MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI
B.Sc. PHYSICS (Choice Based Credit System)
(with effect from the academic year 2017-2018 onwards)
Semester I & II

Sem	Part	No.	Subject Type	Subject Title	C	L	P	Credit
I	Part I	1	Language	Tamil/Other Languages	6	6	0	4
	Part II	2	Language	English	6	6	0	4
	Part III	3	Core-1	Mechanics and Relativity	4	4	0	4
		4	Core-2	Properties of matter and Acoustics	4	4	0	4
		5.	Major Practical-I	Practical-I	2	0	2	2
		6	Allied Paper -1	Allied Physics Paper-1	4	4	0	4
		7	Allied Practical -1	Allied Practical-1	2	0	2	2
	Part IV	8	Common	Environmental Studies	2	2	0	2
				Total	**30**			**26**
II	Part I	9	Language	Tamil/Other Languages	6	6	0	4
	Part II	10	Language	English	6	6	0	4
	Part III	11	Core-3	Thermal physics and Statistical mechanics	4	4	0	4
		12	Core-4	Optics	4	4	0	4
		13	Major Practical-II	Practical-II	2	0	2	2
		14	Allied Paper-2	Allied Physics Paper-2	4	4	0	4
		15	Allied Practical -2	Practical-2	2	0	2	2
	Part IV	16	Common	Value Based education	2	2	0	2
				Total	**30**			**26**

C- Contact hours /week   L- Lecture hours/week   P – Practical hours /week

Semester III and IV

Sem	Part	Subject	TH	Cr	IM	EM	Tot
III	Part I	Tamil/Other Languages	6	4	25	75	100
	Part II	English	6	4	25	75	100
	Part III	5. Electricity (Core sub)	4	4	25	75	100
		Major Practical-III	2	1	50	50	100
		Allied Subject-II (With theory and practicals) 1.Theory- Paper-I	4	3	25	75	100
		2.Practicals-1	2	1	50	50	100
		Allied Subject-II (Theory alone) 1.Theory- Paper-I	6	3	25	75	100
		Skill based subject (Any one) a. Maintanance of Electrical appliances b. Astrophysics	4	4	25	75	100
	Part IV	Non-Major Elective : Paper-I	2	2	25	75	100
		Common-Yoga *	2	2			
		Total	30	23			
IV	Part I	Tamil/Other Languages	6	4	25	75	100
	Part I I	English	6	4	25	75	100
	Part III	6. Electromagnetism (Core Sub)	4	4	25	75	100
		Practical-IV	2	1	50	50	100
		Allied Subject-II (with theory and practical) 1. Theory - Paper-II	4	3	25	75	100
		2. Practicals-II	2	1	50	50	100
		Allied Subject-II (with theory alone) 1.Theory- Paper-II	6	3	25	75	100
		Skill based subject (Any one) a) Maintanance of Electronic appliances b) Physics of Human Anatomy	4	4	25	75	100
	Part IV	Non-Major Elective : Paper-II	2	2	25	75	100
		Common : Computer for Digital Era *	2	2			
	Part V	**Extension activity**	-	1	-	-	-
		Total	**30**	**24**			

MECHANICS AND RELATIVITY

UNIT-I: **VECTORS**

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

UNIT-II: **CONSERVATION LAWS**

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

UNIT-III: **DYNAMICS OF RIGID BODIES**

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

UNIT-IV: HYDROSTATICS AND HYDRODYNAMICS

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

UNIT-V: RELATIVITY

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

BOOKS FOR STUDY

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

Books for Reference

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

PROPERTIES OF MATTER AND ACOUSTICS

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

UNIT-II: **BENDING OF BEAMS**
Bending of beams - Expression for bending moment - Cantilever - Expression for cantilever depression and oscillations - theory and experiments. Uniform bending and Non-uniform bending - theory and experiments .

