



Sem	Part	Course	Title	Inst. Hours/ Week	Credit	Exam Hours	Marks		Total
							Int	Ext	
I	I	Language Course-I (LC) – Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course - I (ELC)		6	3	3	25	75	100
	III	Core Course-I (CC)	Properties of Matter and Acoustics	6	6	3	25	75	100
		Core Practical – I (CP)	Practical I	3	-	-	-	-	-
		First Allied Course-I (AC)		4	4	3	25	75	100
		First Allied Course-II (AC)		3	-	-	-	-	-
	IV	Value Education	Value Education	2	2	3	25	75	100
Total				30	18				500
II	I	Language Course-II (LC)- Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course-II (ELC)		6	3	3	25	75	100
	III	Core Course-II (CC)	Mechanics	6	6	3	25	75	100
		Core Practical – I (CP)	Practical I	3	3	3	40	60	100
		First Allied Course-II (AC)		3	3	3	25	75	100
		First Allied Course-III (AC)		4	2	3	25	75	100
	IV	Environmental Studies	Environmental Studies	2	2	3	25	75	100
Total				30	22				700
III	I	Language Course – III (LC)-Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course-III (ELC)		6	3	3	25	75	100
	III	Core Course – III (CC)	Thermal Physics	6	6	3	25	75	100
		Core Practical – II (CP)	Practical II	3	-	-	-	-	-
		Second Allied Course – I (AC)		4	4	3	25	75	100
		Second Allied Course-II (AP)		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	Energy Physics	2	2	3	25	75	100
Total				30	18				500

IV	I	Language Course –IV (LC) - Tamil*/Other Languages ** #		6	3	3	25	75	100	
	II	English Language Course – IV (ELC)		6	3	3	25	75	100	
	III	Core Course – IV (CC)	Electricity, Magnetism and Electro Magnetism		5	5	3	25	75	100
		Core Practical – II (CP)	Practical II		3	3	3	40	60	100
		Second Allied Course - II (AP)			3	3	3	40	60	100
		Second Allied Course - 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	Laser Physics		2	2	3	25	75	100
		Skill Based Elective - I	Skill Based Elective - I		2	2	3	25	75	100
Total				30	23				800	
V	III	Core Course – V (CC)	Optics	5	5	3	25	75	100	
		Core Course – VI (CC)	Atomic and Molecular Physics	5	5	3	25	75	100	
		Core Course – VII (CC)	Electronics	6	5	3	25	75	100	
		Core Practical – III (CP)	Practical III		3	3	3	40	60	100
		Major Based Elective – I	Material Science		5	5	3	25	75	100
	IV	Skill Based Elective – II	Skill Based Elective - II		2	2	3	25	75	100
		Skill Based Elective – III	Skill Based Elective - III		2	2	3	25	75	100
		Soft Skills Development	Soft Skills Development		2	2	3	25	75	100
Total				30	29				800	
VI	III	Core Course – VIII (CC)	Nuclear Physics	6	6	3	25	75	100	
		Core Course – IX (CC)	Theoretical Physics	6	6	3	25	75	100	
		Core Practical – IV (CP)	Practical IV		5	4	3	40	60	100
		Major Based Elective II	Microprocessor and ‘C’ Programming		6	6	3	25	75	100
		Major Based Elective III	Communication Physics		6	6	3	25	75	100
	V	Extension Activities	Extension Activities		-	1	-	-	-	-
		Gender Studies	Gender Studies		1	1	3	25	75	100
Total				30	30				600	
Grand Total				180	140				3900	

List of Allied Courses

Allied Course I

Mathematics

Language Part – I	-	4
English Part –II	-	4
Core Paper	-	9
Core Practical	-	4
Allied Paper	-	5
Allied Practical	-	1

Allied Course II

Chemistry / Computer Science

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)

* for those who studied Tamil upto 10th +2 (Regular Stream)

+ Syllabus for other Languages should be on par with Tamil at degree level

those who studied Tamil upto 10th +2 but opt for other languages in degree level under Part I should study special Tamil in Part IV

** Extension Activities shall be out side instruction hours

Non Major Elective I & II – for those who studied Tamil under Part I

- a) Basic Tamil I & II for other language students
- b) Special Tamil I & II for those who studied Tamil upto 10th or +2 but opt for other languages in degree programme

Note:

	Internal Marks	External Marks
1. Theory	25	75
2. Practical	40	60
3. Separate passing minimum is prescribed for Internal and External marks		

FOR THEORY

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 PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]
 The passing minimum for University Examinations **shall be 40% out of 60 marks** [i.e. 24 marks]

CORE COURSE I

PROPERTIES OF MATTER AND ACOUSTICS

Objective:

To identify the characteristics of matter in terms their properties and to know the basic principles of acoustics.

UNIT I Elasticity

Hooke's law – Stress-Strain diagram – Factors affecting elasticity- Different moduli of elasticity - Relation between the elastic moduli – Poisson's ratio -- Twisting couple on a cylinder – Determination of rigidity modulus by static torsion – Work done in twisting a wire -Torsional oscillations of a body-Torsion pendulum - Determination of rigidity modulus and moment of inertia.

UNIT II Bending of Beams

Bending of beams - Expression for bending moment – Cantilever – Expression for depression of the loaded end of a cantilever — Young's modulus by measuring the tilt in a loaded cantilever – Oscillation of a cantilever - Non-uniform bending – Expression for depression- Uniform bending – Expression for elevation –Experimental determination of Young's modulus using pin and microscope method (Non-uniform bending – Uniform bending) - Determination of Young's modulus by Koenig's method.

UNIT III Surface Tension

Definition – Molecular forces – Explanation of surface tension on kinetic theory – Surface energy – Work done on increasing the area of a surface - Angle of contact - Neumann's triangle- Excess pressure inside a liquid drop and soap bubble - Excess pressure inside a curved liquid surface - Force between two plates separated by a thin layer of a liquid - Experimental determination of surface tension - Jaegar's method - Drop- weight method - Capillary rise method - Variation of surface tension with temperature.

