TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (August-December)

Department	Physics	Semester	1st (Major) (Theory)
Subject	Physics	Paper no	101
Course	BSc (Semester)	Marks	60

Unit	Course Content	Allotted to	Hours	Month	date
1	**Vector analysis:** Vectors, Scalars, Vector algebra, Product rules, Vector fields, scalar fields.	Utpala Baishya	5	August	From 2/8/18 to 20/8/18
2	**Vector differentiation:** Ordinary derivatives of vectors, space curves, Partial derivatives of vectors, Differentials of vectors, Concept of gradient, divergence and curl. Application of above concept to simple physical phenomena.	Utpala Baishya	13	August-September	From 21/8/18 to 30/9/18
b)	**MECHANICS**				
1.	Non-inertial systems and fictitious forces, rotating frame of reference, fictitious/apparent force in a rotating co-ordinate system, Coriolis force, Coriolis and centrifugal forces produced as a result of earth's rotation. Deflection of a freely	Chandrama Kalita	8	August	From 2/8/18 to 25/8/18

	falling body, effect of Coriolis force on the horizontal straight line motion of a body on the surface of the earth.				
2.	Work-energy theorem, integral of the equation of motion, conservative forces, potential energy, conservative force as the negative gradient of potential energy, curl of a conservative force, non-conservative forces, general law of conservation of energy.	Chandrama Kalita	5	August-September	From 26/8/18-6/9/18
3.	Mechanics of a system of particles, centre of mass, motion of the centre of mass, conservation of momentum, calculation of centre of mass of (i) non-uniform rod, (ii) semicircular arc (iii) semi-circular disk and (iv) solid hemisphere. Laboratory frame of reference and centre of mass frame of reference, two dimensional elastic collision in laboratory frame of reference and centre of mass frame.	Chandrama Kalita	8	September	From 7/9/18 to 30/9/ 18
4.	Angular momentum, angular momentum of a system of particles in terms of the centre of mass co-ordinate, conservation law of angular momentum, angular momentum and fixed axis rotation of a rigid body, moment of inertia, calculation of moment of inertia for spherical bodies (shell,	Chandrama Kalita	8	October	From 1/10/18 to 31/10/18

	hollow and solid). The compound pendulum, determination of g by Kater's pendulum.				
5.	Gravitation, gravitational field and potential due to spherical shell and solid sphere.	Chandrama Kalita	5	November	From 1/11/18 To 15/11/18

TEACHING PLAN

Department of Physics, SBMS College

Session: 2018-2019 (August – December)

Department	Physics	Semester	1^{st} (Major) (Theory)
Subject	Physics	Marks	60
Course	BSc(Semester)	Paper no	102

Unit	Course Content	Allotted to	Hours	Month	date
a)	**Waves and Oscillation:**				
1.	**Harmonic Motion:** Simple Harmonic motion, Composition of two simple harmonic oscillations at right angles, Lissajous figures. Free, damped and forced oscillations, resonance, and sharpness of resonance.	Jayanta Deka	12	August	2/8/18 to 25/8/18
2.	**Wave Motion:** Wave motion in an elastic medium, characteristic of progressive waves, mathematical representation of a progressive wave. Differential wave equation in one dimension, solution of wave equation (method of separation of variables). Energy density of plane progressive waves, Superposition of waves. Stationary waves, characteristics of stationary waves.	Jayanta Deka	12	August-September	26/8/18 to 30/8/18

3.	**Sound Waves:** Velocity of longitudinal waves in a solid bar. Intensity of sound wave. Units of intensity. Acoustics of auditorium, reverberation, Sabine's law. 6 Lectures	Jayanta Deka	8	October	1/10/18 to 20/10/18
4.	**Fourier analysis**: Fourier analysis and evaluation of Fourier coefficients. Application of Fourier analysis to square and saw tooth waves. Equation of transverse vibration of a stretched string, energy of vibrating string, plucked string and struck string.	Jayanta Deka	16	October to November	21/10/18 to 15/11/18
b)	**RAY OPTICS:**				
1.	**Fermat's principle:** Fermat's principle and its application in establishing laws of reflection and refraction at spherical and plane boundaries.	Utpala Baishya	3	October	1/10/18 to 10/10/18
2.	**Matrix method:** Translation matrix and Refraction Matrix, use of matrix method in refraction at a spherical surface and refraction through thin lens.	Utpala Baishya	3	October	11/10/18 to 20/10/18
3.	**Lens system:** Sign convention, conjugate foci, relation for refraction of paraxial rays at single spherical surface, interrelation among lateral, longitudinal and angular magnification, Lagrange's law and Helmholtz equation and its modification for telescopic system.	Utpala Baishya	5	October - November	21/10/18 to 5/11/18
4.	**Defects of image:** Spherical aberration and its magnitude for thin lens for object at finite distance and condition for minimum aberration when object is at infinity, Minimization of spherical aberration by using suitable lens of different radii of curvature and by aplanatic surface, Qualitative idea about coma, astigmatism and distortion, Chromatic aberration, circle of least confusion, achromatism of two thin lenses separated by a distance.	Utpala Baishya	7	November	6/11/18 to 15/11/18

TEACHING PLAN

Department of Physics, SBMS College

Session: 2018-2019 (August – December)

Department	Physics	Semester	1^{st} (Practical) (Major)
Subject	Physics	Marks	50
Course	BSc (Semester)	Paper no	103

Unit	Course Content	Allotted to	Hours	Month	date
a)	**TEST OF LABORATORY SKILL:**				
1.	Identification of active and passive components of an electronic circuit.	Chandrama Kalita	1	August	2/8/18 to 10/8/18
2.	To use a multimeter for identification of different terminals of (i) diode and (ii) transistor.	Chandrama Kalita	1	August	2/8/18 to 10/8/18
3.	To find the value of resistor from colour code and verify by measuring the resistance by multimeter.	Chandrama Kalita	1	August	12/8/18 to 20/8/18
4.	To make connections using soldering.	Chandrama Kalita	1	August	12/8/18 to 20/8/18
5.	To measure small distances and angles using different varnier scales attached to (i) traveling microscope, (ii) polarimeter and (iii) spectrometer	Chandrama Kalita	1	August	21/8/18 to 30/8/18
6.	To check the condition of a lead-acid battery (i) acid strength by common hydrometer, (ii) acid level and (iii) emf(using multimeter).	Chandrama Kalita	1	August	21/8/18 to 30/8/18
7.	To check the condition of capacitor using multimeter.	Chandrama Kalita	1	August	21/8/18 to 30/8/18
b)	**PRACTICAL:**				

1.	To measure the extension of an experimental wire due to different pulling forces using Searle's apparatus and hence determine the Young's modulus of the material of the wire.	Utpala Baishya	4	August	2/8/18 to 30/8/18
2.	Study the variation of angle of twist of a given rod at different lengths from the fixed end, with torque & then determine the rigidity modulus of the material of the rod.	Chandrama Kalita	4	September	1/9/18 to 30/9/18
3.	To study the variation of time period of a bar pendulum about different point of suspension and use the result to find the value of g at a place.	Jayanta Deka	4	October	1/10/18 to 30/10/18
4.	To determine the moment of inertia of a cylinder or a rectangular parallelopiped about two different axes of symmetry by torsional oscillation method.	Chandrama Kalita	4	November	1/11/18 to 15/11/18

TEACHING PLAN

DEPARTMENT OF PHYSICS

SBMS COLLEGE, SUALKUCHI

Session: 2018-19 (August –December)

Department	Physics	Semester	1st (General)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	101

Unit	Course Content	Allotted to	Hours	Month	date
a)	**Mechanics and properties of Matter:**				

1.	Conservative and non-conservative forces, force as gradient of potential.	Chandrama Kalita	2	August	From 2/8/18 to 31/8/18
2.	Rotational motion, torque, angular momentum, conservation of angular momentum,work and power in rotational motion, KE of rotation, moment of inertia, theorems of moment of inertia, moment of inertia of rectangular plate, circular disc, cylinder, sphere (solid and hollow), body rolling without slip.	Chandrama Kalita	6	August	From 2/8/18 to 31/8/18
3.	Gravitation: determination of G by Cavendish method, gravitational field and potentials due to solid sphere and spherical shell, Kepler's law of planetary motion, Newton's law of gravitation from Kepler's law, artificial satellites, geostationary satellite, eccentricity of orbit of a satellite, escape velocity.	Chandrama Kalita	5	October	From 2/10/18 to 31/10/18
4.	Compound pendulum: equivalent simple pendulum, centers of suspension and oscillation, four points of equal time period, condition for minimum time period.	Chandrama Kalita	4	November	From 1/11/18 to 15/11/18
5.	Elasticity: Hook's law, different kinds of elastic constants, work done in deforming a body, Relation among the elastic constants. Bending of beam fixed at one end and loaded at the other end, torsion of a rod.	Utpala Baishya	7	August	From 2/8/18 to 31/8/18
6.	Streamline and turbulent flow, critical velocity, viscosity of fluids, Poiseuille's equation. Bernoulli's equation, its derivation and applications.	Utpala Baishya	5	September	From 2/9/18 to 15/9/18
b)	**Wave and Sound:**				
1.	Simple harmonic motion, differential equation of S.H.M., total energy of a particle executing S.H.M., oscillation of loaded spring. Free, damped and forced vibrations,	Jayanta Deka	6	September	From 16/9/18 to 31/9/18

	resonance, sharpness of resonance, equation of wave motion, principle of superposition of waves, beats, stationary wave and Doppler's effect.				
2.	Velocity of sound in a homogeneous medium, effect of temperature and pressure on velocity of sound in air, intensity level of sound and its unit (bel and decibel).	Jayanta Deka	4	October	From 1/10/18 to 12/10/18
3.	Ultrasonic waves production of ultrasonic waves, application of ultrasonic waves, principle of SONAR system.	Jayanta Deka	4	November	From 1/11/18 to 12/11/18

TEACGING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (August- December)

Department	Physics	Semester	3rd (Major)(Theory)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	301

Unit	Course Content	Allotted to	Hours	Month	date
a)	**MATHEMATICAL METHODS-III:**				
1.	Properties of matrices, Transpose matrix, complex conjugate matrix, Hermitian matrix, special square matrix, unit matrix, diagonal matrix, Co-factor matrix, adjoint of a matrix, self-adjoint matrix, symmetric matrix, anti-symmetric matrix, túnitary matrix, orthogonal	Utpala Baishya	15	August-September	2/08/18-30/9/18

	matrix, trace of a matrix, inverse matrix.				
2.	Eigenvalue problems, Cayley-Hamilton Theorem, Diagonalization of matrices.	Utpala Baishya	6	October	1/10/18to10/10/18
3.	Co-ordinate transformations, rotation in two dimensions, rotation in three dimensions.	Utpala Baishya	8	October	11/10/18 to 20/11/18
b)	**<u>ELECTROSTATICS:</u>**				
1.	Electric field, Electric field due to a uniformly charged (a) wire, (b) ring, and (c) disc. Divergence of Electric field, Gauss's law in integral and Applications of Gauss's law. Curl of an electric field, Electric potential, electric potential due to a uniformly charged (a) wire, (b) ring, and (c) disc. Electric dipole, Potential and field due to a dipole, dipole in a uniform external electric field, dipole- dipole interaction. Multipole expansion of electrostatic potential due to a volume distribution of charge.	Chandrama Kalita	14	August	2/08/18-31/8/18
2.	Electrostatic boundary conditions. Electrostatic energy. Energy of (a) an assembly of P.39 Bijle point charges, (b) uniformly charged sphere. Laplace's and Poisson's equations, P-47 boundary conditions and Uniqueness theorem, Solutions of Laplace's equation in one dimension Electric, potential and intensity (a) inside an infinite parallel plate capacitor, (b) inside spherical capacitor, and (c) due to a long and uniformly charged conducting wire.	Chandrama Kalita	10	September	1/09/18-30/8/18
3.	Method of trical image with examples of (a) infinite grounded conducting, plane electrical and (b) grounded conducting sphere.	Chandrama Kalita	4	October	1/10/18 -10/10/18

4.	Dielectrics: induced dipoles, atomic polarizability, polar and nonpolar molecules, polarization. The electric field of a polarized object, bound charges, The electric field inside a dielectric, Gauss's law in the presence of dielectrics, Electric displacessent, linear dielectrics, susceptibility, permitivity and dielectric constant, Clausius equation. Massotti	Chandrama Kalita	7	October - November	11/10/18-15/11/18

TEACGING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (August- December)

Department	Physics	Semester	3rd (Major) (Theory)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	302

Unit	Course Content	Allotted to	Hours	Month	date
a)	**CURRENT ELECTRICTY:**				
1.	Electric current density, continuity equation, Ohm's law, Applications of Kirchoff's law to solve electrical network problem, Kelvin double bridge for low resistance measurement, moving coil ballistic galvanometer and its nd its sensitivity	Jayanta Deka	10	August	2/8/18-31/9/18
2.	Electromagnetic induction: Self and mutual induction, coefficient of coupling, reciprocity theorem, self induction of a long solenoid, mutual induction of two solenoids, measurement of L. and M using	Jayanta Deka	10	September	1/9/18-25/9/18

	dic source and ballistic galvanometer.				
3.	Transient growth and decay of current in LR, CR and LCR circuits, oscillatory discharge. Thermo electricity: Coefficients of thermo-emf, thermoelectric power	Jayanta Deka	8	September to October	26/9/18 - 10/10/18
4.	Alternating current: Generation of alternating current, Phasor (complex number method) method of analyzing a.c. circuits, current and potential across resistive, inductive and capacitive elements and their phase relationships, power factor, LR, CR and LCR (series and parallel) circuits, quality factor, resonance, Maxwell's LC bridge and Anderson's bridge.	Jayanta Deka	10	October	11/10/18 – 31/10/18
5.	Rotating magnetic field, a.c. motor, transformer, reflected impedance in transformer. use of transformer.	Jayanta Deka	7	November	1/11/18 - 15/11/18
b)	MAGNETOSTATICS:				
1.	Magnetic field, Lorentz force, Cyclotron motion, cycloid motion, Biot-Savart law. Magnetic field due to a steady current in (a) straight conductor and (b) a circular coil. Divergence and Curl of a magnetic field.	Utpala Baisshya	7	October to November	21/10/18- 5/11/18
2.	Ampere's circuital few: magnetic field due to a (a) long straight conductor and (b) an infinite solenoid carrying a steady current, Magnetic scalar and vector potential. Force and torque on a current loop in a uniform magnetic field, Current loop as a magnetic dipole	Utpala Baisshya	8	November	6/11/18 – 15/11/18

TEACHING PLAN

Department Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019

Department	Physics	Semester	3rd (Practical) (Major)
Subject	Physics	Marks	50
Course	BSc(Semester)	Paper no	303

Unit	Course Content	Allotted to	Hours	Month	date
1	To determine the horizontal component of earth's magnetic field using deflection and vibration magnetometer,	Utpala Baishya	6	August	2/8/18 to 15/8/18
2	To compare the values of two given low resistances using a potentiometer.	Jayanta Deka	6	August	16/8/18 to 31/8/18
3	To determine the internal resistance of a given cell using a potentiometer.	Jayanta Deka	6	September	1/9/18 to 15/9/18
4	To determine the end correction of a meter bride and than to determine the specific resistance of the material of a given wire with help of the meter hridge using end correction.	Chandrama Kalita	6	September	16/9/18 to 30/8/18
5	To convert a given galvanometer into an ammeter of given range and than calibrate it with the help of a copper voltameter.	Chandrama Kalita	6	Octobert	1/10/18 to 15/10/18

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (August- December)

Department	Physics	Semester	3rd (General)(Theory)
Subject	Physics	Marks	40
Course	BSc(Semester)	Paper no	301

Unit	Course Content	Allotted to	Hours	Month	date
a)	**Heat:**				
1.	Platinum resistance thermometer and thermocouple thermometer.	Utpala Baishya	4	August	2/8/18-15/8/18
2.	Kinetic theory of gases, expression of Maxwell's law of velocity distribution (deduction not necessary), degree of freedom, law of equipartition of energy, mean free path, Brownian motion.	Utpala Baishya	5	August	16/8/18-31/8/18
3	Andrew's and Amagat's experiment, equation of state, Van-der-Waals' equation of state, reduced equation of state, critical constants.	Utpala Baishya	5	September	1/9/18-15/9/18
4.	Joule-Thomson effect, liquefaction of gases by Joule-Thomson effect.	Chandrama Kalita	4	August	2/8/18-15/8/18
5.	Phase, first order phase transitions, Clausius-Clayperon equation, Gibbs' phase rule, triple point.	Chandrama Kalita	4	August	16/8/18-31/8/18
6.	Radiation: Kirchhoff's law and its applications, relation between radiation pressure and energy density, Black body radiation, expressions of Stefan-Boltzmann law, Wien's displacement	Chandrama Kalita	7	September	1/9/18-30/9/18

	law, Rayleigh-Jean's law and Planck's law of black body radiation.				
b)	**Thermodynamics:**				
1.	Zeroth law of themodynamics and concept of temperature.	Jayanta Deka	2	September	1/9/18-8/9/18
2.	Heat and work and their equivalence, First law of thermodynamics and concept of internal energy, Applications of first law of thermodynamics.	Jayanta Deka	4	September	9/9/18-20/9/18
3.	Inadequacy of first law of thermodynamics, Second law of thermodynamics, reversible and irreversible processes, isothermal and adiabatic processes, work done by perfect gas under isothermal and adiabatic expansion, Carnot engine and Carnot cycle, Thermodynamic scale of temperature.	Jayanta Deka	5	September	21/9/18-30/9/18
4.	Entropy, change of entropy in reversible and irreversible processes, Clousious inequality relation.	Jayanta Deka	3	October	1/10/18-7/9/18
5.	Maxwell's thermodynamic relations and their applications.	Jayanta Deka	2	October	8/10/18-12/10/18

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (August- December)

Department	Physics	Semester	3rd (General Practical)
Subject	Physics	Marks	50
Course	BSc (Semester)	Paper no	302

Unit	Course Content	Allotted to	Hours	Month	date
1	To study the elongation of a wire by different pulling forces using Searle's apparatus and find the value of Young's modulus.	Utpala Baishya	5	August	2/8/18-12/8/18
2	To determine the value of g by bar pendulum.	Utpala Baishya	5	August	16/8/18-25/8/18
3	To determine the specific resistance of the material of the given wire by Meter Bridge and then find the length of wire necessary to construct a one ohm coil.	Jayanta Deka	5	September	1/9/18-15/9/18
4	To determine the emf of a cell using a cell of known emf with the help of potentiometer.	Jayanta Deka	5	September	16/9/18-30/9/18
5	To determine the resistance per unit of the length of meter bridge wire by Carey-Foster method.	Chandrama Kalita	5	October	1/10/18-15/10/18
6	7. To convert a given galvanometer into a voltmeter of given range and then calibrate it with standard resistance and ammeter.	Chandrama Kalita	5	November	1/11/18-15/11/18

TEACHING PLAN

Department Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019

Department	Physics	Semester	5th (Major)(Theory)
Subject	Physics	Marks	60
Course	BSC (Semester)	Paper no	501

Unit	Course Content	Allotted to	Hours	Month	date
a)	**MATHEMATICAL METHODS-V:**				
1	Algebraic operation, Argand diagram, vector representation, complex coniuures Euler's formula, De-Moiver's theorem.	Utpala Baishya	5	August	2/8/18to12/8/18
2	Analytic function of a complex variable, Derivative of F(z) and its analyticity, contour integrals, equivalent contours, Cauchy integral theorem, differentiation under integral sign.	Utpala Baishya	13	August	13/8/18 to 24/8/18
3	Series expansion: Taylor and Laurent series and their simple applications Residues, Zeros, isolated singular points, evaluation of residues. Evaluation of definite intragrals.	Utpala Baishya	12	August-September	25/8/18 to 30/9 18
b)	**CLASSICAL MECHANICS:**				
1	Central force motion, two body central force motion, two body motion as a one body problem, general properties of central force motion, Energy and momenturn	Chandrama Kalita	8	August	2/8/18 to12/8/18

	as constants of motion in central force, Energy equation involving only the radial motion, energy diagram and nature of orbits.				
2	Application of central force problem to motion under inverse square force field. solution of the equation of the path to find the nature of the orbits as hyperbolic, parabolic and elliptic.	Chandrama Kalita	8	August	13/8/18 to 24/8/18
3	Constraints, generalized co-ordinates, principle of virtual work. D' Alembert's principle and Lagrange's equations of motion, simple applications of Lagrangian formulations (i) Atwood machine (ii) simple pendulum (iii) Keplerian motion (iv) bead sliding on rotating wire. (v)compound pendulum, (vi)linear harmonic oscillator Hamilton's principle, calculus of variation, shortest distance between two points as example, Lagrange's equations from Hamilton's principle, Hamiltonian of a system, Hamilton's canonical equations of motion, applications of Hamilton's equations to simple problems like simple pendulum, Kepler's problem., Poisson brackets.	Chandrama Kalita	14	September	25/8/18 to 30/9 18

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (August –December)

Department	Physics	Semester	5th (Major Theory)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	502

Unit	Course Content	Allotted to	Hours	Month	date
1	Positive rays and their analysis: Thomson's mass parabola method, Aston's mass spectrograph, Bainbridge mass spectrograph.	Utpala Baishya	10	August	2/8/18 to 15/8/18
2	Rutherford's nuclear atom model, alpha scattering expt, deduction of the scattering formula.	Utpala Baishya	8	August	16/8/18 to 31/8/18
3	Atomic spectra: Bohr's theory of hydrogen spectra, energy level diagram, Ritz combination principle, resonance, excitation, critical and ionization potentials; fine structures of the spectral lines, Sommerfeld's extension of the Bohr's theory.	Utpala Baishya	12	September	1/9/18 to 31/9/18
4	Vector stom model: Spectra of alkali stoms, Bohr magneton; spinning electron; quantum numbers; Pauli's exclusion principle; explanation of the periodic classification of the clements; spectroscopic notations, source of radiation in external fields- normal Zeeman effect; anomalous Zeeman effect, Paschen-Back effect, Stark effect, Stern-Garlach experiment.	Utpala Baishya	15	October	1/10/18 to 31/10/18

5	X-Rays: Continuous and Characteristics X-rays, Mosley's law, Compton effect	Utpala Baishya	8	November	1/11/18 to 15/11/18
6	Scattering of light: Rayleigh scattering formula; colour of the sky: polarisation of the scattered light; Raman effect, experimental study of Raman effect, quantum Raman effect, application of the effect.	Utpala Baishya	7	November	1/11/18 to 15/11/18

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (August –December)

Department	Physics	Semester	5th (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	503

Unit	Course Content	Allotted to	Hours	Month	date
a)	**QUANTUM MECHANICS:**				
1.	Development of quantum mechanics in light of Black body radiation, failure of classical idea, Plank's quantum hypothesis, photoelectric effect and Compton effect.	Jayanta Deka	5	August	2/8/18 to 14/8/18
2.	Matter wave: Wave particle duality, de Broglie wave associated with moving particles- (i) non relativistic and (ii) relativistic case, verification of matter waves by (i) Davisson	Jayanta Deka	8	August	15/8/18 to 31/8/18

	Germer's experiment and (ii) G.P. Thomson's electron diffraction experiment.				
3.	Complimentary principle of Neils Bohr, Heisenberg's Uncertainty Principle, Gamma ray microscope experiment, application of Uncertainty Principle.	Jayanta Deka	7	September	1/9/18 to 15/9/18
4.	Wave function and its probabilistic interpretation as probability amplitude; Continuity equation, probability density and probability current density J; Normalisation condition and normalised wave function; properties of well behaved wave function in quantum mechanics. Wave packets, Superposition of waves, phase velocity and group velocity and their relation.	Jayanta Deka	8	September	16/9/18 to 30/9/18
5.	Introduction to operator formalism, Dynamical variable as operator (position, momentum and Hamiltonian), Eigenvalues and eigenfunction; Expectation value, Ehrenfest's theorem. Schrodinger wave equation (i) time dependent and (ii) time independent.. Correspondence Principle. Application of Schrodinger's wave equation (i) one dimensional step potential (ii) one dimensional potential barrier, Reflection and transmission coefficients and tunneling effect, (iii) a particle in a one dimensional potential well of infinite depth (iv) one dimensional harmonic oscillator.(v) Theory of hydrogen atom-separation of variables, radial solution.	Jayanta Deka	12	October	1/10/18 to 20/10/18
b)	**ASTROPHYSICS:**				

1.	Astrophysical Co-ordinates: Celestial coordinate systems, The right Ascension. Declination and Altitude-Azimuth coordinate systems. The ecliptic and annual motion of the Sun across the thy the Signs of Zotine Identifications of the Constelationsecure and bright star.	Hirak Choudhury	5	August	2/8/18 to 14/8/18
2.	Concept of time: Sidereal time and solar time; Greenwich Mean Time(GMT), standard time and local time; Julian date and its importance in astronomical observation .	Hirak Choudhury	5	August	15/8/18 to 31/8/18
3	Stellar Magnitude system and Distance measurement: The Stellar magnitude system and its relation with luminosity. Apparent and absolute magnitude and their relations with distances. Trigonometric and spectroscopic parallax to determine the distances. Difference magnitude systems.	Hirak Choudhury	5	September	1/9/18 to 15/9/18
4.	Spectral Classification and H.R. Diagram: Spectral classification, color index, H-D classification. The H-R Diagram. Steller evolution and the evolutionary track of a star.	Hirak Choudhury	5	September	16/9/18 to 30/9/18

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (August –December)

Department	Physics	Semester	5^{th} (Major, Theory)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	504

Unit	Course Content	Allotted to	Hours	Month	date
1	Volt-ampere relation of P-N junction diode (deduction not necessary), Energy band diagram of P-N diode, photo diode, LED, varactor diode and zener diode. Rectifiers- half wave and full wave with resistive load, efficiency, ripple factor, filters- series inductor, shunt capacitor, L-section and I-section. Voltage regulation and regulated Power Supply. Clipping and clamping circuits.	Chandrama Kalita	8	August	2/8/18 to 16/8/18
2	Thevenin, Norton and Millman theorem & maximum power transfer theorem.	Chandrama Kalita	6	August	17/82/18to 31/8/18
3	Transistor, different mode of operations and characteristics of transistor, basic transistor amplifier, load line and operating point (Q point) of transistor, Stabilization of Q point, transistor biasing circuits, two port (four terminals) device and z, y and h	Chandrama Kalita	14	September	1/9/18to 15/9/18

	parameters, h parameter equivalent circuit, analysis of transistor amplifier (CE) with h parameters, current gain, voltage gain and power gain, input and output impedance, Classification of amplifiers, Class A, Class B and Class C amplifiers, cascade amplifiers, small signal RC coupled amplifier (CE) and its voltage and current gain in low, mid and high frequency, frequency response curve, Phase relation between input and output, Power amplifiers, power dissipation, Harmonic distortion, large signal Push Pull Amplifier (Class B)				
4	Concept of feedback, different types of feedback, advantages of negative feedback in amplifier, Barkhousen criterion, classification of oscillators, tuned collector oscillator,Phase shift(R-C) and Wein bridge oscillator, Multivibrators.	Chandrama Kalita	7	September	16/9/18 to 24/9 18
5	Direct Coupled Amplifier, differential amplifier, introduction to IC. OPAM, characteristics of an ideal OPAM, common and differential mode, CMMR, inverting, non-inverting mode of OPAM, OPAM as scale changer, adder, subtractor, differentiator and integrator.	Chandrama Kalita	6	September	25/9/18 to 30/9/18
6	Modulation, need of modulation, Theories of AM and FM, side-bands, power content in different parts of the modulated wave, band width of AM and FM, modulators, amplitude, modulation circuits, circuit of square band-widulation and detection, SSB transmission, AM Transmitter (block diagrams), super heterodyne receiver (block diagraenic Introduction to radio wave propagation, ground or	Chandrama Kalita	12	October20/10/24	1/10/18 to 20/10/18

	surface wave, space or tropospheric wave and sky wave. Working and uses of CRO, Introductory idea of microprocesser .				
7	Binary Number System, Decimal to binary conversion, Binary to decimal conversion, Binary addition and subtraction. OR, AND, NOT, NOR and NAND Logic gates using P- N junction diode and transistors, Boolean Algebra, De Morgan's Theorem, Sequential circuits, Latch, RS, JK, MSJK, D and T flip flops. Introduction to binary transmission ASK, FSK and PSK.	Chandrama Kalita	7	Ocober	21/10/18 to 30/10/18

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (August –December)

Department	Physics	Semester	5th (Major Practical)
Subject	Physics	Marks	75
Course	BSC (Semester)	Paper no	505

Unit	Course Content	Allotted to	Hours	Month	date
1	To draw the characteristic curve of a photo cell and find the maximum velocity of the emitted electrons.	Chandrama Kalita	6	August	2/8/18 to15/8/18
2	To determine the value of Planck's constant with the help of	Jayanta Deka	6	August	16/8/18 to31/8/18

	photo cell a monochromatic filter				
3	To determine the value of Stefan's constant by electrical method using an incandescent electric bulb.	Utpala Baishya	4	September	1/9/18 to15/9/18
4	To calibrate a spectrometer with spectral lines of known wavelength and hence determine unknown wavelength of spectral lines emitted by a given source	Chandrama Kalita	6	September	16/9/18 to30/9/18
5	To study the variation of refractive index of the material of a prism with known wavelengths of spectral lines of a source and hence determine the unknown wavelength of a spectral line emitted by a source.	Chandrama Kalita	6	October	1/10/18 to 15/10/18
6	To determine he boiling point of the given liquid with the help of a Platinum Resistance thermometer.	Utpala Baishya	8	October	16/10/18 to 31/10/18

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (August –December)

Department	Physics	Semester	5th (Major Practical)
Subject	Physics	Marks	75
Course	BSc (Semester)	Paper no	506