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

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

UNIT-V: **ULTRASONICS**
Ultrasonics - production - piezoelectric method-magnetostriction method- detection - properties – applications. Acoustics - Intensity level and loudness
 Acoustics of buildings: Reverberation - reverberation time - derivation of Sabine's formula - determination of absorption coefficient - optimum reverberation time-factors affecting acoustics of buildings-sources of noises and its control-sound level meter.

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

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

PRACTICAL-1

(8 EXPERIMENTS COMPULSORY)

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

ALLIED PHYSICS – I
UNIT I : ELASTICITY AND BENDING MOMENT
Hooke's law – Elastic moduli – Relation between elastic constants – Work done in stretching a wire – Expression for bending moment - uniform bending- Experiment to determine Young's modulus using pin and microscope-Twisting couple of a wire – Expression for couple per unit twist – Work done in twisting – Experimental determination of rigidity modulus of a wire using
Torsion pendulum with theory
UNIT II: SURFACE TENSION AND VISCOSITY
Surface tension – Definition – Examples – Molecular interpretation – Expression for excess of pressure inside a synclastic and anticlastic surface-Application to spherical and cylindrical drops and bubbles
Viscosity: Coefficient of viscosity – Rate of flow of liquid in a capillary tube (Poisueuille's formula) – Analogy between liquid flow and current flow – Stokes' formula for highly viscous liquids (Dimension method) – Experimental determination of viscosity of highly viscous liquid (stokes' method)
UNIT III: SOUND
Simple harmonic motion – Free, damped ,forced vibrations and resonance – Composition of two SHMs along a straight line and in perpendicular direction – Melde's string experiment – Determination of frequency of tuning fork(both longitudinal and transverse mode)
Unit IV : Thermal physics : Mean free path- Expression for mean free path (Zero order approximation) – Transport phenomena – Expression for viscosity and thermal conductivity – Conduction in solids – coefficient of thermal conductivity – Lee's disc method to determine thermal conductivity of a bad conductor – Wiedmann – Franz's law – Convection : Newton's law of cooling – Experimental verification – Radiation : Black body radiation – Distribution of energy in black body spectrum – Important features.
UNIT V: OPTICS
Interference: Condition for interference-Air wedge-determination of thickness of a thin wire by air wedge.
Diffraction: Fresnel & Fraunhofer diffraction-Plane diffraction grating- theory and experiment to determine wavelength (normal incidence)
Polarization: Double refraction- half wave and quarter wave plate – Production and detection of plane, elliptically and circularly polarized light.
Books for study
1. Optics – Brijlal & Subramanian
2. Properties of matter – R.Murugesan
3. Heat & Thermodynamics – D.S.Mathur
Reference Books
1.Heat and thermodynamics - Brijlal & Subramanian, S Chand & Co., New Delhi
2.Fundamentals of Optics by Jenkins A Francis and White E Harvey, McGRaw Hill Inc., New Delhi, 1976.
3. Elements of Properties of Matter by Mathur D S, Shyamlal Charitable Trust, New Delhi, 1993

PRACTICAL- 1 (8 experiments compulsory)

1. Youngs modulus - non uniform bending - pin and microscope

2. Youngs modulus - uniform bending - optic lever and telescope

3. Torsional pendulum -Rigidity modulus

4. Co-efficient of viscosity-Stoke's method

5. Co-efficient of viscosity-variable pressure head

6. Thermal conductivity of a bad conductor - Lee's disc method.

7. Spectrometer –dispersive power

8. Spectrometer - grating - -normal incidence method.

9. Air wedge - thickness of a wire

10. Melde's string-frequency of tuning fork

SEMESTER- III PAPER –V   : ELECTRICITY

L	T	P	C
4	0	0	4

UNIT-1:   ELECTRIC FIELD AND POTENTIAL

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

UNIT-II: THERMO ELECTRICITY

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

UNIT-III: CHEMICAL EFFECT OF ELECTRIC CURRENT

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

UNIT-IV: STEADY CURRENT AND TRANSIENT CURRENT

Current and current density-ohm's law in vector form-conversion of galvanometer into voltmeter and ammeter-kirchoff's law-application to wheatstone's network - Growth and decay of current in a circuit containing L and R   with d.c.voltages - growth and decay of charge in a capacitance ,resistance circuit- determination of high resistance by leakage –growth and decay of charge in LCR circuit-conditions for the discharge to be oscillatory –frequency of oscillation   (15L)

