



DEPARTMENT OF PHYSICS CHANDIDAS MAHAVIDYALAYA



A Govt. Aided Degree College Affiliated to the University of Burdwan

UGC Accredited under section 2(f) & 12(B) [1979] * NAAC Accredited in 2016

KHUJUTIPARA, BIRBHUM, WEST BENGAL, INDIA- 731215

E-mail: kiron.phys@gmail.com (HOD)

Mobile: 9735340332 (HOD)

Ref. No.

Date:

Three-Year Physics General Degree Course (CBCS) Course Module 2022-23

SEMESTER-I		Class
CORE COURSE I-A: MECHANICS (Theory)		
Module 1	<ul style="list-style-type: none"> Vector algebra, Scalar and vector products. Derivatives of a vector with respect to a parameter. 	4
Module 2	<ul style="list-style-type: none"> 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients. 	4
Module 3	<ul style="list-style-type: none"> Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. 	4
Module 4	<ul style="list-style-type: none"> Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets. 	4
Module 5	<ul style="list-style-type: none"> Angular velocity and angular momentum. Torque. Conservation of angular momentum. 	4
Module 6	<ul style="list-style-type: none"> Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane. Angular momentum is conserved, areal velocity is constant). 	4
Module 7	<ul style="list-style-type: none"> Kepler's Laws (statement only). Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS). 	4
Module 8	<ul style="list-style-type: none"> Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations. 	4
Module 8	<ul style="list-style-type: none"> 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. 	4
Module 9	<ul style="list-style-type: none"> Work done in stretching and work done in twisting a wire-Twisting couple on a cylinder. Determination of Rigidity modulus by static torsion. Torsional pendulum- Determination of Rigidity modulus and moment of inertia - q, η and σ by Searle's method. 	4
Module 10	<ul style="list-style-type: none"> Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities. 	4

CORE COURSE I-A: MECHANICS (Practical)		
Module 1	<ul style="list-style-type: none"> Measurements of length (or diameter) using Vernier Caliper, Screw Gauge and Travelling Microscope. 	4
Module 2	<ul style="list-style-type: none"> To determine the Moment of Inertia of a Flywheel/ regular shaped object. 	4
Module 3	<ul style="list-style-type: none"> To determine Young's Modulus by flexure method. 	4
Module 4	<ul style="list-style-type: none"> To determine the Modulus of Rigidity of a wire by dynamical method. To determine the Elastic Constants of a Wire by Searle's method. 	6
Module 5	<ul style="list-style-type: none"> To determine g by Bar/Kater's Pendulum. To determine the coefficient of viscosity by Poiseuille's method. 	6

SEMESTER-II CC-1B: ELECTRICITY AND MAGNETISM (Theory)		Class
Module 1	<ul style="list-style-type: none"> Review of vector algebra (Scalar and Vector product). Gradient Divergence Curl and their significance. 	3
Module 2	<ul style="list-style-type: none"> Vector Integration. Line, surface and volume integrals of Vector fields. Gauss-divergence theorem and Stoke's theorem of vectors (statement only). 	3
Module 3	<ul style="list-style-type: none"> Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss Theorem-Electric field due to point charge. Infinite line of charge, Uniformly charged spherical shell 	3
Module 4	<ul style="list-style-type: none"> Applications of Gauss Theorem-Electric field due to Solid Sphere, Plane charged sheet and Charged Conductor. Electric potential as line integral of electric field. 	3
Module 5	<ul style="list-style-type: none"> Potential due to a Point Charge and Electric Dipole Uniformly charged Spherical Shell and Solid Sphere. Calculation of electric field from potential. 	3
Module 6	<ul style="list-style-type: none"> Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. 	3
Module 7	<ul style="list-style-type: none"> Dielectric medium, Polarization, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric. 	3
Module 8	<ul style="list-style-type: none"> Magnetostatics Biot-Savart's law & its applications- <ul style="list-style-type: none"> Straight Conductor Circular Coil Solenoid Carrying Current 	3
Module 9	<ul style="list-style-type: none"> Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. 	2
Module 10	<ul style="list-style-type: none"> Magnetic properties of materials: <ul style="list-style-type: none"> Magnetic Intensity Magnetic Induction Permeability Magnetic Susceptibility Brief introduction of dia, para and ferro-magnetic materials. 	4