UNIT IV Viscosity

Newton's law of viscous flow – streamlined and turbulent motion – Reynold's number - Poiseuille's formula for the flow of a liquid through a horizontal capillary tube – Experimental determination of co-efficient of a liquid by Poiseuille's method - Ostwald's viscometer – Terminal velocity and Stokes' formula - Viscosity of gases – Meyer's formula - Rankine's method - Variation of viscosity with temperature and pressure - Lubrication.

Equation of continuity of flow – Euler's equation for unidirectional flow - Bernoulli's theorem – Filter pump and Wings of aeroplane - Torricelli's theorem - Pitot tube.

UNIT V Acoustics

Newton's Formula for velocity of sound –Effect of Temperature, Pressure, Humidity , Density of medium and Wind - Musical Sound and Noise – Speech- Characteristics of Musical sound – Intensity of sound – Measurement of intensity of sound :Decibel and Phon- Bel.

Reverberation – Sabine's Reverberation formula – Factors Affecting the Acoustics of Buildings – Sound distribution in an Auditorium – Requisites for good acoustics – Ultrasonics – Production and detection – Medical applications of Ultrasonic waves – Acoustic Grating.

Books for Study:

1. R. Murugesan, *Properties of matter*, S. Chand & Co. Pvt. Ltd., Revised edition, 2012.
2. D.S. Mathur, *Elements of Properties of matter*, S. Chand & Co. Pvt.Ltd., Revised edition, 2010
3. Brijlal & N. Subramanyam, *Properties of matter*, Vikas Publishng. Pvt. Ltd, 2005.
4. Brijlal & N. Subramanyam, '*A Text Book of Sound*', Vikas Publishing. Pvt. Ltd, 2008.

Books for Reference:

1. Feynman, *Lectures on Physics*. Vol. I & II by Richard P. Feynman, The New Millennium Edition, 2012.
2. David Halliday and Robert Resnick, *Fundamentals of Physics* by Wiley Plus., 2013.
3. B.H. Flowers and E. Mendoza, *Properties of matter*, Wiley Plus, 1991.
4. H.R. Gulati, *Fundamentals of General properties of matter*, S. Chand & Co. Pvt. Ltd, 2012.
5. Chatterjee and Sen Gupta, *A treatise on general properties of matter*, New central Books agency (p) Ltd, Kolkata, 2001.
6. R.L. Saihgal, *A Text Book of Sound*, S. Chand & Co. Pvt. Ltd, New Delhi, 1979.

CORE PRACTICAL I
(Any Twelve Experiments)

Objective:

To motivate and educate the students to acquire skill in physics Experiments.

1. Measurements of length (or diameter) using Vernier calipers, Screw gauge and Travelling microscope.
2. Non uniform bending - Pin & Microscope Method.
3. Cantilever depression—Scale and Telescope Method.
4. Surface Tension, Interfacial Surface Tension – Drop weight Method.
5. Surface Tension by Capillary rise method
6. Joule's Calorimeter - determination of Specific heat capacity of liquid.
7. Compound pendulum - g & k determination.
8. Specific heat capacity of liquid - Newton's law of cooling.
9. Coefficient of viscosity of liquid—Poiseuille's flow method.
10. Spectrometer - determination of μ of a solid prism.
11. P.O box – determination of Temperature coefficient.
12. Meter bridge - Specific resistance determination.
13. Comparison of Viscosities of two liquids – Ostwald's Viscometer/ HARE's apparatus
14. Long focus convex lens - f, R, refractive index-determination.
15. Concave lens – Focal length determination.
16. Determination of the Elastic Constants of a Wire by Searle's method.
17. Determine the frequency of a given tuning fork – Sonometer.

Books for Study :

1. Dr. S. Somasundaram, *Practical Physics*, Apsara publications, Tiruchirapalli, 2012.
2. Department of Physics, *Practical Physics*, (B.Sc. Physics Main), St. Joseph's College, Tiruchirapalli 1998.

Books for Reference:

1. S. Srinivasan, *A Text Book of Practical physics*, S. Sultan Chand publications. 2005
2. R. Sasikumar, *Practical Physics*, PHI Learning Pvt. Ltd, New Delhi, 2011.

CORE COURSE II

MECHANICS

Objective:

An attempt is made to give a better insight of the change of position of any physical object or event and their consequences.

UNIT I Projectile, Impulse and Impact

Projectile - particle projected in any direction - Path of a projectile is a parabola - Range of a projectile on plane inclined to the horizontal - Maximum range on the inclined plane - Impulse of a force - Laws of impact - Direct impact between two smooth spheres - oblique impact between two smooth spheres - Impact of a smooth sphere on a smooth fixed horizontal plane - Loss of KE due to direct impact - Oblique impact.

UNIT II Motion on a plane curve

Centripetal and centrifugal forces - Hodograph - Expression for normal acceleration - Motion of a cyclist along a curved path - Motion of a railway carriage round a curved track- upsetting of a carriage - Motion of a carriage on a banked up curve - Effect of earth's rotation on the value of the acceleration due to gravity - Variation of 'g' with altitude, latitude and depth.

UNIT III Gravitation

Newton's law of gravitation - Mass and density of earth - Inertial and Gravitation mass - Determination of G-Boy's experiment -Kepler's Laws of planetary motion -Deduction of Newton's law of gravitation from Kepler's Law - Gravitation - Field - potential -Intensity of Gravitational field - gravitational potential due to a point mass - Equipotential surface - Gravitational potential and field due to a spherical shell and solid sphere - Escape velocity -Orbital velocity.

UNIT IV Dynamics of rigid body and Friction

Moment of Inertia - Kinetic energy and angular momentum of rotating body - Theorems of perpendicular and parallel axes - Acceleration of a body rolling down an inclined plane without slipping - Oscillations of a small sphere on a large concave smooth surface - Compound pendulum - Centre of suspension and centre of oscillation - Centre of percussion - Minimum period of a compound pendulum - Kater's pendulum.