UNIT-V: ALTERNATING CURRENT

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

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

Books for Reference
1. Electricity and Magnetism -D.N.Vasudeva (Twelfth revised edition)
2. Electricity and Magnetism - K.K.Tiwari (S.Chand &Co.)
3. Electricity and Magnetism -E.M.Pourcel,Berkley Physics Cource, Vol.2 (Mc Grraw-Hill)
4. Electricity and Magnetism -   Tayal (Himalalaya Publishing Co.)
5. Fundamentals of Physics, 6th Edition, by D Halliday, R Resnick and J Walker. wiley NY 2001.

L	T	P	C
4	0	0	4

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

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

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

UNIT-I:

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

UNIT-II:

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

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

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

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

Books for study and Reference

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

L	T	P	C
4	0	0	4

PAPER 1.b.   ASTROPHYSICS

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

UNIT-I : ASTRONOMICAL INSTRUMENTS

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

UNIT-II: SOLAR SYSTEM

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

UNIT-III: STELLAR EVOLUTION, BINARY AND VARIABLE STARS

Birth of a star - Death of a star - Chandrasekhar limit - white dwarfs - Neutron stars - black holes - Quasars - Nebulae - Supernovae - Binary stars - Origin of binary stars-variable stars - cepheid variables - RV Tauri variables - long period variables - irregular variables - flare stars. (10L) **UNIT-IV: MAGNITUDES, DISTANCE AND SPECTRAL** CLASSIFICATION OF STARS

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

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

Origin of the universe - the big bang theory - the steady state theory - the oscillating universe theory - Hubble's law. Galaxies - types of galaxies - Milky Way - star clusters - open clusters - globular clusters. (13L)

Books for study and reference:

1. K.S. Krishnasamy, 'Astro Physics a modern perspective,' Reprint, New Age International (p) Ltd, New Delhi,2002.

2. Baidyanath Basu, 'An introduction to Astro physics', second printing, prentice - Hall of India Private limited, New Delhi,2001.

3. R. Murugesan, ' Modern Physics', Eleventh revised edition, S. Chand & Company Ltd, New Delhi, 2003.

4. S. Kumaravelu, 'Astronomy, Janki calendar corporation, Sivakasi, 1993

5. Baker and Fredrick, 'Astronomy, ninth edition, Van No strand Rein hold, Co, New York - 1964.

6. Illustrated World of Science Encyclopedia - Vol I and Vol VIII - Creative world publication - Chicago.

PRACTICAL- III 2-HRS

Preamble: To learn physical concepts through experiments
(8 experiments compulsory)

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

L	T	P	C
2	0	0	2

SEMESTER- III (Any one)
(For those who do not study Physics as Major / Allied Subject)
PAPER 1.a   BASIC PHYSICS -1
Preamble: Objective of the paper is to provide a basic knowledge in Physics for students who do not study physics as major/allied subject

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

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

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

UNIT IV: OPTICS
Reflection and refraction-concave and convex mirrors and lenses-dispersion-spectra- rainbow- interference-diffraction-polarization-concepts with examplesuses-double refraction-optical activity-quartz crystal(6L)

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

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

L	T	P	C
2	0	0	2

PAPER 1.b. APPLIED PHYSICS (2 x 15= 30 hours)

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

UNIT-I: Conventional energy sources

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

UNIT-II: Fossil fuels

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

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

UNIT-I V: Renewable energy sources

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

UNIT-V: Geothermal energy

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

Books for study and Reference

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

Semester V and VI (with effect from the academic year 2016-2017 onwards)
(44th SCAA meeting held on 30.05.2016