Unit	Course Content	Allotted to	Hours	Month	date
1	To verify De Morgan's theorem using IC 7400 and 7402. (Using Breadboard).	Jayanta Deka	8	September	5/9/18 to 25/9/18
2	To assemble (a) OR, (b) AND, (c)	Jayanta	8	October	3/10/18 to

	NOT and (d) NAND gate with resistance, diode and transistors using bread board and verify their truth table. (Using Breadboard).	Deka			31/10/18
3	To draw the forward bias characteristic of a semiconductor diode and the reverse bias characteristic of a Zener diode and hence determine their DC and AC resistances. Also determine the breakdown voltage of the Zener diode (Using Breadboard).	Jayanta Deka	8	November	1/11/18 to 15/11/18

TEACHING PLAN

Department Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019

Department	Physics	Semester	5^{th} (General)(Theory)
Subject	Physics	Marks	80
Course	BSc (Semester)	Paper no	501

Unit	Course Content	Allotted to	Hours	Month	date
a)	**Mathematical methods:**				
1.	Vector Algebra, scalar and vector product with illustration from physics, vector triple products.	Utpala Baishya	5	August	2/8/18-12/8/18

2.	Vector calculus: Scalar and Vector fields with example from physics, space curve, differentiation of a vector with respect to a scalar, gradient of scalar, divergence and curl of vector with example from physics.	Utpala Baishya	10	August	13/8/18-31/8/18
3.	Line integral, surface integral and volume integral. Gauss's theorem, Stoke's and Green's theorem.	Utpala Baishya	5	September	1/9/18-10/9/18
4.	Curvilinear coordinate system, coordinate line and coordinate surface, unit normal vectors and unit tangent vectors, scale factor, orthogonal curvilinear coordinates, cylindrical polar and spherical polar coordinate systems.	Utpala Baishya	10	October	11/9/18-30/10/1
b)	**Atomic Physics:**				
1.	Positive rays: analysis of positive rays, Aston and Bainbridge mass spectrographs.	Chandrama Kalita	5	August	2/8/18-12/8/18
2.	Bohr's theory of hydrogen spectra, energy level diagram, Ritz combination principle, excitation, critical and ionization potentials, fine structures of the spectral lines, Sommerfeld's extension of the Bohr's theory(Qualitative only).	Chandrama Kalita	8	September	13/8/18-31/8/18
3.	Vector atom model, Bohr magnetron, spinning electron; quantum numbers; Pauli's exclusion principle, source of radiation in external fields-normal Zeeman effect.	Chandrama Kalita	8	September	13/8/18-31/8/18
4.	X-rays: origin and production of x-rays, continuous and characteristic X-rays, Mosley's law; diffraction of X-rays by	Chandrama Kalita	6	October	1/10/18-31/10/18

	crystals, Bragg's law, Compton Effect.				
5.	Frank and Hertz experiment, matter wave, Davisson and Germer experiment.	Chandrama Kalita	6	November	1/11/18-15/10/18
c)	**Relativity:**				
1.	Michelson-Morley experiment, postulates of special theory of relativity, Lorentz transformation equations (derivation not necessary), time dilation, length contraction, mass variation, mass energy relation, veločity addition theorem.	Jayanta Deka	8	August	2/8/18-12/8/18
d)	**Renewable energy sources:**				
1.	Need and importance, different renewable energy sources, solar energy, solar radiatant, instruments for measuring solvabliation, solar heaters (air and liquid), solar radiation concentrators (reflector elc.), solar cooker, photovoltaic effect, solar cells.	Jayanta Deka	10	September	13/8/18-31/8/18

TEACHING PLAN

Department Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019

Department	Physics	Semester	5^{th} (General Practical)
Subject	Physics	Marks	100
Course	BSc (Semester)	Paper no	502

Unit	Course Content	Allotted to	Hours	Month	date
1	To determine the value of 'H' with the help of a deflection and vibration magnetometer.	Utpala Baishya	8	August	2/8/18-31/8/18
2	To determine the surface tension of a liquid by capillary rise method.	Utpala Baishya	8	September	1/9/18-31/9/18
3	To draw I-D curve for the given prism with the help of a spectrometer and hence find the angle of minimum deviation.	Chandrama Kalita	8	October	1/10/18-30/10/18
4	To determine the wavelength of sodium light by Newton's ring.	Chandrama Kalita	8	November	1/11/18-10/11/18

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January- June)

Department	Physics	Semester	2^{nd} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	201

Unit	Course Content	Allotted to	Hours	Month	date
a)	**MATHEMATICAL METHODS-II:**				
1.	**Integration of vectors:** Ordinary integration of vectors. Line integral, surface integral and volume integrals and their applications to simple problems. Green's theorem in the plane Gauss's divergence theorem, Stokes' theorem and their applications.	Utpala Baishya	12	January	20/1/2019 to 31/1/19
2	**Curvilinear co-ordinate system:** Curvilinear co-ordinates, Unit vectors and scale factors in curvilinear co-ordinates systems, orthogonal curvilinear co-ordinates, plane polar co- ordinates, right circular cylindrical co-ordinates and spherical polar co-ordinates. Arc length, area and volume elements in each of these systems. Divergence, curl and Laplacian in plane polar co-ordinates, right circular cylindrical co-ordinates and spherical polar co-ordinates. Application of above	Utpala Baishya	15	February	1/2/19 to 20/2/19

	concept to simple physical phenomena.				
3	**Gamma and Dirac Delta function**: Elementary introduction to Gamma function and Dirac Delta function.	Utpala Baishya	8	February	21/2/19 to 28/2/19
b)	**PROPERTIES OF MATTER**:				
1	**Elasticity:** Different type of elastic constants and relation among them. Energy in a strained ARN-S body, torsion of a rod, torsional oscillation, bending of beam, bending moment, cantilever. Le Som depression of a cantilever considering the weight of the beam.	Utpala Baishya	12	March	1/3/19 to 31/3/19
2	**Surface tension:** Surface tension, relation between surface tension and surface energy E=S-T dS/dT, excess pressure inside a curved liquid surface. Determination of surface tension by ripple method.	Utpala Baishya	7	April	1/4/19 to 30/4/19
3	**Viscosity**: Poiseullie's equation for flow of a liquid through narrow tube. Determination of viscosity by rotating viscometer.	Utpala Baishya	6	May	1/5/19 to 15/5/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018 – 2019 (January-June)

Department	Physics	Semester	2^{nd} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	202

Unit	Course Content	Allotted to	Hours	Month	date
1	Kinetic theory of gases, pressure exerted by a gas using spherical polar coordinates, degree of freedom, law of equipartition of energy. Maxwell Law of velocity distribution, Maxwellian mean free path, transport phenomena viscosity, Brownian motion (Einstein's Langevin's theory), experimental determination of Avogadro's number, examples of Brownian motion.	Chandrama Kalita	15	January to February	20/1/19 to 20/2/19
2	Equation of state of a gas, Andrew's experiment, Van der Waal's equation of state, critical constants and law of corresponding states. Thermal conductivity, Fourier equation for rectilinear flow of heat and its solution. Platinum resistance thermometer Thermal conductivity, Fourier equation for rectilinear flow of heat and its solution. Platinum resistance thermometer.	Chandrama Kalita	15	February to March	21/2/19 to 15/3/19
3	Zeroth and first law of thermodynamics, specific heats of gases, isothermal and adiabatic processes. Reversible and irreversible processes, conversion of heat into work. Carnot cycle, Carnot's theorem. Second law of thermodynamics: Heat engine, Kelvin-Planck statement of second law, Clausius statement of second law, equivalence of Kelvin-Planck and Clausius statements, Kelvin's thermodynamical scale of temperature and its relation to perfect gas scale, Clausius formulation of entropy. entropy changes in reversible and irreversible processes, entropy of ideal gas, relation between entropy and probability.	Jayanta Deka	15	March to April	16/3/19to 12/4/19

4	Enthalpy, Gibbs-Helmholtz function, Maxwell's thermodynamic relations and their applications, Gibbs phase rule, triple point, Joule Thomson effect, adiabatic demagnetization. Black body radiation, Kirchoff's law of radiation, radiation pressure, Stefan-Boltzmann law, Wein's displacement law, Rayleigh-Jean's law, Planck's radiation law.	Jayanta Deka	15	April to May	19/4/19 to 10/5/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January-June)

Department	Physics	Semester	2nd (Major Practical)
Subject	Physics	Marks	50
Course	BSC (Semester)	Paper no	203

Unit	Course Content	Allotted to	Hours	Mounth	date
1	To determine the focal length of a given convex mirror with the help of a convex lens.	Chandrama Kalita	6	February	1/2/19-28/2/19
2	To determine the value of J, the mechanical equivalent of heat by Joule's calorimeter.	Utpala Baishya	6	March	1/3/19-15/3/19
3	To determine the refractive index of a liquid by using a plane mirror and a convex lens.		6	March	1/3/19-31/3/19
4	To convert a given galvanometer into a voltmeter of given range and then calibrate it with help of an ammeter and standard resistance.	Jayanta Deka	6	April	1/4/19-30/3/19

5	Determination of surface tension of water solutions of minerals or organic compounds using capillary method and study the variation of surface tension with concentration. (Additional experiment for those Colleges having Star College Scheme).	Utpala Baishya	6	May	1/5/19-15/5/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019

Department	Physics	Semester	2nd (General)(Theory)
Subject	Physics	Marks	60
Course	BSc(Semester)	Paper no	201

Unit	Course Content	Allotted to	Hours	Month	date
a)	**Current Electricity:**				
1.	Electric current density, continuity equation, Ohm's law as JoE, Applications of Kirchoff's law to solve electrical network problem.	Chandrama Kalita	6	January-February	20/1/19-19/2/19
2.	Moving coil ballistic galvanometer its sensitivity and uses.	Chandrama Kalita	2	February	20/2/19-5/3/19
3.	Electromagnetic induction: Self and mutual induction, coefficient of coupling. reciprocity theorem, self induction of a long solenoid, mutual induction of two solenoids.	Chandrama Kalita	5	March	\6/3/19-18/3/19
4.	Transient growth and decay of current in LR, CR and LCR circuits.	Chandrama Kalita	5	March	19/3/19-10/4/19

5.	Alternating current: Generation of alternating current, current and potential across resistive, inductive and capacitive elements and their phase relationships, power factor, concept of rotating magnetic field. a.c. motor, transformer, reflected impedance in transformer.	Chandrama Kalita	6	April	11/4/19-30/4/19
b)	**Electrostatics:**				
1.	Gauss's theorem and its applications to determine field due to linear, plane and spherical charge distribution, potential due to dipole, derivation of field due to a dipole Mutual potential energy of two dipoles.	Utpala Baishya	7	January-February	20/1/19-28/2/19
2.	Capacity of parallel plate capacitor, spherical and cylindrical capacitor, effect of dielectric on capacity of capacitor, mechanical force on charged conductor, energy stored in a charged capacitor.	Utpala Baishya	7	March	1/3/19-20/3/19
3.	Dielectrics, Electric polarisation of dielectrics, polarizability, Relation between D, E, & P. Gauss's law in dielectric. Electrostatic boundary conditions in dielectric medium.	Utpala Baishya	6	March-April	21/3/19-28/4/19
c)	**Magnetism:**				
1.	Electric current as source of magnetic field, Equivalent magnetic dipole produced by a current flowing though a circular conductor, magnetic dipole moment, force and couples on dipole placed in a uniform magnetic field, magnetic shell, potential due to magnetic shell, magnetic intensity, induction and intensity of magnetisation, magnetic susceptibility, permeability, hystersis and hystersis loss.	Jyanta Deka	8	April-May	29/4/19-28/5/19
2.	Dia, para and ferro magnetism, Atomic dipole moment, Langevin's Classical theory of para magnetism.	Jyanta Deka	4	May	29/5/19-10/5/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January-June)

Department	Physics	Semester	4^{th} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	401

Unit	Course Content	Allotted to	Hours	Month	date
a)	**MATHEMATICAL METHODS-IV:**				
1.	Differential Equations. Second order linear differential equations, series method of solutions Basu (Frobenius), Legendre's differential equations, Legendre's polynomial,Hermite's differential equations, Hermite's polynomial, generating function, spherical harmonics, orthogonal properties & recurrence relations.	Utpala Baishya	25	January-February	20/1/19-28/2/19
2.	Probability theory: Mutually exclusive events, theorem of total probability, compound events and theorem of compound probability. Probability distributions -Gaussian distribution, mean and standard deviation.	Utpala Baishya	15	March	1/3/19-31/3/19
b)	INTRODUCTON TO COMPUTER AND COMPUTER PROGRAMMING:	Utpala Baishya			
1.	Functional organization of a digital computer-CPU, memory,	Utpala Baishya	20	April-May	1/4/19 -10/5/19

	input/output unit. Flowcharts, Algorithms, High level Computer languages, programming in one high level language (either FORTRAN-95 or C or C). Data types, different types of variables, important commands, I/O statements, relation and logical statements, transfer staternents, string manipulation, subscripted variables, Functions and subroutines				

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January-June)

Department	Physics	Semester	4^{th} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	402

Unit	Course Content	Allotted to	Hours	Month	date
a)	**WAVE OPTICS:**				
1	**Interference:** Concept of light wave and its equation, complex representation of superposition of waves, meaning of coherence, to show that interference fringes are hyperbolic in general, condition for straight fringes, Stokes law, interference due to Fresnel's biprism, interference by a plane parallel film, wedge shaped film, colour of thin film, Newton's rings, Michelson interferometer and its application for	Chandrama Kalita	15	January-February	20/1/19-28/2/19

	finding difference in wavelengths.				
2	**Diffraction:** Difference between Fresnel and Fraunhofer classes, half-period zones and strips, Zone plate and its lensing property, diffraction at a straight edge and at a circular aperature (with B.S.Agun reference to microscope), Fraunhofer diffraction due to a single slit, double slit and transmission gratng, wavelength measurement by the plane transimission grating, resolving power of a grating. theory of concave grating.	Chandrama Kalita	15	March-April	1/3/19-15/4/19
3	Polarisation: Double refraction, optic axis and CaCO, crystal, plane, circular and elliptically polarised light, Retarding plates and their uses for producing and analysing different polarised light, specific rotation of plane of polarisation on and half-shade polarimeter.	Chandrama Kalita	10	April-May	16/4/19-10/5/19
b)	**SPECIAL THEORY OF RELATIVITY:**				
1	Formulation of Special Theory of Relativity and Relativistic Kinematics: The need for a new model of kinematics (relativity). Electromagnetism and null result of Michelson-Morley experiment, negation of ether concept. Postulates of special theory of relativity. Galilean transformation (Newtonian kinematics) and Lorentz transformation. Application of Lorentz transformation,. Length contraction, time dilation and their examples and application to physical situations (viz. muon decay). Relativistic transformation of velocity. Relativistic Doppler Effect and twin paradox.	Jayanta Deka	12	February	1/2/19-28/2/19

2	Relativistic Momentum and Energy, Space-time: Relativistic momentum and energy. Equivalence of mass and energy. Massless particles (i.e. photons). The geometry of space-time and space-time interval. Time-like and space-like events Concept of four-vectors and Minkowski space.	Jayanta Deka	8	March	1/3/19-20/3/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January-June)

Department	Physics	Semester	4th (Major Practical)
Subject	Physics	Marks	50
Course	BSc (Semester)	Paper no	403

Unit	Course Content	Allotted to	Hours	Month	date
1	To adjust and focus the given spectrometer using Schuster's method and then determine the refractive index of the material of the prism.	Chandrama Kalita	8	February	2/2/19-28/2/19
2	To determine he wavelength of light emitted by a monochromatic source with the help of Newton's ring arrangement.	Chandrama Kalita	8	March	1/3/19-31/3/19
3	To study the variation in liquid column height with diameter of capillary tube and determine the surface tension of the liquid.	Utpala Baishya	6	April	1/4/19-10/4/19
4	To determine the value of acceleration due to gravity using Katter's Pendulum.	Jayanta Deka	6	May	1/5/19-10/5/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January-June)

Department	Physics	Semester	4^{th} (General)
Subject	Physics	Marks	40
Course	BSc (Semester)	Paper no	401

Unit	Course Content	Allotted to	Hours	Month	date
1	Fermat's principle: application to reflection and refraction at plane and curved boundaries, reflection through combination of two thin lenses, dispersion produced by lens, spherical and chromatic aberration and their remedies, achromatic combination of lenses, spectrometer	Utpala Baishya	6	January-February	20/1/19-10/2/19
2	Huygen's wave theory: Formula for refraction at a spherical surface, formula for thin convex and concave lenses.	Utpala Baishya	4	February	11/2/19-28/2/19
3	Interference of light: Fresnel biprism, colour of thin films, Newton's ring phenomenon.	Utpala Baishya	4	March	1/3/19-31/3/19
4	Diffraction of light: Fresnel and Fraunhofer classes of diffraction, diffraction at a straight edge and single slit, diffraction grating.	Chandrama Kalita	5	January-February	20/1/19-10/2/19
5	Polarisation of light: plane polarised light, polarisation on reflection, Brewster's law, double	Chandrama Kalita	5	February	11/2/19-28/2/19

	refraction, Nicol prism, rotation of plane of polarization by optically active substances, specific rotation, polarimeter.				
6	Ramsden's and Huygen's eye piece, aplanatic foci.	Chandrama Kalita	3	March	1/3/19-7/3/19
7	Michelson interferometer, resolving and dispersive power of grating, production and analysis of polarised light, retarding plates, Babinet's compensator.	Jayanta Deka	5	February	10/2/19-25/2/19
8	Laser and its characteristics, stimulated absorption, spontaneous and stimulated emission, population inversion, basic elements of laser, Ruby laser (principle only).	Jayanta Deka	5	February-March	26/2/19-5/3/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January-June)

Department	Physics	Semester	4th (General Practical)
Subject	Physics	Marks	50
Course	BSc (Semester)	Paper no	402

Unit	Course Content	Allotted to	Hours	Month	date
1	To determine the modulus of rigidity of the material of a rod by static method.	Chandrama Kalita	6	March	1/3/19-31/3/19
2	To determine the moment of inertia of symmetrical body about an axis by torsional oscillation method.	Utpala Baishya	6	April	1/4/19-30/4/19

3	To determine the refractive index of a liquid by using plane mirror and convex lens.	Utpala Baishya	4	May	1/5/19-15/5/19
4	To determine the electrochemical equivalent of copper by using an ammeter and copper voltameter.	Jayanta Deka	6	March	1/3/19-31/3/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January-June)

Department	Physics	Semester	6^{th} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	601

Unit	Course Content	Allotted to	Hours	Month	date
a)	**NUCLEAR PHYSICS:**				
1	Nuclear forces and Stability of Nuclei: Concept of packing fraction and binding energy, binding energy curve and its significance. Nucleon-nucleon forces qualitative discussions on nuclear force. Brief outline of Yukawas meson theory, Nuclear stability, neutron proton ratio in stable nuclei, stability curve, odd-even rules of nuclear stability. 8 Lectures	Jayanta Deka	8	January-February	20/1/19-5/2/19
2	Alpha decay: Cause of alpha decay, basic a-decay process, range and energy of a-decay, a-decay systematics, Geiger Nuttle rules, Qualitative discussion on the theory of a-decay. 6 Lectures	Jayanta Deka	6	February	6/2/19-18/2/19
3	Beta-decay: Types of ß-decays, conditions of B & B decay and K	Jayanta Deka	5	February	19/2/19 - 26/2/19

	capture, B-ray spectrum, Pauli's neutrino hypothesis.				
4	Gamma-rays: y-rays and their origin. Interaction of y-particle with matter.	Jayanta Deka	2	February	27/2/19-28/2/19
5	Nuclear models: Evidence in favour of liquid properties of nuclei, Liquid drop model Bethe-Weisackar's mass formula. Applications of mass formula estimation of fission energy, prediction of most stable member of an isobaric family. Shell model (Basic concepts only).	Jayanta Deka	8	March	1/3/19-12/3/19
6	Nuclear Reactions: Types of nuclear reactions, conserved quantities of nuclear reaction, energies of nuclear reaction - Q-value & its experimental determination. Exoergic & endoergic reactions. Cross-section of nuclear reaction and its unit. Nuclear fission and chain reaction, critical size, controlled chain reaction and basic principle of nuclear reactor. Nuclear fusion reaction-basic concepts of fusion reactions, fusion barrier, fusion and thermonuclear reactions (PP chains only).	Jayanta Deka	15	March-April	13/3/19 - 8/4/19
7	Accelerators: Necessity of charge particle acceleration construction and working principle of linear accelerator. Construction and working principle of a cyclotron.	Jayanta Deka	5	April	9/4/19-30/4/19
8	Detectors: Principles of detection of charge particles. Construction and working principle of gas filled detectors. Ionization chamber - its construction & working principle. 9. Cosmic rays: Origin of cosmic rays, primary & secondary cosmic rays and their composition. The East West effect. Latitude, longitude & altitude effec, Extensive Air Shower (EAS).	Jayanta Deka	5	May	2/5/19-15/5/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January-June)

Department	Physics	Semester	6^{th} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	602

Unit	Course Content	Allotted to	Hours	Month	date
a)	**MATHEMATICAL METHODS:**				
	Introduction to tensor, transformation of coordinates, contravariant and covariant tensor, tensorial character of physical quantities, symmetric and antisymmetric tensors, kronecker delta. Rules for combination of tensors- addition, subtraction, outer multiplication, contractions and inner multiplications.	Utpala Baishya	15	January-February	20/1/19-15/2/19
b)	**SOLID STATE PHYSICS:**				
1.	The idea of amorphous and crystalline solids, The crystal lattice and translation vectors, unit cell, types of crystal lattice, Miller indices, diffraction of X-rays, use of Bragg's law to the determination of lattice constants.	Utpala Baishya	10	February	16/2/19-28/2/19
2.	The different types of crystal bonding: ionic, covalent, metallic, Van der Waal and hydrogen bondings, cohesive energy of ionic	Utpala Baishya	5	March	1/3/19-10/3/19

	crystal, Madelung constant.				
3.	Free electron theory of metals, Boltzmann's equation of state, electronic specific heat, electrical and thermal conductivity of metals, Wiedemann-Franz law. (Quantum Mecanical treatment to be used).Bloch theorem in one dimension, Kronig-Penny model of energy bands of solids, distinction among metal, insulator and semiconductor, intrinsic and extrinsic semiconductors (qualitative discussion only).	Utpala Baishya	15		11/3/19-31/3/19
4.	Introductory concept of superconductivity, Meissner effect, types 1 and type II superconductors.	Utpala Baishya	5	April	1/4/19-31/4/19
5.	Magnetic properties of solids: Magnetization, magnetic intensity, magnetic susceptibility, permeability, hysteresis, B-H curve and energy loss in hysteresis, different classes of magnetic material, magnetic moment, Bohr magneton, Larmor precession, Classical theory of paramagnetism (Langevin's theory and Curie law), Weiss theory(Quantum Mecanical treatment to be used), relation between para and ferromagnetism, Ferromagnetic domain.	Utpala Baishya	10	May	2/5/19-15/5/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January-June)

Department	Physics	Semester	6^{th} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	603

Unit	Course Content	Allotted to	Hours	Month	date
1	**MODERN OPTICS:**				
1.	Optics of crystals: Wollaston prism, Rochon prism, Jones calculus, Interference of polarized light: interference due to crystal plates in plane polarised light, Babinet compensator. Principle of liquid crystal display.	Chandrama Kalita	8	January	20/1/19-31/1/19
2.	Lasers: Characteristics of laser light, absorption Spontaneous emission, Stimulated Vémission, Einstein coefficients, Population inversion and light amplification, Essential components of the laser, Ruby and He-Ne laser (principles only). Elementary idea about non-linear optics: Second Harmonic Generation.	Chandrama Kalita	10	February	1/2/19-28/2/19
3.	Holography: Formation of a hologram, Reconstruction of the hologram (mathematical aspect).	Chandrama Kalita	6	March	1/3/19-12/3/19
4.	Optical Fibers: Types of fibers; propagation of a ray through step index fiber: numerical aperture,	Chandrama Kalita	10	March	13/3/19-31/3/19

	multipath dispersion; propagation through graded index fiber. Basic idea about communication through an optical fiber cable (Block diagram).				
5.	Optical components & Spectrographs: Ramsden and Huygen's eyepieces, oil immersion objective, Prism spectrograph (Glass and quartz), Grating spectrograph.	Chandrama Kalita	6	April	1/4/19-12/4/19
b)	**ELECTROMAGNETIC THEORY:**				
1.	Electromagnetic field equation in integral and differential form, displacement current, Maxwell's equations, Energy Conservation Law-Poynting theorem and Poyntingvector.	Chandrama Kalita	6	April	16/4/19-30/4/19
2.	Electromagnetic wave equation, velocity of electromagnetic wave, Monochromatic plane wave equation in free space and conducting medium. Reflection and Refraction of plane electromagnetic wave for normal and oblique incidence, Snell's law, reflection and transmission co-efficient, Fresnel's equations, Polarisation of electromagnetic wave, linear, circular and elliptical polarization. Brewster's law.	Chandrama Kalita	14	May	2/5/19-16/5/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January-June)

Department	Physics	Semester	6th (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	604

Unit	Course Content	Allotted to	Hours	Month	date
a)	**STATISTICAL MECHANICS:**				
1.	Statistical system, and its coordinates, specification of a state in statistical mechanics, Macrostate and microstate, phase space, ensemble, Boltzmann entropy relation ergodic hypothesis, postulate of equal a priori probability, density of phase points is phase space, Liouville' theorem.	Jayanta Deka	8	February	1/2/19-28/2/19
2.	Symmetry of wavefunction, restriction regarding the number of particles in given state, different types of statistics Maxwell-Boltzmann(MB), Bose-Einstein (BE) and Fermi-Dirac(FD) Statistics, Most probable distribution relation in MB, BE and FD statistics and their comparison. Degeneracy Factor, Density of state.	Chandrama Kalita	7	March	1/3/19-20/3/19
3	Application of MB statistics to derive Maxwell distribution law (velocity, energy momentum and frequency).	Chandrama Kalita	5	March	21/3/19-31/3/19

4	Fermi energy and Fermi temperature, Fermi distribution function, Application of FD statistics to discuss electronic specific heat.	Utpala Baishya	5	April	1/4/19-13/3/19
5	Application of BE statistics to explain BE condensation and to derive Black body radiation formula.	Utpala Baishya	5	May	2/5/19-15/5/19
b)	**COMPUTER APPLICATIONS:**				
1	Programming exercise (either FORTRAN-95 or C or C): simple mathematical series generation and summation, sorting of numbers largest of n numbers, sorting a list ascending/descending order, solution of quadratic equation, solution of simultaneous linear equation, least square graph fitting (straight line and quadratic curve) of given data, iterative methods, implementation of Runge-Kutta 4th order method of solving differential equation and Simpson's rule for integration.	Kishor Das	30	February-May	2/2/19-15/5/19

TEACHNG PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January-June)

Department	Physics	Semester	6^{th} (Major Practical)
Subject	Physics	Marks	75
Course	BSc (Semester)	Paper no	605

Unit	Course Content	Allotted to	Hours	Month	date
1	To determine the Q- factor of a series resonance circuit containing L. C and R for three different values of R.	Chandrama Kalita	8	February	1/2/19-20/2/19
2	To determine the value of "J' (the mechanical equivalent of heat) by Callender and Bern's method.	Chandrama Kalita	10	March	5/3/19-25/3/19
3	To determine the value of self-induction of a coil with the help of Anderson's Bridge.	Chandrama Kalita	8	April	1/4/19-12/4/19
4	To measure the phase difference between he sgnal accros R and C of an R-C network using CRO and hence find the value of the resistor and frequency of the signal.	Jayanta Deka	8	May	1/5/19-15/5/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January-June)

Department	Physics	Semester	6^{th} (Major Practical)
Subject	Physics	Marks	75
Course	BSc (Semester)	Paper no	606

Unit	Course Content	Allotted to	Hours	Month	date
a)	**PROJECT**				
	(Experimental project work of any relevant topic within the syllabus of Physics, to be guided by a teacher and to be submitted along with a	Utpala Baishya	8	March	1/3/19-31/3/19

	report)				
b)	<u>**COMPUTER PROGRAMMING:**</u>				
1.	To determine (a) mean, (b)standard deviation and (c)standard error of the given experimental data.	Kishor Das	8	March	1/3/19-31/3/19
2.	To analyse the supplied experimental data between two variables using least square straight line fitting programme.	Kishor Das	8	April	1/4/19-30/4/19
3.	To rearrange the supplied numerical data in ascending/descending order and find the largest/smallest number in a given list of numbers.	Kishor Das	8	May	2/5/19-15/5/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January-June)

Department	Physics	Semester	6^{th} (General)
Subject	Physics	Marks	80
Course	BSc (Semester)	Paper no	601