Module 11	<ul style="list-style-type: none"> Faraday's and Lenz's laws of electromagnetic induction Self and Mutual Inductance, L of single coil, M of two coils. Energy stored in magnetic field. 	3
Module 12	<ul style="list-style-type: none"> Equation of continuity of current Displacement current. Maxwell's equations Poynting vector 	4
Module 13	<ul style="list-style-type: none"> Energy density in electromagnetic field. Electromagnetic wave propagation through vacuum and isotropic dielectric medium. Transverse nature of EM waves, Polarization. 	3
CC-1B: ELECTRICITY AND MAGNETISM (Practical)		
Module 1	<ul style="list-style-type: none"> To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses. 	2
Module 2	<ul style="list-style-type: none"> To study the Characteristics of a Series RC Circuit. To determine a Low Resistance by Carey Foster's Bridge 	6
Module 3	<ul style="list-style-type: none"> To verify the Thevenin and Norton Theorem. To verify the Superposition, and Maximum Power Transfer Theorem. To determine the horizontal component of earth's magnetic field. 	6
Module 4	<ul style="list-style-type: none"> To study a Series and Parallel LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor. 	6
<p style="text-align: center;">SEMESTER-III</p> <p style="text-align: center;">CC-1C: THERMAL PHYSICS AND STATISTICAL MECHANICS (Theory)</p>		
		Class
Module 1	<ul style="list-style-type: none"> Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work. Various Thermo dynamical Processes. 	4
Module 2	<ul style="list-style-type: none"> Applications of First Law. General Relation between C_p & C_v Work Done during Isothermal and Adiabatic Processes. 	3
Module 3	<ul style="list-style-type: none"> Compressibility & Expansion Coefficient, Reversible & Irreversible Processes Second law & Entropy, Carnot's cycle & theorem. Entropy changes in Reversible & Irreversible processes. 	4
Module 4	<ul style="list-style-type: none"> Entropy-temperature diagrams. Third law of thermodynamics. Unattainability of absolute zero. 	3
Module 5	<ul style="list-style-type: none"> Enthalpy, Gibbs, Helmholtz and Internal Energy functions. Maxwell's relations & applications. 	4
Module 6	<ul style="list-style-type: none"> Joule-Thompson Effect Clausius-Clapeyron Equation. Expression for $(C_p - C_v)$, C_p/C_v, TdS equations. 	4
Module 7	<ul style="list-style-type: none"> Derivation of Maxwell's law of distribution of velocities and its experimental verification. Mean free path (Zeroth Order) and Transport Phenomena Viscosity 	3

Module 8	<ul style="list-style-type: none"> Conduction and Diffusion (for vertical case) Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases. 	3
Module 9	<ul style="list-style-type: none"> Blackbody radiation, Spectral distribution and Concept of Energy Density. Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh-Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law. 	4
Module 10	<ul style="list-style-type: none"> Phase space, Macro state and Micro state. Entropy and Thermodynamic probability. Maxwell-Boltzmann law - distribution of velocity. 	4
Module 11	<ul style="list-style-type: none"> Quantum statistics - Fermi-Dirac distribution law - electron gas. Bose-Einstein Distribution law - photon gas. Comparison of three statistics. 	3
CC-1C: THERMAL PHYSICS AND STATISTICAL MECHANICS (Practical)		
Module 1	<ul style="list-style-type: none"> To determine Stefan's Constant. 	4
Module 2	<ul style="list-style-type: none"> To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method. 	4
Module 3	<ul style="list-style-type: none"> To study the variation of thermo emf across two junctions of a thermocouple with temperature. 	4
Module 4	<ul style="list-style-type: none"> To determine the temperature co-efficient of resistance by Platinum resistance thermometer. 	4
Module 5	<ul style="list-style-type: none"> To determine the coefficient of thermal conductivity of a good conductor by Searle's method. 	4