Sem	Status	Subject Title	Hr	Cr
V	Core - 7	Basic Electronics	4	4
	Core - 8	Solid State Physics	4	4
	Elective – 1 (any one)	A)Spectroscopy B) Mathematical Physics	5	5
	Elective 2 (any one)	A) Communication electronics B) Numerical Methods	5	5
	Practical -5	Non Electronics (No examination in the Fifth semester)	3	-
	Practical - 6	Electronics (No examination in the Fifth Semester)	3	-
	Practical - 7	Computer Programming with C++ (No examination in the Fifth sem)	2	-
	Skill Based (Common)	Personality Development / Effective Communication	4	4
		Subtotal	**30**	**22**
VI	Core - 9	Digital Electronics	6	4
	Core - 10	Atomic And Nuclear Physics	6	4
	Core - 11	Quantum Mechanics	5	4
	Elective – 3 (Any one)	A.) Medical Physics B.) Energy Physics	5	5
	Practical - 5	Non Electronics	3	4
	Practica- 6	Electronics	3	4
	Practical -7	Computer Programming with C ++	2	4
		Subtotal	**30**	**29**

Mark Distribution

Type	Internal Mark	External Mark	Total Mark	External Passing Minimum	Total Passing Minimum
Theory	25	75	100	30	40
Practical	50	50	100	20	40

BASIC ELECTRONICS

UNIT-I: **LINEAR CIRCUIT ANALYSIS**

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

UNIT-II: **SEMICONDUCTORS DIODES AND DEVICES**

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

UNIT-III: **TRANSISTOR AMPLIFIERS**

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

UNIT-IV: **OSCILLATIONS AND WAVE SHAPING CIRCUITS**

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

UNIT-V: **OPERATIONAL AMPLIFIER**

Op-Amp - pin diagram- characteristics of ideal Op - Amp - DC and A.C analysis of Op-Amp - Bandwidth of an Op-Amp - Slew rate - Frequency response - Op- Amp with negative feedback - applications - Inverting amplifier - Input and output impedance of Inverting amplifier - Non inverting amplifier - Voltage follower- Summing amplifier - Adder - Subtractor - Integrator – Differentiator-low pass ,high pass and band pass filters

Books for study

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

BOOKS FOR REFERENCE

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

SOLID STATE PHYSICS

UNIT-I: **CRYSTAL LATTICES**

Seven classes of crystals - Bravais Lattice in three dimensions - crystal structure - Simple Cubic, Face Centered Cubic, Body Centered Cubic and Hexagonal Close packed structure - Sodium Chrloride, Zinc Blende and Diamond Structure. Miller Indices and crystal planes - procedure for finding Miller Indices - interplanar spacing - Diffraction of X-Rays - Bragg's Law - reciprocal lattices - reciprocal lattice to SCC, BCC and FCC lattices.

UNIT-II: **TYPES OF MAGNETIC MATERIALS**

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

UNIT-III: **BONDING IN SOLIDS**

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

UNIT-IV: **SUPER CONDUCTIVITY**

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

UNIT-V: **NANOTECHNOLOGY**

Nanomaterials-synthesis and classsification -–techniques used in synthesis of nanomaterialschemical vapour deposition-sol-gel technieque-electro deposition method-ball milling method- charecterisation - properties and applications of nanomaterials-fullerence, grapphine and carbon nanotubes

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

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

SPECTROSCOPY

UNIT - I MICROWAVE SPECTROSCOPY

Rotation of molecules – Classification of molecules – Rotation spectra of diatomic molecules – Intensities of Spectral lines – Effect of Isotopic Substitution – Non-rigid rotator – Spectrum of a Non-Rigid Rotator –Polyatomic Molecules – Symmetric Top molecules – Asymmetric Top molecules -Techniques and Instrumentation – Chemical analysis by Microwave spectroscopy.