Unit	Course Content	Allotted to	Hours	Month	date
a)	<u>**Nuclear Physics:**</u>				
1.	Concept of a Nucleus - its composition, mass, volume, density and temperature, units and dimension.	Jayanta Deka	5	January-February	20/1/19-5/2/19
2.	Mass defect and packing fraction, total binding energy, binding energy per nucleon, binding energy curve & its	Jayanta Deka	6	February	6/2/19-20/2/19

	significance, nucleon separation energy, nuclear reactions, Q-value of a reaction, exothermic & endothermic reactions.				
3.	Type of radioactive decays, radioactive decay law, concept of half life and disintegration constant, natural radioactivity, radioactive dating. Activity of radioactive sources, its unit. Radioisotopes - their production & uses.	Jayanta Deka	5	February	21/2/19-28/2/19
4.	Need of a particle accelerator, Linear Accelerator its construction & working principle. Need of nuclear Detectors. Ionization Chamber - its construction & working principle.	Jayanta Deka	5	March	1/3/19-15/3/19
5.	Primary and secondary cosmic rays and their composition, EAS.	Jayanta Deka	5	May	2/5/19-15/5/19
c)	**Electronics:**				
1.	Semiconductors, P-N junction unction dode, unbiased and biased P-N junction, depletion layer, barrier potential, junction capacitnice Volt-ampere relations (derivation nod NANury), photo diode, Zener diode, Dentamer, OR, AND, NOT, NOR and NAND Gates using diode and transistor.	Chandrama Kalita	8	January-February	20/1/19-5/2/19
2.	Rectifier, half wave and full-wave, efficiency of rectification, ripple factor, idea of filter circuit.	Chandrama Kalita	5	February	6/2/19-20/2/19
3.	Thevenin's and Norton's theorems, maximum power transfer theorem	Chandrama Kalita	5	March	1/3/19-15/3/19
4.	Transistor, different configurems, maximum power transferathistor, alpha and beta of a transistor, transistor as amplifier.	Chandrama Kalita	6	March	16/3/19-25/3/19
5.	Biasing and Q-point of a transistor, stability factors, biasing circuits.	Chandrama Kalita	5	March	26/3/19-31/3/19
6.	Classification of amplifiers: class A, B, C, voltage and power amplifiers.	Chandrama Kalita	2	April	1/4/19-10/4/19
7.	Two port four terminal device and z, y and h-parameters. Use of h-parameters to find input and output	Chandrama Kalita	4	April	11/4/19-30/4/19

	resistances, current, voltage and power gain of a small signal transistor amplifier.				
8.	Feedback and Barkhausen criterion for sustained oscillations, Tuned collector oscillator.	Chandrama Kalita	3	May	2/5/19-5/5/19
c)	**Electromagnetic waves:**				
1.	Electromagnetic wave spectrum, graphical representation of electromagnetic wave.	Chandrama Kalita	4	May	6/4/19-10/5/19
2.	Maxwell's equations, wave equation in free space from Maxwell's equations, velocity of electromagnetic waves in free space, Pointing vector.	Chandrama Kalita	4	May	11/5/19-15/5/19
d)	**Solid State Physics**				
1.	Crystalline and amorphous state of substances, single crystal and polycrystalline substances, basis, crystal lattice, unit cell, primitive unit cell, translation vectors, lattice parameters, directions, lattice planes, Miller indices, inter-planar spacing	Utpala Baishya	10	February	6/2/19-20/2/19
2.	Crystallographic axes, Crystal systems and Bravais lattice.	Utpala Baishya	4	March	1/3/19-15/3/19
3.	Different types of bonding in solids, ionic, covalent, metallic and hydrogen bonding.	Utpala Baishya	5	March	16/3/19-25/3/19
4.	Classical free electron theory of metals.,	Utpala Baishya	2	April	1/4/19-10/4/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2018-2019 (January-June)

Department	Physics	Semester	6^{th} (General Practical)
Subject	Physics	Marks	100
Course	BSc (Semester)	Paper no	602

Unit	Course Content	Allotted to	Hours	Month	date
1	To determine the value of'g' by Kater's pendulum.	Utpala Baishya	8	February	1/2/19-28/2/19
2	To determine the value of 'J', the mechanical equivalent of heat by Joule's calorimeter.	Utpala Baishya	6	March	1/3/19-15/3/19
3	To determine the angle of minimum deviation and angle of the prism with the help of a spectrometer and hence find refractive index of the material of the prism.	Chandrama Kaita	8	April	1/4/19-15/4/19
4	To assemble OR, AND and NOT gates using diode and transistor and verify their tuth tables.	Jayanta Deka	6	March	16/3/19-31/3/19
5	To draw the characteristics of- (i) a forward biased PN diode and (ii) reverse biased Zener diode and hence determine the ac resistance of the PN diode and breakdown voltage of the Zener diode.	Chandrama Kaita	6	April	16/4/19-30/4/19

TEACHING PLAN

DEPARTMENT OF PHYSICS

SBMS COLLEGE, SUALKUCHI

Session: 2019-20 (August –December)

Department	Physics	Semester	First semester
Subject	Mathematical Physics I	Credit	6
Course		Paper No	PHY-HC-1016
Remarks		Marks	100

Unit	Course Content	Allotted to	Hours	Month	Date
Unit I: Vector Calculus	Revision: Properties of vectors under rotations. Scalar product and its invariance under rotations. Vector product, Scalar triple product and their interpretation in terms of area and volume respectively. Scalar and Vector fields. Vector Differentiation: Directional derivatives and normal derivative. Gradient of a scalar field and its geometrical interpretation. Divergence and curl of a vector field. Del and Laplacian operators. Vector identities. Vector Integration: Ordinary Integrals of Vectors. Multiple integrals, Jacobian. Notion of infinitesimal line, surface and volume elements. Line, surface and volume integrals of Vector fields. Flux of a vector field. Gauss' divergence theorem, Green's and Stokes Theorems and their applications (no rigorous	Dr. Utpala Baishya	25	August-September	From 1/8/2019 to 10/9/2019

	proofs).				
Unit II: First and Second order Differential Equations	First Order and Second Order Differential equations: First Order Differential Equations and Integrating Factor. Homogeneous Equations with constant coefficients. Wronskian and general solution. Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor, with simple illustration.	Dr. Utpala Baishya	17	September	From 11/9/2019 to 30/9/2019
Unit III: Orthogonal Curvilinear Coordinates	Orthogonal Curvilinear Coordinates. Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems.	Dr. Utpala Baishya	6	October	1/10/2019 to 21/10/2019
Unit IV: Dirac Delta function and its Properties	Definition of Dirac delta function. Representation as limit of a Gaussian function and rectangular function. Properties of Dirac delta function.	Dr. Utpala Baishya	2	October	From 22/10/2019 to 25/10/2019
Unit V: Introduction to Probability	Independent random variables: Probability distribution functions; binomial, Gaussian and Poisson, with examples. Mean and variance.	Dr. Utpala Baishya	4	October	From 26/10/2019 to 31/10/2019
Unit VI: Theory of Errors	Systematic and Random Errors. Propagation of Errors. Normal Law of Errors. Standard and Probable Error. Least-squares fit.	Dr. Utpala Baishya	6	November	From/ 1/11/ 2019 to 7/11/2019
Lab	**Introduction and Overview** Computer architecture and organization, memory and Input/output devices.	Dr. Utpala Baishya	30	November	From 8/11/2019 to 25/11/2019

	Basics of scientific computing Binary and decimal arithmetic, Floating point numbers, algorithms, Sequence, Selection and Repetition, single and double precision arithmetic, underflow & overflow- emphasize the importance of making equations in terms of dimensionless variables, Iterative methods Review of C & C++/Python/ **Matlab/ Mathematica Programming fundamentals** Introduction to Programming, constants, variables and data types, operators and Expressions I/O statements, scanf and printf, c in and c out, Manipulators for data formatting, Control statements (decision making and looping statements) (if statement. if-else Statement. Nested if Structure. else-if Statement. Ternary Operator. goto Statement. switch Statement. Uncondi- tional and Conditional Looping. while Loop. do-while Loop. for Loop. Breakand continue Statements. Nested Loops), Arrays (1D & 2D) and strings, user defined functions, Structures and Unions, Idea of classes and objects. **Programs** Sum & average of a list of numbers, largest of a given list of numbers and its location in the list, sorting of numbers in ascending descending order, Binary search. **Random number generation** Area of circle, area of square, volume of sphere, value of pi (π)				

	Solution of Algebraic and Transcendental equations by Newton Raphson methods Solution of linear and quadratic equation, solving $\alpha = tan\alpha$, $I = I_0(sin\alpha/\alpha)^2$ in optics **Interpolation by Newton Gregory Forward and Backward difference formula** Evaluation of trigonometric functions e.g. sinθ, cosθ, tanθ etc. **Numerical Integration (Trapezoidal and Simpson rules), Monte Carlo method** Given Position with equidistant time data to calculate velocity and acceleration and vice versa. Find the area of B-H Hysteresis loop **Solution of Ordinary Differential Equations (ODE) First order Differential equation Euler, modifted Euler and Runge-Kutta (RK) second and fourth order methods First order differential equation** (a) Radioactive decay (b) Newton's law of cooling.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2019-20 (August –December)

Department	Physics	Semester	First semester
Subject	Mechanics	Credit	6
Course		Paper No	PHY-HC-1026
Remarks		Marks	100

Unit	Course Content	Allotted to	Hours	Month	Date
Unit I: Fundamentals of Dynamics	Reference frames. Inertial frames; Review of Newton's Laws of Motion. Galilean transformations; Galilean invariance. Momentum of variable mass system: motion of rocket. Motion of a projectile in Uniform gravitational field Dynamics of a system of particles. Centre of Mass. Principle of conservation of momentum. Impulse.	Dr. Chandrama Kalita	6	August	From 1/8/2019 to 16/8/2019
Unit II: Work and Energy	Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Potential Energy. Energy diagram. Stable and unstable equilibrium. Elastic potential energy. Force as gradient of potential energy. Work & Potential energy. Work done by non-conservative forces. Law of conservation of Energy.	Mr. Jayanta Deka	4	August	From 17/8/2019 to 22/8/2019
Unit III: Collisions	Elastic and inelastic collisions between particles. Centre of Mass and	Dr. Chandrama Kalita	3	August	From 23/8/2019 to

	Laboratory frames.				26/8/2019
Unit IV: Rotational Dynamics	Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. Kinetic energy of rotation. Motion involving both translation and rotation.	Mr. Jayanta Deka	12	August and September	From 27/8/2019 to 17/9/2019
Unit V: Elasticity	Relation between Elastic constants. Twisting torque on a Cylinder or Wire. Cantilever.	Dr. Chandrama Kalita	3	September	From 18/9/2019 to 23/9/2019
Unit VI: Fluid Motion	Kinematics of Moving Fluids: Poiseuille's Equation for Flow of a Liquid through a Capillary Tube.	Dr. Chandrama Kalita	2	September	From 24/9/2019 to 27/9/2019
Unit VII: Gravitation and Central Force Motion	Law of gravitation. Gravitational potential energy. Inertial and gravitational mass. Potential and field due to spherical shell and solid sphere. Motion of a particle under a central force field. Two-body problem and its reduction to one- body problem and its solution. The energy equation and energy diagram. Kepler's Laws.	Dr. Chandrama Kalita	8	September and October	From 28/9/2019 to 16/10/2019
Unit VIII:	SHM: Simple Harmonic	Dr.	8	October	From

Oscillations	Oscillations. Differential equation of SHM and its solution. Kinetic energy, potential energy, total energy and their time-average values. Damped oscillation. Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor. Compound Pendulum.	Chandrama Kalita		and November	17/10/2019 to 4/11/2019
Unit IX: Non-Inertial Systems	Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of Physics in rotating coordinate systems. Centrifugal force. Coriolis force and its applications.	Mr. Jayanta Deka	4	November	From 5/11/2019 to 13/11/2019
Unit X: Special Theory of Relativity	Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz Transformations. Simultaneity and order of events. Lorentz contraction. Time dilation. Relativistic transformation of velocity, frequency and wave number. Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy Equivalence. Relativistic Doppler effect. Relativistic Kinematics. Transformation of Energy and Momentum.	Mr. Jayanta Deka	10	November	From 14/11/2019 to 26/11/2019
Lab	*A minimum of seven experiments to be done.* 1. Measurements of length (or diameter)	Dr. Chandrama Kalita and Mr.	15	November and December	From 27/11/2019 to 12/12/2019

	using vernier caliper, screw gauge, Spherometer and travelling micro-scope. 2. To study the Motion of Spring and calculate (a) Spring constant and (b) Rigidity modulus. 3. To determine the Moment of Inertia of a cylinder about two different axes of symmetry by torsional oscillation method. 4. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method). 5. To determine the Young's Modulus of the material of a wire by Searle's apparatus. 6. To determine the Modulus of Rigidity of a Wire Static method. 7. To determine the value of g using Bar Pendulum. 8. To determine the value of g using Kater's Pendulum. 9. To determine the height of a building using a Sextant. 10. To determine g and velocity for a freely falling body using Digital Timing Technique	Jayanta Deka			

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2019-20 (August –December)

Department	Physics	Semester	First semester
Subject	Mechanics	Credit	6
Course		Paper No	PHY-HG/RC-1016
Remarks		Marks	100

Unit	Course Content	Allotted to	Hours	Month	Date
Unit I : Vectors	Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter. Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coeffcients	Dr. Utpala Baishya	6	August	From 1/8/2019 to 9/8/2019
Unit II : Laws of Motion	Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass.	Mr. Jayanta Deka	10	August	From 10/8/2019 to 26/8/2019
Unit III : Momentum and Energy	Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets.	Dr. Chandrama Kalita	6	August and September	From 27/8/2019 to 2/9/2019
Unit IV : Rotational Motion	Angular velocity and angular momentum. Torque. Conservation of angular momentum	Dr. Chandrama Kalita	5	September	From 3/9/2019 to 10/9/2019
Unit V : Gravitation	Newton's Law of Gravitation. Motion of a	Mr. Jayanta Deka	7	September	From 11/9/2019

	particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only).				to 20/9/2019
Unit VI : Oscillations	Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations. Compound pendulum.	Mr. Jayanta Deka	7	September	From 21/9/2019 to 30/9/2019
Unit VII : 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 – 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 Searles method.	Dr. Chandrama Kalita	8	October	From 1/10/2019 to 21/10/2019
Unit VIII : Special Theory of Relativity	Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.	Dr. Utpala Baishya	7	October and November	From 22/10/2019 to 4/11/2019
Lab	*A minimum of five experiments to be done.* 1. Measurements of length (or diameter)	Dr. Chandrama Kalita and	16	November	From 5/11/2019 to 25/11/2019

	using vernier caliper, screw gauge and Spherometer. 2. To determine the Moment of Inertia of a Symmetrical body about an axis by torsional oscillation method. 3. To determine the Young's Modulus of the material of a wire by Searle's apparatus. 4. To determine the Modulus of Rigidity of a Wire Static method. 5. To determine the elastic Constants of a wire by Searle's method. 6. To determine the value of g using Bar Pendulum. 7. To determine the value of g using Kater's Pendulum. 8. To study the Motion of Spring and calculate (a) Spring constant and (b) value of g.	Mr. Jayanta Deka			

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (August-December)

Department	Physics	Semester	3rd (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	301

Unit	Course Content	Allotted to	Hours	Month	date
a)	**MATHEMATICAL METHODS-III:**				
1.	Properties of matrices, Transpose matrix, complex conjugate matrix, Hermitian matrix, special square matrix, unit matrix, diagonal matrix, Co-factor matrix, adjoint of a matrix, self-adjoint matrix, symmetric matrix, anti-symmetric matrix, túnitary matrix, orthogonal matrix, trace of a matrix, inverse matrix.	Utpala Baishya	15	August-September	2/08/19-30/9/19
2.	Eigenvalue problems, Cayley-Hamilton Theorem, Diagonalization of matrices.	Utpala Baishya	6	October	1/10/19to10/10/19
3.	Co-ordinate transformations, rotation in two dimensions, rotation in three dimensions.	Utpala Baishya	8	October	11/10/19 to 20/11/19
b)	**ELECTROSTATICS:**				
1.	Electric field, Electric field due to a uniformly charged (a) wire, (b) ring, and (c) disc. Divergence of Electric field, Gauss's law in integral and Applications of Gauss's law. Curl of an electric field, Electric potential, electric potential due to a	Chandrama Kalita	14	August	2/08/19-31/8/19

	uniformly charged (a) wire, (b) ring, and (c) disc. Electric dipole, Potential and field due to a dipole, dipole in a uniform external electric field, dipole- dipole interaction. Multipole expansion of electrostatic potential due to a volume distribution of charge.				
2.	Electrostatic boundary conditions. Electrostatic energy. Energy of (a) an assembly of P.39 Bijle point charges, (b) uniformly charged sphere. Laplace's and Poisson's equations, P-47 boundary conditions and Uniqueness theorem, Solutions of Laplace's equation in one dimension Electric, potential and intensity (a) inside an infinite parallel plate capacitor, (b) inside spherical capacitor, and (c) due to a long and uniformly charged conducting wire.	Chandrama Kalita	10	September	1/09/19-30/8/19
3.	Method of trical image with examples of (a) infinite grounded conducting, plane electrical and (b) grounded conducting sphere.	Chandrama Kalita	4	October	1/10/19 -10/10/19
4.	Dielectrics: induced dipoles, atomic polarizability, polar and nonpolar molecules, polarization. The electric field of a polarized object, bound charges, The electric field inside a dielectric, Gauss's law in the presence of dielectrics, Electric displacessent, linear dielectrics, susceptibility, permitivity and dielectric constant, Clausius equation. Massotti	Chandrama Kalita	7	October - November	11/10/19- 15/11/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (August-December)

Department	Physics	Semester	3^{rd} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	302

Unit	Course Content	Allotted to	Hours	Month	date
a)	**CURRENT ELECTRICTY:**				
1.	Electric current density, continuity equation, Ohm's law, Applications of Kirchoff's law to solve electrical network problem, Kelvin double bridge for low resistance measurement, moving coil ballistic galvanometer and its nd its sensitivity	Jayanta Deka	10	August	2/8/19-31/9/19
2.	Electromagnetic induction: Self and mutual induction, coefficient of coupling, reciprocity theorem, self induction of a long solenoid, mutual induction of two solenoids, measurement of L. and M using dic source and ballistic galvanometer.	Jayanta Deka	10	September	1/9/19-25/9/19
3.	Transient growth and decay of current in LR, CR and LCR circuits, oscillatory discharge. Thermo electricity: Coefficients of thermo-emf, thermoelectric power	Jayanta Deka	8	September to October	26/9/19 - 10/10/19
4.	Alternating current: Generation of alternating current, Phasor (complex number method) method of analyzing a.c. circuits, current and potential across resistive, inductive and capacitive elements and their phase relationships,	Jayanta Deka	10	October	11/10/19 – 31/10/19

	power factor, LR, CR and LCR (series and parallel) circuits, quality factor, resonance, Maxwell's LC bridge and Anderson's bridge.				
5.	Rotating magnetic field, a.c. motor, transformer, reflected impedance in transformer. use of transformer.	Jayanta Deka	7	November	1/11/19 - 15/11/19
b)	MAGNETOSTATICS:				
1.	Magnetic field, Lorentz force, Cyclotron motion, cycloid motion, Biot-Savart law. Magnetic field due to a steady current in (a) straight conductor and (b) a circular coil. Divergence and Curl of a magnetic field.	Utpala Baisshya	7	October to November	21/10/19-5/11/19
2.	Ampere's circuital few: magnetic field due to a (a) long straight conductor and (b) an infinite solenoid carrying a steady current, Magnetic scalar and vector potential. Force and torque on a current loop in a uniform magnetic field, Current loop as a magnetic dipole	Utpala Baisshya	8	November	6/11/19 – 15/11/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (August-December)

Department	Physics	Semester	3rd (Practical) (Major)
Subject	Physics	Marks	50
Course	BSc(Semester)	Paper no	303

Unit	Course Content	Allotted to	Hours	Month	date
1	To determine the horizontal component of earth's magnetic field using deflection and vibration magnetometer,	Utpala Baishya	6	August	2/8/19 to 15/8/19
2	To compare the values of two given low resistances using a potentiometer.	Jayanta Deka	6	August	16/8/19 to 31/8/19
3	To determine the internal resistance of a given cell using a potentiometer.	Jayanta Deka	6	September	1/9/19 to 15/9/19
4	To determine the end correction of a meter bride and than to determine the specific resistance of the material of a given wire with help of the meter hridge using end correction.	Chandrama Kalita	6	September	16/9/19 to 30/8/19
5	To convert a given galvanometer into an ammeter of given range and than calibrate it with the help of a copper voltameter.	Chandrama Kalita	6	October	1/10/19 to 15/10/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (August-December)

Department	Physics	Semester	3rd (General)
Subject	Physics	Marks	40
Course	BSc(Semester)	Paper no	301

Unit	Course Content	Allotted to	Hours	Month	date
a)	**Heat:**				
1.	Platinum resistance thermometer and thermocouple thermometer.	Utpala Baishya	4	August	2/8/19-10/8/19
2.	Kinetic theory of gases, expression of Maxwell's law of velocity distribution (deduction not necessary), degree of freedom, law of equipartition of energy, mean free path, Brownian motion.	Utpala Baishya	5	August	11/8/19-20/8/19
3	Andrew's and Amagat's experiment, equation of state, Van-der-Waals' equation of state, reduced equation of state, critical constants.	Utpala Baishya	5	September	1/9/19-15/9/19
4.	Joule-Thomson effect, liquefaction of gases by Joule-Thomson effect.	Chandrama Kalita	4	August	2/8/19-10/8/19
5.	Phase, first order phase transitions, Clausius-Clayperon equation, Gibbs' phase rule, triple point.	Chandrama Kalita	4	August	11/8/19-20/8/19
6.	Radiation: Kirchhoff's law and its applications, relation between radiation pressure and energy density, Black body radiation, expressions of Stefan-Boltzmann law, Wien's displacement law, Rayleigh-Jean's law and	Chandrama Kalita	7	September	1/9/19-20/9/19

	Planck's law of black body radiation.				
b)	**Thermodynamics:**				
1.	Zeroth law of themodynamics and concept of temperature.	Jayanta Deka	2	September	1/9/19-6/9/19
2.	Heat and work and their equivalence, First law of thermodynamics and concept of internal energy, Applications of first law of thermodynamics.	Jayanta Deka	4	September	7/9/19-18/9/19
3.	Inadequacy of first law of thermodynamics, Second law of thermodynamics, reversible and irreversible processes, isothermal and adiabatic processes, work done by perfect gas under isothermal and adiabatic expansion, Carnot engine and Carnot cycle, Thermodynamic scale of temperature.	Jayanta Deka	5	September	19/9/19-30/9/19
4.	Entropy, change of entropy in reversible and irreversible processes, Clousious inequality relation.	Jayanta Deka	3	October	1/10/19-8/9/19
5.	Maxwell's thermodynamic relations and their applications.	Jayanta Deka	2	October	9/9/19-14/9/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (August-December)

Department	Physics	Semester	3rd (General Practical)
Subject	Physics	Marks	50
Course	BSc (Semester)	Paper no	302

Unit	Course Content	Allotted to	Hours	Month	date
1	To study the elongation of a wire by different pulling forces using Searle's apparatus and find the value of Young's modulus.	Utpala Baishya	5	August	2/8/19-31/8/19
2	To determine the value of g by bar pendulum.	Utpala Baishya	5	September	1/9/19-30/9/19
3	To determine the specific resistance of the material of the given wire by Meter Bridge and then find the length of wire necessary to construct a one ohm coil.	Jayanta Deka	5	August	2/8/19-15/8/19
4	To determine the emf of a cell using a cell of known emf with the help of potentiometer.	Jayanta Deka	5	September	1/9/19-30/9/19
5	To determine the resistance per unit of the length of meter bridge wire by Carey-Foster method.	Chandrama Kalita	5	October	1/10/19-15/10/19
6	7. To convert a given galvanometer into a voltmeter of given range and then calibrate it with standard resistance and ammeter.	Chandrama Kalita	5	October	16/10/19-30/10/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (August-December)

Department	Physics	Semester	5^{th} (Major)
Subject	Physics	Marks	60
Course	BSC (Semester)	Paper no	501

Unit	Course Content	Allotted to	Hours	Month	date
a)	**MATHEMATICAL METHODS-V:**				
1	Algebraic operation, Argand diagram, vector representation, complex coniuures Euler's formula, De-Moiver's theorem.	Utpala Baishya	5	August	2/8/19to12/8/19
2	Analytic function of a complex variable, Derivative of F(z) and its analyticity, contour integrals, equivalent contours, Cauchy integral theorem, differentiation under integral sign.	Utpala Baishya	13	August	13/8/19 to 24/8/19
3	Series expansion: Taylor and Laurent series and their simple applications Residues, Zeros, isolated singular points, evaluation of residues. Evaluation of definite intragrals.	Utpala Baishya	12	August-September	25/8/19 to 30/9 19
b)	**CLASSICAL MECHANICS:**				
1	Central force motion, two body central force motion, two body motion as a one body problem, general properties of central force motion, Energy and momenturn as constants of motion in central force, Energy equation involving only the radial motion, energy diagram and nature of orbits.	Chandrama Kalita	8	August	2/8/19 to12/8/19

2	Application of central force problem to motion under inverse square force field. solution of the equation of the path to find the nature of the orbits as hyperbolic, parabolic and elliptic.	Chandrama Kalita	8	August	13/8/19 to 24/8/19
3	Constraints, generalized co-ordinates, principle of virtual work. D' Alembert's principle and Lagrange's equations of motion, simple applications of Lagrangian formulations (i) Atwood machine (ii) simple pendulum (iii) Keplerian motion (iv) bead sliding on rotating wire. (v)compound pendulum, (vi)linear harmonic oscillator Hamilton's principle, calculus of variation, shortest distance between two points as example, Lagrange's equations from Hamilton's principle, Hamiltonian of a system, Hamilton's canonical equations of motion, applications of Hamilton's equations to simple problems like simple pendulum, Kepler's problem., Poisson brackets.	Chandrama Kalita	14	September	25/8/19 to 30/9 19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (August-December)

Department	Physics	Semester	5^{th} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	502

Unit	Course Content	Allotted to	Hours	Month	date
1	Positive rays and their analysis: Thomson's mass parabola method, Aston's mass spectrograph, Bainbridge mass spectrograph.	Utpala Baishya	10	August	2/8/19 to 15/8/19
2	Rutherford's nuclear atom model, alpha scattering expt, deduction of the scattering formula.	Utpala Baishya	8	August	16/8/19 to 31/8/19
3	Atomic spectra: Bohr's theory of hydrogen spectra, energy level diagram, Ritz combination principle, resonance, excitation, critical and ionization potentials; fine structures of the spectral lines, Sommerfeld's extension of the Bohr's theory.	Utpala Baishya	12	September	1/9/19 to 31/9/19
4	Vector stom model: Spectra of alkali stoms, Bohr magneton; spinning electron; quantum numbers; Pauli's exclusion principle; explanation of the periodic classification of the clements; spectroscopic notations, source of radiation in external fields- normal Zeeman effect; anomalous Zeeman effect, Paschen-Back effect, Stark effect, Stern-Garlach experiment.	Utpala Baishya	15	October	1/10/19 to 31/10/19

5	X-Rays: Continuous and Characteristics X-rays, Mosley's law, Compton effect	Utpala Baishya	8	November	1/11/19 to 15/11/19
6	Scattering of light: Rayleigh scattering formula; colour of the sky: polarisation of the scattered light; Raman effect, experimental study of Raman effect, quantum Raman effect, application of the effect.	Utpala Baishya	7	November	1/11/19 to 15/11/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (August-December)

Department	Physics	Semester	5^{th} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	503

Unit	Course Content	Allotted to	Hours	Month	date
a)	**QUANTUM MECHANICS:**				
1.	Development of quantum mechanics in light of Black body radiation, failure of classical idea, Plank's quantum hypothesis, photoelectric effect and Compton effect.	Jayanta Deka	5	August	2/8/19 to 14/8/19
2.	Matter wave: Wave particle duality, de Broglie wave associated with moving particles-(i) non relativistic and (ii) relativistic case, verification of matter waves by (i) Davisson Germer's experiment and (ii) G.P. Thomson's electron diffraction experiment.	Jayanta Deka	8	August	15/8/19 to 31/8/19
3.	Complimentary principle of Neils	Jayanta	7	September	1/9/19 to

	Bohr, Heisenberg's Uncertainty Principle, Gamma ray microscope experiment, application of Uncertainty Principle.	Deka			15/9/19
4.	Wave function and its probabilistic interpretation as probability amplitude; Continuity equation, probability density and probability current density J; Normalisation condition and normalised wave function; properties of well behaved wave function in quantum mechanics. Wave packets, Superposition of waves, phase velocity and group velocity and their relation.	Jayanta Deka	8	September	16/9/19 to 30/9/19
5.	Introduction to operator formalism, Dynamical variable as operator (position, momentum and Hamiltonian), Eigenvalues and eigenfunction; Expectation value, Ehrenfest's theorem. Schrodinger wave equation (i) time dependent and (ii) time independent.. Correspondence Principle. Application of Schrodinger's wave equation (i) one dimensional step potential (ii) one dimensional potential barrier, Reflection and transmission coefficients and tunneling effect, (iii) a particle in a one dimensional potential well of infinite depth (iv) one dimensional harmonic oscillator.(v) Theory of hydrogen atom-separation of variables, radial solution.	Jayanta Deka	12	October	1/10/19 to 20/10/19
b)	**ASTROPHYSICS:**				
1.	Astrophysical Co-ordinates: Celestial coordinate systems, The right Ascension. Declination and Altitude-Azimuth coordinate	Hirak Choudhury	5	August	2/8/19 to 14/8/19

	systems. The ecliptic and annual motion of the Sun across the thy the Signs of Zotine Identifications of the Constelationsecure and bright star.				
2.	Concept of time: Sidereal time and solar time; Greenwich Mean Time(GMT), standard time and local time; Julian date and its importance in astronomical observation .	Hirak Choudhury	5	August	15/8/19 to 31/8/19
3	Stellar Magnitude system and Distance measurement: The Stellar magnitude system and its relation with luminosity. Apparent and absolute magnitude and their relations with distances. Trigonometric and spectroscopic parallax to determine the distances. Difference magnitude systems.	Hirak Choudhury	5	September	1/9/19 to 15/9/19
4.	Spectral Classification and H.R. Diagram: Spectral classification, color index, H-D classification. The H-R Diagram. Steller evolution and the evolutionary track of a star.	Hirak Choudhury	5	September	16/9/19 to 30/9/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (August-December)