SEMESTER-III		
Skill Enhancement Course:		
SEC-1: RENEWABLE ENERGY AND ENERGY HARVESTING (Theory)		Class
Module 1	<ul style="list-style-type: none"> Fossil fuels and Nuclear Energy, their imitation. Need of renewable energy, Non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy. 	2
Module 2	<ul style="list-style-type: none"> Wave energy systems, Ocean Thermal Energy Conversion, Solar energy. Biomass, biochemical conversion, biogas generation. Geothermal energy tidal energy, Hydro electricity. 	3
Module 3	<ul style="list-style-type: none"> Solar energy, its importance. Storage of solar energy, Solar pond. Non convective solar pond. 	2
Module 4	<ul style="list-style-type: none"> Applications of solar pond and solar energy, solar water heater, flat plate collector. Solar distillation, solar cooker, solar green houses. Solar cell, absorption air conditioning. 	3
Module 5	<ul style="list-style-type: none"> Need and characteristics of photovoltaic (PV) systems, PV models. Equivalent circuits. Sun tracking systems. 	2

Module 6	<ul style="list-style-type: none"> Fundamentals of Wind energy. Wind Turbines and different electrical machines in wind turbines. Power electronic interfaces, and grid interconnection topologies. 	2
Module 7	<ul style="list-style-type: none"> Ocean Energy Potential against Wind and Solar. Wave Characteristics and Statistics, Wave Energy Devices. Tide characteristics and Statistics, Tide Energy Technologies. Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass. 	3
Module 8	<ul style="list-style-type: none"> Geothermal Resources Geothermal Technologies 	2
Module 9	<ul style="list-style-type: none"> Hydro power resources, hydro power technologies. Environmental impact of hydro power sources. 	2
Module 10	<ul style="list-style-type: none"> Introduction, Physics and characteristics of piezoelectric effect. Materials and mathematical description of piezoelectricity. Piezoelectric parameters and modeling piezoelectric generators, Piezoelectric energy harvesting applications, Human power. 	3
Module 11	<ul style="list-style-type: none"> Linear generators, physics mathematical models. Recent applications..... <ul style="list-style-type: none"> Carbon captured technologies, cell, batteries, power consumption. Environmental issues and Renewable sources of energy, sustainability. 	3
Demonstrations and Experiments		
Module 1	<ul style="list-style-type: none"> Demonstration of Training modules on solar energy, wind energy. Conversion of vibration to voltage using piezoelectric materials Conversion of thermal energy into voltage using thermoelectric modules. 	3

SEMESTER-IV		Class
CC- 1D: WAVES AND OPTICS (Theory)		
Module 1	<ul style="list-style-type: none"> Linearity and Superposition Principle. Oscillations having equal frequencies, Oscillations having different frequencies (Beats). 	4
Module 2	<ul style="list-style-type: none"> Graphical and Analytical Methods. Lissajous Figures with equal and unequal frequency and their uses. 	3
Module 3	<ul style="list-style-type: none"> Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. 	2
Module 4	<ul style="list-style-type: none"> Group velocity, Phase velocity. Plane waves and Spherical waves. Wave intensity. 	3
Module 5	<ul style="list-style-type: none"> Surface Tension: Synclastic and anticlastic surface - Excess of pressure Application to spherical and cylindrical drops and bubbles-variation of surface tension with temperature - Jaeger's method. 	4
Module 6	<ul style="list-style-type: none"> Viscosity: Viscosity - Rate flow of liquid in a capillary tube - Poiseuille's formula. Determination of coefficient of viscosity of a liquid. Variations of viscosity of a liquid with temperature lubrication. 	3