Friction - Laws of friction - Resultant reaction - Angle and cone of friction - Equilibrium of a body on a rough plane inclined to the horizontal - The friction clutch.

UNIT V Centre of gravity, Centre of Pressure, Floating bodies, Atmospheric pressure

Centre of gravity of a body - Centre of gravity of a trapezoidal lamina - C.G. of a solid hemisphere - C.G. of a solid tetrahedron - C.G. of a solid cone.

Centre of pressure - rectangular lamina - triangular lamina - triangular lamina immersed in a liquid.

Conditions of equilibrium of a floating body - Stability of equilibrium of a floating body - Metacentre - Experimental determination of a metacentric height of a ship.

The barometer - Fortin's barometer - Correction for a barometer - Faulty barometer - Variation of atmospheric pressure with altitude.

Books for study:

1. M. Narayanamurthi and N. Nagarathinam, *Dynamics*, The National Publishing Company 2005, Chennai.
2. M. Narayanamurthi and N. Nagarathinam, *Statics, Hydrostatics and Hydrodynamics* - The National Publishing Company 2005, Chennai.

Books for reference:

1. R. Murugesan, *Mechanics and Mathematical Physics*, S. Chand & Company Ltd., New Delhi, 2008.
2. D.S. Mathur, *Mechanics*, S. Chand & Company Ltd., New Delhi - 1990.

CORE COURSE III
THERMAL PHYSICS

Objective :

To understand the phenomena connected with heat as radiation, conduction, different thermal capacities of substances and the converse process of making heat to do mechanical work.

UNIT I Specific Heat

Specific heat of solids – Method of mixtures – radiation correction – Dulong and Petit's law - Quantum theory - Einstein's theory of specific heat – Debye's theory of specific heat– Specific heat of liquids – Newton's law of cooling - Specific heat of gases – Mayer's Relation – Quantization of various contributions to energy of diatomic molecules – Specific heat of diatomic gases.

UNIT II Conduction.

Coefficient of Thermal Conductivity - Rectilinear Flow of Heat along a Bar - Thermal conductivity of good conductors - Lee's method for metals – Forbe's method to find K – Lee's disc method for Bad Conductors – Heat Flow Through a Compound wall – Accretion of Ice on Ponds – Wiedemann-Franz law – Practical applications of conduction of heat.

UNIT III Radiation

Radiation – Stefan's law - Deduction of Newton's law from Stefan's law – Boltzmann's law – Black body radiation – Wein's law – Rayleigh-Jean's law – Planck's law – Angstrom Pyrheliometer – Solar constant – Surface temperature of sun - Sources of solar energy – Photo voltaic cell – Greenhouse effect.

UNIT IV Low Temperature

Joule – Thomson's effect – Porous plug experiment – Liquefaction of gases –Linde's method – Liquefaction of hydrogen - Adiabatic demagnetization – Liquefaction of He – Practical applications of low temperature – Refrigerating mechanism – Air conditioning mechanism – solid carbon dioxide(dry ice).

UNIT V Thermodynamics

Zeroth law of thermodynamics – First law of thermodynamics – Heat engines – Reversible and irreversible process - 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 thermo dynamical relations – Clausius' - Claypeyron's latent heat equations.

Books for Study:

1. Brijlaland Subramaniam, *Heat and Thermodynamics*, S. Chand &Co., 2001.
2. J. B. Rajamand C. L Arora, *Heat and Thermodynamics*, S. Chand & Co.1983.
3. Brijlaland Subramaniam, *Heat and Thermodynamics & Statistical physics*, S. Chand & Co. 2015.

Books for Reference:

1. M. Narayanamoorthy and N. Nagarathinam, *Heat*, National publishing Co, Chennai, Eight edition, 1987.
2. D.S. Mathur, *Heat and Thermodynamics*, S. Chand & Co. 2014.

CORE PRACTICAL II

(Any Twelve Experiments)

Objective:

To enhance the knowledge in experimental physics.

1. Uniform bending –Pin and Microscope.
2. Static Torsion -Determination of Rigidity modulus (n).
3. Torsional Pendulum – Rigidity modulus (n) and moment of inertia (I).
4. Stoke's method - Viscosity of highly viscous liquid.
5. Coefficient of viscosity of highly viscous liquid –Searle's viscometer method.
6. Emissive power of a surface - Spherical calorimeter.
7. Thermal conductivity of a bad conductor -Lee's disc method.
8. Carey Foster's Bridge –specific resistance determination.
9. Potentiometer - Ammeter calibration.
10. Potentiometer - Voltmeter calibration - low range.
11. Potentiometer - determination of resistance.
12. Figure of merit of a mirror Galvanometer.
13. Spectrometer -Determination μ of a liquid.
14. Spectrometer- Grating--normal incidence method.
15. Air Wedge - determination of Thickness of a thin wire.
16. High resistance by leakage – Using BG.
17. Characteristics of Junction and Zener diodes.

Books for Study :

- 1 Dr. S. Somasundaram, *Practical Physics*, Apsara publications, Tiruchirapalli, 2012.
- 2 Department of Physics, *Practical Physics*, (B.Sc. Physics Main), St. Joseph's College, Tiruchirapalli 1998.

Books for Reference:

1. S. Srinivasan, *A Text Book of Practical physics*, S. Sultan Chand publications, 2005.
2. R. Sasikumar, *Practical Physics*, PHI Learning Pvt. Ltd, New Delhi, 2011.

NON-MAJOR ELECTIVE I

ENERGY PHYSICS

Objective:

To make the students to understand the present day crisis of need for conserving energy and alternatives are provided.

UNIT I Conventional Energy Sources

World reserve- Commercial energy sources and their availability – Various forms of energy – Renewable and Conventional energy system – comparison – Coal, oil and natural gas – applications – Merits and Demerits.

