MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

UG COURSES – AFFILIATED COLLEGES

B.Sc. PHYSICS

(Choice Based Credit System)

(with effect from the academic year 2020-2021 onwards)

	Sub. No:	Subject status	Subject Title	Contact Hrs/week	L Hrs/ week	T Hrs/ week	P Hrs/ week	Credits
Part I	1	Language	Tamil/Other Languages	6	6	0	0	4
Part II	2	Language	Communicative English	6	6	0	0	4
Part III	3	Core-1	Properties of Matter &Mechanics	4	4	0	0	4
	4	Major Practical-I	Practical-I	2	0	0	2	2
	5	Add on Major (Mandatory)	Professional English for Physical Sciences -I	4	4	0	0	4
	6	Allied Paper-1	Allied Physics Paper-1	4	4	0	0	4
	7	Allied Practical	Allied Practical-I	2	0	0	2	2
Part IV	8	Common	Environmental Studies	2	2	0	0	2
			Total	**30**				**26**
Part I	9	Language	Tamil/Other Languages	6	6	0	0	4
Part II	10	Language	English	6	6	0	0	4
Part III	11	Core-2	Optics and Thermal Physics	4	4	0	0	4
	12	Add on Major (Mandatory)	Professional English for Physical Sciences - II	4	4	0	0	4
	13	Allied Paper-2	Allied Physics Paper-2	4	4	0	0	4
	14	Major Practical-II	Practical-II	2	0	0	2	2
	15	Allied Practical	Allied Practical-II	2	0	0	2	2
Part IV	16	Common	Value Based Education	2	2	0	0	2
			Total	**30**				**26**

MSU/ 2020 -21/ UG-Colleges / Part-III (B.Sc. Physics) / Semester – I

Core - 1

PROPERTIES OF MATTER & MECHANICS

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 griders

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: DYNAMICS OF RIGID BODIES

Translational and rotational motion - Angular momentum and angular impulse - moment of inertia and radius of gyration - - 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 -

UNIT-V: 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

Books for study

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

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. Fundamentals of Physics, - D Halliday, R Resnick and J Walker, Wiley NY 2001. 6th Edition
4. Mechanics – Berkely Physics course: Charles Kittel-Tata Mc Graw Hill Publication

MSU/ 2020-21 / UG-Colleges / Part-III (B.Sc.Physics) / Semester – I / Major Practical - I

PRACTICAL-1

(6 experiments compulsory)

1. Young's modulus - non uniform bending - pin and microscope
2. Young's modulus - uniform bending - optic lever and telescope
3. Young's modulus - cantilever – depression
4. Torsional pendulum -Rigidity modulus and moment of inertia (with & without masses)
5. Compound pendulum - g and I
6. Co-efficient of viscosity-Stoke's method
7. Surface tension – Capillary rise.
8. Surface tension – Drop weight method

MSU/ 2020-21 / UG-Colleges / Part-III (B.Sc.Physics) / Semester – I / Allied - I

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

MSU/ 2020-21 / UG-Colleges / Part-III (B.Sc.Physics) / Semester – I /
Allied Practical - I

PRACTICAL-I

(6 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. Thermal conductivity of a bad conductor - Lee's disc method.
6. Spectrometer –dispersive power
7. Spectrometer - grating - -normal incidence method.
8. Air wedge - thickness of a wire

MSU/ 2020 -21/ UG-Colleges / Part-III (B.Sc. Physics) / Semester – II
Core - 2
OPTICS AND THERMAL PHYSICS

UNIT-I: GEOMETRICAL OPTICS

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

UNIT-II: INTERFERENCE

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

UNIT-III: DIFFRACTION & POLARISATION

Fresnel and Fraunhofer Diffraction – comparison between Fresnel and Fraunhofer diffraction - Diffraction by single slit - Diffraction by circular aperture - plane transmission grating- diffraction at normal and oblique incidence

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

UNIT-IV: LOW TEMPERATURE PHYSICS

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

UNIT-V: THERMODYNAMICS

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

Books for Study

1. Heat and thermodynamics - Brijlal and Subramaniyam, S Chand & Co.
2. Thermal Physics - R Murugeshan and KiruthigaSivaprasad, S Chand & Co., New Delhi.
3. Optics by Subramaniam N & Brij Lal, S Chand & Co. Pvt. Ltd., New Delhi, 1990

Books for Reference

1. Heat and thermodynamics - D S Mathur, S Chand & Co., New Delhi
2. Introduction to Solid State Physics - C Kittel, Prentice Hall of India
3. Thermal Physics – S C Garg, R M Bansal and C K Ghosh, Tata McGraw-Hill 6.. Heat and thermodynamics - J B Rajam, S Chand & Co., New Delhi
4. Fundamentals of Optics by Jenkins A Francis and White E Harvey, McGRaw Hill Inc., New Delhi, 1976.
5. Fundamentals of Physics, 6th Edition, by D Halliday, R Resnick and J Walker. Wiley NY 2001.

MSU/ 2020-21 / UG-Colleges / Part-III (B.Sc.Physics) / Semester – II / Major Practical - II

PRACTICAL-1I

(6 experiments compulsory)

1. Spectrometer – dispersive power of prism
2. Spectrometer – refractive index of liquid
3. Spectrometer - grating - N and λ -normal incidence
4. Spectrometer - grating – oblique incidence - dispersive power
5. Air wedge - thickness of a wire and thickness of enamel coating.
6. Newton's rings-refractive index
7. Specific heat capacity of liquid - Newton's law of cooling
8. Thermal conductivity of a bad conductor - Lee's disc method

MSU/ 2020-21 / UG-Colleges / Part-III (B.Sc.Physics) / Semester – II / Allied - II

ALLIED PHYSICS - II

Unit I: Electricity

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

Unit II: Electromagnetism

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

Unit III: Electronics

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

Unit IV: Nuclear physics

Introduction – Classification of nuclei – General properties of nucleus – Nuclear size, Nuclear mass, Nuclear density, Nuclear charge, Nuclear spin & Nuclear magnetic dipole moments – Mass defect – Binding energy - Binding energy curve – Nuclear forces – Properties – Fundamental laws of radioactivity – Soddy Fajan's displacement law – Law of radioactive disintegration – Half life period – The mean life.

Unit V: Mechanics and Relativity

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

Books for study

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

Reference Books

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

MSU/ 2020-21 / UG-Colleges / Part-III (B.Sc.Physics) / Semester – II / Allied Practical - II

PRACTICAL-II

(6 experiments compulsory)

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