Department	Physics	Semester	5th (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	504

Unit	Course Content	Allotted to	Hours	Month	date
1	Volt-ampere relation of P-N junction diode (deduction not necessary), Energy band diagram of P-N diode, photo diode, LED, varactor diode and zener diode. Rectifiers- half wave and full wave with resistive load, efficiency, ripple factor, filters- series inductor, shunt capacitor, L-section and I-section. Voltage regulation and regulated Power Supply. Clipping and clamping circuits.	Chandrama Kalita	8	August	2/8/19 to 16/8/19
2	Thevenin, Norton and Millman theorem & maximum power transfer theorem.	Chandrama Kalita	6	August	17/82/19to 31/8/19
3	Transistor, different mode of operations and characteristics of transistor, basic transistor amplifier, load line and operating point (Q point) of transistor, Stabilization of Q point, transistor biasing circuits, two port (four terminals) device and z, y and h parameters, h parameter equivalent circuit, analysis of transistor amplifier (CE) with h parameters, current gain, voltage gain and power gain, input and output impedance, Classification of amplifiers, Class A, Class B and Class C amplifiers, cascade amplifiers, small signal RC coupled amplifier (CE) and its voltage and current gain in low, mid and high frequency, frequency response curve, Phase relation between input and output, Power amplifiers, power dissipation, Harmonic distortion, large signal Push Pull Amplifier (Class B)	Chandrama Kalita	14	September	1/9/19to 15/9/19

4	Concept of feedback, different types of feedback, advantages of negative feedback in amplifier, Barkhousen criterion, classification of oscillators, tuned collector oscillator,Phase shift(R-C) and Wein bridge oscillator, Multivibrators.	Chandrama Kalita	7	September	16/9/19 to 24/9 19
5	Direct Coupled Amplifier, differential amplifier, introduction to IC. OPAM, characteristics of an ideal OPAM, common and differential mode, CMMR, inverting, non-inverting mode of OPAM, OPAM as scale changer, adder, subtractor, differentiator and integrator.	Chandrama Kalita	6	September	25/9/19 to 30/9/19
6	Modulation, need of modulation, Theories of AM and FM, side-bands, power content in different parts of the modulated wave, band width of AM and FM, modulators, amplitude, modulation circuits, circuit of square band-widulation and detection, SSB transmission, AM Transmitter (block diagrams), super heterodyne receiver (block diagraenic Introduction to radio wave propagation, ground or surface wave, space or tropospheric wave and sky wave. Working and uses of CRO, Introductory idea of microprocesser .	Chandrama Kalita	12	October20/10/24	1/10/19 to 20/10/19
7	Binary Number System, Decimal to binary conversion, Binary to decimal conversion, Binary addition and subtraction. OR, AND, NOT, NOR and NAND Logic gates using P- N junction diode and transistors, Boolean Algebra, De Morgan's Theorem, Sequential circuits, Latch, RS, JK, MSJK, D and T flip flops. Introduction to binary transmission ASK, FSK and PSK.	Chandrama Kalita	7	October	21/10/19 to 30/10/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (August-December)

Department	Physics	Semester	5th (Major Practical)
Subject	Physics	Marks	75
Course	BSC (Semester)	Paper no	505

Unit	Course Content	Allotted to	Hours	Month	date
1	To draw the characteristic curve of a photo cell and find the maximum velocity of the emitted electrons.	Chandrama Kalita	6	August	2/8/19 to15/8/19
2	To determine the value of Planck's constant with the help of photo cell a monochromatic filter	Jayanta Deka	6	August	16/8/19 to31/8/19
3	To determine the value of Stefan's constant by electrical method using an incandescent electric bulb.	Utpala Baishya	4	September	1/9/19 to15/9/19
4	To calibrate a spectrometer with spectral lines of known wavelength and hence determine unknown wavelength of spectral lines emitted by a given source	Chandrama Kalita	6	September	16/9/18 to30/9/18
5	To study the variation of refractive index of the material of a prism with known wavelengths of spectral lines of a source and hence determine the unknown wavelength of a spectral line emitted by a source.	Chandrama Kalita	6	October	1/10/19 to 15/10/19
6	To determine he boiling point of the given liquid with the help of a Platinum Resistance thermometer.	Utpala Baishya	8	October	16/10/19 to 31/10/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (August-December)

Department	Physics	Semester	5^{th} (Major Practical)
Subject	Physics	Marks	75
Course	BSc (Semester)	Paper no	506

Unit	Course Content	Allotted to	Hours	Month	date
1	To verify De Morgan's theorem using IC 7400 and 7402. (Using Breadboard).	Jayanta Deka	8	September	5/9/19 to 25/9/19
2	To assemble (a) OR, (b) AND, (c) NOT and (d) NAND gate with resistance, diode and transistors using bread board and verify their truth table. (Using Breadboard).	Jayanta Deka	8	October	3/10/19 to 31/10/19
3	To draw the forward bias characteristic of a semiconductor diode and the reverse bias characteristic of a Zener diode and hence determine their DC and AC resistances. Also determine the breakdown voltage of the Zener diode (Using Breadboard).	Jayanta Deka	8	November	1/11/19 to 15/11/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (August-December)

Department	Physics	Semester	5th (General)
Subject	Physics	Marks	80
Course	BSc (Semester)	Paper no	501

Unit	Course Content	Allotted to	Hours	Month	date
a)	**Mathematical methods:**				
1.	Vector Algebra, scalar and vector product with illustration from physics, vector triple products.	Utpala Baishya	5	August	2/8/19-12/8/19
2.	Vector calculus: Scalar and Vector fields with example from physics, space curve, differentiation of a vector with respect to a scalar, gradient of scalar, divergence and curl of vector with example from physics.	Utpala Baishya	10	August	13/8/19-31/8/19
3.	Line integral, surface integral and volume integral. Gauss's theorem, Stoke's and Green's theorem.	Utpala Baishya	5	September	1/9/19-10/9/19
4.	Curvilinear coordinate system, coordinate line and coordinate surface, unit normal vectors and unit tangent vectors, scale factor, orthogonal curvilinear coordinates, cylindrical polar and spherical polar coordinate	Utpala Baishya	10	October	11/9/19-30/10/19

	systems.				
b)	**Atomic Physics:**				
1.	Positive rays: analysis of positive rays, Aston and Bainbridge mass spectrographs.	Chandrama Kalita	5	August	2/8/19-12/8/19
2.	Bohr's theory of hydrogen spectra, energy level diagram, Ritz combination principle, excitation, critical and ionization potentials, fine structures of the spectral lines, Sommerfeld's extension of the Bohr's theory(Qualitative only).	Chandrama Kalita	8	September	13/8/19-31/8/19
3.	Vector atom model, Bohr magnetron, spinning electron; quantum numbers; Pauli's exclusion principle, source of radiation in external fields-normal Zeeman effect.	Chandrama Kalita	8	September	13/8/19-31/8/19
4.	X-rays: origin and production of x-rays, continuous and characteristic X-rays, Mosley's law; diffraction of X-rays by crystals, Bragg's law, Compton Effect.	Chandrama Kalita	6	October	1/10/19-31/10/19
5.	Frank and Hertz experiment, matter wave, Davisson and Germer experiment.	Chandrama Kalita	6	November	1/11/19-15/10/19
c)	**Relativity:**				
1.	Michelson-Morley experiment, postulates of special theory of relativity, Lorentz transformation equations (derivation not necessary), time dilation, length contraction, mass variation, mass energy relation, veločity addition theorem.	Jayanta Deka	8	August	2/8/19-12/8/19
d)	**Renewable energy sources:**				

1.	Need and importance, different renewable energy sources, solar energy, solar radiatant, instruments for measuring solvabliation, solar heaters (air and liquid), solar radiation concentrators (reflector elc.), solar cooker, photovoltaic effect, solar cells.	Jayanta Deka	10	September	13/8/19-31/8/19

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (August-December)

Department	Physics	Semester	5th (General Practical)
Subject	Physics	Marks	100
Course	BSc (Semester)	Paper no	502

Unit	Course Content	Allotted to	Hours	Month	date
1	To determine the value of 'H' with the help of a deflection and vibration magnetometer.	Utpala Baishya	8	August	2/8/19-31/8/19
2	To determine the surface tension of a liquid by capillary rise method.	Utpala Baishya	8	September	1/9/19-31/9/19
3	To draw I-D curve for the given prism with the help of a spectrometer and hence find the angle of minimum deviation.	Chandrama Kalita	8	October	1/10/19-30/10/19
4	To determine the wavelength of sodium light by Newton's ring.	Chandrama Kalita	8	November	1/11/19-10/11/19

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2019-20 (January -June)

Department	Physics	Semester	Second semester
Subject	Electricity & Magnetism	Credit	6
Course		Paper No	PHY-HC-2016
Remarks		Marks	100

Unit	Course conent	Allotted to	Hours	Month	Date
Unit I: Electric Field and Electric Potential	Electric field: Electric field lines. Electric flux. Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry. Conservative nature of Electrostatic Field. Electrostatic Potential. Laplace's and Poisson equations. The Unique- ness Theorem. Potential and Electric Field of a dipole. Force and Torque on a dipole. Electrostatic energy of system of charges. Electrostatic energy of a charged sphere. Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Parallel-plate capacitor. Capacitance of an isolated conductor. Method of Images and its application to: (1) Plane Infinite Sheet and (2) Sphere.	Dr. Chandrama Kalita,	26	January and February	From 20/1/20 to 23/2/20
Unit II:	Electric Field in matter.	Dr. Utpala	8	February	From

Dielectric Properties of Matter (Lectures	Polarization, Polarization Charges. Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector $\vec{D}$. Relations between $\vec{E}$, $\vec{P}$ and $\vec{D}$ Gauss' Law in dielectrics.	Baishya ,		And March	24/2/20 to 5/3/20
Unit III: Magnetic Field	Magnetic Force on a point charge, definition and properties of magnetic field $\vec{B}$. Curl and Divergence. Vector potential $\vec{A}$. Magnetic Force on (1) a current carrying wire (2) between current elements. Torque on a current loop in a uniform magnetic field. Biot-Savart's law and its simple application : straight wire and circular loop. Current loop as a magnetic dipole and its dipole moment (analogy with electric dipole) Ampere's circuital law and its application to (1) Solenoid (2) Torus.	Dr. Utpala Baishya ,	9	March	From 6/3/20 to 18/3/20
Unit IV: Magnetic Properties of Matter	Magnetization vector ($\vec{M}$). Magnetic Intensity ($\vec{H}$). Magnetic Susceptibility and permeability. Relation between $\vec{B}$, $\vec{H}$, $\vec{M}$. Ferromagnetism. B-H curve and hysteresis.	, Dr. Utpala Baishya ,	4	March	From 19/3/20 to 24/3/20
Unit V: Electromagnetic	Faraday's Law. Lenz's Law. Self Inductance and Mutual	Mr. Jayanta Deka	6	March and April	From 25/3/20 to

Induction	Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field. Introduction to Maxwell’s Equations. Charge Conservation and Displacement current.				5/4/20
Unit VI: Electrical Circuits	AC Circuits: Kirchhoff’s laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) 13 Quality Factor, and (4) Band Width. Parallel LCR Circuit.	Mr. Jayanta Deka	4	April	From 6/4/20 to 12/4/20
Unit VII: Network Theorems	Ideal Constant-voltage and Constant-current Sources. Network Theorems: Thevenin theorem, Norton theorem,Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem. Applications to dc circuits.	Mr. Jayanta Deka	3	April	From 13/4/20 to 20/4/20
Unit VIII: Ballistic Galvanometer	Torque on a current Loop. Ballistic Galvanometer: Current and Charge Sensitivity. Electromagnetic damping. Logarithmic damping. CDR.	Dr. Utpala Baishya ,	3	April	From 21/4/20 to 27/4/20
Lab	*A minimum of seven experiments to be done.* 1. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses. 2. To study the characteristics	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	14	April and May	From 28/4/20 to 25/5/20

	of a series RC Circuit. 3. To determine an unknown Low Resistance using Potentiometer. 4. To determine an unknown Low Resistance using Carey Foster's Bridge. 5. To compare capacitances using De' Sauty's bridge. 6. Measurement of field strength $\vec{B}$ and its variation in a solenoid (determine $\frac{dB}{dx}$). 7. To verify the Thevenin and Norton theorems. 8. To verify the Superposition, and Maximum power transfer theorems. 9. To determine self inductance of a coil by Anderson's bridge. 10. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width. 11. To study the response curve of a parallel LCR circuit and determine its (a) Anti- resonant frequency and (b) Quality factor Q. 12. Measurement of charge and current sensitivity and CDR of Ballistic Galvanometer. 13. Determine a high resistance				—

	by leakage method using Ballistic Galvanometer. 14. To determine self-inductance of a coil by Rayleigh's method. 15. To determine the mutual inductance of two coils by Absolute method.					

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2019-20 (January –June)

Department	Physics	Semester	Second semester
Subject	Waves & Optics	Credit	6
Course		Paper No	PHY-HC-2026
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Superposition of Collinear Harmonic Oscillations	Linearity and Superposition Principle. Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies (Beats). Superposition of N collinear Harmonic Oscillations with (1) equal phase differences and (2) equal frequency differences.	Dr. Chandrama Kalita,	5	January	From 20/1/20 to 29/1/20
Unit II: Superposition of Two Perpendicular Harmonic Oscillations	Graphical and Analytical Methods. Lissajous Figures with equal an unequal frequency and their uses.	Dr. Chandrama Kalita,	2	January And February	From 30/1/20 to 1/2/20
Unit III: Wave	Plane and Spherical	Dr. Chandrama	4	February	From 2/2/20

Motion	Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves. Wave Equation. Particle and Wave Velocities. Differential Equation. Pressure of a Longitudinal Wave. Energy Transport. Intensity of Wave. Water Waves: Ripple and Gravity Waves.	Kalita,			to8/2/20
Unit IV: Velocity of Waves	Velocity of Transverse Vibrations of Stretched Strings. Velocity of Longitudinal Waves in a Fluid in a Pipe. Newton's Formula for Velocity of Sound. Laplace's Correction.	Dr. Chandrama Kalita,	6	February	From 9/2/20 to17/2/20
Unit V: Superpositi on of Two Harmonic Waves	Standing (Stationary) Waves in a String: Fixed and Free Ends. Analytical Treatment. Phase and Group Velocities. Changes with respect to Position and Time. Energy of Vibrating String. Transfer of Energy. Normal Modes of Stretched Strings. Plucked and Struck Strings. Melde's Experiment. Longitudinal Standing Waves and Normal Modes. Open and Closed Pipes. Superposition of N	Dr. Utpala Baishya ,	7	February and March	From 18/2/20 to 1/3/20

	Harmonic Waves.				
Unit VI: Wave Optics	Electromagnetic nature of light. Definition and properties of wave front. Huygens Principle. Temporal and Spatial Coherence.	, Dr. Utpala Baishya ,	3	March	From 2/3/20 To 8/3/20
Unit VII: Interference	Division of amplitude and wavefront. Young's double slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. 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.	Dr. Utpala Baishya ,	9	March	From 9/3/20 to 22/3/20
Unit VIII: Interferomet er	Michelson Interferometer- (1) Idea of form of fringes (No theory required), (2) Determination of Wavelength, (3) Wavelength Difference, (4) Refractive Index, (5) Visibility of fringes. Fabry-Perot interferometer.	Mr. Jayanta Deka	4	March	From 23/3/20 to 30/3/20

Unit IX: Diffraction	Fresnel and Fraunhofer diffraction. Fresnel's Half-Period Zones for Plane Wave. Explanation of Rectilinear Propagation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel diffraction pattern of a straight edge and at a circular aperture . Resolving Power of a telescope.	Mr. Jayanta Deka	9	March and April	From 31/3/20 to 12/4/20
Unit X: Fraunhofer Diffraction	Single slit. Double slit. Multiple slits. Diffraction grating . Resolving power of grating.	Mr. Jayanta Deka	8	April	From 13/4/20 to 28/4/20
Unit XI: Holography	Principle of Holography. Recording and Reconstruction Method. Theory of Holography as Interference between two Plane Waves. Point source holograms.	Mr. Jayanta Deka	3	April and May	From 29/4/20 to 5/5/20
Lab	A minimum of seven experiments to be done. 1. To determine the frequency of an electric tuning fork by Melde's experiment and verify λ2 – T law. 2. To study Lissajous	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	16	May	From 6/5/20 to 25/5/20

	Figures. 3. Familiarization with: Schuster's focusing, determination of angle of prism. 4. To determine refractive index of the Material of a prism using sodium source. 5. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source. 6. To determine wavelength of sodium light using Fresnel Biprism. 7. To determine wavelength of sodium light using Newton's Rings. 8. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film. 9. To determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating. 10. To determine dispersive power and resolving power of a plane diffraction grating.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2019-20 (January –June)

Department	Physics	Semester	Second semester
Subject	Electricity & Magnetism	Credit	6
Course		Paper No	PHY-HG/RC-2016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I : Vector Analysis	Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only).	Dr. Chandrama Kalita,	12	January and February	From 20/1/20 to 8/2/20
Unit II : Electrostatics	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 and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical	, Dr. Utpala Baishya ,	22	February and March	From 9/2/20 to 7/3/20

	shell and solid sphere. Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.				
Unit III : Magnetism	Magnetostatics: Biot-Savart's law & its applications – straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia, para, and ferro-magnetic materials.	Dr. Chandrama Kalita,	10	March	From 8/3/20 to 22/3/20
Unit IV : Electromagnetic Induction	Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.	Mr. Jayanta Deka	6	March and April	From 23/3/20 to 5/4/20

Unit V : Maxwell's Equations and EM Wave	Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.	, Mr. Jayanta Deka	10	April	From 6/4/20 to 19/4/20
Lab	1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses. 2. Ballistic Galvanometer (a) Measurement of charge and current sensitivity (b) Measurement of CDR (c) Determine a high resistance by Leakage Method (d) To determine Self Inductance of a Coil by Rayleigh's Method. 3. To compare capacitances using De'Sauty's bridge. 4. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx). 5. To study the Characteristics of a Series RC Circuit. 6. To study the a series	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	14	April and May	From 20/4/20 to 16/5/20

	LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor 7. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q . 8. To determine a Low Resistance by Carey Foster's Bridge. 9. To verify the Thevenin and Norton theorem. 10. To verify the Superposition, and Maximum Power Transfer Theorem.				

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (January-June)

Department	Physics	Semester	4th (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	401

Unit	Course Content	Allotted to	Hours	Month	date
a)	**MATHEMATICAL METHODS-IV:**				
1.	Differential Equations. Second order linear differential equations, series	Utpala Baishya	25	January-February	20/1/20-28/2/20

	method of solutions Basu (Frobenius), Legendre's differential equations, Legendre's polynomial,Hermite's differential equations, Hermite's polynomial, generating function, spherical harmonics, orthogonal properties & recurrence relations.				
2.	Probability theory: Mutually exclusive events, theorem of total probability, compound events and theorem of compound probability. Probability distributions -Gaussian distribution, mean and standard deviation.	Utpala Baishya	15	March	1/3/20-31/3/20
b)	INTRODUCTON TO COMPUTER AND COMPUTER PROGRAMMING:	Utpala Baishya			
1.	Functional organization of a digital computer-CPU, memory, input/output unit. Flowcharts, Algorithms, High level Computer languages, programming in one high level language (either FORTRAN-95 or C or C). Data types, different types of variables, important commands, I/O statements, relation and logical statements, transfer staternents, string manipulation, subscripted variables, Functions and subroutines	Utpala Baishya	20	April-May	1/4/20 - 10/5/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (January-June)

Department	Physics	Semester	4^{th} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	402

Unit	Course Content	Allotted to	Hours	Month	date
a)	**WAVE OPTICS:**				
1	**Interference:** Concept of light wave and its equation, complex representation of superposition of waves, meaning of coherence, to show that interference fringes are hyperbolic in general, condition for straight fringes, Stokes law, interference due to Fresnel's biprism, interference by a plane parallel film, wedge shaped film, colour of thin film, Newton's rings, Michelson interferometer and its application for finding difference in wavelengths.	Chandrama Kalita	15	January-February	20/1/20-28/2/20
2	**Diffraction:** Difference between Fresnel and Fraunhofer classes, half-period zones and strips, Zone plate and its lensing property, diffraction at a straight edge and at a circular aperature (with B.S.Agun reference to microscope), Fraunhofer diffraction due to a single slit, double slit and transmission gratng, wavelength measurement by the plane transimission grating, resolving power of a grating. theory of concave grating.	Chandrama Kalita	15	March-April	1/3/20-15/4/20
3	Polarisation: Double refraction,	Chandrama	10	April-	16/4/20-

	optic axis and CaCO, crystal, plane, circular and elliptically polarised light, Retarding plates and their uses for producing and analysing different polarised light, specific rotation of plane of polarisation on and half-shade polarimeter.	Kalita		May	10/5/20
b)	**SPECIAL THEORY OF RELATIVITY:**				
1	Formulation of Special Theory of Relativity and Relativistic Kinematics: The need for a new model of kinematics (relativity). Electromagnetism and null result of Michelson-Morley experiment, negation of ether concept. Postulates of special theory of relativity. Galilean transformation (Newtonian kinematics) and Lorentz transformation. Application of Lorentz transformation,. Length contraction, time dilation and their examples and application to physical situations (viz. muon decay). Relativistic transformation of velocity. Relativistic Doppler Effect and twin paradox.	Jayanta Deka	12	February	1/2/20-28/2/20
2	Relativistic Momentum and Energy, Space-time: Relativistic momentum and energy. Equivalence of mass and energy. Massless particles (i.e. photons). The geometry of space-time and space-time interval. Time-like and space-like events Concept of four-vectors and Minkowski space.	Jayanta Deka	8	March	1/3/20-20/3/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (January-June)

Department	Physics	Semester	4th (Major Practical)
Subject	Physics	Marks	50
Course	BSc (Semester)	Paper no	403

Unit	Course Content	Allotted to	Hours	Month	date
1	To adjust and focus the given spectrometer using Schuster's method and then determine the refractive index of the material of the prism.	Chandrama Kalita	8	February	2/2/20-28/2/20
2	To determine he wavelength of light emitted by a monochromatic source with the help of Newton's ring arrangement.	Chandrama Kalita	8	March	1/3/20-31/3/20
3	To study the variation in liquid column height with diameter of capillary tube and determine the surface tension of the liquid.	Utpala Baishya	6	April	1/4/20-10/4/20
4	To determine the value of acceleration due to gravity using Katter's Pendulum.	Jayanta Deka	6	May	1/5/20-10/5/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (January-June)

Department	Physics	Semester	4^{th} (General)
Subject	Physics	Marks	40
Course	BSc (Semester)	Paper no	401

Unit	Course Content	Allotted to	Hours	Month	date
1	Fermat's principle: application to reflection and refraction at plane and curved boundaries, reflection through combination of two thin lenses, dispersion produced by lens, spherical and chromatic aberration and their remedies, achromatic combination of lenses, spectrometer	Utpala Baishya	6	January-February	20/1/20-10/2/20
2	Huygen's wave theory: Formula for refraction at a spherical surface, formula for thin convex and concave lenses.	Utpala Baishya	4	February	11/2/20-28/2/20
3	Interference of light: Fresnel biprism, colour of thin films, Newton's ring phenomenon.	Utpala Baishya	4	March	1/3/20-31/3/20
4	Diffraction of light: Fresnel and Fraunhofer classes of diffraction, diffraction at a straight edge and single slit, diffraction grating.	Chandrama Kalita	5	January-February	20/1/20-10/2/20
5	Polarisation of light: plane polarised light, polarisation on reflection, Brewster's law, double refraction, Nicol prism, rotation of plane of polarization by optically active substances, specific rotation, polarimeter.	Chandrama Kalita	5	February	11/2/20-28/2/20

6	Ramsden's and Huygen's eye piece, aplanatic foci.	Chandrama Kalita	3	March	1/3/20-7/3/20
7	Michelson interferometer, resolving and dispersive power of grating, production and analysis of polarised light, retarding plates, Babinet's compensator.	Jayanta Deka	5	February	10/2/20-25/2/20
8	Laser and its characteristics, stimulated absorption, spontaneous and stimulated emission, population inversion, basic elements of laser, Ruby laser (principle only).	Jayanta Deka	5	February-March	26/2/20-5/3/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (January-June)

Department	Physics	Semester	4th (General Practical)
Subject	Physics	Marks	50
Course	BSc (Semester)	Paper no	402

Unit	Course Content	Allotted to	Hours	Month	date
1	To determine the modulus of rigidity of the material of a rod by static method.	Chandrama Kalita	6	March	1/3/20-31/3/20
2	To determine the moment of inertia of symmetrical body about an axis by torsional oscillation method.	Utpala Baishya	6	April	1/4/20-30/4/20
3	To determine the refractive index of a liquid by using plane mirror	Utpala Baishya	4	May	1/5/20-15/5/20

	and convex lens.				
4	To determine the electrochemical equivalent of copper by using an ammeter and copper voltameter.	Jayanta Deka	6	March	1/3/20-31/3/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (January-June)

Department	Physics	Semester	6^{th} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	601

Unit	Course Content	Allotted to	Hours	Month	date
a)	**NUCLEAR PHYSICS:**				
1	Nuclear forces and Stability of Nuclei: Concept of packing fraction and binding energy, binding energy curve and its significance. Nucleon-nucleon forces qualitative discussions on nuclear force. Brief outline of Yukawas meson theory, Nuclear stability, neutron proton ratio in stable nuclei, stability curve, odd-even rules of nuclear stability. 8 Lectures	Jayanta Deka	8	January-February	20/1/20-5/2/20
2	Alpha decay: Cause of alpha decay, basic a-decay process, range and energy of a-decay, a-decay systematics, Geiger Nuttle rules, Qualitative discussion on the theory of a-decay. 6 Lectures	Jayanta Deka	6	February	6/2/20-18/2/20
3	Beta-decay: Types of ß-decays, conditions of B & B decay and K capture, B-ray spectrum, Pauli's neutrino hypothesis.	Jayanta Deka	5	February	19/2/20-26/2/20

4	Gamma-rays: y-rays and their origin. Interaction of y-particle with matter.	Jayanta Deka	2	February	27/2/20-28/2/20
5	Nuclear models: Evidence in favour of liquid properties of nuclei, Liquid drop model Bethe-Weisackar's mass formula. Applications of mass formula estimation of fission energy, prediction of most stable member of an isobaric family. Shell model (Basic concepts only).	Jayanta Deka	8	March	1/3/20-12/3/20
6	Nuclear Reactions: Types of nuclear reactions, conserved quantities of nuclear reaction, energies of nuclear reaction - Q-value & its experimental determination. Exoergic & endoergic reactions. Cross-section of nuclear reaction and its unit. Nuclear fission and chain reaction, critical size, controlled chain reaction and basic principle of nuclear reactor. Nuclear fusion reaction-basic concepts of fusion reactions, fusion barrier, fusion and thermonuclear reactions (PP chains only).	Jayanta Deka	15	March-April	13/3/20-8/4/20
7	Accelerators: Necessity of charge particle acceleration construction and working principle of linear accelerator. Construction and working principle of a cyclotron.	Jayanta Deka	5	April	9/4/20-30/4/20
8	Detectors: Principles of detection of charge particles. Construction and working principle of gas filled detectors. Ionization chamber - its construction & working principle. 9. Cosmic rays: Origin of cosmic rays, primary & secondary cosmic rays and their composition. The East West effect. Latitude, longitude & altitude effec, Extensive Air Shower (EAS).	Jayanta Deka	5	May	2/5/20-15/5/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (January-June)

Department	Physics	Semester	6th (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	602

Unit	Course Content	Allotted to	Hours	Month	date
a)	**MATHEMATICAL METHODS:**				
	Introduction to tensor, transformation of coordinates, contravariant and covariant tensor, tensorial character of physical quantities, symmetric and antisymmetric tensors, kronecker delta. Rules for combination of tensors- addition, subtraction, outer multiplication, contractions and inner multiplications.	Utpala Baishya	15	January-February	20/1/20-15/2/20
b)	**SOLID STATE PHYSICS:**				
1.	The idea of amorphous and crystalline solids, The crystal lattice and translation vectors, unit cell, types of crystal lattice, Miller indices, diffraction of X-rays, use of Bragg's law to the determination of lattice constants.	Utpala Baishya	10	February	16/2/20-28/2/20
2.	The different types of crystal bonding: ionic, covalent, metallic, Van der Waal and hydrogen bondings, cohesive energy of ionic crystal, Madelung constant.	Utpala Baishya	5	March	1/3/20-10/3/20
3.	Free electron theory of metals, Boltzmann's equation of state, electronic specific heat, electrical and thermal conductivity of metals, Wiedemann-Franz law. (Quantum	Utpala Baishya	15		11/3/20-31/3/20

	Mecanical treatment to be used).Bloch theorem in one dimension, Kronig-Penny model of energy bands of solids, distinction among metal, insulator and semiconductor, intrinsic and extrinsic semiconductors (qualitative discussion only).				
4.	Introductory concept of superconductivity, Meissner effect, types 1 and type II superconductors.	Utpala Baishya	5	April	1/4/20-31/4/20
5.	Magnetic properties of solids: Magnetization, magnetic intensity, magnetic susceptibility, permeability, hysteresis, B-H curve and energy loss in hysteresis, different classes of magnetic material, magnetic moment, Bohr magneton, Larmor precession, Classical theory of paramagnetism (Langevin's theory and Curie law), Weiss theory(Quantum Mecanical treatment to be used), relation between para and ferromagnetism, Ferromagnetic domain.	Utpala Baishya	10	May	2/5/20-15/5/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (January-June)

Department	Physics	Semester	6^{th} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	603