UNIT II Solar energy

Renewable energy sources – Solar energy – nature and Solar radiation – components – Solar heaters – Crop dryers – Solar cookers – Water desalination (block diagram) -Photovoltaic generation – merits and demerits.

UNIT III Biomass energy fundamentals:

Biomass energy – classification – Photosynthesis – Biomass conversion process

UNIT IV Biomass Utilization

Gobar gas plants – Wood gasification – advantage & disadvantages of biomass as energy source

UNIT V Other forms of energy sources

Geothermal energy – Wind energy – Ocean thermal energy conversion – Energy from waves and tides (basic ideas).

Books for study:

1. D.P. Kothari, K.C. Singal & Rakesh Ranjan, *Renewable energy sources and emerging Technologies*, Prentice Hall of India Pvt. Ltd., New Delhi (2008).
2. Suhas P Sukhatme, *Solar energy -- Principles of thermal collection and storage*, Tata McGraw-Hill Publishing company, New Delhi, Second edition, 2012.

Books for References:

1. S.A. Abbasi and Nasema Abbasi, *Renewable Energy sources and their environmental impact*, PHI Learning Pvt. Ltd., New Delhi (2008).

CORE COURSE IV

ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM

Objective:

This course provides an in depth coverage of behaviour of stationary electric charges, electricity, magnetism and how they are connected.

UNIT I Electrostatics

Coulomb's Law – Gauss's Law and its applications (Electric Field due to a uniformly charged sphere, hollow cylinder & solid cylinder)– Electric Potential – Potential at a point due to a uniformly charged conducting sphere – Principle of a capacitor– Capacity of a spherical and cylindrical capacitors – Energy stored in a charged capacitor–Loss of energy on sharing of charges between two capacitors.

UNIT II Current Electricity

Ampere's circuital law and its applications -Field along the axis of a circular coil and Solenoid–Theory of Ballistic Galvanometer –Figure of merit– Damping Correction– Kirchhoff's Laws of Electricity –Wheatstone's Bridge–Carey Foster's Bridge–Potentiometer– Calibration of Ammeter – Calibration of Voltmeter (Low range and High range) – Comparison of Resistances.

UNIT III 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 (Rayleigh's method) and mutual inductance– Growth and decay of current in a circuit containing L and R–Growth and decay of charge in a circuit containing C and R– Measurement of High resistance by leakage.

UNIT IV AC Circuits

Alternating EMF applied to series circuits containing LC, LR and CR– Alternating EMF applied to circuits containing L, C and R–Series and Parallel resonance circuits– Sharpness of resonance–Q factor– Comparison between Series and Parallel resonant circuits –Power in AC circuits (R, L-R, L-C-R only) – Power factor– Wattless current – Choke Coil – Transformer – Uses of Transformers – Skin Effect.

UNIT V Magnetism

Intensity of Magnetization– Magnetic Susceptibility– Magnetic Permeability – Types of magnetic materials– Properties of para, dia and ferromagnetic materials– Langevin's theory of dia and para magnetism– Weiss's theory of ferromagnetism – B-H curve–Energy loss due to magnetic hysteresis – Ballistic Galvanometer method for plotting B-H curve - Magnetic properties of iron and steel.

Books for Study:

1. BrijLal and N. Subrahmanyam, *A Text Book of Electricity and Magnetism*, Ratan Prakashan Mandir Educational & University Publishers, New Delhi, 2000.
2. R. Murugesan, *Electricity and Magnetism*, S. Chand & Company Pvt. Ltd., New Delhi – 2015

Books for Reference:

1. D. L. Sehgal, K. L. Chopra and N. K. Sehgal, *Electricity and Magnetism*, S. Chand & Sons. New Delhi. 1996.

NON MAJOR ELECTIVE II

LASER PHYSICS

Objective:

To introduce the physical and engineering principles of laser operation and their applications.

UNIT I **Fundamentals of LASER**

Spontaneous emission – Stimulated emission – Meta stable state – Population inversion – Pumping – Laser Characteristics

UNIT II **Production of LASER**

Helium – Neon Laser – Ruby Laser – CO₂ Laser – Semiconductor Laser

UNIT III **Industrial Applications of LASER**

Laser cutting – Welding – Drilling – Hologram – Recording and reconstruction of hologram

UNIT IV **Lasers in Medicine**

Lasers in Surgery – Lasers in ophthalmology – Lasers in cancer treatment

UNIT V **Lasers in Communication**

Optic fibre communication – Total internal reflection – Block diagram of fibre optic communication system – Advantages of fibre optic communication.

Books for study:

1. N. Avadhanulu , *An introduction to LASERS*, S. Chand & Company,2001.

Books for References:

1. William T. Silfvast, *Laser fundamentals*, University Press, Published in South Asia by Foundation books, New Delhi, 1998.
2. K. Thyagarajan and A.K. Ghatak, *LASER Theory and Application*, Mc Millan, India Ltd, 1984.

CORE COURSE V

OPTICS

Objective :

To familiarize the fundamental laws concerning reflection, refraction, interference, diffraction, polarization, spectrum and allied phenomena.

UNIT I Geometrical optics

Spherical aberration - Spherical aberration of a thin and thick lens - Methods of reducing Spherical aberration - Coma - Aplanatic surface - Astigmatism - Curvature of the field - Meniscus lens - Distortion - Chromatic aberration - Chromatic aberration in a lens - Circle of least Chromatic aberration - Achromatic lenses.

UNIT II Interference

Air wedge - Newton's rings - Haidinger's fringes - Brewster's fringes - Michelson Interferometer and its applications - Fabry- Perot Interferometer - Interference filter - Stationary waves in light - Colour photography (qualitatively) - Holography - Construction and reconstruction of a hologram - Applications.

UNIT III Diffraction

Fresnel's diffraction - Diffraction at a (1) circular aperture (2) Straight edge (3) narrow wire - Fraunhofer diffraction at a single slit - Double slit - Missing orders in a Double slit, Diffraction pattern - Grating (theory) - Oblique incidence - Overlapping of spectral lines - Resolving power - Rayleigh's criterion of resolution- Resolving power of a Telescope and Grating - Dispersive power and resolving power of a grating.

