Marks : 100
Hours / Week: 5	Internal Marks : 40
Credit: 4	External Marks : 60

Section – A – Electronics

Any SEVEN experiments only

1. Regulated power supply using Zener, Percentage of regulation.
2. Single stage – RC coupled amplifier – Transistor.
3. Emitter follower amplifier – Frequency response.
4. Hartley oscillator using transistor.
5. Colpitt's oscillator.
6. Astable multivibrator.
7. Monostable multivibrator.
8. FET Characteristics.
9. FET amplifier.
10. Logic gates – AND, OR and NOT gates using discrete components – Truth table.
11. Universal gates NAND/NOR and basic gates from Universal gates.
12. Adder and Subtractor – Half and Full.
13. BCD to 7 segment decoder – 7 segment LED display.
14. Op – Amp – Adder and Subtractor.
15. Op – Amp – Integrator and Differentiator.
16. Demorgan's theorem and Boolean algebra.
17. Flip flop using gates.
18. Construction of power amplifier.

Section –B – Microprocessor 8085

Any THREE experiments only

19. 8-bit addition and 8-bit subtraction.
20. 8-bit multiplication and division.
21. Conversion from decimal to hexadecimal system.
22. Conversion from hexadecimal to decimal system.
23. 16 bit addition.

COMPUTER PROGRAMMING IN C

Major based elective: II — Semester: VI
Course Code: 18UPH6MBE2 — Max. Marks : 100
Hours / Week: 6 — Internal Marks : 25
Credit: 3 — External Marks : 75

Unit I

Introduction: Importance of C – Basic structure of C Programs – Programming Style. Constants, Variables and Data Types: 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 – Procedure and Associativity.

Unit II

Input Output Operator: Getchar, putchar, Formatted output (printf) and Formatted input (scanf). Control Structure: Decision making with if, - if. Else – switch – go to – The break and continue statements – while – do, while – for statements. Arrays. One – dimensional and two dimensional arrays, declaring arrays, storing arrays in memory – initializing arrays.

Unit III

Functions: Basic functions – Return values and their types – calling functions – function arguments – external variables and scope rules. Structures and Union: Structures – Arrays of Structures – Arrays within structures – structures and functions – Unions.

Unit IV

Pointers: Pointers and functions – arguments – Pointers and arrays – address arithmetic – character points and functions – Pointer arrays – Point arrays – Point on Pointers. Preprocessor: Macro substitution – File inclusion – Complier control directives – opening and closing a file – reading and writing data – error handling – Random Access.

Unit V

Development of algorithm, flowchart and program for the following problem.
1. Average of a set of numbers.
2. Conversion of Fahrenheit to Celsius.
3. Solving quadratic equation.
4. Finding the factorial using recursion.
5. To add/subtract/multiply two matrices.
6. To find the smallest and largest element in an array.
7. Sorting a set of numbers in ascending/ descending order.
8. To arrange the names in alphabetical order.

Books for Study

1. Programming in ANSI – C – E. Balagurusamy – Tata McGraw Hill.
2. Schaum's Outline Series Theory and Problems of Programming with C – Byron S.Gottifried, McGraw Hill, Internationals.
3. Programming with C – Venugopal, K.R.and Sudep R.P.Tata McGraw Hill, 1998.

OPTO ELECTRONICS AND FIBER OPTIC COMMUNICATION

Major Based Elective: III	Semester: VI
Course Code: 18UPH6MBE3	Max. Marks : 100
Hours / Week: 6	Internal Marks : 25
Credit: 6	External Marks : 75

Objectives:

- To understand the salient features of optical absorption in metals, semiconductors and insulators
- To know about the characteristics of the opto electronic materials
- To study about the different types of optical data storage device

Unit I: Interaction of light with matter

Introduction - Optical constants - Basic principle - Extinction coefficient - Absorption coefficient - Reflectivity and Transmissivity - Light absorption in metals, semiconductors – Excitons - Salient features of optical absorption in metals, semiconductors and insulators.

Unit II: Opto electronic materials and devices

Optoelectronic materials – Characteristics - Liquid crystal display - Types of display - Light emitting diode - LED materials - LED displays.

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

Unit III: Types and applications of Laser

Basic ideas of Lasers - Stimulated emission and radiation – Population inversion - Types of Lasers: Ruby Laser – Helium-Neon Laser - CO_2 Laser – Semiconductor Laser – Nd: YAG Laser – Applications of Laser.

Unit IV: Fiber optic communication

Introduction - Principle of Optical Fiber - Propagation of optical signal through fiber - Acceptance angle - Numerical aperture - Single and multi mode fibers - Characteristics of step index and graded index fibers - Light source: Laser diode - Light detectors: Avalanche photo diode - Optical fiber communication link (block diagram) -Advantages of fiber optics communication.

Unit V: Optical data storage

Surface storage - Phase change recording - Magneto optical data storage - Hi-tech evolved in system development –Automatic focusing - Automatic track following capacity of CD - Advantages of CD – Holographic storage -Construction and reconstruction of a Hologram.

Books for study

1. S. Jayakumar, Material Science, R.K Publishers, Coimbatore, 2005(Unit I to III).
2. A. Marikani, Engineering Physics, PHI Learning Private Limited, New Delhi, 2nd Edition, 2013 (Unit IV).
3. P.K. Palanisamy, Semiconductor Physics and Opto Electronics, Scitech Publications, 2003(Unit V).

Books for References

1. M.N. Avadhanulu, An introduction to Lasers theory and Applications, S.Chand Publication, 1st edition, 2011.
2. B.B. Laud, Laser and non-linear optics, New age International Publishers, 2nd Edition, 1992.