UNIT – II INFRARED SPECTROSCOPY

I.R. Spectroscopy – Vibrating diatomic molecules – Simple Harmonic Oscillator - Anharmonic oscillator – Diatomic vibrating rotator – IR Spectrum of carbon monoxide - Interaction of rotations and vibrations – Vibration of Polyatomic molecules – Analysis by IR techniques.

UNIT – III RAMAN SPECTROSCOPY

Raman effect: Discovery – Quantum theory of Raman effect – Classical theory of Raman Effect – Pure rotational Raman Spectra- Linear molecules – Raman Spectrum of symmetric top molecules -
Vibrational Raman spectra – Rule of mutual exclusion – Overtone and Combination Vibrations - Rotational Fine Structure – Polarization of light and the Raman Effect - Structure determination from IR and Raman spectroscopy.

UNIT – IV ELECTRONIC SPECTROSCOPY

Born - Oppenheimer approximation – Vibrational coarse structure: Progressions – Frank-Condon principle – Dissociation energy and Dissociation products – Rotational Fine Structure of Electronic Vibration Transitions - Fortrat diagram - Predissociation – Diatomic molecules.

UNIT – V 5. INSTRUMENTATION

 Instrumentation and Techniques in Infrared spectroscopy – Sources – Monochromators – Sample cells – Detectors – Single beam Infra red spectrometer – Double beam Infra red spectrometer.

Book For Study
Fundamentals Of Molecular Spectroscopy - Colin N Banwell Elaine- M Mccash Fifth Edition

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

Major Elective – I (B)
MATHEMATICAL PHYSICS

UNIT-1 – VECTORS

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

UNIT – 2: DIFFERENTIAL EQUATION

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

UNIT – 3: MATRIX

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

UNIT – 4: LAPLACE TRANSFORMATION

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

UNIT -5: PARTIAL DIFFERENTIAL EQUATIONS

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

Books for study

Mathematical Methods for Physicists: A concise introduction, - *TAI   L. CHOW -* Cambridge university press

BOOKS FOR REFERENCE

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

COMMUNICATION ELECTRONICS
UNIT – I AMPLITUDE MODULATION AND TRANSMISSION
Introduction – Amplitude Modulation – AM envelop – AM frequency spectrum and bandwidth – Phasor representation of AM with carrier – Coefficient of modulation or percentage modulation or modulation index – Degrees of modulation – AM power distribution – AM Current relation and efficiency - Modulation by complex information signal - Doubleside band suppressed carrier AM - Single side band suppressed carrier AM – Vestigal side band amplitude modulation – AM modulator circuits – Emitter modulations or low power AM – Collector modulator or medium and high power AM modulator - AM transmitters – Broadcast AM transmitters – Low level of AM transmitter – High level AM transmitter.

UNIT – II AMPLITUDE MODULATION RECEPTION
Comparison of AM system – Quadrature amplitude modulation – Principles of AM detection – AM receivers – Receiver parameters – Tuned radio frequency (TRF) receiver or straight receiver – Principles of superhetrodyne –Double frequency conversion AM receiver.

Unit – III Angle Modulation – Transmission
Introduction – Frequency modulation – Phase modulation – Phase deviation and modulation index – Multitone modulation – Transmission band width of FM – Conversion of PM to FM or frequency modulator – Conversion of FM to PM / phase modulators – Commercial broadcast FM – Phasor representation of an FM and PM – Average power of an AM/FM wave – Generation of FM – Direct method of FM generation – Reactance tube modulator – Indirect method of FM wave generation – FM transmitters – Indirect method – Comparison of AM and FM.

UNIT – IV FM RECEPTION
FM detectors – Balanced slope detector – Foster seely discriminator – Ratio detector – FM super heterodyne receiver – FM noise suppression – Threshold extension by FMFB technique.