UNIT IV Polarization

Nicol prism - Nicol prism as an analyzer and polarizer - Huygens's explanation of Double refraction in uniaxial crystals - Double Image polarizing prisms - Elliptical and Circularly polarized light - Production and detection - Quarter wave and half wave plates - Babinet's compensator - Optical activity - Fresnel's explanation of optical activity - Laurent's Half shade polarimeter.

UNIT V Optical Instruments

Microscopes - Simple Microscope (Magnifying glass) - Compound Microscope - Ultra-Microscope - Eyepieces - Huygen's Eyepiece - Ramsden's Eyepiece - Comparison of Eyepieces - Telescope - Refracting astronomical telescope - Abbe Refractometer - Pulfrich refractometer - Photographic Camera - Prism binoculars.

Books for study:

1. Dr. N. Subramaniam, Brijlal and Dr.M.N. Avathanulu, *Optics*, S. Chand &Co. Pvt.Ltd. 25th revised edition , New Delhi ,2012 .
2. Dr. N. Subramaniam, Brijlal and Dr.M.N. Avathanulu, *Optics*, S. Chand & Co. Pvt. Ltd.- 9th revised edition, New Delhi ,2014.
3. Krishnapada Ghosh Anandamoy Manna, *Text book of Physical Optics*, McMillan India Ltd, First edition, 2007.

Books for Reference:

1. Singh & Agarwal, *Optics and Atomic Physics*, Pragati Prakashan Meerut, Nineth edition, 2002.
2. A.B. Gupta, *Modern Optics*, Books and allied (P) Ltd, Kolkata, First edition, 2006.
3. Ajoy Ghatak, *Optics*, (TMH), New Delhi, Fourth edition, 2009.
4. Arial Lipson, Stephen G.Lipson and Hentry Lipson, *Optical Physics*, Cambrige, Fourth edition, 2011.
5. Schaum's outlines, *Optics*, Tata McGraw Hill, 2011.

CORE COURSE VI

ATOMIC AND MOLECULAR PHYSICS

Objective:

The purpose is to understand the outgrowth of the structure, extra nuclear part of the atom and origin of the spectra.

UNIT I Cathode and Positive Ray - Analysis

Production and Properties of Cathode rays - Electronic charge - Millikan's oil-drop method - Production and properties of positive rays - Thomson's parabola method - Aston's, Dempster's and Bainbridge's mass spectrographs (e/m) - Mass defect and Packing Fraction.

UNIT II Atom model

Bohr atom model - Critical Potentials - Experimental determination of critical potentials - Franck and Hertz's experiment - Sommerfield's Relativistic atom model - Vector atom model - Quantum numbers associated with vector atom model - Pauli's exclusion principle - Electronic configuration of elements and periodic table - Magnetic dipole moment due to orbital motion and spin of the electron - The Stern and Gerlach experiment - Zeeman effect - Experimental arrangement for the normal Zeeman effect - Larmor's theorem - Quantum mechanical explanation of the normal Zeeman effect - Anomalous Zeeman effect - Paschen Back Effect - Stark effect.

UNIT III X-Rays

X-rays - production - detection and properties - Bragg's law - Bragg's X-ray spectrometer - Laue's experiment - The Powder crystal method - Rotating crystal method - X-ray spectra - Characteristics of X-ray spectrum - Moseley's law - Compton effect - Determination of wavelength - Symmetry operations and elements of Symmetry.

UNIT IV Photoelectric Effect and Free Electron theory of metals

Free electron theory of metals - Properties of metals - Drude and Lorentz theory - Electrical and thermal conductivities - Wiedemann and Franz law.

Photoelectric effect - Lenard's experiment - Richardson and Compton experiment - Experimental investigations on the photoelectric effect - Laws of photoelectric emission - Einstein's photoelectric equation - Experimental verification - Millikan's experiment - Photoelectric cells - Photoemissive cell - Photovoltaic cell - Photoconductive cell - Applications of Photoelectric cells.

UNIT V Molecular Physics

Induced absorption - Spontaneous emission - Stimulated emission - Ruby laser - He laser - Semiconductor laser - Properties of laser beam – Applications of LASER in Medicine and Industry - Theory of the pure rotational spectrum of a molecule - Theory of the origin of the vibration - rotation spectrum of a molecule - Electronic spectra of molecules - Molecular orbital theory of Hydrogen molecule ion - Heitler-London theory of Hydrogen molecule - Theory of ESR .

Books for study:

1. R. Murugesan, KiruthigaSivaprasath, *Modern Physics*, S. Chand &Co Ltd., New Delhi, 14th Revised edition, 2014.
2. J.B. Rajam, *Atomic Physics*, S. Chand & Co Ltd., New Delhi, Revised edition, 2009.

Books for Reference:

1. Sehgal, Chopra and Sehgal, *Modern physics*, Sultan Chand & Sons, New Delhi.
2. Arthur Beiser, Shobhit Mahajan, S. RaiChoudhury, *Concepts of Modern Physics*, Sixth edition, SIE, 2009.
3. S.N .Ghoshal, *Atomic Physics*, S. Chand & Co Ltd., New Delhi, Revised edition, 2004.

CORE COURSE VII

ELECTRONICS

Objective:

To enable the students to understand all aspects of electronics in a lucid and comprehensive manner.

UNIT I Semiconductors, diodes and Bipolar Transistors

Intrinsic and extrinsic semi-conductors –PN junction diode – Biasing–V-I Characteristics– Rectifiers – Half wave – full wave and Bridge rectifiers – Break down mechanisms – Zener diode- characteristics of Zener diode – Zener diode as voltage regulator-Bipolar junction transistor – Basic configurations -Relation between α and β – Characteristic curves of transistor – CB, CE mode – DC load line – DC bias and stabilization – fixed bias – voltage divider bias.