Module 7	<ul style="list-style-type: none"> Physics of low pressure - production and measurement of low pressure. Rotary pump- Diffusion pump -Molecular pump. Knudsen absolute gauge - penning and pirani gauge – Detection of leakage. 	3
Module 8	<ul style="list-style-type: none"> Simple harmonic motion - forced vibrations and resonance. Fourier's Theorem Application to saw tooth wave and square wave - Intensity and loudness of sound. 	4
Module 9	<ul style="list-style-type: none"> Decibels - Intensity levels – musical notes - musical scale. Acoustics of buildings: Reverberation and time of reverberation. Absorption coefficient - Sabine's formula – measurement of reverberation time- Acoustic aspects of halls and auditoria. 	4
Module 10	<ul style="list-style-type: none"> Electromagnetic nature of light. Definition and Properties of wave-front. Huygens Principle. Interference: Division of amplitude and division of wave-front. 	3
Module 11	<ul style="list-style-type: none"> Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment 	4
Module 12	<ul style="list-style-type: none"> Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index. 	4
Module 13	<ul style="list-style-type: none"> Michelson's Interferometer: Idea of form of fringes (no theory needed). Determination of wavelength, Wavelength difference. Determination of Refractive index and Visibility offringes. 	4
Module 14	<ul style="list-style-type: none"> Fraunhofer diffraction: Single slit Double Slit Multiple slits & Diffraction grating 	3
Module 15	<ul style="list-style-type: none"> Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis. 	3
Module 16	<ul style="list-style-type: none"> Transverse nature of light waves. Plane polarized light – production and analysis. Circular and elliptical polarization. 	3
CC- 1D: WAVES AND OPTICS (Practical)		
Module 1	<ul style="list-style-type: none"> To determine the angle of prism by (i) Rotating telescope or (ii) Rotating prism method. 	4
Module 2	<ul style="list-style-type: none"> To determine the Refractive Index of the Material of a given Prism using Sodium Light. 	4
Module 3	<ul style="list-style-type: none"> To determine Dispersive Power of the Material of a given Prism using Mercury Light 	4
Module 4	<ul style="list-style-type: none"> To determine the Resolving Power of a Prism. 	3
Module 5	<ul style="list-style-type: none"> To determine wavelength of sodium light using Newton's Rings. 	3
Module 6	<ul style="list-style-type: none"> To determine wavelength of Sodium light using plane diffraction Grating. 	4
Module 7	<ul style="list-style-type: none"> To determine the Resolving Power of a Plane Diffraction Grating. 	4
Module 8	<ul style="list-style-type: none"> To determine the refractive index of a liquid by travelling microscope. 	4
Module 9	<ul style="list-style-type: none"> To determine the focal length of a concave lens by combination method. 	4

SEMESTER-IV		
Skill Enhancement Course:		
SEC-2: WEATHER FORECASTING (Theory)		Class
Module 1	<ul style="list-style-type: none"> • Elementary idea of atmosphere: physical structure and composition. • Compositional layering of the atmosphere. • Variation of pressure and temperature with height. 	4
Module 2	<ul style="list-style-type: none"> • Air temperature; requirements to measure air temperature. • Temperature sensors: types • Atmospheric pressure: its measurement; cyclones and anti cyclones: its characteristics. 	5
Module 3	<ul style="list-style-type: none"> • Wind; forces acting to produce wind • Wind speed direction: units, its direction; measuring wind speed and direction. • Humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere; radiation laws. 	5
Module 4	<ul style="list-style-type: none"> • Global wind systems air masses and fronts. • Classifications: jet streams, local thunderstorms • Tropical cyclones: classification; tornadoes; hurricanes. 	4
Module 5	<ul style="list-style-type: none"> • Climate: Its classification; causes of climate change. • Global warming and its outcomes; air pollution; aerosols, ozone depletion. • Acid rain, environmental issues related to climate. 	4
Module 6	<ul style="list-style-type: none"> • Weather forecasting: analysis and its historical background. • Need of measuring weather. • Types of weather forecasting; weather forecasting methods. 	4
Module 7	<ul style="list-style-type: none"> • Criteria of choosing weather station; basics of choosing site and exposure. • Satellites observations in weather forecasting. • Weather maps; uncertainty and predictability; probability forecasts. 	4