Unit	Course Content	Allotted to	Hours	Month	date
1	**<u>MODERN OPTICS:</u>**				
1.	Optics of crystals: Wollaston prism, Rochon prism, Jones calculus, Interference of polarized light: interference due to crystal plates in plane polarised light, Babinet compensator. Principle of liquid crystal display.	Chandrama Kalita	8	January	20/1/20-31/1/20
2.	Lasers: Characteristics of laser light, absorption Spontaneous emission, Stimulated Vémission, Einstein coefficients, Population inversion and light amplification, Essential components of the laser, Ruby and He-Ne laser (principles only). Elementary idea about non-linear optics: Second Harmonic Generation.	Chandrama Kalita	10	February	1/2/20-28/2/20
3.	Holography: Formation of a hologram, Reconstruction of the hologram (mathematical aspect).	Chandrama Kalita	6	March	1/3/20-12/3/20
4.	Optical Fibers: Types of fibers; propagation of a ray through step index fiber: numerical aperture, multipath dispersion; propagation through graded index fiber. Basic idea about communication through an optical fiber cable (Block diagram).	Chandrama Kalita	10	March	13/3/20-31/3/20
5.	Optical components & Spectrographs: Ramsden and Huygen's eyepieces, oil immersion objective, Prism spectrograph (Glass and quartz), Grating spectrograph.	Chandrama Kalita	6	April	1/4/20-12/4/20
b)	**<u>ELECTROMAGNETIC THEORY:</u>**				
1.	Electromagnetic field equation in integral and differential form, displacement current, Maxwell's equations, Energy Conservation	Chandrama Kalita	6	April	16/4/20-30/4/20

	Law-Poynting theorem and Poyntingvector.				
2.	Electromagnetic wave equation, velocity of electromagnetic wave, Monochromatic plane wave equation in free space and conducting medium. Reflection and Refraction of plane electromagnetic wave for normal and oblique incidence, Snell's law, reflection and transmission co-efficient, Fresnel's equations, Polarisation of electromagnetic wave, linear, circular and elliptical polarization. Brewster's law.	Chandrama Kalita	14	May	2/5/20-16/5/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (January-June)

Department	Physics	Semester	6^{th} (Major)
Subject	Physics	Marka	60
Course	BSc (Semester)	Paper no	604

Unit	Course Content	Allotted to	Hours	Month	date
a)	**STATISTICAL MECHANICS:**				
1.	Statistical system, and its coordinates, specification of a state in statistical mechanics, Macrostate and microstate, phase space, ensemble, Boltzmann entropy relation ergodic hypothesis, postulate of equal a priori	Jayanta Deka	8	February	1/2/20-28/2/20

	probability, density of phase points is phase space, Liouville' theorem.				
2.	Symmetry of wavefunction, restriction regarding the number of particles in given state, different types of statistics Maxwell-Boltzmann(MB), Bose-Einstein (BE) and Fermi-Dirac(FD) Statistics, Most probable distribution relation in MB, BE and FD statistics and their comparison. Degeneracy Factor, Density of state.	Chandrama Kalita	7	March	1/3/20-20/3/20
3	Application of MB statistics to derive Maxwell distribution law (velocity, energy momentum and frequency).	Chandrama Kalita	5	March	21/3/20-31/3/20
4	Fermi energy and Fermi temperature, Fermi distribution function, Application of FD statistics to discuss electronic specific heat.	Utpala Baishya	5	April	1/4/20-13/3/20
5	Application of BE statistics to explain BE condensation and to derive Black body radiation formula.	Utpala Baishya	5	May	2/5/20-15/5/20
b)	**COMPUTER APPLICATIONS:**				
1	Programming exercise (either FORTRAN-95 or C or C): simple mathematical series generation and summation, sorting of numbers largest of n numbers, sorting a list ascending/descending order, solution of quadratic equation, solution of simultaneous linear equation, least square graph fitting (straight line and quadratic curve) of given data, iterative methods, implementation of Runge-Kutta 4th order method of solving differential equation and Simpson's rule for integration.	Kishor Das	30	February-May	2/2/20-15/5/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (January-June)

Department	Physics	Semester	6th (Major Practical)
Subject	Physics	Marks	75
Course	BSc (Semester)	Paper no	605

Unit	Course Content	Allotted to	Hours	Month	date
1	To determine the Q- factor of a series resonance circuit containing L. C and R for three different values of R.	Chandrama Kalita	8	February	1/2/20-20/2/20
2	To determine the value of "J' (the mechanical equivalent of heat) by Callender and Bern's method.	Chandrama Kalita	10	March	5/3/20-25/3/20
4	To determine the value of self-induction of a coil with the help of Anderson's Bridge.	Chandrama Kalita	8	April	1/4/20-12/4/20
	To measure the phase difference between he sgnal accros R and C of an R-C network using CRO and hence find the value of the resistor and frequency of the signal.	Jayanta Deka	8	May	1/5/20-15/5/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (January-June)

Department	Physics	Semester	6^{th} (Major Practical)
Subject	Physics	Marks	75
Course	BSc (Semester)	Paper no	606

Unit	Course Content	Allotted to	Hours	Month	date
a)	**PROJECT**				
	(Experimental project work of any relevant topic within the syllabus of Physics, to be guided by a teacher and to be submitted along with a report)	Utpala Baishya	8	March	1/3/20-31/3/20
b)	**COMPUTER PROGRAMMING:**				
1.	To determine (a) mean, (b)standard deviation and (c)standard error of the given experimental data.	Kishor Das	8	March	1/3/20-31/3/20
2.	To analyse the supplied experimental data between two variables using least square straight line fitting programme.	Kishor Das	8	April	1/4/20-30/4/20
3.	To rearrange the supplied numerical data in ascending/descending order and find the largest/smallest number in a given list of numbers.	Kishor Das	8	May	2/5/20-15/5/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (January-June)

Department	Physics	Semester	6^{th} (General)
Subject	Physics	Marks	80
Course	BSc (Semester)	Paper no	601

Unit	Course Content	Allotted to	Hours	Month	date
a)	**Nuclear Physics:**				
1.	Concept of a Nucleus - its composition, mass, volume, density and temperature, units and dimension.	Jayanta Deka	5	January-February	20/1/20-5/2/20
2.	Mass defect and packing fraction, total binding energy, binding energy per nucleon, binding energy curve & its significance, nucleon separation energy, nuclear reactions, Q-value of a reaction, exothermic & endothermic reactions.	Jayanta Deka	6	February	6/2/20-20/2/20
3.	Type of radioactive decays, radioactive decay law, concept of half life and disintegration constant, natural radioactivity, radioactive dating. Activity of radioactive sources, its unit. Radioisotopes - their production & uses.	Jayanta Deka	5	February	21/2/20-28/2/20
4.	Need of a particle accelerator, Linear Accelerator its construction & working principle. Need of nuclear Detectors. Ionization Chamber - its construction & working principle.	Jayanta Deka	5	March	1/3/20-15/3/20

5.	Primary and secondary cosmic rays and their composition, EAS.	Jayanta Deka	5	May	2/5/20-15/5/20
c)	**Electronics:**				
1.	Semiconductors, P-N junction unction dode, unbiased and biased P-N junction, depletion layer, barrier potential, junction capacitnice Volt-ampere relations (derivation nod NANury), photo diode, Zener diode, Dentamer, OR, AND, NOT, NOR and NAND Gates using diode and transistor.	Chandrama Kalita	8	January-February	20/1/20-5/2/20
2.	Rectifier, half wave and full-wave, efficiency of rectification, ripple factor, idea of filter circuit.	Chandrama Kalita	5	February	6/2/20-20/2/20
3.	Thevenin's and Norton's theorems, maximum power transfer theorem	Chandrama Kalita	5	March	1/3/20-15/3/20
4.	Transistor, different configurems, maximum power transferathistor, alpha and beta of a transistor, transistor as amplifier.	Chandrama Kalita	6	March	16/3/20-25/3/20
5.	Biasing and Q-point of a transistor, stability factors, biasing circuits.	Chandrama Kalita	5	March	26/3/20-31/3/20
6.	Classification of amplifiers: class A, B, C, voltage and power amplifiers.	Chandrama Kalita	2	April	1/4/20-10/4/20
7.	Two port four terminal device and z, y and h-parameters. Use of h-parameters to find input and output resistances, current, voltage and power gain of a small signal transistor amplifier.	Chandrama Kalita	4	April	11/4/20-30/4/20
8.	Feedback and Barkhausen criterion for sustained oscillations, Tuned collector oscillator.	Chandrama Kalita	3	May	2/5/20-5/5/20
c)	**Electromagnetic waves:**				
1.	Electromagnetic wave spectrum, graphical representation of electromagnetic wave.	Chandrama Kalita	4	May	6/4/20-10/5/20
2.	Maxwell's equations, wave equation in free space from Maxwell's equations, velocity of electromagnetic waves in free space, Pointing vector.	Chandrama Kalita	4	May	11/5/20-15/5/20
d)	**Solid State Physics**				
1.	Crystalline and amorphous state of	Utpala	10	February	6/2/20-

	substances, single crystal and polycrystalline substances, basis, crystal lattice, unit cell, primitive unit cell, translation vectors, lattice parameters, directions, lattice planes, Miller indices, inter-planar spacing	Baishya			20/2/20
2.	Crystallographic axes, Crystal systems and Bravais lattice.	Utpala Baishya	4	March	1/3/20-15/3/20
3.	Different types of bonding in solids, ionic, covalent, metallic and hydrogen bonding.	Utpala Baishya	5	March	16/3/20-25/3/20
4.	Classical free electron theory of metals.,	Utpala Baishya	2	April	1/4/20-10/4/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2019-2020 (January-June)

Department	Physics	Semester	6th (General Practical)
Subject	Physics	Marks	100
Course	BSc (Semester)	Paper no	601

Unit	Course Content	Allotted to	Hours	Month	date
1	To determine the value of'g' by Kater's pendulum.	Utpala Baishya	8	February	1/2/20-28/2/20
2	To determine the value of 'J', the mechanical equivalent of heat by Joule's calorimeter.	Utpala Baishya	6	March	1/3/20-15/3/20
3	To determine the angle of minimum deviation and angle of the prism with the help of a spectrometer and hence find refractive index of the material of the prism.	Chandrama Kaita	8	April	1/4/20-15/4/20

4	To assemble OR, AND and NOT gates using diode and transistor and verify their tuth tables.	Jayanta Deka	6	March	16/3/20-31/3/20
5	To draw the characteristics of- (i) a forward biased PN diode and (ii) reverse biased Zener diode and hence determine the ac resistance of the PN diode and breakdown voltage of the Zener diode.	Chandrama Kaita	6	April	16/4/20-30/4/20

TEACHING PLAN

DEPARTMENT OF PHYSICS

SBMS COLLEGE, SUALKUCHI

Session: 2020-21 (August –December)

Department	Physics	Semester	First semester
Subject	Mathematical Physics I	Credit	6
Course		Paper No	PHY-HC-1016
Remarks		Marks	100

Unit	Course Content	Allotted to	Hours	Month	Date
Unit I: Vector Calculus	Revision: Properties of vectors under rotations. Scalar product and its invariance under rotations. Vector product, Scalar triple product and their interpretation in terms of area and volume respectively. Scalar and Vector fields. Vector Differentiation:	Dr. Utpala Baishya	25	August-September	From 1/8/2020 to 10/9/2020

	Directional derivatives and normal derivative. Gradient of a scalar field and its geometrical interpretation. Divergence and curl of a vector field. Del and Laplacian operators. Vector identities. Vector Integration: Ordinary Integrals of Vectors. Multiple integrals, Jacobian. Notion of infinitesimal line, surface and volume elements. Line, surface and volume integrals of Vector fields. Flux of a vector field. Gauss' divergence theorem, Green's and Stokes Theorems and their applications (no rigorous proofs).				
Unit II: First and Second order Differential Equations	First Order and Second Order Differential equations: First Order Differential Equations and Integrating Factor. Homogeneous Equations with constant coefficients. Wronskian and general solution. Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor, with simple illustration.	Dr. Utpala Baishya	17	September	From 11/9/2020 to 29/9/2020
Unit III: Orthogonal Curvilinear Coordinates	Orthogonal Curvilinear Coordinates. Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems.	Dr. Utpala Baishya	6	September-October	30/9/2020 to 9/10/2020
Unit IV: Dirac Delta function and its Properties	Definition of Dirac delta function. Representation as limit of a Gaussian function and rectangular function. Properties of Dirac delta function.	Dr. Utpala Baishya	2	October	From 10/10/2020 to 14/10/2020
Unit V:	Independent random variables:	Dr.	4	October	From

Introduction to Probability	Probability distribution functions; binomial, Gaussian and Poisson, with examples. Mean and variance.	Utpala Baishya			15/10/2020 to 20/10/2020
Unit VI: Theory of Errors	Systematic and Random Errors. Propagation of Errors. Normal Law of Errors. Standard and Probable Error. Least-squares fit.	Dr. Utpala Baishya	6	October-November	From/ 21/10/ 2020 to 10/11/2020
Lab	**Introduction and Overview** Computer architecture and organization, memory and Input/output devices. **Basics of scientific computing** Binary and decimal arithmetic, Floating point numbers, algorithms, Sequence, Selection and Repetition, single and double precision arithmetic, underflow & overflow- emphasize the importance of making equations in terms of dimensionless variables, Iterative methods Review of C & C++/Python/ **Matlab/ Mathematica Programming fundamentals** Introduction to Programming, constants, variables and data types, operators and Expressions I/O statements, scanf and printf, c in and c out, Manipulators for data formatting, Control statements (decision making and looping statements) (if statement. if-else Statement. Nested if Structure. else-if Statement. Ternary Operator. goto Statement. switch Statement. Uncondi- tional and Conditional Looping. while Loop. do-while Loop. for Loop.	Dr. Utpala Baishya	30	November	From 11/11/2020 to 25/11/2020

	Breakand continue Statements. Nested Loops), Arrays (1D & 2D) and strings, user defined functions, Structures and Unions, Idea of classes and objects. **Programs** Sum & average of a list of numbers, largest of a given list of numbers and its location in the list, sorting of numbers in ascending descending order, Binary search. **Random number generation** Area of circle, area of square, volume of sphere, value of pi (π) **Solution of Algebraic and Transcendental equations by Newton Raphson methods** Solution of linear and quadratic equation, solving $\alpha = tan\alpha$, $I = I_0(sin\alpha/\alpha)^2$ in optics **Interpolation by Newton Gregory Forward and Backward difference formula** Evaluation of trigonometric functions e.g. $\sin\theta$, $\cos\theta$, $\tan\theta$ etc. **Numerical Integration (Trapezoidal and Simpson rules), Monte Carlo method** Given Position with equidistant time data to calculate velocity and acceleration and vice versa. Find the area of B-H Hysteresis loop **Solution of Ordinary**				

	Differential Equations (ODE) First order Differential equation Euler, modifted Euler and Runge-Kutta (RK) second and fourth order methods First order differential equation (a) Radioactive decay (b) Newton's law of cooling.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (August –December)

Department	Physics	Semester	First semester
Subject	Mechanics	Credit	6
Course		Paper No	PHY-HC-1026
Remarks		Marks	100

Unit	Course Content	Allotted to	Hours	Month	Date
Unit I: Fundamentals of Dynamics	Reference frames. Inertial frames; Review of Newton's Laws of Motion. Galilean transformations; Galilean invariance. Momentum of variable mass system: motion of rocket. Motion of a projectile in Uniform gravitational field Dynamics of a system of particles. Centre of Mass. Principle of conservation of momentum. Impulse.	Dr. Chandrama Kalita	6	August	From 1/8/2020 to 11/8/2020
Unit II: Work	Work and Kinetic Energy	Mr.	4	August	From

and Energy	Theorem. Conservative and non-conservative forces. Potential Energy. Energy diagram. Stable and unstable equilibrium. Elastic potential energy. Force as gradient of potential energy. Work & Potential energy. Work done by non-conservative forces. Law of conservation of Energy.	Jayanta Deka			12/8/2020 to 18/8/2020
Unit III: Collisions	Elastic and inelastic collisions between particles. Centre of Mass and Laboratory frames.	Dr. Chandrama Kalita	3	August	From 19/8/2020 to 26/8/2020
Unit IV: Rotational Dynamics	Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. Kinetic energy of rotation. Motion involving both translation and rotation.	Mr. Jayanta Deka	12	August and September	From 27/8/2020 to 14/9/2020
Unit V: Elasticity	Relation between Elastic constants. Twisting torque on a Cylinder or Wire. Cantilever.	Dr. Chandrama Kalita	3	September	From 15/9/2020 to 22/9/2020
Unit VI: Fluid Motion	Kinematics of Moving Fluids: Poiseuille's Equation for Flow of a Liquid through a Capillary Tube.	Dr. Chandrama Kalita	2	September	From 23/9/2020 to 28/9/2020
Unit VII:	Law of gravitation.	Dr.	8	September	From

Gravitation and Central Force Motion	Gravitational potential energy. Inertial and gravitational mass. Potential and field due to spherical shell and solid sphere. Motion of a particle under a central force field. Two-body problem and its reduction to one- body problem and its solution. The energy equation and energy diagram. Kepler's Laws.	Chandrama Kalita		and October	29/9/2020 to 12/10/2020
Unit VIII: Oscillations	SHM: Simple Harmonic Oscillations. Differential equation of SHM and its solution. Kinetic energy, potential energy, total energy and their time-average values. Damped oscillation. Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor. Compound Pendulum.	Dr. Chandrama Kalita	8	October and November	From 13/10/2020 to 3/11/2020
Unit IX: Non-Inertial Systems	Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of Physics in rotating coordinate systems. Centrifugal force. Coriolis force and its applications.	Mr. Jayanta Deka	4	November	From 4/11/2020 to 9/11/2020
Unit X: Special Theory of Relativity	Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz Transformations. Simultaneity and order of events. Lorentz contraction. Time dilation. Relativistic	Mr. Jayanta Deka	10	November	From 10/11/2020 to 20/11/2020

	transformation of velocity, frequency and wave number. Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy Equivalence. Relativistic Doppler effect. Relativistic Kinematics. Transformation of Energy and Momentum.				
Lab	*A minimum of seven experiments to be done.* 11. Measurements of length (or diameter) using vernier caliper, screw gauge, Spherometer and travelling micro-scope. 12. To study the Motion of Spring and calculate (a) Spring constant and (b) Rigidity modulus. 13. To determine the Moment of Inertia of a cylinder about two different axes of symmetry by torsional oscillation method. 14. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method). 15. To determine the Young's Modulus of the material of a wire by Searle's apparatus. 16. To determine the Modulus of Rigidity of a Wire Static	Dr. Chandrama Kalita and Mr. Jayanta Deka	15	November and December	From 21/11/2020 to 7/12/2020

	method. 17. To determine the value of g using Bar Pendulum. 18. To determine the value of g using Kater's Pendulum. 19. To determine the height of a building using a Sextant. 20. To determine g and velocity for a freely falling body using Digital Timing Technique				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (August –December)

Department	Physics	Semester	First semester
Subject	Mechanics	Credit	6
Course		Paper No	PHY-HG/RC-1016
Remarks		Marks	100

Unit	Course Content	Allotted to	Hours	Month	Date
Unit I : Vectors	Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter. Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coeffcients	Dr. Utpala Baishya	6	August	From 1/8/2020 to 10/8/2020
Unit II : Laws of	Frames of reference. Newton's Laws of motion.	Mr. Jayanta Deka	10	August	From 11/8/2020

Motion	Dynamics of a system of particles. Centre of Mass.				to 24/8/2020
Unit III : Momentum and Energy	Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets.	Dr. Chandrama Kalita	6	August and September	From 26/8/2020 to 2/9/2020
Unit IV : Rotational Motion	Angular velocity and angular momentum. Torque. Conservation of angular momentum	Dr. Chandrama Kalita	5	September	From 3/9/2020 to 10/9/2020
Unit V : Gravitation	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). Kepler's Laws (statement only).	Mr. Jayanta Deka	7	September	From 11/9/2020 to 21/9/2020
Unit VI : Oscillations	Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations. Compound pendulum.	Mr. Jayanta Deka	7	September	From 22/9/2020 to 30/9/2020
Unit VII : 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 – Work done in stretching and work done in twisting a wire – Twisting couple on a cylinder – Determination of Rigidity modulus by static torsion - Torsional	Dr. Chandrama Kalita	8	October	From 1/10/2020 to 12/10/2020

	pendulum-Determination of Rigidity modulus and moment of inertia – q, η and σ by Searles method.				
Unit VIII : Special Theory of Relativity	Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.	Dr. Utpala Baishya	7	October and November	From 13/10/2020 to 2/11/2020
Lab	*A minimum of five experiments to be done.* 9. Measurements of length (or diameter) using vernier caliper, screw gauge and Spherometer. 10. To determine the Moment of Inertia of a Symmetrical body about an axis by torsional oscillation method. 11. To determine the Young's Modulus of the material of a wire by Searle's apparatus. 12. To determine the Modulus of Rigidity of a Wire Static method. 13. To determine the elastic Constants of a wire by Searle's method. 14. To determine the value of g using Bar Pendulum. 15. To determine the value of g using Kater's Pendulum. 16. To study the Motion of Spring and calculate (a) Spring	Dr. Chandrama Kalita and Mr. Jayanta Deka	16	November	From 3/11/2020 to 25/11/2020

	constant and (b) value of g.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (August –December)

Department	Physics	Semester	Third semester
Subject	Mathematical Physics II	Credit	6
Course		Paper No	PHY-HC-3016
Remarks		Marks	100

Unit	Course conent	Allotted to	Hours	Month	Date
Unit I: Frobenius Method and Special Functions	Singular Points of Second Order Linear Differential Equations and their importance. Frobenius method and its applications to differential equations. Legendre, Hermite and Laguerre Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Generating Function, Orthogonality. Simple recurrence relations. Expansion of function in a series of Legendre Polynomials.	Dr. Utpala Baishya	18	August	From 1/08/20 to 24/08/20
Unit II: Partial Differential Equations	Solutions to partial differential equations, using separation of variables: Laplace's Equation in problems of rectangular, cylindrical and spherical symmetry. Wave equation and its solution for vibrational modes of a stretched string, rectangular and circular membranes. Diffusion Equation.	Dr. Utpala Baishya	14	August and September	From 25/08/20 to 10/09/20

Unit III: Some Special Integrals	Beta and Gamma Functions and Relation between them. Expression of Integrals in terms of Gamma Functions.	Dr. Utpala Baishya	4	September	From 11/09/20 to 16/09/20
Unit IV: Matrix	Matrix algebra using index notation, Properties of matrices, Special matrix with their properties: Transpose matrix, complex conjugate matrix, Hermitian matrix, Anti-Hermitian matrix, special square matrix, unit matrix, diagonal matrix, co-factor matrix, adjoint of a matrix, self- adjoint matrix, symmetric matrix, anti-symmetric matrix, unitary matrix, orthogonal matrix, trace of a matrix, inverse matrix. Determinant, Rank, Eigen value, Eigen vector and diagonalisation of matrix.		15	September and October	From 17/09/20 to 5/10/20
Unit V: Fourier Series	Periodic functions. Orthogonality of sine and cosine functions, Dirichlet Conditions (Statement only). Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coeffcients. Complex representation of Fourier series. Expansion of functions with arbitrary period. Application to square and triangular waves.	Dr. Utpala Baishya	9	October	From 6/10/20 to 15/10/20
Lab	The aim of this Lab is to use the computational methods to solve physical problems. Course will consist of lectures (both theory and practical) in the Lab. Evaluation done not on the programming but on the basis of formulating the problem. Introduction to Numerical computation softwares Introduction to Scilab/Mathematica/Matlab/Python, Advantages and disadvantages, Scilab	Dr. Utpala Baishya	15	October and November	From 16/10/20 to 20/11/20

	/ Mathematica / Matlab/ Python environment, Command window, Figure window, Edit window, Variables and arrays, Initialising variables in Scilab / Mathematica / Matlab/ Python, Multidimensional ar- rays, Subarray, Special values, Displaying output data, data file, Scalar and array operations, Hierarchy of operations, Built in Scilab / Mathematica / Matlab/Python functions, Introduction to plotting, 2D and 3D plotting. Curve fttting, Least square fit, Goodness of fit, standard deviation Ohms law to calculate R, Hooke’s law to calculate spring constant. Solution of Linear system of equations Solution of Linear system of equations by Gauss elimination method and Gauss Seidal method. Diagonalisation of matrices, Inverse of a matrix, Eigen vectors, eigenvalues prob- lems. Solution of mesh equations of electric circuits (3 meshes) Solution of coupled spring mass systems (3 masses). Generation of Special functions Generation of Special functions using User defined functions in Scilab / Math- ematica / Matlab. Generating and plotting Legendre Polynomials Generating and plotting Hermite function. First order ODE Solution of first order Differential equation Euler, modified Euler and Runge-Kutta second order methods. First order differential equation (a) Current in RC, LC circuits with DC source (b) Classical equations of motion. Second order ODE Second order differential equation. Fixed				

	difference method. Second order Differential Equation Harmonic oscillator (no friction) (b) Damped Harmonic oscillator (c) Over damped (d) Critical damped. Partial Differential Equation (PDE) Solution of Partial Differential Equation: (a) Wave equation (b) Heat equation.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (August –December)

Department	Physics	Semester	Third semester
Subject	Thermal Physics	Credit	6
Course		Paper No	PHY-HC-3026
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: *Zeroth and First Law of Thermodynamics*	Extensive and intensive Thermodynamic Variables, Thermodynamic Equilibrium, Zeroth Law of Thermodynamics & Concept of Temperature, Concept of Work & Heat, State Functions, First Law of Thermodynamics and its differential form, Internal Energy, First Law & various processes, Applications of First Law: General Relation between C_P and C_V, Work	Dr. Chandrama Kalita	8	August	From 1/08/20 to 11/08/20

	Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Coefficient.				
Unit II: *Second Law of Thermodynamics*	Reversible and Irreversible process with examples. Conversion of Work into Heat and Heat into Work. Heat Engines. Carnot's Cycle, Carnot engine & effciency. Refrigerator & coeffcient of performance, 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Carnot's Theorem. Applications of Second Law of Thermodynamics: Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale.	Dr. Chandrama Kalita	10	August	From 12/08/20 to 24/08/20
Unit III: *Entropy*	Concept of Entropy, Clausius Theorem. Clausius Inequality, Second Law of Thermodynamics in terms of Entropy. Entropy of a perfect gas. Principle of Increase of Entropy. Entropy Changes in Reversible and Irreversible processes with examples. Entropy of the Universe. Entropy Changes in Reversible and Irreversible Processes. Principle of	Dr. Chandrama Kalita	7	August and September	From 25/08/20 to 3/09/20

	Increase of Entropy. Temperature–Entropy diagrams for Carnot's Cycle. Third Law of Thermodynamics. Unattainability of Absolute Zero.				
Unit IV: *Thermodynamic Potentials*	Thermodynamic Potentials: Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy. Their Definitions, Properties and Applications. Surface Films and Variation of Surface Tension with Temperature. Magnetic Work, Cooling due to adiabatic demagnetization, First and second order Phase Transitions with examples, Clausius Clapeyron Equation and Ehrenfest equations.	Dr. Chandrama Kalita	7	September	From 4/09/20 To 15/09/20
Unit V: *Maxwell's Thermodynamic Relations*	Derivations and applications of Maxwell's Relations, Maxwell's Relations:(1) Clausius Clapeyron equation, (2) Values of C_p-C_v, (3) TdS Equations, (4) Joule-Kelvin coefficient for Ideal and Van der Waal Gases, (5) Energy equations, (6) Change of Temperature during Adiabatic Process.	Dr. Chandrama Kalita	7	September	From 16/09/20 to 23/09/20
Unit VI: *Distribution of Velocitie*	Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and its	Dr. Chandrama Kalita	7	September and October	From 24/09/20 to 5/10/20

s	Experimental Verification. Doppler Broadening of Spectral Lines and Stern's Experiment. Mean, RMS and Most Probable Speeds. Degrees of Freedom. Law of Equipartition of Energy (No proof required). Specific heats of Gases.				
Unit VII: *Molecular Collisions*	Mean Free Path. Collision Probability. Estimates of Mean Free Path. Transport Phenomenon in Ideal Gases: (1) Viscosity, (2) Thermal Conductivity and (3) Diffusion. Brownian Motion and its Significance.	Dr. Chandrama Kalita	4	October	From 6/10/20 to 12/10/20
Unit VIII: *Real Gases*	Behaviour of Real Gases: Deviations from the Ideal Gas Equation. The Virial Equation. Andrew's Experiments on CO2 Gas. Critical Constants. Continuity of Liquid and Gaseous State. Vapour and Gas. Boyle Temperature. Van der Waal's Equation of State for Real Gases. Values of Critical Constants. Law of Corresponding States. Comparison with Experimental Curves. P-V Diagrams. Joule's Experiment. Free Adiabatic Expansion of a Perfect Gas. Joule- Thomson Porous Plug Experiment. Joule- Thomson Effect for Real and Van der Waal Gases. Temperature of Inversion. Joule-Thomson Cooling.	Dr. Chandrama Kalita	10	October and November	From 13/10/20 to 4/11/20
Lab	1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's	Dr. Chandrama Kalita	14	November	From 5/11/20 to 28/11/20

	constant flow method. 2. To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus. 3. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method. 4. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method. 5. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT). 6. To study the variation of Thermo-emf of a Thermocouple with Difference of Temperature of its Two Junctions. 7. To calibrate a thermocouple to measure temperature in a specified Range using (1) Null Method, (2) Direct measurement using Op-Amp difference amplifier and to determine Neutral Temperature				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (August –December)