UNIT II Amplifiers and Oscillators

Single stage CE amplifier – Analysis of hybrid equivalent circuit – Power amplifiers – Efficiency of class A,B & C Power amplifier - General theory of feedback – Properties of negative feedback – Criterion for oscillations – Hartley oscillator – Colpitt's oscillator.

UNIT III Number Systems, Logic Gates and Boolean Algebra

Introduction to decimal, binary, octal, hexadecimal number systems – Inter conversions– 1's and 2's complements –Logic gates, Symbols and their truth tables – AND, OR, NOT, NAND, NOR, XOR, and XNOR – Universality of NAND and NOR gates.

Boolean algebra – De-Morgan's theorems –Reducing Boolean expressions using Boolean laws – SOP forms of expressions (minterms) – Karnaugh map simplification(Four variables).

UNIT IV Combinational and Sequential Digital Systems

Half and full adders – Half and full subtractors – Decoder(2:4 line) – Encoder (4:2 line)– Multiplexer(4:1 line) – Demultiplexer (1:4 line) - Flip flop – RS – clocked RS – T and D flip flops – JK and master slave flip flops – Counters – Four bit asynchronous ripple counter – Mod-10 counter — Synchronous counter – Ring counter - Shift registers – SISO and SIPO shift registers.

UNIT V Operational amplifier

Operational amplifier - Characteristics – Inverting and Non-inverting amplifier – Voltage follower – Adder, Subtractor, Integrator and Differentiator circuits – Log & antilog amplifiers – Op- amp as Comparator – Filters-low,

bandpass, high pass filters -A/D conversion – Successive approximation method – D/A conversion – R-2R ladder network.

Books for study:

1. Mehta V.K., *Principles of Electronics*, S. Chand and company Ltd, 2014.
2. A.P. Malvino, D.P. Leach, *Digital Principles and Application*, IV Edition, Tata McGraw Hill, New Delhi, 2011.
3. V. Vijayendran, *Digital Fundamentals*, S.Viswanathan, Printers & Publishers Private Ltd, Chennai, 2004.

Books for Reference :

1. Theraja. B.L, *Basic electronics - Solid State*, S.Chand and Company Ltd 2002.
2. Sedha R.S., *A text book of applied Electronics*, S.Chand & company Ltd 2002.
3. W.H.Gothmann, *Digital Electronics*, Prentice Hall of India, Pvt. Ltd., New Delhi 1996.

CORE PRACTIAL III

(Any Twelve Experiments)

Objective:

To promote scientific temper and to learn physical concepts through these experiments.

1. Spectrometer- i - d curve.
2. Spectrometer - i - i' curve.
3. Spectrometer - small angle prism.
4. Field along the axis of a coil – determination of M .
5. Potentiometer - EMF of a thermocouple.
6. Potentiometer -Temperature coefficient of thermistor.
7. Ballistic Galvanometer-Figure of merit
8. Ballistic Galvanometer-Absolute Determination of Mutual Inductance.
9. Anderson's bridge – Self-inductance of a coil.
10. Series resonance circuits.
11. Parallel Resonance circuits.
12. Regulated power supply using Zener diode - Percentage of regulation.
13. Single stage - RC coupled amplifier – Transistor.
14. Hartley oscillator using transistor.
15. FET Characteristics.
16. AND, OR and NOT gates using discrete components
17. AND, OR and NOT gates using IC's.
18. Op - Amp -Adder and Subtractor.
19. Op - Amp - Integrator and Differentiator.
20. Construction of Half wave rectifier.
21. Half Adder and Full adder circuits using logic gates.
22. Half Subtractor and Full Subtractor circuits using logic gates.

Books for Study :

1. Dr. S. Somasundaram, *Practical Physics*, Apsara publications, Tiruchirapalli, 2012.
2. Department of Physics, *Practical Physics*, (B.Sc. Physics Main), St. Joseph's College, Tiruchirapalli 1998.

Books for Reference:

1. S. Srinivasan, *A Text Book of Practical physics*, S. Sultan Chand publications. 2005
2. R. Sasikumar, *Practical Physics*, PHI Learning Pvt. Ltd, New Delhi, 2011.

MAJOR BASED ELECTIVE I

MATERIAL SCIENCE

Objectives:

To develop knowledge in material science and to understand the relationship between properties and material characteristics.

UNIT I Crystal Structure

Types of crystals-space lattice-basis- unit cell and lattice parameters – Bravais lattices-Lattice planes and Miller indices-inter planar spacing in a cubic lattice-cubic lattice-SC – BCC – FCC- Sodium chloride and Diamond crystal structure – Bonding of solids (Ionic , Covalent , Metallic , Hydrogen and Van der Waal).

UNIT II Super Conducting Materials

Superconductivity – Properties-Meissner's effect- London equations - types of superconductors Type I and Type II –High temperature superconductors - Josephson effects and its applications – SQUIDS - Applications of superconductor.

UNIT III Nano Materials

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 – creep – Fracture-technological properties – factors affecting mechanical properties of material-Heat treatment-cold and hot working-types of mechanical tests- metal forming process-deformation of metals-Deformation of crystals and polycrystalline materials.

Books for study:

1. Dr. M.N. Avadhanulu, *Material science*, S.Chand & Company, New Delhi, 2014.

Books for Reference:

1. M.Arumugam, *Material science*, Anuradha publishers, 1990.
2. V. Raghavan, *Material Science and Engineering* , Printice Hall India.,2004.
3. V. Rajendran, *Material Science*, Tata McGraw Hill Ltd, New Delhi,2001.

CORE COURSE VIII

NUCLEAR PHYSICS

Objective:

To emphasize the understanding of nuclear forces and models, elementary particles and Accelerators.

UNIT I General Properties of Nuclei and Nuclear Models

Constituents of nuclei-Classification of nuclei - Nuclear mass and binding energy - Binding energy and stability of nucleus, Mass defect and Packing fraction, Binding fraction Vs Mass number curve - Nuclear size - Nuclear spin-nuclear energy levels - Nuclear magnetic moment --Parity of nuclei - Nuclear forces - Yukawa's model of nuclear force.