SEMESTER-V		
Discipline Specific Elective Course:		
DSE-1A: ELEMENTS OF MODERN PHYSICS (Theory)		Class
Module 1	<ul style="list-style-type: none"> • Planck's quantum, Planck's constant and light as a collection of photons. • Photo-electric effect and Compton scattering. • De Broglie wavelength and matter waves; Davisson – Germer experiment. 	4
Module 2	<ul style="list-style-type: none"> • Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra. • Bohr's quantization rule and atomic stability. • Calculation of energy levels for hydrogen like atoms and their spectra. 	5
Module 3	<ul style="list-style-type: none"> • Position measurement- gamma ray microscope thought experiment; Wave-particle duality. • Heisenberg uncertainty principle- impossibility of a particle following a trajectory. • Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle. 	5
Module 4	<ul style="list-style-type: none"> • Two slit interference experiments with photons. • Atoms and particles; linear superposition principle as a consequence. • Matter waves and wave amplitude. 	4

Module 5	<ul style="list-style-type: none"> Schrodinger equation for non- relativistic particles. Momentum and Energy operators. Stationary states; physical interpretation of wave-function. 	4
Module 6	<ul style="list-style-type: none"> Probabilities and normalization. Probability and probability current densities in one dimension. 	3
Module 7	<ul style="list-style-type: none"> One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization. Quantum dot as an example; Quantum mechanical scattering and tunnelling in one dimension - across a step potential and across a rectangular potential barrier. 	5
Module 8	<ul style="list-style-type: none"> Size and structure of atomic nucleus and its relation with atomic weight Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy. 	4
Module 9	<ul style="list-style-type: none"> Radioactivity: stability of nucleus Law of radioactive decay. Mean life & half-life 	4
Module 10	<ul style="list-style-type: none"> α decay; β decay - energy released. Spectrum and Pauli's prediction of neutrino. γ-ray emission. 	4
Module 11	<ul style="list-style-type: none"> Fission and fusion-mass deficit, relativity and generation of energy Fission-nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium-235. Fusion and thermonuclear reactions. 	6
DSE-1A: ELEMENTS OF MODERN PHYSICS (Practical)		
Module 1	<ul style="list-style-type: none"> To determine the value of Boltzmann constant using the V-I characteristic of the PN diode. 	4
Module 2	<ul style="list-style-type: none"> Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light. 	4
Module 3	<ul style="list-style-type: none"> To determine the value of e/m by magnetic focusing. 	4

SEMESTER-V		
Skill Enhancement Course:		
SEC-3: COMPUTATIONAL PHYSICS (Theory)		Class
Module 1	<ul style="list-style-type: none"> Importance of computers in Physics, paradigm for solving physics problems for solution. Usage of linux as an Editor. 	1
Module 2	<ul style="list-style-type: none"> Algorithm: Definition, properties and development. Flowchart: Concept of flowchart, symbols, guidelines, types. Examples: Cartesian to Spherical Polar Coordinates, Roots of Quadratic Equation, Sum of two matrices, Sum and Product of a finite series. Calculation of $\sin(x)$ as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a projectile thrown at an angle with the horizontal. 	3