Department	Physics	Semester	Third semester
Subject	Digital Systems & Applications	Credit	6
Course		Paper No	PHY-HC-3036
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Introduction to CRO	Block Diagram of CRO. Electron Gun, Deflection System and Time Base. Deflection Sensitivity. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference.	Mr. Jayanta Deka	3	August	From 1/08/20 to 5/08/20
Unit II: Integrated Circuits (qualitative treatment only)	Active & Passive components. Discrete components. Wafer. Chip. Advantages and drawbacks of ICs. Scale of integration: SSI, MSI, LSI and VLSI (basic idea and definitions only). Classification of ICs. Examples of Linear and Digital lCs.	Mr. Jayanta Deka	3	August	From 6/08/20 to 10/08/20
Unit III: Digital Circuits	Difference between Analog and Digital Circuits. Binary Numbers. Decimal to	Mr. Jayanta Deka	6	August	From 11/08/20 to

	Binary and Binary to Decimal Conversion. BCD, Octal and Hexadecimal numbers. AND, OR and NOT Gates (realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates.				21/08/20
Unit IV: Boolean Algebra	De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Idea of Minterms and Maxterms. Conversion of a Truth table into Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map.	Mr. Jayanta Deka	6	August	From 22/08/20 to 28/08/20
Unit V: Data Processing Circuits	Basic idea of Multiplexers, De-multiplexers, Decoders, Encoders.	Mr. Jayanta Deka	4	August and September	From 29/08/20 to 3/09/20
Unit VI: Arithmetic Circuits	Binary Addition. Binary Subtraction using 2's Complement. Half and Full Adders. Half & Full Subtractors, 4-bit binary Adder/Subtractor.	Mr. Jayanta Deka	5	September	From 4/09/20 to 10/09/20
Unit VII: Sequential Circuits	SR, D, and JK Flip-Flops. Clocked (Level and Edge	Mr. Jayanta Deka	6	September	From 11/09/20 to

	Triggered) Flip-Flops. Preset and Clear operations. Race- around conditions in JK Flip-Flop. M/S JK Flip-Flop.				17/09/20
Unit VIII: Timers:	Block diagram and applications: Astable multivibrator and Monostable multivibrator.	Mr. Jayanta Deka	3	September	From 18/09/20 to 30/09/20
Unit IX: Shift Registers	Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to4 bits).	Mr. Jayanta Deka	2	October	From 1/10/20 to 5/10/20
Unit X: Counters	Ring Counter, Asynchronous counters, Decade Counter. Synchronous Counter.	Mr. Jayanta Deka	4	October	From 6/10/20 to 12/10/20
Unit XI: Computer Organization	Input/Output Devices. Data storage (idea of RAM and ROM). Computer memory. Memory organization & addressing.	Mr. Jayanta Deka	6	October	From 13/10/20 to 19/10/20
Unit XII: Intel 8085 Microprocessor Architecture	Main features of 8085. Block diagram. Components. Pin-out diagram. Buses. Registers. ALU. Memory. Stack memory. Timing & Control circuitry.	Mr. Jayanta Deka	8	October and November	From 20/10/20 to 6/11/20
Unit XIII: Introduction to Assembly Language	1 byte, 2 byte, & 3 byte instructions.	Mr. Jayanta Deka	4	November and December	From 7/11/20 to 16/11/20

Lab	*A minimum of eight experiments to be done.* 1. To measure (a) Voltage, and (b) Time period of a periodic waveform using CRO. 2. To test a Diode and Transistor using a Multimeter. 3. To design a switch (NOT gate) using a transistor. 4. To verify and design AND, OR, NOT and XOR gates using NAND gates. 5. To design a combinational logic system for a specified Truth Table. 6. To convert a Boolean expression into logic circuit and design it using logic gate ICs. 7. Half Adder, Full Adder and 4-bit binary Adder. 8. Half Subtractor, Full Subtractor, Adder-Subtractor using Full Adder IC. 9. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates. 10. To build JK Master-slave flip-flop using Flip-Flop ICs . 11. To build a 4-bit Counter using D-type/JK Flip-Flop ICs and study	Mr. Jayanta Deka	16		From 17/11/20 to 5/12/20

	timing diagram. 12. To make a 4-bit Shift Register (serial and parallel) using D-type/JK Flip-Flop ICs. 13. To design an astable multivibrator of given specifications using 555 Timer. 14. To design a monostable multivibrator of given specifications using 555 Timer. 15. Write the following programs using 8085 Microprocessor (a) Addition and subtraction of numbers using direct addressingmode (b) Addition and subtraction of numbers using indirect addressin gmode (c) Multiplication by repeated addition (d) Division by repeated subtraction (e) Handling of 16-bit Numbers (f) Use of CALL and RETURN Instruction (g) Block data handling				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (August –December)

Department	Physics	Semester	Third semester
Subject	Thermal Physics & Statistical Mechanics	Credit	6
Course		Paper No	PHY-HG/RC-3016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I : Laws of Thermodynamics	Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between CP & CV , Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient, Reversible & irreversible processes, Second law & Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.	Mr. Jayanta Deka	22	August	From 1/8/20 to 28/8/20
Unit II :	Enthalpy, Gibbs, Helmholtz	Dr. Utpala	10	August	From

Thermodynamic Potentials	and Internal Energy functions, Maxwell's relations & applications - Joule-Thompson Effect, Clausius- Clapeyron Equation, Expression for (C_P — C_V), C_P/C_V , TdS equations.	Baishya		and September	29/8/20 to 14/9/20
Unit III : Kinetic Theory of Gases	Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, 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.	Dr. Utpala Baishya	10	September	From 15/9/20 to 29/9/20
Unit IV : Theory of Radiation	Blackbody radiation, Spectral distribution, 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.	Dr. Chandrama Kalita	6	September and October	From 30/9/20 to 6/10/20
Unit V : Statistical Mechanics	Phase space, Macrostate and Microstate, Entropy and Thermodynamic probability, Maxwell-Boltzmann law - dis- tribution of velocity – Quantum statistics – Fermi-Dirac distribution law – electron gas – Bose-Einstein distribution law – photon gas – comparison of three statistics.	Dr. Chandrama Kalita	12	October and November	From 7/10/20 to 2/11/20

Lab	1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method. 2. Measurement of Planck's constant using black body radiation. 3. To determine Stefan's Constant. 4. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus. 5. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method. 6. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method. 7. To determine the temperature co-efficient of resistance by Platinum resistance thermometer. 8. To study the variation of thermo emf across two junctions of a thermocouple with temperature.	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	20	November	From 3/11/20 to 28/11/20

	9. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system. 10. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (August –December)

Department	Physics	Semester	Third semester
Subject	Digital Photography & Editing	Credit	4
Course		Paper No	PHY-SE-3044
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Theory of Basic Photography	History of Photography, Introduction to Digital Photography, Digital Camera, dSLR, Advantages and Disadvantages of Digital Photography	Mr. Jayanta Deka	2	August	From 1/8/20 to 17/8/20
Unit II: The Camera-Components and Concepts	Lens, Focal Length, Lens type, Aperture, Depth of Field, Shutter, Shutter Speed, Image sensor, Memory cards,External Flash, File types	Dr. Chandrama Kalita	2	August	From 18/8/20 to 28/8/20
Unit III: Capturing an Image, Hands-on Basics	Elements of Composition: Pattern, Symmetry, Texture, Depth of Field, Lines; Law of Thirds, Camera Shake, Red eye,Lighting, Digital Noise	Dr. Chandrama Kalita	3	August and September	From 29/8/20 to 14/9/20
Unit IV: Exposure Modes	Automatic mode, Manual mode, aperture mode, shutter mode, Scene mode, Portrait mode, landscape mode, close upmode,	Dr. Chandrama Kalita	5	September and October	From 15/9/20 to 19/10/20

	sports mode, Twilight mode, Night Mode, Black and white, sepia, Panoramic mode.				
Unit V: Conditions in Digital Photography	Lighting, Importance of Natural Light, Best Time of Day to Take Photos, Disable Flash Indoors, Disable Flash in Low Light, Use Flash to Balance Bright Light, Get Closer to the Subject, Crop Your Photo, Choose Better Backgrounds, Pick Proper Orientation, Use Point of View, Frame your Subject, Experiment with Abstract Photography, Holding your DSLR	Dr. Utpala Baishya	7	October and November	From 20/10/20 to 12/11/20
Unit VI: Digital Videography	Various Parts, Contrl and Features of Video Camera, Types of daylight applications, Three points lighting- (a) The key light, (b) The fill light and the back light, (c) Bounce and diffuse light, Framing and shots, Camera angle and camera movements	Dr. Utpala Baishya	4	November	From 13/11/20 to 17/11/20
Unit VII: Post Production	The Digital Workflow: Capturing the Image, Storing the Photo, Cataloging the Image Files, Editing the Photo, Sharing, Archiving and Backing Up the Photograph	Mr. Jayanta Deka	7	November	From 18/11/20 to 28/11/20

TEACHING PLAN

Department Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021

Department	Physics	Semester	5th (Major)(Theory)
Subject	Physics	Marks	60
Course	BSC (Semester)	Paper no	501

Unit	Course Content	Allotted to	Hours	Month	date
a)	**MATHEMATICAL METHODS-V:**				
1	Algebraic operation, Argand diagram, vector representation, complex coniuures Euler's formula, De-Moiver's theorem.	Utpala Baishya	5	August	2/8/20 To 12/8/20
2	Analytic function of a complex variable, Derivative of F(z) and its analyticity, contour integrals, equivalent contours, Cauchy integral theorem, differentiation under integral sign.	Utpala Baishya	13	August	13/8/20 to 24/8/20
3	Series expansion: Taylor and Laurent series and their simple applications Residues, Zeros, isolated singular points, evaluation of residues. Evaluation of definite intragrals.	Utpala Baishya	12	August-September	25/8/20 to 30/9 /20

b)	**CLASSICAL MECHANICS:**				
1	Central force motion, two body central force motion, two body motion as a one body problem, general properties of central force motion, Energy and momenturn as constants of motion in central force, Energy equation involving only the radial motion, energy diagram and nature of orbits.	Chandrama Kalita	8	August	2/8/20 to12/8/20
2	Application of central force problem to motion under inverse square force field. solution of the equation of the path to find the nature of the orbits as hyperbolic, parabolic and elliptic.	Chandrama Kalita	8	August	13/8/20 to 24/8/20
3	Constraints, generalized co-ordinates, principle of virtual work. D' Alembert's principle and Lagrange's equations of motion, simple applications of Lagrangian formulations (i) Atwood machine (ii) simple pendulum (iii) Keplerian motion (iv) bead sliding on rotating wire. (v)compound pendulum, (vi)linear harmonic oscillator Hamilton's principle, calculus of variation, shortest distance between two points as example, Lagrange's equations from Hamilton's principle,	Chandrama Kalita	14	September	25/8/20 to 30/9 /20

	Hamiltonian of a system, Hamilton's canonical equations of motion, applications of Hamilton's equations to simple problems like simple pendulum, Kepler's problem., Poisson brackets.				

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021 (August –December)

Department	Physics	Semester	5th (Major Theory)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	502

Unit	Course Content	Allotted to	Hours	Month	date
1	Positive rays and their analysis: Thomson's mass parabola method, Aston's mass spectrograph, Bainbridge mass spectrograph.	Utpala Baishya	10	August	2/8/20 to 15/8/20
2	Rutherford's nuclear atom model, alpha scattering expt, deduction of the scattering formula.	Utpala Baishya	8	August	16/8/20to 31/8/20
3	Atomic spectra: Bohr's theory of hydrogen spectra, energy level diagram, Ritz combination principle,	Utpala Baishya	12	September	1/9/20 to 31/9/20

	resonance, excitation, critical and ionization potentials; fine structures of the spectral lines, Sommerfeld's extension of the Bohr's theory.				
4	Vector stom model: Spectra of alkali stoms, Bohr magneton; spinning electron; quantum numbers; Pauli's exclusion principle; explanation of the periodic classification of the clements; spectroscopic notations, source of radiation in external fields-normal Zeeman effect; anomalous Zeeman effect, Paschen-Back effect, Stark effect, Stern-Garlach experiment.	Utpala Baishya	15	October	1/10/20 to 31/10/20
5	X-Rays: Continuous and Characteristics X-rays, Mosley’s law, Compton effect	Utpala Baishya	8	November	1/11/20 to 15/11/20
6	Scattering of light: Rayleigh scattering formula; colour of the sky: polarisation of the scattered light; Raman effect, experimental study of Raman effect, quantum Raman effect, application of the effect.	Utpala Baishya	7	November	1/11/20 to 15/11/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021 (August –December)

Department	Physics	Semester	5^{th} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	503

Unit	Course Content	Allotted to	Hours	Month	date
a)	**QUANTUM MECHANICS:**				
1.	Development of quantum mechanics in light of Black body radiation, failure of classical idea, Plank's quantum hypothesis, photoelectric effect and Compton effect.	Jayanta Deka	5	August	2/8/20 to 14/8/20
2.	Matter wave: Wave particle duality, de Broglie wave associated with moving particles-(i) non relativistic and (ii) relativistic case, verification of matter waves by (i) Davisson Germer's experiment and (ii) G.P.	Jayanta Deka	8	August	15/8/20 to 31/8/20

	Thomson's electron diffraction experiment.				
3.	Complimentary principle of Neils Bohr, Heisenberg's Uncertainty Principle, Gamma ray microscope experiment, application of Uncertainty Principle.	Jayanta Deka	7	September	1/9/20 to 15/9/20
4.	Wave function and its probabilistic interpretation as probability amplitude; Continuity equation, probability density and probability current density J; Normalisation condition and normalised wave function; properties of well behaved wave function in quantum mechanics. Wave packets, Superposition of waves, phase velocity and group velocity and their relation.	Jayanta Deka	8	September	16/9/20 to 30/9/20
5.	Introduction to operator formalism, Dynamical variable as operator (position, momentum and Hamiltonian), Eigenvalues and eigenfunction; Expectation value, Ehrenfest's theorem. Schrodinger wave equation (i) time dependent and (ii) time independent.. Correspondence Principle. Application of Schrodinger's wave equation (i) one dimensional step potential (ii) one dimensional potential barrier, Reflection and	Jayanta Deka	12	October	1/10/20 to 20/10/20

	transmission coefficients and tunneling effect, (iii) a particle in a one dimensional potential well of infinite depth (iv) one dimensional harmonic oscillator.(v) Theory of hydrogen atom-separation of variables, radial solution.				
b)	**ASTROPHYSICS:**				
1.	Astrophysical Co-ordinates: Celestial coordinate systems, The right Ascension. Declination and Altitude-Azimuth coordinate systems. The ecliptic and annual motion of the Sun across the thy the Signs of Zotine Identifications of the Constelationsecure and bright star.	Hirak Choudhury	5	August	2/8/20 to 14/8/20
2.	Concept of time: Sidereal time and solar time; Greenwich Mean Time(GMT), standard time and local time; Julian date and its importance in astronomical observation .	Hirak Choudhury	5	August	15/8/20 to 31/8/20
3	Stellar Magnitude system and Distance measurement: The Stellar magnitude system and its relation with luminosity. Apparent and absolute magnitude and their relations with distances. Trigonometric and spectroscopic parallax to determine the distances.	Hirak Choudhury	5	September	1/9/20 to 15/9/20

	Difference magnitude systems.				
4.	Spectral Classification and H.R. Diagram: Spectral classification, color index, H-D classification. The H-R Diagram. Steller evolution and the evolutionary track of a star.	Hirak Choudhury	5	September	16/9/20 to 30/9/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021 (August –December)

Department	Physics	Semester	5th (Major, Theory)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	504

Unit	Course Content	Allotted to	Hours	Month	date
1	Volt-ampere relation of P-N junction diode (deduction not necessary), Energy band diagram of P-N diode, photo diode, LED, varactor diode and zener diode. Rectifiers- half wave and full wave with resistive load, efficiency, ripple factor, filters- series inductor,	Chandrama Kalita	8	August	2/8/20 to 16/8/20

	shunt capacitor, L-section and I-section. Voltage regulation and regulated Power Supply. Clipping and clamping circuits.				
2	Thevenin, Norton and Millman theorem & maximum power transfer theorem.	Chandrama Kalita	6	August	17/82/20 to 31/8/20
3	Transistor, different mode of operations and characteristics of transistor, basic transistor amplifier, load line and operating point (Q point) of transistor, Stabilization of Q point, transistor biasing circuits, two port (four terminals) device and z, y and h parameters, h parameter equivalent circuit, analysis of transistor amplifier (CE) with h parameters, current gain, voltage gain and power gain, input and output impedance, Classification of amplifiers, Class A, Class B and Class C amplifiers, cascade amplifiers, small signal RC coupled amplifier (CE) and its voltage and current gain in low, mid and high frequency, frequency response curve, Phase relation between input and	Chandrama Kalita	14	September	1/9/20 to 15/9/20

	output, Power amplifiers, power dissipation, Harmonic distortion, large signal Push Pull Amplifier (Class B)				
4	Concept of feedback, different types of feedback, advantages of negative feedback in amplifier, Barkhousen criterion, classification of oscillators, tuned collector oscillator,Phase shift(R-C) and Wein bridge oscillator, Multivibrators.	Chandrama Kalita	7	September	16/9/20 to 24/9/ 20
5	Direct Coupled Amplifier, differential amplifier, introduction to IC. OPAM, characteristics of an ideal OPAM, common and differential mode, CMMR, inverting, non-inverting mode of OPAM, OPAM as scale changer, adder, subtractor, differentiator and integrator.	Chandrama Kalita	6	September	25/9/20 to 30/9/20
6	Modulation, need of modulation, Theories of AM and FM, side-bands, power content in different parts of the modulated wave, band width of AM and FM, modulators, amplitude, modulation circuits, circuit of square band-widulation and detection, SSB transmission, AM Transmitter (block diagrams), super	Chandrama Kalita	12	October20/10/24	1/10/20 to 20/10/20

	heterodyne receiver (block diagraenic Introduction to radio wave propagation, ground or surface wave, space or tropospheric wave and sky wave. Working and uses of CRO, Introductory idea of microprocesser .				
7	Binary Number System, Decimal to binary conversion, Binary to decimal conversion, Binary addition and subtraction. OR, AND, NOT, NOR and NAND Logic gates using P- N junction diode and transistors, Boolean Algebra, De Morgan's Theorem, Sequential circuits, Latch, RS, JK, MSJK, D and T flip flops. Introduction to binary transmission ASK, FSK and PSK.	Chandrama Kalita	7	Ocober	21/10/20 to 30/10/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021 (August –December)

Department	Physics	Semester	5th (Major Practical)
Subject	Physics	Marks	75
Course	BSC (Semester)	Paper no	505

Unit	Course Content	Allotted to	Hours	Month	date
1	To draw the characteristic curve of a photo cell and find the maximum velocity of the emitted electrons.	Chandrama Kalita	6	August	2/8/20 to15/8/20
2	To determine the value of Planck's constant with the help of photo cell a monochromatic filter	Jayanta Deka	6	August	16/8/20 to31/8/20
3	To determine the value of Stefan's constant by electrical method using an incandescent electric bulb.	Utpala Baishya	4	September	1/9/20 to15/9/20
4	To calibrate a spectrometer with spectral lines of known wavelength and hence determine unknown wavelength of spectral lines emitted by a given source	Chandrama Kalita	6	September	16/9/20 to30/9/20
5	To study the variation of refractive index of the material of a prism with known wavelengths of spectral lines of a source and	Chandrama Kalita	6	October	1/10/20 to 15/10/20

	hence determine the unknown wavelength of a spectral line emitted by a source.				
6	To determine he boiling point of the given liquid with the help of a Platinum Resistance thermometer.	Utpala Baishya	8	October	16/10/20 to 31/10/20

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021 (August –December)

Department	Physics	Semester	5^{th} (Major Practical)
Subject	Physics	Marks	75
Course	BSc (Semester)	Paper no	506

Unit	Course Content	Allotted to	Hours	Month	date
1	To verify De Morgan's theorem using IC 7400 and 7402. (Using Breadboard).	Jayanta Deka	8	September	5/9/20 to 25/9/20
2	To assemble (a) OR, (b) AND, (c) NOT and (d) NAND gate with resistance, diode and transistors using bread board and verify their truth table. (Using Breadboard).	Jayanta Deka	8	October	3/10/20 to 31/10/20
3	To draw the forward bias characteristic of a semiconductor diode and the	Jayanta Deka	8	November	1/11/20 to 15/11/20

	reverse bias characteristic of a Zener diode and hence determine their DC and AC resistances. Also determine the breakdown voltage of the Zener diode (Using Breadboard).				

TEACHING PLAN

Department Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021

Department	Physics	Semester	5th (General)(Theory)
Subject	Physics	Marks	80
Course	BSc (Semester)	Paper no	501

Unit	Course Content	Allotted to	Hours	Month	date
a)	**Mathematical methods:**				
1.	Vector Algebra, scalar and vector product with illustration from physics, vector triple products.	Utpala Baishya	5	August	2/8/20-12/8/20

2.	Vector calculus: Scalar and Vector fields with example from physics, space curve, differentiation of a vector with respect to a scalar, gradient of scalar, divergence and curl of vector with example from physics.	Utpala Baishya	10	August	13/8/20-31/8/20
3.	Line integral, surface integral and volume integral. Gauss's theorem, Stoke's and Green's theorem.	Utpala Baishya	5	September	1/9/20-10/9/20
4.	Curvilinear coordinate system, coordinate line and coordinate surface, unit normal vectors and unit tangent vectors, scale factor, orthogonal curvilinear coordinates, cylindrical polar and spherical polar coordinate systems.	Utpala Baishya	10	October	11/9/20-30/10/20
b)	**Atomic Physics:**				
1.	Positive rays: analysis of positive rays, Aston and Bainbridge mass spectrographs.	Chandrama Kalita	5	August	2/8/20-12/8/20
2.	Bohr's theory of hydrogen spectra, energy level diagram, Ritz combination principle, excitation, critical and ionization potentials, fine structures of the spectral lines, Sommerfeld's extension of the Bohr's theory(Qualitative only).	Chandrama Kalita	8	September	13/8/20-31/8/20
3.	Vector atom model, Bohr magnetron, spinning electron; quantum numbers;	Chandrama Kalita	8	September	13/8/20-31/8/20

	Pauli's exclusion principle, source of radiation in external fields- normal Zeeman effect.				
4.	X-rays: origin and production of x-rays, continuous and characteristic X-rays, Mosley's law; diffraction of X-rays by crystals, Bragg's law, Compton Effect.	Chandrama Kalita	6	October	1/10/20-31/10/20
5.	Frank and Hertz experiment, matter wave, Davisson and Germer experiment.	Chandrama Kalita	6	November	1/11/20-15/10/20
c)	**Relativity:**				
1.	Michelson-Morley experiment, postulates of special theory of relativity, Lorentz transformation equations (derivation not necessary), time dilation, length contraction, mass variation, mass energy relation, veločity addition theorem.	Jayanta Deka	8	August	2/8/20-12/8/20
d)	**Renewable energy sources:**				
1.	Need and importance, different renewable energy sources, solar energy, solar radiatant, instruments for measuring solvabliation, solar heaters (air and liquid), solar radiation concentrators (reflector elc.), solar cooker, photovoltaic effect, solar cells.	Jayanta Deka	10	September	13/8/20-31/8/20

TEACHING PLAN

Department Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021

Department	Physics	Semester	5^{th} (General Practical)
Subject	Physics	Marks	100
Course	BSc (Semester)	Paper no	502

Unit	Course Content	Allotted to	Hours	Month	date
1	To determine the value of 'H' with the help of a deflection and vibration magnetometer.	Utpala Baishya	8	August	2/8/20-31/8/20
2	To determine the surface tension of a liquid by capillary rise method.	Utpala Baishya	8	September	1/9/20-31/9/20
3	To draw I-D curve for the given prism with the help of a spectrometer and hence find the angle of minimum deviation.	Chandrama Kalita	8	October	1/10/20-30/10/20
4	To determine the wavelength of sodium light by Newton's ring.	Chandrama Kalita	8	November	1/11/20-10/11/20

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (January -June)

Department	Physics	Semester	Second semester
Subject	Electricity & Magnetism	Credit	6
Course		Paper No	PHY-HC-2016
Remarks		Marks	100

Unit	Course conent	Allotted to	Hours	Month	Date
Unit I: Electric Field and Electric Potential	Electric field: Electric field lines. Electric flux. Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry. Conservative nature of Electrostatic Field. Electrostatic Potential. Laplace's and Poisson equations. The Unique- ness Theorem. Potential and Electric Field of a dipole. Force and Torque on a dipole. Electrostatic energy of system of charges. Electrostatic energy of a charged sphere. Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Parallel-plate capacitor. Capacitance of an isolated conductor. Method of	Dr. Chandrama Kalita,	26	January and February	From 20/1/21 to 23/2/21

	Images and its application to: (1) Plane Infinite Sheet and (2) Sphere.				
Unit II: Dielectric Properties of Matter (Lectures	Electric Field in matter. Polarization, Polarization Charges. Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector $\vec{D}$. Relations between $\vec{E}$, $\vec{P}$ and $\vec{D}$ Gauss' Law in dielectrics.	Dr. Utpala Baishya ,	8	February And March	From 24/2/21 to 5/3/21
Unit III: Magnetic Field	Magnetic Force on a point charge, definition and properties of magnetic field $\vec{B}$. Curl and Divergence. Vector potential $\vec{A}$. Magnetic Force on (1) a current carrying wire (2) between current elements. Torque on a current loop in a uniform magnetic field. Biot-Savart's law and its simple application : straight wire and circular loop. Current loop as a magnetic dipole and its dipole moment (analogy with electric dipole) Ampere's circuital law and its application to (1) Solenoid (2) Torus.	Dr. Utpala Baishya ,	9	March	From 6/3/21 to 18/3/21
Unit IV: Magnetic Properties of Matter	Magnetization vector ($\vec{M}$). Magnetic Intensity ($\vec{H}$). Magnetic Susceptibility and permeability. Relation between $\vec{B}$, $\vec{H}$, $\vec{M}$. Ferromagnetism.	, Dr. Utpala Baishya ,	4	March	From 19/3/21 to 24/3/21

	B-H curve and hysteresis.				
Unit V: Electromagnetic Induction	Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field. Introduction to Maxwell's Equations. Charge Conservation and Displacement current.	Mr. Jayanta Deka	6	March and April	From 25/3/21 to 5/4/21
Unit VI: Electrical Circuits	AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) 13 Quality Factor, and (4) Band Width. Parallel LCR Circuit.	Mr. Jayanta Deka	4	April	From 6/4/21 to 12/4/21
Unit VII: Network Theorems	Ideal Constant-voltage and Constant-current Sources. Network Theorems: Thevenin theorem, Norton theorem,Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem. Applications to dc circuits.	Mr. Jayanta Deka	3	April	From 13/4/21 to 20/4/21
Unit VIII: Ballistic Galvanometer	Torque on a current Loop. Ballistic Galvanometer: Current and Charge Sensitivity. Electromagnetic damping. Logarithmic damping. CDR.	Dr. Utpala Baishya ,	3	April	From 21/4/21 to 27/4/21
Lab	*A minimum of seven experiments to be done.*	Dr. Chandrama Kalita,	14	April and May	From 28/4/21 to

		16. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses. 17. To study the characteristics of a series RC Circuit. 18. To determine an unknown Low Resistance using Potentiometer. 19. To determine an unknown Low Resistance using Carey Foster's Bridge. 20. To compare capacitances using De' Sauty's bridge. 21. Measurement of field strength $\vec{B}$ and its variation in a solenoid (determine $\frac{dB}{dx}$). 22. To verify the Thevenin and Norton theorems. 23. To verify the Superposition, and Maximum power transfer theorems. 24. To determine self inductance of a coil by Anderson's bridge. 25. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width. 26. To study the response curve of a parallel LCR circuit and determine its	Dr. Utpala Baishya , Mr. Jayanta Deka			25/5/21 —

	(a) Anti- resonant frequency and (b) Quality factor Q. 27. Measurement of charge and current sensitivity and CDR of Ballistic Galvanometer. 28. Determine a high resistance by leakage method using Ballistic Galvanometer. 29. To determine self-inductance of a coil by Rayleigh's method. 30. To determine the mutual inductance of two coils by Absolute method.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (January –June)

Department	Physics	Semester	Second semester
Subject	Waves & Optics	Credit	6
Course		Paper No	PHY-HC-2026
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Superposition of Collinear Harmonic Oscillations	Linearity and Superposition Principle. Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies	Dr. Chandrama Kalita,	5	January	From 20/1/21 to 28/1/21

	(Beats). Superposition of N collinear Harmonic Oscillations with (1) equal phase differences and (2) equal frequency differences.				
Unit II: Superposition of Two Perpendicular Harmonic Oscillations	Graphical and Analytical Methods. Lissajous Figures with equal an unequal frequency and their uses.	Dr. Chandrama Kalita,	2	January And February	From 29/1/21 to 1/2/21
Unit III: Wave Motion	Plane and Spherical Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves. Wave Equation. Particle and Wave Velocities. Differential Equation. Pressure of a Longitudinal Wave. Energy Transport. Intensity of Wave. Water Waves: Ripple and Gravity Waves.	Dr. Chandrama Kalita,	4	February	From 2/2/21 to8/2/21
Unit IV: Velocity of Waves	Velocity of Transverse Vibrations of Stretched Strings. Velocity of Longitudinal Waves in a Fluid in a Pipe. Newton's Formula for Velocity of Sound. Laplace's Correction.	Dr. Chandrama Kalita,	6	February	From 9/2/21 to17/2/21
Unit V: Superposition of Two Harmonic Waves	Standing (Stationary) Waves in a String: Fixed and Free Ends. Analytical Treatment.	Dr. Utpala Baishya ,	7	February and March	From 18/2/21 to 1/3/21