Nuclear Models - Liquid drop model, Semi-empirical mass formula - Shell model- Salient features of shell model.

UNIT II Radioactivity

Radioactive decay law-Half life and Average life - Activity or strength of a radio - sample - Successive transformation - Radioactive chain- Radioactive equilibrium - Radioactive dating - α - decay - Geiger-Nuttall law - Tunnel effect - Gamow's theory of α decay - β -decay - Energetics of β -decay - Continuous β -spectrum - Inverse β -decay -Parity violation in β -decay - Neutrino hypothesis - Properties of neutrino - Gamma rays-origin of the gamma rays - Internal conversion.

UNIT III Particle Accelerators and Detectors

Linear accelerator - Cyclotron - Betatron - Electron synchrotron - Accelerators in India.

Radiation Detectors - Ionisation Chamber - Proportional counter - G.M. Counter-Cloud chamber - Scintillation counter - Solid state track detector - Semiconductor detector.

UNIT IV Nuclear Reactions and Nuclear Reactors

Nuclear reactions - Types of nuclear reactions - Conservation laws in nuclear reactions -Energetic of nuclear reactions - Kinematics of nuclear reactions -Threshold energy of nuclear reactions - Solution of the Q- value equation - Cross-section of nuclear reactions.

Nuclear fission - fission of light nuclei - Prompt and delayed neutrons - Neutron speed , classifications - Nuclear chain reaction - Neutron cycle - Nuclear reactor - Types of reactor -Fission bomb - Nuclear power in India-Fusion-Thermonuclear reaction - Hydrogen bomb -Possibility of fusion reactor.

UNIT V Elementary Particles

Classification of elementary particles – Pions and Muons - K-mesons – Hyperons- Conservation laws - Exact laws - Approximate conservative laws- Fundamental interactions – Antiparticles -Resonance particles – Hyper-nucleus - Symmetry classification of elementary particles - Quark model.

Books for Study:

1. Gupta & Roy., *Physics of the Nucleus*, Books and Allied (P) Ltd. Kolkatta, 2011 .

Books for Reference:

1. S. N. Ghoshal, *Nuclear Physics* , S. Chand & Co., Edition ,2003.
2. M L Pandya& R. P .S .Yadav, *Elements of Nuclear Physics*,Kedaar Nath & Ram Nath ,2000.
3. SatyaPrakash, *Nuclear Physics*, A Pragati Prakasan Publication, 2011.
4. Jahan Singh, *Fundamentals of Nuclear Physics*, A Pragati Publication, 2012.
5. D.C.Tayal, *Nuclear Physics*, Himalaya Publishing House, 2009.

CORE COURSE IX
THEORETICAL PHYSICS

Objective:

To know the facts and develop a unified and logical treatment of the subject matter with clarity and conciseness.

UNIT I Fundamental Principles and Lagrangian Formulation

Mechanics of a particle and system of particles – Conservation laws – Constraints – Generalized coordinates – Principle of virtual work-D’Alembert’s principle and Lagrange’s equation – Hamilton’s principle –Lagrange’s equation of motion – conservation theorems and symmetry properties –Atwood’s machine – Simple pendulum.

UNIT II Hamilton’s Formulation

Hamilton’s canonical equations of motion – Hamilton’s equations from variational principle –Principle of least action – Phase space – Generalized momentum – Cyclic co-ordinates –Conservation theorem for generalized momentum – Conservation theorem for energy

UNIT III 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. Thomson’s experiment for verifying De Broglie relation – Heisenberg’s uncertainty Principle – Electron microscope – Gamma ray microscope.

UNIT IV Basics of Quantum Mechanics

Basic postulates of wave Mechanics – Development of Schrödinger wave equation – Time independent and dependent forms of equations – Properties of wave function – Orthogonal and normalized wave function Eigen function and eigen values – Expectation values and Ehrenfest’s theorem.

UNIT V Exactly Solvable Quantum Systems

Linear harmonic oscillator – Particle in a box –Rectangular barrier potential –Rigid rotator – Hydrogen atom.

Books for study:

1. S.L.Gupta., V. Kumar and H.V.Sharma, Pragathi Prakashan, *Classical Mechanics* Educational Publisher, Meerut, 25th edition, 2011.
2. Murugesan, R., *Modern Physics*, S.Chand & Co., New Delhi, 2006.

Books for Reference:

1. Arthur Beiser, *Concept of Modern Physics*: McGraw Hill Ed. V (1999).
2. H.Goldstein, *Classical Mechanics*, Narosa Book distributors, New Delhi 1980.
3. N.C.Rana and P.S.Joag, *Classical Mechanics*, Tata Mc Graw Hill, New Delhi 1991.
4. P M. Mathews and K. Venkatesan, *A Text Book of Quantum Mechanics* ,Tata McGrawHill, New Delhi, 1987.

CORE PRACTIAL IV

(Any Twelve Experiments)

Objective:

To provide an indepth knowledge and skill in Electronics, C- Programming and Micro Processor.

SECTION – A

(Any Eight Experiments)

1. Koenig's method – Uniform bending.
2. Spectrometer - Grating-minimum deviation method
3. Spectrometer – Grating - dispersive power.
4. Spectrometer - Cauchy's constants.
5. M and H - Absolute determination using deflection and vibration magnetometer.
6. Potentiometer - High range Voltmeter calibration.
7. B.G. Absolute capacity of condenser.
8. Emitter follower amplifier - Frequency response.
9. Colpitt's oscillator using transistor.
10. Astable multi-vibrator using Transistor/op.amp
11. Monostable multi-vibrator using Transistor/op.amp.
12. FET amplifier – Common source.
13. Verification of Boolean Laws (any four.)
14. NAND as universal gate.
15. NOR as universal gate.