UNIT – V DIGITAL MODULATION TECHNIQUES
Introduction – BFSK – Binary phase shift keying – Quadrature PSK – Differential PSK –

Performance comparison of digital modulation schemes – M ary FSK – Correlative coding – Duobinary encoding.

Book For Study
Principles Of Communication Engineering-Dr. K.S. Srinivasan, Second Edition : 2010.
Book For Reference
1. Electronic communication systems – George Kennedy & Bernard Davis, Tata Mcgraw Hills, 4th edition, 2008
2. Electronic communication Systems – Blake, Joseph J. Adams ki, Sun Yifeng, Delamer publication, 2nd edition, 2012 (Rupa Publication, India).
3. Fundamentals of Electrical engineering – Wayone tomasi

NUMERICAL METHODS

UNIT-I: ERRORS AND ROOT OF EQUATIONS

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

Root of equations-Iteration method-Maclaurin's series method-Newton-Raphson method-Von Mises Formula-Bisection method

UNIT-II: MATRIX AND LINEAR EQUATIONS

Introduction- Pivotal condensation method- system of linear equations- Gauss Elimination method- Gauss Seidal Iteration Method-Gauss Jordan elimination method-Matrix Inversion method.

UNIT-III: INTERPOLATION AND APPROXIMATION

Linear Interpolation –Qudratic Interpolation - Lagrange's interpolation –Richardson's Extrapolation –Aitken's iterated Interpolation

UNIT-IV: Numerical Differentiation and Integration:

Numerical Differentiation-Approximation of derivatives using interpolation polynomials-Taylor series method - Numerical Integration - trapezoidal rule-Simpson's 1/3 and 3/8 rules

UNIT –V: DIFFERENTIAL EQUATIONS

Introduction-Euler's method (Adams Bashforth first order method)- Backward Euler method- Taylor' s series method- Runge-kutta method - Predictor corrector methods

Books for study and Reference:

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

NON ELECTRONICS
(12 EXPERIMENTS COMPULSORY)

1. Youngs modulus of glass-Elliptic fringes

2. Spectrometer-Cauchy's constants

3. Spectrometre-Hartman's formula

4. Spectrometre-i_1-i_2 curve

5. Spectrometre-Biprism

6. Newton's Rings – determination of R_1,R_2 and f of the lens

7. Absolute determination of capacitance -BG

8. Absolute determination of mutual inductance & comparison of mutual inductance -BG

9. High resistance by leakage-BG

10. Potentiometre-calibration of volt meter(high range)

11. Potentiometre-temperature coefficient of resistance

12. Network theorems (thevenins&nortons)- verification

13. Thermoemf-Mirror Galvanometre

14. Conversion of galvanometer into voltmeter&ammeter

15. Self inductance-Anderson's bridge

Major Practical – 6

ELECTRONICS

(12 experiments compulsory

1. Dual power supply using IC

2. Diode charecteristics(pn diode & zener diode)

3. Transistor charecteristics

4. FET charecteristics

5. NAND &NOR as universal building block

6. Half Adder &Full Adder

7. Colpitt's Oscillator and Hartley Oscillator

8. Single stage amplifier-with and without feedback

9. OPAMP-Adder&Subtractor

10. OPAMP-Differentiator & Integrator

11. OPAMP-Low pass and high pass filter

12. Astable multivibrator using IC555

13. Monostable multivibrator using IC555

14. Wienbridge oscillator

15. Full wave rectifier without and with filters.

Major Practical - 7
Computer Programming IN C++

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

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

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

a. Sum = 1+3+5+…………+n.

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

c. Sum = $1^2 + 2^2 + 4^2 +$……….…..$+n^2$

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

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

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

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

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

7. To generate a series of Fibonacci numbers using constructor

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

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

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

10. Solve Quadratic equation.

11. Multiplication of two matrices.

12. Define a class to represent a bank account details

      Data members

          Name of the depositor , Account name , Type of account

          Balance amount in the account

      Member function

        1. to assign initial values   3. to withdraw an amount

        4 .to display name and balance