	Phase and Group Velocities. Changes with respect to Position and Time. Energy of Vibrating String. Transfer of Energy. Normal Modes of Stretched Strings. Plucked and Struck Strings. Melde's Experiment. Longitudinal Standing Waves and Normal Modes. Open and Closed Pipes. Superposition of N Harmonic Waves.				
Unit VI: Wave Optics	Electromagnetic nature of light. Definition and properties of wave front. Huygens Principle. Temporal and Spatial Coherence.	, Dr. Utpala Baishya ,	3	March	From 2/3/21 To 8/3/21
Unit VII: Interference	Division of amplitude and wavefront. Young's double slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau	Dr. Utpala Baishya ,	9	March	From 9/3/21 to 22/3/21

	Fringes). Newton's Rings: Measurement of wavelength and refractive index.				
Unit VIII: Interferometer	Michelson Interferometer- (1) Idea of form of fringes (No theory required), (2) Determination of Wavelength, (3) Wavelength Difference, (4) Refractive Index, (5) Visibility of fringes. Fabry-Perot interferometer.	Mr. Jayanta Deka	4	March	From 23/3/21 to 30/3/21
Unit IX: Diffraction	Fresnel and Fraunhofer diffraction. Fresnel's Half-Period Zones for Plane Wave. Explanation of Rectilinear Prop-agation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel diffraction pattern of a straight edge and at a circular aperture . Resolving Power of a telescope.	, Mr. Jayanta Deka	9	March and April	From 31/3/21 to 12/4/21
Unit X: Fraunhofer Diffraction	Single slit. Double slit. Multiple slits. Diffraction grating . Resolving power of grating.	Mr. Jayanta Deka	8	April	From 13/4/21 to 28/4/21

Unit XI: Holography	Principle of Holography. Recording and Reconstruction Method. Theory of Holography as Interference between two Plane Waves. Point source holograms.	Mr. Jayanta Deka	3	April and May	From 29/4/21 to 5/5/21
Lab	A minimum of seven experiments to be done. 1. To determine the frequency of an electric tuning fork by Melde's experiment and verify λ2 − T law. 2. To study Lissajous Figures. 3. Familiarization with: Schuster's focusing, determination of angle of prism. 4. To determine refractive index of the Material of a prism using sodium source. 5. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source. 6. To determine wavelength of sodium light using Fresnel Biprism. 7. To determine wavelength of sodium light using Newton's	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	16	May	From 6/5/21 to 25/5/21

	Rings. 8. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film. 9. To determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating. 10. To determine dispersive power and resolving power of a plane diffraction grating.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (January –June)

Department	Physics	Semester	Second semester
Subject	Electricity & Magnetism	Credit	6
Course		Paper No	PHY-HG/RC-2016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I : Vector Analysis	Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance,	Dr. Chandrama Kalita,	12	January and February	From 20/1/21 to 8/2/21

	Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only).				
Unit II : Electrostatics	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 and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.	, Dr. Utpala Baishya ,	22	February and March	From 9/2/21 to 7/3/21
Unit III : Magnetism	Magnetostatics: Biot-Savart's law & its applications – straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic	Dr. Chandrama Kalita,	10	March	From 8/3/21 to 22/3/21

	vector potential. Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia, para, and ferro-magnetic materials.				
Unit IV : Electromagnetic Induction	Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.	Mr. Jayanta Deka	6	March and April	From 23/3/21 to 5/4/21
Unit V : Maxwell's Equations and EM Wave	Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.	, Mr. Jayanta Deka	10	April	From 6/4/21 to 19/4/21
Lab	11. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses. 12. Ballistic Galvanometer (a) Measurement of charge and current sensitivity (b) Measurement of CDR	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	14	April and May	From 20/4/21 to 16/5/21

	(c) Determine a high resistance by Leakage Method (d) To determine Self Inductance of a Coil by Rayleigh's Method. 13. To compare capacitances using De'Sauty's bridge. 14. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx). 15. To study the Characteristics of a Series RC Circuit. 16. To study the a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor 17. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q . 18. To determine a Low Resistance by Carey Foster's Bridge. 19. To verify the Thevenin and Norton theorem. 20. To verify the Superposition, and Maximum Power Transfer Theorem.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Mathematical Physics III	Credit	6
Course		Paper No	PHY-HC-4016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Complex Analysis	Functions of Complex Variables. Analyticity and Cauchy-Riemann Conditions. Examples of analytic functions. Singular functions: poles and branch points, order of singularity.	Dr. Utpala Baishya ,	10	January and February	From 20/1/21 to 10/2/21
Unit II: Comple x Integrati on	Integration of a function of a complex variable. Cauchys Integral formula. Simply and multiply connected region. Laurent and Taylors expansion. Residues and Residue Theorem with numerical application.	Dr. Utpala Baishya ,	10	February	From 11/2/21 to 24/2/21
Unit III: Fourier Transfor ms	Fourier Transforms: Fourier Integral theorem. Fourier Transform. Examples. Fourier trans- form of trigonometric, Gaussian functions	Dr. Utpala Baishya ,	15	February and March	From 25/2/21 to 22/3/21

	Representation of Dirac delta function as a Fourier Integral. Fourier transform of derivatives, Inverse Fourier transform, Convolution theorem (Statement only). Properties of Fourier transforms (translation, change of scale, complex conjugation).				
Unit IV: Laplace Transforms	Laplace Transform (LT) of Elementary functions. Properties of LTs: Change of Scale Theorem, Shifting Theorem. LTs of 1st and 2nd order Derivatives and Integrals of Functions, Derivatives and Integrals of LTs. LT of Unit Step function, Dirac Delta function, Periodic Functions. Convolution Theorem (Statement only). Inverse LT. Application of Laplace Transforms to 2nd order Differential Equations: Damped Harmonic Oscillator.	Dr. Utpala Baishya ,	15	March and April	From 23/3/21 to 12/4/21
Unit V: Tensor Algebra	Introduction to tensor, Transformation of co-ordinates, Einsteins summation convention. contravariant and co- variant tensor, tensorial character of physical quantities, symmetric and antisymmetric tensors, kronecker delta, Levi-Civita tensor. Quotient law of tensors, Raising and lowering of indices Rules for combination of tensors-addition, subtraction, outer multiplication, contraction and inner multiplications.	Dr. Utpala Baishya ,	10	April	From 13/4/21 to 28/4/21

Lab	1. Solve differential equations $\frac{dy}{dx} = e^x \; with \; y = o \; and \; x = 0$ $\frac{dy}{dx} + e^{-x} y = x^2 \frac{d^2y}{dx^2} + 2\frac{dy}{dx} = -y$ $$\frac{d^2y}{dx^2} + e^{-t}\frac{dy}{dx} = -y$$ 2. Dirac Delta Function Evaluate the integral I $\frac{1}{\sqrt{2\pi a^2}} \int exp\left[\frac{(x-2)^2}{2a^2}\right](x+3)\overline{dx}$ 3. Fourier Series Make a program to evaluate $$\sum_{n=1}^{\alpha} (0.2)^n$$ Evaluate the Fourier coefficients of a given periodic function (square wave) 4. Frobenius method and special Function evaluate $\int_{-1}^{1} P_n(x) P_m(x) dx = d_{n,m}$ Plot $P_n(x), jv(x)$ and show the recursion relation 5. Calculation of error for each data point of observations recorded in experiments done in previous semesters (choose any two) 6. Calculation of least	Dr. Utpala Baishya ,	15	April and May	From 29/4/21 to 25/5/21

	square fitting manually without giving weightage to error. Confirmation of least square fitting of data through computer program. 7. Evaluation of trigonometric functions e.g. sinθ, ,given Bessel'sfunctionat *N* points find its value at an intermediate point. 8. Integrate $$\frac{1}{(x^2+2)}$$ Numerically in a given interval. 9. Compute the nth roots of unity for n=2, 3, and 4. 10. Find the two square roots of 5+12j. Integral transform Evaluate FFT of e^{-x^2} 11. Solve Kirchoff's current law for any node of an arbitrary circuit using Laplace's transform.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Elements of Modern Physics	Credit	6
Course		Paper No	PHY-HC-4026
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Quantum Theory and Blackbody Radiation	Quantum theory of light; photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment. Wave description of particles by wave packets. group and phase velocities and relation between them. Two-slit experiment with electrons. Probability. wave amplitude and wave functions.	Mr. Jayanta Deka	12	January and February	From 20/1/21 to 9/2/21
Unit II: Uncertainty and Wave-Particle Duality	Position measurement : gamma ray microscope thought experiment; wave-particle duality, Heisenberg uncertainty principle (Uncertainty relations involving Canonical pair of variables): Derivation from	Mr. Jayanta Deka	5	February	From 10/2/21 to 17/2/21

	wave packets, impossibility of a particle following a trajectory; estimating minimum energy of a confined particle using uncertainty principle; energy-time uncertainty principle- application to virtual particles and range of an interaction.				
Unit III: Schrödinger Equation	Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrödinger equation for non- relativistic particles; expectation value, momentum and energy operators; stationary states; physical interpretation of a wave function, probabilities and normalization; probability and probability current densities in one dimension.	Mr. Jayanta Deka	8	February & March	From 18/2/21 to 1/3/21
Unit IV: One-dimensional Box and Step Barrier	One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization; quantum dot as example; quantum mechanical scattering and tunnelling in one dimension- across a step potential and	Mr. Jayanta Deka	9	March	From 2/3/21 to 12/3/21

	rectangular potential barrier.				
Unit V: Structure of the Atomic Nucleus	Size and structure of atomic nucleus and its relation with atomic weight; impossibility of an electron being in liquid drop model: semi-empirical mass formula and binding energy, nuclear shell model (qualitative discussions) and magic numbers.	Mr. Jayanta Deka	6	March	From 13/3/21 to 22/3/21
Unit VI: Radioactivity	Stability curve and stability of nuclei, Law of radioactive decay, disintegration constant, half life and mean life. Activity unit. Alpha decay – Range energy relation, Fine structure of alpha energy spectrum. Beta decay energy released, continuous beta spectrum and Pauli's prediction of neutrino. Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus.	Mr. Jayanta Deka	8	March and April	From 23/3/21 to 4/4/21
Unit VII : Detection of nuclear radiation	Method of energy loss by charged particles and gamma photons. Photoelectric, Compton and Pair-production processes Gas filled detectors – principle and construction of a gas filled detector, Ionization, proportional, GM and spark region.	Mr. Jayanta Deka	4	April	From 5/4/21 to 12/4/21

Unit VIII: Fission and Fusion	Energy consideration in Nuclear Reaction, Q-value of nuclear reaction, Mass deficit, Einstein's mass-energy equivalence principle and generation of nuclear energy. Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235. Fusion and thermonuclear reactions driving stellar energy (brief qualitative discussions).	Mr. Jayanta Deka	4	April	From 13/4/21 to 21/4/21
Unit IX: Lasers	Einstein's *A* and *B* coefficients. Metastable states. Spontaneous and Stimulated emissions. Optical Pumping and Population Inversion. Three-Level and Four-Level Lasers. Ruby Laser and He-Ne Laser. Basic lasing.	Mr. Jayanta Deka	4	April	From 22/4/21 to 30/4/21
Lab	*A minimum of six experiments to be done.* 1. Measurement of Planck's constant using black body radiation and photo-detector. 2. Photo-electric effect Photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of	Mr. Jayanta Deka	16	May	From 1/5/21 to 25/5/21

	light. 3. To determine work function of material of filament of directly heated vacuum diode. 4. To determine the Planck's constant using LEDs of at least 4 different colours. 5. To determine the wavelength of $H - \alpha$ emission line of hydrogen atom. 6. To determine the ionization potential of mercury. 7. To determine the absorption lines in the rotational spectrum of iodine vapour. 8. To determine the value of e/m by (a) magnetic focusing or (b) bar magnet. 9. To setup the Millikan oil drop apparatus and determine the charge of an electron. 10. To show the tunneling effect in tunnel diode using $I - V$ characteristics. 11. To determine the wavelength of laser source using diffraction of single slit. 12. To determine the wavelength of laser source using diffraction of double slits. 13. To determine (1)				

	wavelength and (2) angular spread of He-Ne laser using plane diffraction grating.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Analog Systems & Applications	Credit	6
Course		Paper No	PHY-HC-4036
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Semiconductor Diodes	P and N type semiconductors. Energy Level Diagram. Conductivity and Mobility, Concept of Drift velocity. PN Junction Fabrication (Simple Idea). Barrier Formation in PN Junction Diode. Static and Dynamic Resistance. Current Flow Mechanism in Forward and Reverse Biased Diode. Drift Velocity. Derivation for Barrier Potential, Barrier Width and Current for Step Junction. Current flow mechanism in Forward and Reverse Biased Diode.	Dr. Chandrama Kalita,	10	January and February	From 20/1/21 to 8/2/21

Unit II: Two-terminal Devices and their Applications	(1) Rectifier Diode: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, C-filter (2) Zener Diode and Voltage Regulation. Principle and structure of (1) LEDs, (2) Photodiode and (3) Solar Cell.	Dr. Chandrama Kalita,	6	February	From 9/2/21 to 17/2/21
Unit III: Bipolar Junction Transistors	$n-p-n$ and $p-n-p$ Transistors. Characteristics of CB, CEand CC Configurations. Current gains α and β. Relations between α and β. Load Line analysis of Transistors. DC Load line and *Q*-point. Physical Mechanism of Current Flow. Active, Cutoff and Saturation Regions.	Dr. Chandrama Kalita,	6	February	From 18/2/21 to 23/2/21
Unit IV: Amplifiers	Transistor Biasing and Stabilization Circuits. Fixed Bias and Voltage Divider Bias. Transistor as 2-port Network. *h*- parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains. Classification of Class *A*, *B* & *C* Amplifiers.	Dr. Chandrama Kalita,	10	February and March	From 25/2/21 to 12/3/21

Unit V: Coupled Amplifier	Two stage RC-coupled amplifier and its frequency response.	Dr. Chandrama Kalita,	4	March	From 13/3/21 to 25/3/21
Unit VI: Feedback in Amplifiers	Effects of Positive and Negative Feedback on Input Impedance, Output Impedance, Gain, Stability, Distortion and Noise.	Dr. Chandrama Kalita,	4	March	From 26/3/21 to 31/3/21
Unit VII: Sinusoidal Oscillators	Barkhausen's Criterion for self-sustained oscillations. RC Phase shift oscillator, determination of Frequency. Hartley & Colpitts oscillators.	Dr. Chandrama Kalita,	4	April	From 1/4/21 to 6/4/21
Unit VIII: Operational Amplifiers (Black Box approach)	Characteristics of an Ideal and Practical Op-Amp. (IC 741) Open-loop and Closed-loop Gain. Frequency Response. CMRR. Slew Rate and concept of Virtual ground.	Dr. Chandrama Kalita,	9	April	From 7/4/21 to 22/4/21
Unit IX: Applications of Op-Amps	(1) Inverting and non-inverting amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator, (6) Log amplifier, (7) Zero crossing detector (8) Wein bridge oscillator.	Dr. Chandrama Kalita,	9	April and May	From 23/4/21 to 5/5/21

Unit X: Convversion	Resistive network (Weighted and R − 2R Ladder). Accuracy and Resolution. A/D Conversion (successive approximation).	Dr. Chandrama Kalita,	3	May	From 6/5/21 to 10/5/21
Lab	*A minimum of eight experiments to be done.* 1. To study V − I characteristics of PN junction diode, and Light emitting diode. 2. To study the V − I characteristics of a Zener diode and its use as voltage regulator. 3. Study of V − I & power curves of solar cells, and find maximum power point & effciency. 4. To study the characteristics of a Bipolar Junction Transistor in CE configuration. 5. To study the various biasing configurations of BJT for normal class A operation. 6. To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias. 7. To study the frequency response of voltage gain of a RC- coupled transistor amplifier. 8. To design a Wien bridge oscillator for given frequency using an op-amp.	Dr. Chandrama Kalita,	9	May	From 11/5/21 to 25/5/21

	9. To design a phase shift oscillator of given specifications using BJT. 10. To study the Colpitt's oscillator. 11. To design a digital to analog converter (DAC) of given specifications. 12. To study the analog to digital convertor (ADC) IC. 13. To design an inverting amplifier using Op-amp (741/351) for dc voltage of given gain . 14. To design inverting amplifier using Op-amp (741/351) and study its frequency response. 15. To design non-inverting amplifier using Op-amp (741/351) & study its frequency response. 16. To study the zero-crossing detector and comparator. 17. To add two dc voltages using Op-amp in inverting and non-inverting mode. 18. To design a precision Differential amplifier of given I/O specification using Op-amp. 19. To investigate the use of an op-amp as an Integrator. 20. To investigate the use of an op-amp as a Differentiator.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Waves & Optics	Credit	6
Course		Paper No	PHY-HG/RC-4016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Superposition of Two Collinear Harmonic Oscillations	Linearity & Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats).	Dr. Chandrama Kalita,	4	January	From 20/1/21 to 27/1/21
Unit II: Superposition of Two Perpendicular Harmonic Oscillations	Graphical and Analytical Methods. Lissajous Figures Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka with equal an unequal frequency and their uses.	Dr. Chandrama Kalita,	2	January and February	From 28/1/21 to 1/2/21
Unit III: Waves Motion	General: Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string.	Dr. Chandrama Kalita,	7	February	From 2/2/21 to 12/2/21

	Group velocity, Phase velocity. Plane waves. Spherical waves, Wave intensity.				
Unit IV: Fluids	Surface Tension: Synclastic and anticlastic surface – Excess of pressure – Application to spherical and cylindrical drops and bubbles – variation of surface tension with temperature – Jaegar's method. Viscosity – Rate flow of liquid in a capillary tube – Poiseuille's formula – Determination of coefficient of viscosity of a liquid – Variations of viscosity of liquid with temperature – lubrication.	Dr. Chandra ma Kalita,	6	February	From 13/2/21 to 22/2/21
Unit V : Sound	Simple harmonic motion - forced vibrations and resonance - Fourier's Theorem - Application to saw tooth wave and square wave - Intensity and loudness of sound - 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.	Dr. Utpala Baishya ,	6	February and March	From 23/2/21 to 2/3/21
Unit VI : Wave Optics	Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle.	Dr. Utpala Baishya , Mr.	3	March	From 3/3/21 to 8/3/21

Unit VII : Interference	Division of amplitude and division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination and Fringes of equal thickness . Newton's Rings: measurement of wavelength . Michelson's Interferometer: Idea of form of fringes (no theory needed), Determination of wavelength, Wavelength difference, Refractive index Visibility of fringes.	Dr. Utpala Baishya ,	10	March	From 9/3/21 to 22/3/21
Unit VIII : Michelson Interferometer	(1) Idea of form of fringes (No theory required), (2) Determination of Wavelength, (3) Refractive Index. (4) Visibility of fringes.	Mr. Jayanta Deka	3	March	From 23/3/21 to 31/3/21
Unit IX : Diffraction	Fresnel and Fraunhofer diffraction . Fresnel's Half-Period Zones for Plane Wave. Explanation of Rectilinear Propa- gation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel diffraction pattern of a straight edge and at a circular aperture . Resolving Power of a telescope. Fraunhofer diffraction due to a Single slit , Diffraction grating . Resolving power of grating.	Mr. Jayanta Deka	14	April	From 1/4/21 to 23/4/21

Unit X : Polarization	Transverse nature of light waves. Double Refraction, Plane, circular and elliptically polarized light , Production and analysis of polarized light. Retarding plates.	Mr. Jayanta Deka	5	April	From 24/4/21 to 29/4/21
Lab	*A minimum of five experiments to be done.* 1. To study the variation in liquid column height with diameter of capillary tube and determine the surface tension of the liquid. 2. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify Z^2 — T Law. 3. To determine the coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method) 4. To determine the focal length of a convex mirror with the help of convex lens . 5. To determine the refractive index of a liquid by using plane mirror and convex lens. 6. To determine the focal length of two lenses and their combination by	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	14	April and May	From 30/4/21 to 20/5/21

	displacement method . 7. Familiarization with Schuster's focussing; determination of angle of prism. 8. To determine the Refractive Index of the Material of a Prism using Sodium Light. 9. To determine wavelength of sodium light using Newton's Rings.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2020-21 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Photoshop	Credit	4
Course		Paper No	PHY-SE-4044
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Getting Started with Adobe Photoshop CC	Overview of Adobe Photoshop CC, Features of Adobe Photoshop CC	Dr. Chandrama Kalita,	3	January and February	From 20/1/21 To 10/2/21
Unit II: Importance of Adobe Photoshop	Overview of Tools Used in Adobe Photoshop CC, Importance of Adobe Photoshop CC	Dr. Chandrama Kalita,	5	February	From 11/2/21 to 22/2/21

CC					
Unit III: Working with Typography	Typography, Creating Typographies, Choosing the Right Font and Color	Dr. Chandrama Kalita,	4	February and March	From 23/2/21 to 2/3/21
Unit IV: Working with Layers and Images	Cropping a Photo, Resizing Images, Basics of Layers, Creating Layers for Print and Digital Media, Aligning Images within Multiple Layers, Merging Layer Techniques	, Dr. Utpala Baishya ,	6	February and March	From 3/3/21 to 16/3/21
Unit V: Working with Filters	Photoshop Filters, Smart Filters, Common Features of Photoshop Filter	Dr. Utpala Baishya ,	4	March	From 17/3/21 to 30/3/21
Unit VI: Digital Painting in Adobe Photoshop CC	Working with Brush Tool, Importance of Using Colors	, Mr. Jayanta Deka	4	March and April	From 31/3/21 to 19/4/21
Unit VII: Masking and File Formats in Adobe Photoshop CC	Introduction to Mask, Creating Vector and Layer Masks, Essential File Formats, Choosing the Right Format for Print and Digital Media	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	4	April	From 20/4/21 to 30/4/21

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021 (January-June)

Department	Physics	Semester	6^{th} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	601

Unit	Course Content	Allotted to	Hours	Month	date
a)	**NUCLEAR PHYSICS:**				
1	Nuclear forces and Stability of Nuclei: Concept of packing fraction and binding energy, binding energy curve and its significance. Nucleon-nucleon forces qualitative discussions on nuclear force. Brief outline of Yukawas meson theory, Nuclear stability, neutron proton ratio in stable nuclei, stability curve, odd-even rules of nuclear stability. 8 Lectures	Jayanta Deka	8	January-February	20/1/21-5/2/21
2	Alpha decay: Cause of alpha decay, basic a-decay process, range and energy of a-decay, a-decay systematics, Geiger Nuttle rules, Qualitative discussion on the theory of a-decay. 6 Lectures	Jayanta Deka	6	February	6/2/21-18/2/21
3	Beta-decay: Types of ß-decays, conditions of B & B decay and K capture, B-ray spectrum, Pauli's neutrino hypothesis.	Jayanta Deka	5	February	19/2/21-26/2/21
4	Gamma-rays: y-rays and their origin. Interaction of y-particle with	Jayanta Deka	2	February	27/2/21 - 28/2/21

	matter.				
5	Nuclear models: Evidence in favour of liquid properties of nuclei, Liquid drop model Bethe-Weisackar's mass formula. Applications of mass formula estimation of fission energy, prediction of most stable member of an isobaric family. Shell model (Basic concepts only).	Jayanta Deka	8	March	1/3/21 - 12/3/21
6	Nuclear Reactions: Types of nuclear reactions, conserved quantities of nuclear reaction, energies of nuclear reaction - Q-value & its experimental determination. Exoergic & endoergic reactions. Cross-section of nuclear reaction and its unit. Nuclear fission and chain reaction, critical size, controlled chain reaction and basic principle of nuclear reactor. Nuclear fusion reaction-basic concepts of fusion reactions, fusion barrier, fusion and thermonuclear reactions (PP chains only).	Jayanta Deka	15	March-April	13/3/21 - 8/4/21
7	Accelerators: Necessity of charge particle acceleration construction and working principle of linear accelerator. Construction and working principle of a cyclotron.	Jayanta Deka	5	April	9/4/21 - 30/4/21
8	Detectors: Principles of detection of charge particles. Construction and working principle of gas filled detectors. Ionization chamber - its construction & working principle. 9. Cosmic rays: Origin of cosmic rays, primary & secondary cosmic rays and their composition. The East West effect. Latitude, longitude & altitude effec, Extensive Air Shower (EAS).	Jayanta Deka	5	May	2/5/21 - 15/5/21

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021 (January-June)

Department	Physics	Semester	6^{th} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	602

Unit	Course Content	Allotted to	Hours	Month	date
a)	**MATHEMATICAL METHODS:**				
	Introduction to tensor, transformation of coordinates, contravariant and covariant tensor, tensorial character of physical quantities, symmetric and antisymmetric tensors, kronecker delta. Rules for combination of tensors- addition, subtraction, outer multiplication, contractions and inner multiplications.	Utpala Baishya	15	January-February	20/1/21 - 15/2/21
b)	**SOLID STATE PHYSICS:**				
1.	The idea of amorphous and crystalline solids, The crystal lattice and translation vectors, unit cell, types of crystal lattice, Miller indices, diffraction of X-rays, use of Bragg's law to the determination of lattice constants.	Utpala Baishya	10	February	16/2/21 - 28/2/21
2.	The different types of crystal bonding: ionic, covalent, metallic,	Utpala Baishya	5	March	1/3/21 - 10/3/21

	Van der Waal and hydrogen bondings, cohesive energy of ionic crystal, Madelung constant.				
3.	Free electron theory of metals, Boltzmann's equation of state, electronic specific heat, electrical and thermal conductivity of metals, Wiedemann-Franz law. (Quantum Mecanical treatment to be used).Bloch theorem in one dimension, Kronig-Penny model of energy bands of solids, distinction among metal, insulator and semiconductor, intrinsic and extrinsic semiconductors (qualitative discussion only).	Utpala Baishya	15		11/3/21 - 31/3/21
4.	Introductory concept of superconductivity, Meissner effect, types 1 and type II superconductors.	Utpala Baishya	5	April	1/4/21 - 31/4/21
5.	Magnetic properties of solids: Magnetization, magnetic intensity, magnetic susceptibility, permeability, hysteresis, B-H curve and energy loss in hysteresis, different classes of magnetic material, magnetic moment, Bohr magneton, Larmor precession, Classical theory of paramagnetism (Langevin's theory and Curie law), Weiss theory(Quantum Mecanical treatment to be used), relation between para and ferromagnetism, Ferromagnetic domain.	Utpala Baishya	10	May	2/5/21 - 15/5/21

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021 (January-June)

Department	Physics	Semester	6^{th} (Major)
Subject	Physics	Marks	60
Course	BSc (Semester)	Paper no	603

Unit	Course Content	Allotted to	Hours	Month	date
1	**<u>MODERN OPTICS:</u>**				
1.	Optics of crystals: Wollaston prism, Rochon prism, Jones calculus, Interference of polarized light: interference due to crystal plates in plane polarised light, Babinet compensator. Principle of liquid crystal display.	Chandrama Kalita	8	January	20/1/21 - 31/1/21
2.	Lasers: Characteristics of laser light, absorption Spontaneous emission, Stimulated Vémission, Einstein coefficients, Population inversion and light amplification, Essential components of the laser, Ruby and He-Ne laser (principles only). Elementary idea about non-linear optics: Second Harmonic Generation.	Chandrama Kalita	10	February	1/2/21 - 28/2/21
3.	Holography: Formation of a hologram, Reconstruction of the hologram (mathematical aspect).	Chandrama Kalita	6	March	1/3/21- 12/3/21

4.	Optical Fibers: Types of fibers; propagation of a ray through step index fiber: numerical aperture, multipath dispersion; propagation through graded index fiber. Basic idea about communication through an optical fiber cable (Block diagram).	Chandrama Kalita	10	March	13/3/21-31/3/21
5.	Optical components & Spectrographs: Ramsden and Huygen's eyepieces, oil immersion objective, Prism spectrograph (Glass and quartz), Grating spectrograph.	Chandrama Kalita	6	April	1/4/21-12/4/21
b)	**ELECTROMAGNETIC THEORY:**				
1.	Electromagnetic field equation in integral and differential form, displacement current, Maxwell's equations, Energy Conservation Law-Poynting theorem and Poyntingvector.	Chandrama Kalita	6	April	16/4/21 - 30/4/21
2.	Electromagnetic wave equation, velocity of electromagnetic wave, Monochromatic plane wave equation in free space and conducting medium. Reflection and Refraction of plane electromagnetic wave for normal and oblique incidence, Snell's law, reflection and transmission co-efficient, Fresnel's equations, Polarisation of electromagnetic wave, linear, circular and elliptical polarization. Brewster's law.	Chandrama Kalita	14	May	2/5/21 - 16/5/21

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021 (January-June)

Department	Physics	Semester	6th (Major)
Subject	Physics	Marka	60
Course	BSc (Semester)	Paper no	604

Unit	Course Content	Allotted to	Hours	Month	date
a)	**STATISTICAL MECHANICS:**				
1.	Statistical system, and its coordinates, specification of a state in statistical mechanics, Macrostate and microstate, phase space, ensemble, Boltzmann entropy relation ergodic hypothesis, postulate of equal a priori probability, density of phase points is phase space, Liouville' theorem.	Jayanta Deka	8	February	1/2/21 - 28/2/21
2.	Symmetry of wavefunction, restriction regarding the number of particles in given state, different types of statistics Maxwell-Boltzmann(MB), Bose-Einstein (BE) and Fermi-Dirac(FD) Statistics, Most probable distribution relation in MB, BE and FD statistics and their comparison. Degeneracy Factor, Density of state.	Chandrama Kalita	7	March	1/3/21 - 20/3/21
3	Application of MB statistics to derive Maxwell distribution law (velocity, energy momentum and frequency).	Chandrama Kalita	5	March	21/3/21 - 31/3/21
4	Fermi energy and Fermi temperature, Fermi distribution function, Application of FD statistics to discuss electronic specific heat.	Utpala Baishya	5	April	1/4/21 - 13/3/21
5	Application of BE statistics to explain BE condensation and to derive Black body radiation formula.	Utpala Baishya	5	May	2/5/21 - 15/5/21

b)	**COMPUTER APPLICATIONS:**				
1	Programming exercise (either FORTRAN-95 or C or C): simple mathematical series generation and summation, sorting of numbers largest of n numbers, sorting a list ascending/descending order, solution of quadratic equation, solution of simultaneous linear equation, least square graph fitting (straight line and quadratic curve) of given data, iterative methods, implementation of Runge-Kutta 4th order method of solving differential equation and Simpson's rule for integration.	Kishor Das	30	February-May	2/2/21 - 15/5/21