Module 3	<ul style="list-style-type: none"> Some fundamental Linux Commands (Internal and External commands). Development of FORTRAN, Basic elements of FORTRAN: Character Set, Constants and their types Variables and their types, Keywords, Variable Declaration and concept of instruction and program. 	3
Module 4	<ul style="list-style-type: none"> Operators: Arithmetic, Relational, Logical and Assignment Operators. Expressions: Arithmetic, Relational, Logical, Character and Assignment Expressions. Fortran Statements: I/O Statements (unformatted/formatted), Executable and Non-Executable Statements, Layout of Fortran Program. Format of writing Program and concept of coding, Initialization and Replacement Logic. Examples from physics problems. 	3
Module 5	<ul style="list-style-type: none"> Types of Logic (Sequential, Selection, Repetition), Branching Statements (Logical IF, Arithmetic IF, Block IF, Nested Block IF, SELECT CASE and ELSE IF Ladder statements). Looping Statements (DO-CONTINUE, DO-ENDDO, DO-WHILE, Implied and Nested DO Loops), Jumping Statements (Unconditional GOTO, Computed GOTO, Assigned GOTO). Subscripted Variables (Arrays: Types of Arrays, DIMENSION Statement, Reading and Writing Arrays), Functions and Subroutines (Arithmetic Statement Function, Function Subprogram and Subroutine), RETURN, CALL, COMMON and EQUIVALENCE Statements). Structure, Disk I/O Statements, openfile, writing in a file, reading from a file. Examples from physics problems. 	7
Module 6	<ul style="list-style-type: none"> Exercises on syntax on usage of FORTRAN Usage of GUI Windows, Linux Commands, familiarity with DOS commands and working in an editor to write our codes in FORTRAN. To print out all natural even/odd numbers between given limits. To find maximum, minimum and range of a given set of numbers. Calculating Euler number using $\exp(x)$ series evaluate $\ln x=1$ 	4
Module 7	<ul style="list-style-type: none"> TeX/LaTeX word processor, preparing a basic LaTeX file, Document classes. Preparing an input file for LaTeX, Compiling LaTeX File, LaTeX tags for creating different environments. Defining LaTeX commands and environments, Changing the type style, Symbols from other languages. 	3
Module 8	<ul style="list-style-type: none"> Formulae and equations, Figures and other floating bodies, Lining in columns Tabbing and tabular environment, generating table of contents, bibliography and citation. Making an index and glossary, List making environments, Fonts, Picture environment and colors, errors. 	3
Module 9	<ul style="list-style-type: none"> Introduction to graphical analysis and its limitations. Introduction to Gnuplot. importance of visualization of computational and computational data, basic Gnuplot commands: simple plots, plotting data from a file, saving and exporting, multiple data sets per file. Physics with Gnuplot (equations, building functions, user defined variables and functions), Understanding data with Gnuplot. 	3

SEMESTER-VI		Class
DSE-1B: DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTATION (Theory)		
Module 1	<ul style="list-style-type: none"> • Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion. • AND, Or and NOT Gates (Realization using Diodes and Transistor). • NAND and NOR Gates as Universal Gates. XOR and XNOR Gates. 	4
Module 2	<ul style="list-style-type: none"> • De Morgan's Theorems. Boolean Laws. • Implication of Logic Circuit using Boolean Algebra. • Fundamental Products. Minterms and Maxterms. 	3
Module 3	<ul style="list-style-type: none"> • Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map. • Binary Addition. Binary Subtraction using 2's Complement Method). • Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor. 	4
Module 4	<ul style="list-style-type: none"> • Semiconductor Diodes: p and n type semiconductors. Barrier Formation in PN Junction Diode. • Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. PN junction and its characteristics. • Static and Dynamic Resistance. Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell. 	4
Module 5	<ul style="list-style-type: none"> • n-p-n and p-n-p Transistors. • Characteristics of CB, CE and CC Configurations. Active, Cutoff, and Saturation Regions. • Current gains α and β. Relations between α and β. Load Line analysis of Transistors. DC Load line and Q-point. 	4
Module 6	<ul style="list-style-type: none"> • Voltage Divider Bias Circuit for CE Amplifier. • h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. • Input and Output Impedance. Current, Voltage and Power Gains. Class A, B, and C Amplifiers. 	4
Module 7	<ul style="list-style-type: none"> • Characteristics of an Ideal and Practical Op-Amp (IC 741) • Open-loop & Closed-loop Gain. • CMRR, concept of Virtual ground. 	3
Module 8	<ul style="list-style-type: none"> • Applications of Op-Amps: <ul style="list-style-type: none"> • Inverting and Non-inverting Amplifiers • Adder • Subtractor • Differentiator • Integrator • Zero Crossing Detector 	4
Module 9	<ul style="list-style-type: none"> • Barkhausen's Criterion for Self-sustained Oscillations. • Determination of Frequency of RC Oscillator. 	2
Module 10	<ul style="list-style-type: none"> • Introduction to CRO: Block Diagram of CRO. • Applications of CRO: <ul style="list-style-type: none"> • Study of Waveform • Measurement of Voltage, Current, Frequency, and Phase Difference. 	4
Module 11	<ul style="list-style-type: none"> • Power Supply: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers. • Calculation of Ripple Factor and Rectification Efficiency. • Basic idea about capacitor filter. 	3
Module 12	<ul style="list-style-type: none"> • Zener Diode and Voltage Regulation. • Timer IC: IC 555 Pin diagram and its application as Astable & Monostable Multivibrator. 	3