SECTION - B - MICROPROCESSOR 8085.(Any Two)

1. 8-bit addition and 8-bit subtraction.
2. 8-bit multiplication and 8-bit division.
3. Conversion from decimal to hexadecimal system.
4. Conversion from hexadecimal to decimal system.
5. Conversion from binary to hexadecimal.
6. Conversion from hexadecimal to binary.

SECTION- C - COMPUTER PROGRAMMING IN C (Any TWO)

1. Conversion of Centigrade into Fahrenheit.
2. Arranging numbers in ascending order/descending order.
3. Calculation of volume of sphere/cone/cube/rectangular cuboid.
4. Solving quadratic equation.
5. Sum of digits of a series.

Books for Study :

1. Dr.S.Somasundaram , *Practical Physics*, Apsara publications, Tiruchirapalli , 2012.
2. Department of Physics, *Practical Physics*, (B.Sc Physics Main), St. Joseph's College, Tiruchirapalli 1998.

Books for Reference:

1. S.Srinivasan, *A Text Book of Practical physics*, S.Sultan Chand publications, 2005.
2. R. Sasikumar, *Practical Physics*, PHI Learning Pvt. Ltd, New Delhi, 2011.

MAJOR BASED ELECTIVE II
MICROPROCESSOR AND 'C' PROGRAMMING

Objective:

The purpose of this course is to introduce students about the key features and implementation of C language and 8085 Microprocessor assembly.

UNIT I Basics of Digital Computer

Basic components of a digital computer - Evolution of microprocessors - Important INTEL microprocessors - Hardware, Software and Firmware - Memory - Semiconductor memories - RAM,ROM - Flash memory – CCD memory – Cache memory - Buses.

UNIT II Intel 8085 and its Architecture

INTEL 8085 - Pin Diagram - Architecture - Various registers - Status Flags - Interrupts and their order of priority - Addressing modes - Direct, Register, Register indirect, Immediate and implicit addressing - Instruction set - Data transfer group - Arithmetic Group - Logical group - Branch group, Stack, I/O and Machine control group.

UNIT III Assembly Language Programming

Addition - subtraction - multiplication -division of two 8- bit numbers - Finding the largest and smallest number in a data array-Arranging a list of numbers in ascending or descending order-complement – shift – mask-look up table- multibyte addition and subtraction –decimal addition - subtraction.

UNIT IV Introduction To C

Basic Structure of C Programs – Character set – C tokens - Keywords and identifiers – constants – variables – Data types – declaration of variables – Assigning values to variables – Symbolic constants – Operators and Expressions - Arithmetic operators - Relational, Logical and Assignment operators, Increment and Decrement operators – Conditional operator, Bitwise and Special operators– Arithmetic Expressions – Mathematical functions.

UNIT V Preliminaries And Functions

Data input and output – getchar, putchar, scanf, printf, gets, puts functions – Decision making and branching –if, if...else, else if ladder, switch, break, continue, goto – Decision making and looping – while, do... while, for, nested loops –Arrays (one-, two- and multi-dimensional arrays)- Declaration, Initialization of arrays.

Books for study:

1. B. Ram – *Fundamentals of Microprocessors and Microcontrollers*–Dhanpat Rai Publications (P) Ltd., New Delhi, 2013.
2. E. Balagurusamy – *Programming in ANSI C* – Tata McGraw Hill Education Private Limited, New Delhi,2012.

Books For Reference:

1. R. S.Gaonkar- *Microprocessor Architecture, Programming, and Applications with the 8085*, Penram International Publishing (India) Private Limited, Mumbai, 2007.
2. K. R. Venugopal and S. R. Prasad – *Programming with C* – Tata McGraw-Hill Publishing Company Limited, New Delhi, 2002.

MAJOR BASED ELECTIVE III
COMMUNICATION PHYSICS

Objective:

To promote scientific temper among students and update the basic functioning of various communication systems.

UNIT I Radio transmission and reception

Transmitter-modulation-need for modulation- types of modulation-amplitude, frequency and phase modulation- modulation factor-sideband frequencies in AM wave-limitations of amplitude modulation - frequency modulation-block diagram of AM and FM Transmitter.

Receiver- demodulation-AM & FM radio receivers-super heterodyne radio receiver.

UNIT II Fiber Optic Communication

Introduction –structure of optical fiber –total internal reflection in optical fiber – principal and propagation of light in optical fiber - acceptance angle - numerical aperture – types of optical fibers based on material – number of modes – refractive index profile - fiber optical communication system (block diagram) - fiber optic sensors – Temperature sensor – fiber optic endoscope.

UNIT III Radar Communication

Basic radar system -Radar range –Antenna scanning – Pulsed radar system - A- Scope- Plan position indicator- Tracking radar- Moving target indicator- Doppler effect-MTI Principle- CW Doppler Radar- Frequency modulator CW Radar.

UNIT IV Satellite Communication

Introduction – history of satellites – satellite communication system – satellite orbits – classification of satellites – types of satellites – basic components of satellite communication – constructional features of satellites- multiple access – communication package – antenna- power source – satellite foot points- satellite communication in India.

UNIT V Mobile Communication

GSM – mobile services- concept of cell – system architecture – radio interface – logical channels and frame hierarchy – protocols – localization and calling – Handover- facsimile (FAX) – application – VSAT (very small aperture terminals) – Modem – IPTV (internet protocol television) – Wi-Fi - 3G (Basic ideas only).

Books for Study:

1. Metha V.K., *Principles of Electronics*, S. Chand & Company Ltd., 2013
2. Anokh Singh and Chopra A.K., *Principles of communication Engineering*, S. Chand & Company PVT. Ltd., 2013.
3. Mani I. P., *A text book of Engineering Physics*, Dhanam Publications, Chennai-42, 2014.

Books for Reference:

1. Poornima Thangam I, *Satellite communication*, Charulatha Publications, 2012.
2. Dennis Roddy and John Coolen, *Electronic Communication*, PHI, 1990.
3. William C.Y. lee, *Cellular telecommunication* (second edition), Tata Mcgraw hill, 1991.