DSE-1B: DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTATION (Practical)		
Module 1	<ul style="list-style-type: none"> To measure (a) Voltage, and (b) Frequency of a periodic waveform using a CRO To verify and design AND, OR, NOT and XOR gates using NAND gates. To minimize a given logic circuit. 	4
Module 2	<ul style="list-style-type: none"> Half adder, Full adder and 4-bit Binary Adder. Adder-Subtractor using Full Adder I.C. To study I-V characteristics of PN diode and Zener diode. To study the characteristics of a Transistor in CE configuration. 	6
Module 3	<ul style="list-style-type: none"> To design a CE amplifier of a given gain (mid-gain) using voltage divider bias. To design an inverting amplifier of given gain using an Op-amp 741 and study its frequency response. To design a non-inverting amplifier of given gain an Op-amp 741 and study its frequency response. 	8

SEMESTER-VI		
Skill Enhancement Course:		Class
SEC- 4: ELECTRICAL CIRCUITS AND NETWORK SKILLS		
Module 1	<ul style="list-style-type: none"> Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations. AC Electricity and DC Electricity. Familiarization with multimeter, voltmeter and ammeter. 	3
Module 2	<ul style="list-style-type: none"> Main electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Single phase and three phase alternating current sources. Rules to analyze AC sourced electrical circuits. Real, imaginary and complex power components of AC source. Power factor. Saving energy and money. 	5
Module 3	<ul style="list-style-type: none"> Drawing symbols. Blueprints. Reading Schematics. Ladder diagrams. Electrical Schematics. Power circuits. Control circuits. Reading of circuit schematics. Tracking the connections of elements and identifying current flow and voltage drop. 	3
Module 4	<ul style="list-style-type: none"> DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Operation of transformers. 	3
Module 5	<ul style="list-style-type: none"> Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of AC motor. 	3
Module 6	<ul style="list-style-type: none"> Resistors, inductors and capacitors. Diode and rectifiers. Components in Series or in shunt. Response of inductors and capacitors with DC or A C sources. 	3
Module 7	<ul style="list-style-type: none"> Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Phase reversal. Surge protection. Interfacing DC or AC sources to control elements (relay protection device). 	4
Module 8	<ul style="list-style-type: none"> Different types of conductors and cables. Basics of wiring-Star and delta connection. Voltage drop and losses across cables and conductors. Instruments to measure current, voltage, power in DC and AC circuits. 	3
Module 9	<ul style="list-style-type: none"> Insulation. Solid and stranded cable. Conduit. Cable trays. Splices: wire nuts, crimps, terminal blocks, split bolts, and solder. Preparation of the extension board. 	3

K. Mandal

Deptt. of Physics
Chandidas Mahavidyalaya
Khujutipara, Birbhum