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020 -2021 (January-June)

Department	Physics	Semester	6^{th} (Major Practical)
Subject	Physics	Marks	75
Course	BSc (Semester)	Paper no	605

Unit	Course Content	Allotted to	Hours	Month	date
1	To determine the Q- factor of a series resonance circuit containing L. C and R for three different values of R.	Chandrama Kalita	8	February	1/2/21 - 20/2/21
2	To determine the value of "J' (the mechanical equivalent of heat) by Callender and Bern's method.	Chandrama Kalita	10	March	5/3/21 - 25/3/21

4	To determine the value of self-induction of a coil with the help of Anderson's Bridge.	Chandrama Kalita	8	April	1/4/21 - 12/4/21
	To measure the phase difference between he sgnal accros R and C of an R-C network using CRO and hence find the value of the resistor and frequency of the signal.	Jayanta Deka	8	May	1/5/21 - 15/5/21

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021 (January-June)

Department	Physics	Semester	6^{th} (Major Practical)
Subject	Physics	Marks	75
Course	BSc (Semester)	Paper no	606

Unit	Course Content	Allotted to	Hours	Month	date
a)	**PROJECT**				
	(Experimental project work of any relevant topic within the syllabus of Physics, to be guided by a teacher and to be submitted along with a report)	Utpala Baishya	8	March	1/3/21 - 31/3/21
b)	**COMPUTER PROGRAMMING:**				
1.	To determine (a) mean, (b)standard deviation and (c)standard error of the given experimental data.	Kishor Das	8	March	1/3/21 - 31/3/21
2.	To analyse the supplied experimental data between two variables using least square straight line fitting programme.	Kishor Das	8	April	1/4/21 - 30/4/21
3.	To rearrange the supplied numerical	Kishor	8	May	2/5/21 -

	data in ascending/descending order and find the largest/smallest number in a given list of numbers.	Das			15/5/21

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021 (January-June)

Department	Physics	Semester	6^{th} (General)
Subject	Physics	Marks	80
Course	BSc (Semester)	Paper no	601

Unit	Course Content	Allotted to	Hours	Month	date
a)	**Nuclear Physics:**				
1.	Concept of a Nucleus - its composition, mass, volume, density and temperature, units and dimension.	Jayanta Deka	5	January-February	20/1/21 - 5/2/21
2.	Mass defect and packing fraction, total binding energy, binding energy per nucleon, binding energy curve & its significance, nucleon separation energy, nuclear reactions, Q-value of a reaction, exothermic & endothermic reactions.	Jayanta Deka	6	February	6/2/21 - 20/2/21
3.	Type of radioactive decays, radioactive decay law, concept of half life and disintegration constant, natural radioactivity, radioactive dating. Activity of radioactive sources, its unit. Radioisotopes - their production & uses.	Jayanta Deka	5	February	21/2/21 - 28/2/21
4.	Need of a particle accelerator, Linear Accelerator its construction	Jayanta Deka	5	March	1/3/21 - 15/3/21

	& working principle. Need of nuclear Detectors. Ionization Chamber - its construction & working principle.				
5.	Primary and secondary cosmic rays and their composition, EAS.	Jayanta Deka	5	May	2/5/21 - 15/5/21
c)	**Electronics:**				
1.	Semiconductors, P-N junction unction dode, unbiased and biased P-N junction, depletion layer, barrier potential, junction capacitnice Volt-ampere relations (derivation nod NANury), photo diode, Zener diode, Dentamer, OR, AND, NOT, NOR and NAND Gates using diode and transistor.	Chandrama Kalita	8	January-February	20/1/21 - 5/2/21
2.	Rectifier, half wave and full-wave, efficiency of rectification, ripple factor, idea of filter circuit.	Chandrama Kalita	5	February	6/2/21 - 20/2/21
3.	Thevenin's and Norton's theorems, maximum power transfer theorem	Chandrama Kalita	5	March	1/3/21 - 15/3/21
4.	Transistor, different configurems, maximum power transferathistor, alpha and beta of a transistor, transistor as amplifier.	Chandrama Kalita	6	March	16/3/21 - 25/3/21
5.	Biasing and Q-point of a transistor, stability factors, biasing circuits.	Chandrama Kalita	5	March	26/3/21 - 31/3/21
6.	Classification of amplifiers: class A, B, C, voltage and power amplifiers.	Chandrama Kalita	2	April	1/4/21 - 10/4/21
7.	Two port four terminal device and z, y and h-parameters. Use of h-parameters to find input and output resistances, current, voltage and power gain of a small signal transistor amplifier.	Chandrama Kalita	4	April	11/4/21-30/4/21
8.	Feedback and Barkhausen criterion for sustained oscillations, Tuned collector oscillator.	Chandrama Kalita	3	May	2/5/21 - 5/5/21
c)	**Electromagnetic waves:**				
1.	Electromagnetic wave spectrum, graphical representation of electromagnetic wave.	Chandrama Kalita	4	May	6/4/21 - 10/5/21
2.	Maxwell's equations, wave equation in free space from Maxwell's equations, velocity of	Chandrama Kalita	4	May	11/5/21 - 15/5/21

	electromagnetic waves in free space, Pointing vector.				
d)	**Solid State Physics**				
1.	Crystalline and amorphous state of substances, single crystal and polycrystalline substances, basis, crystal lattice, unit cell, primitive unit cell, translation vectors, lattice parameters, directions, lattice planes, Miller indices, inter-planar spacing	Utpala Baishya	10	February	6/2/21 - 20/2/21
2.	Crystallographic axes, Crystal systems and Bravais lattice.	Utpala Baishya	4	March	1/3/21 - 15/3/21
3.	Different types of bonding in solids, ionic, covalent, metallic and hydrogen bonding.	Utpala Baishya	5	March	16/3/21 - 25/3/21
4.	Classical free electron theory of metals.,	Utpala Baishya	2	April	1/4/21 - 10/4/21

TEACHING PLAN

Department of Physics

SBMS COLLEGE, SUALKUCHI

Session: 2020-2021 (January-June)

Department	Physics	Semester	6^{th} (General Practical)
Subject	Physics	Marks	100
Course	BSc (Semester)	Paper no	601

Unit	Course Content	Allotted to	Hours	Month	date
1	To determine the value of'g' by Kater's pendulum.	Utpala Baishya	8	February	1/2/21-28/2/21
2	To determine the value of 'J', the mechanical equivalent of heat by Joule's calorimeter.	Utpala Baishya	6	March	1/3/21 - 15/3/21

3	To determine the angle of minimum deviation and angle of the prism with the help of a spectrometer and hence find refractive index of the material of the prism.	Chandrama Kaita	8	April	1/4/21 - 15/4/21
4	To assemble OR, AND and NOT gates using diode and transistor and verify their tuth tables.	Jayanta Deka	6	March	16/3/21 - 31/3/21
5	To draw the characteristics of- (i) a forward biased PN diode and (ii) reverse biased Zener diode and hence determine the ac resistance of the PN diode and breakdown voltage of the Zener diode.	Chandrama Kaita	6	April	16/4/21 - 30/4/21

TEACHING PLAN

DEPARTMENT OF PHYSICS

SBMS COLLEGE, SUALKUCHI

Session: 2021-22 (August –December)

Department	Physics	Semester	First semester
Subject	Mathematical Physics I	Credit	6
Course		Paper No	PHY-HC-1016
Remarks		Marks	100

Unit	Course Content	Allotted to	Hours	Month	Date
Unit I: Vector Calculus	Revision: Properties of vectors under rotations. Scalar product and its invariance under rotations. Vector product, Scalar triple product and their interpretation in terms of area and volume respectively. Scalar and Vector fields.	Dr. Utpala Baishya	25	August-September	From 1/8/2021 to 6/9/2021

	Vector Differentiation: Directional derivatives and normal derivative. Gradient of a scalar field and its geometrical interpretation. Divergence and curl of a vector field. Del and Laplacian operators. Vector identities. Vector Integration: Ordinary Integrals of Vectors. Multiple integrals, Jacobian. Notion of infinitesimal line, surface and volume elements. Line, surface and volume integrals of Vector fields. Flux of a vector field. Gauss' divergence theorem, Green's and Stokes Theorems and their applications (no rigorous proofs).				
Unit II: First and Second order Differential Equations	First Order and Second Order Differential equations: First Order Differential Equations and Integrating Factor. Homogeneous Equations with constant coefficients. Wronskian and general solution. Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor, with simple illustration.	Dr. Utpala Baishya	17	September	From 7/9/2021 to 28/9/2021
Unit III: Orthogonal Curvilinear Coordinates	Orthogonal Curvilinear Coordinates. Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems.	Dr. Utpala Baishya	6	September-October	29/9/2021 to 6/10/2021
Unit IV: Dirac Delta function and its Properties	Definition of Dirac delta function. Representation as limit of a Gaussian function and rectangular function. Properties of Dirac delta function.	Dr. Utpala Baishya	2	October	From 7/10/2021 to 22/10/2021

Unit V: Introduction to Probability	Independent random variables: Probability distribution functions; binomial, Gaussian and Poisson, with examples. Mean and variance.	Dr. Utpala Baishya	4	October	From 23/10/2021 to 27/10/2021
Unit VI: Theory of Errors	Systematic and Random Errors. Propagation of Errors. Normal Law of Errors. Standard and Probable Error. Least-squares fit.	Dr. Utpala Baishya	6	October-November	From/ 28/10/ 2021 to 3/11/2021
Lab	**Introduction and Overview** Computer architecture and organization, memory and Input/output devices. **Basics of scientific computing** Binary and decimal arithmetic, Floating point numbers, algorithms, Sequence, Selection and Repetition, single and double precision arithmetic, underflow & overflow-emphasize the importance of making equations in terms of dimensionless variables, Iterative methods Review of C & C++/Python/ **Matlab/ Mathematica Programming fundamentals** Introduction to Programming, constants, variables and data types, operators and Expressions I/O statements, scanf and printf, c in and c out, Manipulators for data formatting, Control statements (decision making and looping statements) (if statement. if-else Statement. Nested if Structure. else-if Statement. Ternary Operator. goto Statement. switch Statement. Uncondi- tional and Conditional Looping. while	Dr. Utpala Baishya	30	November	From 4/11/2022 to 20/11/2022

	Loop. do-while Loop. for Loop. Breakand continue Statements. Nested Loops), Arrays (1D & 2D) and strings, user defined functions, Structures and Unions, Idea of classes and objects. **Programs** Sum & average of a list of numbers, largest of a given list of numbers and its location in the list, sorting of numbers in ascending descending order, Binary search. **Random number generation** Area of circle, area of square, volume of sphere, value of pi (π) **Solution of Algebraic and Transcendental equations by Newton Raphson methods** Solution of linear and quadratic equation, solving $\alpha = tan\alpha$, $I = I_0(sin\alpha/\alpha)^2$ in optics **Interpolation by Newton Gregory Forward and Backward difference formula** Evaluation of trigonometric functions e.g. sinθ, cosθ, tanθ etc. **Numerical Integration (Trapezoidal and Simpson rules), Monte Carlo method** Given Position with equidistant time data to calculate velocity and acceleration and vice versa. Find the area of B-H Hysteresis loop				

	Solution of Ordinary Differential Equations (ODE) First order Differential equation Euler, modifted Euler and Runge-Kutta (RK) second and fourth order methods First order differential equation (a) Radioactive decay (b) Newton's law of cooling.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (August –December)

Department	Physics	Semester	First semester
Subject	Mechanics	Credit	6
Course		Paper No	PHY-HC-1026
Remarks		Marks	100

Unit	Course Content	Allotted to	Hours	Month	Date
Unit I: Fundamentals of Dynamics	Reference frames. Inertial frames; Review of Newton's Laws of Motion. Galilean transformations; Galilean invariance. Momentum of variable mass system: motion of rocket. Motion of a projectile in Uniform gravitational field Dynamics of a system of particles. Centre of Mass. Principle of conservation of momentum. Impulse.	Dr. Chandrama Kalita	6	August	From 1/8/2021 to 11/8/2021

Unit II: Work and Energy	Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Potential Energy. Energy diagram. Stable and unstable equilibrium. Elastic potential energy. Force as gradient of potential energy. Work & Potential energy. Work done by non-conservative forces. Law of conservation of Energy.	Mr. Jayanta Deka	4	August	From 12/8/2021 to 18/8/2021
Unit III: Collisions	Elastic and inelastic collisions between particles. Centre of Mass and Laboratory frames.	Dr. Chandrama Kalita	3	August	From 19/8/2021 to 26/8/2021
Unit IV: Rotational Dynamics	Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. Kinetic energy of rotation. Motion involving both translation and rotation.	Mr. Jayanta Deka	12	August and September	From 27/8/2021 to 14/9/2021
Unit V: Elasticity	Relation between Elastic constants. Twisting torque on a Cylinder or Wire. Cantilever.	Dr. Chandrama Kalita	3	September	From 15/9/2021 to 22/9/2021
Unit VI: Fluid Motion	Kinematics of Moving Fluids: Poiseuille's Equation for Flow of a Liquid through a Capillary Tube.	Dr. Chandrama Kalita	2	September	From 23/9/2021 to 27/9/2021

Unit VII: Gravitation and Central Force Motion	Law of gravitation. Gravitational potential energy. Inertial and gravitational mass. Potential and field due to spherical shell and solid sphere. Motion of a particle under a central force field. Two-body problem and its reduction to one- body problem and its solution. The energy equation and energy diagram. Kepler's Laws.	Dr. Chandrama Kalita	8	September and October	From 28/9/2021 to 24/10/2021
Unit VIII: Oscillations	SHM: Simple Harmonic Oscillations. Differential equation of SHM and its solution. Kinetic energy, potential energy, total energy and their time-average values. Damped oscillation. Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor. Compound Pendulum.	Dr. Chandrama Kalita	8	October and November	From 25/10/2021 to 2/11/2021
Unit IX: Non-Inertial Systems	Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of Physics in rotating coordinate systems. Centrifugal force. Coriolis force and its applications.	Mr. Jayanta Deka	4	November	From 4/11/2021 to 8/11/2021
Unit X: Special Theory of Relativity	Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz Transformations. Simultaneity and order of events. Lorentz contraction.	Mr. Jayanta Deka	10	November	From 9/11/2021 to 20/11/2021

	Time dilation. Relativistic transformation of velocity, frequency and wave number. Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy Equivalence. Relativistic Doppler effect. Relativistic Kinematics. Transformation of Energy and Momentum.				
Lab	*A minimum of seven experiments to be done.* 21. Measurements of length (or diameter) using vernier caliper, screw gauge, Spherometer and travelling micro-scope. 22. To study the Motion of Spring and calculate (a) Spring constant and (b) Rigidity modulus. 23. To determine the Moment of Inertia of a cylinder about two different axes of symmetry by torsional oscillation method. 24. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method). 25. To determine the Young's Modulus of the material of a wire by Searle's apparatus. 26. To determine the Modulus of Rigidity	Dr. Chandrama Kalita and Mr. Jayanta Deka	15	November and December	From 21/11/21 to 7/12/2021

	of a Wire Static method. 27. To determine the value of g using Bar Pendulum. 28. To determine the value of g using Kater's Pendulum. 29. To determine the height of a building using a Sextant. 30. To determine g and velocity for a freely falling body using Digital Timing Technique				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (August –December)

Department	Physics	Semester	First semester
Subject	Mechanics	Credit	6
Course		Paper No	PHY-HG/RC-1016
Remarks		Marks	100

Unit	Course Content	Allotted to	Hours	Month	Date
Unit I : Vectors	Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter. Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coeffcients	Dr. Utpala Baishya	6	August	From 1/8/2021 to 9/8/2021
Unit II : Laws of	Frames of reference. Newton's Laws of motion.	Mr. Jayanta Deka	10	August	From 10/8/2021

Motion	Dynamics of a system of particles. Centre of Mass.				to 23/8/2021
Unit III : Momentum and Energy	Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets.	Dr. Chandrama Kalita	6	August	From 24/8/2021 to 31/8/2021
Unit IV : Rotational Motion	Angular velocity and angular momentum. Torque. Conservation of angular momentum	Dr. Chandrama Kalita	5	September	From 1/9/2021 to 6/9/2021
Unit V : Gravitation	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). Kepler's Laws (statement only).	Mr. Jayanta Deka	7	September	From 7/9/2021 to 17/9/2021
Unit VI : Oscillations	Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations. Compound pendulum.	Mr. Jayanta Deka	7	September	From 18/9/2021 to 28/9/2021
Unit VII : 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 – Work done in stretching and work done in twisting a wire – Twisting couple on a cylinder – Determination of Rigidity modulus by static torsion - Torsional	Dr. Chandrama Kalita	8	September and October	From 29/9/2021 to 20/10/2021

	pendulum-Determination of Rigidity modulus and moment of inertia – q, η and σ by Searles method.				
Unit VIII : Special Theory of Relativity	Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.	Dr. Utpala Baishya	7	October and November	From 21/10/2021 to 1/11/2021
Lab	*A minimum of five experiments to be done.* 17. Measurements of length (or diameter) using vernier caliper, screw gauge and Spherometer. 18. To determine the Moment of Inertia of a Symmetrical body about an axis by torsional oscillation method. 19. To determine the Young's Modulus of the material of a wire by Searle's apparatus. 20. To determine the Modulus of Rigidity of a Wire Static method. 21. To determine the elastic Constants of a wire by Searle's method. 22. To determine the value of g using Bar Pendulum. 23. To determine the value of g using Kater's Pendulum. 24. To study the Motion of Spring and calculate (a) Spring	Dr. Chandrama Kalita and Mr. Jayanta Deka	16	November	From 2/11/2021 to 20/11/2021

	constant and (b) value of g.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (August –December)

Department	Physics	Semester	Third semester
Subject	Mathematical Physics II	Credit	6
Course		Paper No	PHY-HC-3016
Remarks		Marks	100

Unit	Course conent	Allotted to	Hours	Month	Date
Unit I: Frobenius Method and Special Functions	Singular Points of Second Order Linear Differential Equations and their importance. Frobenius method and its applications to differential equations. Legendre, Hermite and Laguerre Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Generating Function, Orthogonality. Simple recurrence relations. Expansion of function in a series of Legendre Polynomials.	Dr. Utpala Baishya	18	August	From 1/08/21 to 23/08/21
Unit II: Partial Differential Equations	Solutions to partial differential equations, using separation of variables: Laplace's Equation in problems of rectangular, cylindrical	Dr. Utpala Baishya	14	August and September	From 24/08/21 to 9/09/21

	and spherical symmetry. Wave equation and its solution for vibrational modes of a stretched string, rectangular and circular membranes. Diffusion Equation.				
Unit III: Some Special Integrals	Beta and Gamma Functions and Relation between them. Expression of Integrals in terms of Gamma Functions.	Dr. Utpala Baishya	4	September	From 10/09/21 to 16/09/21
Unit IV: Matrix	Matrix algebra using index notation, Properties of matrices, Special matrix with their properties: Transpose matrix, complex conjugate matrix, Hermitian matrix, Anti-Hermitian matrix, special square matrix, unit matrix, diagonal matrix, co-factor matrix, adjoint of a matrix, self- adjoint matrix, symmetric matrix, anti-symmetric matrix, unitary matrix, orthogonal matrix, trace of a matrix, inverse matrix. Determinant, Rank, Eigen value, Eigen vector and diagonalisation of matrix.		15	September and October	From 17/09/21 to 4/10/21
Unit V: Fourier Series	Periodic functions. Orthogonality of sine and cosine functions, Dirichlet Conditions (Statement only). Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coeffcients. Complex representation of Fourier series. Expansion of functions with arbitrary period. Application to square and triangular waves.	Dr. Utpala Baishya	9	October	From 5/10/21 to 25/10/21
Lab	The aim of this Lab is to use the computational methods to solve physical problems. Course will consist of lectures (both theory and practical) in the Lab. Evaluation done not on the programming but on the basis of formulating the	Dr. Utpala Baishya	15	October and November	From 26/10/21 to 15/11/21

	problem. Introduction to Numerical computation softwares Introduction to Scilab/Mathematica/Matlab/Python, Advantages and disadvantages, Scilab / Mathematica / Matlab/ Python environment, Command window, Figure window, Edit window, Variables and arrays, Initialising variables in Scilab / Mathematica / Matlab/ Python, Multidimensional ar- rays, Subarray, Special values, Displaying output data, data file, Scalar and array operations, Hierarchy of operations, Built in Scilab / Mathematica / Matlab/Python functions, Introduction to plotting, 2D and 3D plotting. Curve fttting, Least square fit, Goodness of fit, standard deviation Ohms law to calculate R, Hooke's law to calculate spring constant. Solution of Linear system of equations Solution of Linear system of equations by Gauss elimination method and Gauss Seidal method. Diagonalisation of matrices, Inverse of a matrix, Eigen vectors, eigenvalues prob- lems. Solution of mesh equations of electric circuits (3 meshes) Solution of coupled spring mass systems (3 masses). Generation of Special functions Generation of Special functions using User defined functions in Scilab / Math- ematica / Matlab. Generating and plotting Legendre Polynomials Generating and plotting Hermite function. First order ODE Solution of first order Differential equation Euler, modified Euler and Runge-Kutta				

	second order methods. First order differential equation (a) Current in RC, LC circuits with DC source (b) Classical equations of motion. Second order ODE Second order differential equation. Fixed difference method. Second order Differential Equation Harmonic oscillator (no friction) (b) Damped Harmonic oscillator (c) Over damped (d) Critical damped. Partial Differential Equation (PDE) Solution of Partial Differential Equation: (a) Wave equation (b) Heat equation.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (August –December)

Department	Physics	Semester	Third semester
Subject	Thermal Physics	Credit	6
Course		Paper No	PHY-HC-3026
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: *Zeroth and First Law of Thermodynamics*	Extensive and intensive Thermodynamic Variables, Thermodynamic Equilibrium, Zeroth Law of Thermodynamics & Concept of Temperature, Concept of Work & Heat, State Functions, First Law of Thermodynamics and its differential form, Internal	Dr. Chandrama Kalita	8	August	From 1/08/21 to 10/08/21

	Energy, First Law & various processes, Applications of First Law: General Relation between C_P and C_V, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Coefficient.				
Unit II: *Second Law of Thermodynamics*	Reversible and Irreversible process with examples. Conversion of Work into Heat and Heat into Work. Heat Engines. Carnot's Cycle, Carnot engine & effciency. Refrigerator & coeffcient of performance, 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Carnot's Theorem. Applications of Second Law of Thermodynamics: Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale.	Dr. Chandrama Kalita	10	August	From 11/08/21 to 24/08/21
Unit III: *Entropy*	Concept of Entropy, Clausius Theorem. Clausius Inequality, Second Law of Thermodynamics in terms of Entropy. Entropy of a perfect gas. Principle of Increase of Entropy. Entropy Changes in Reversible and Irreversible processes with examples.	Dr. Chandrama Kalita	7	August and September	From 25/08/21 to 3/09/21

	Entropy of the Universe. Entropy Changes in Reversible and Irreversible Processes. Principle of Increase of Entropy. Temperature–Entropy diagrams for Carnot's Cycle. Third Law of Thermodynamics. Unattainability of Absolute Zero.				
Unit IV: *Thermodynamic Potentials*	Thermodynamic Potentials: Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy. Their Definitions, Properties and Applications. Surface Films and Variation of Surface Tension with Temperature. Magnetic Work, Cooling due to adiabatic demagnetization, First and second order Phase Transitions with examples, Clausius Clapeyron Equation and Ehrenfest equations.	Dr. Chandrama Kalita	7	September	From 4/09/21 To 15/09/21
Unit V: *Maxwell's Thermodynamic Relations*	Derivations and applications of Maxwell's Relations, Maxwell's Relations:(1) Clausius Clapeyron equation, (2) Values of C_p-C_v, (3) TdS Equations, (4) Joule-Kelvin coefficient for Ideal and Van der Waal Gases, (5) Energy equations, (6) Change of Temperature during Adiabatic Process.	Dr. Chandrama Kalita	7	September	From 16/09/21 to 23/09/21

Unit VI: *Distribution of Velocities*	Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and its Experimental Verification. Doppler Broadening of Spectral Lines and Stern's Experiment. Mean, RMS and Most Probable Speeds. Degrees of Freedom. Law of Equipartition of Energy (No proof required). Specific heats of Gases.	Dr. Chandrama Kalita	7	September and October	From 24/09/21 to 7/10/21
Unit VII: *Molecular Collisions*	Mean Free Path. Collision Probability. Estimates of Mean Free Path. Transport Phenomenon in Ideal Gases: (1) Viscosity, (2) Thermal Conductivity and (3) Diffusion. Brownian Motion and its Significance.	Dr. Chandrama Kalita	4	October	From 8/10/21 to 22/10/21
Unit VIII: *Real Gases*	Behaviour of Real Gases: Deviations from the Ideal Gas Equation. The Virial Equation. Andrew's Experiments on CO2 Gas. Critical Constants. Continuity of Liquid and Gaseous State. Vapour and Gas. Boyle Temperature. Van der Waal's Equation of State for Real Gases. Values of Critical Constants. Law of Corresponding States. Comparison with Experimental Curves. P-V Diagrams. Joule's Experiment. Free Adiabatic Expansion of a Perfect Gas. Joule- Thomson Porous Plug Experiment. Joule- Thomson Effect for Real and Van der Waal Gases. Temperature of Inversion. Joule-Thomson Cooling.	Dr. Chandrama Kalita	10	October and November	From 23/10/21 to 8/11/21

Lab	8. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method. 9. To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus. 10. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method. 11. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method. 12. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT). 13. To study the variation of Thermo-emf of a Thermocouple with Difference of Temperature of its Two Junctions. 14. To calibrate a thermocouple to measure temperature in a specified Range using (1) Null Method, (2) Direct measurement using Op-Amp difference amplifier and to determine Neutral Temperature	Dr. Chandrama Kalita	14	November	From 9/11/21 to 25/11/21

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (August –December)

Department	Physics	Semester	Third semester
Subject	Digital Systems & Applications	Credit	6
Course		Paper No	PHY-HC-3036
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Introduction to CRO	Block Diagram of CRO. Electron Gun, Deflection System and Time Base. Deflection Sensitivity. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference.	Mr. Jayanta Deka	3	August	From 1/08/21 to 4/08/21
Unit II: Integrated Circuits (qualitative treatment only)	Active & Passive components. Discrete components. Wafer. Chip. Advantages and drawbacks of ICs. Scale of integration: SSI, MSI, LSI and VLSI (basic idea and definitions only). Classification of ICs. Examples of Linear and	Mr. Jayanta Deka	3	August	From 5/08/21 to 10/08/21

	Digital lCs.				
Unit III: Digital Circuits	Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion. BCD, Octal and Hexadecimal numbers. AND, OR and NOT Gates (realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates.	Mr. Jayanta Deka	6	August	From 11/08/21 to 20/08/21
Unit IV: Boolean Algebra	De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Idea of Minterms and Maxterms. Conversion of a Truth table into Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map.	Mr. Jayanta Deka	6	August	From 21/08/21 to 30/08/21
Unit V: Data Processing Circuits	Basic idea of Multiplexers, De-multiplexers, Decoders, Encoders.	Mr. Jayanta Deka	4	August and September	From 31/08/21 to 6/09/21
Unit VI: Arithmetic Circuits	Binary Addition. Binary Subtraction using 2's Complement. Half and Full Adders. Half & Full	Mr. Jayanta Deka	5	September	From 7/09/21 to 13/09/21

	Subtractors, 4-bit binary Adder/Subtractor.				
Unit VII: Sequential Circuits	SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race- around conditions in JK Flip-Flop. M/S JK Flip-Flop.	Mr. Jayanta Deka	6	September	From 14/09/21 to 26/09/21
Unit VIII: Timers:	Block diagram and applications: Astable multivibrator and Monostable multivibrator.	Mr. Jayanta Deka	3	September	From 27/09/21 to 31/09/21
Unit IX: Shift Registers	Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to4 bits).	Mr. Jayanta Deka	2	October	From 1/10/21 to 5/10/21
Unit X: Counters	Ring Counter, Asynchronous counters, Decade Counter. Synchronous Counter.	Mr. Jayanta Deka	4	October	From 6/10/21 to 21/10/21
Unit XI: Computer Organization	Input/Output Devices. Data storage (idea of RAM and ROM). Computer memory. Memory organization & addressing.	Mr. Jayanta Deka	6	October and November	From 22/10/21 to 1/11/21
Unit XII: Intel 8085 Microproces sor Architecture	Main features of 8085. Block diagram. Components. Pin-out diagram. Buses. Registers. ALU. Memory. Stack memory. Timing &	Mr. Jayanta Deka	8	November	From 2/11/21 to 12/11/21

	Control circuitry.				
Unit XIII: Introduction to Assembly Language	1 byte, 2 byte, & 3 byte instructions.	Mr. Jayanta Deka	4	November and December	From 13/11/21 to 19/11/21
Lab	*A minimum of eight experiments to be done.* 16. To measure (a) Voltage, and (b) Time period of a periodic waveform using CRO. 17. To test a Diode and Transistor using a Multimeter. 18. To design a switch (NOT gate) using a transistor. 19. To verify and design AND, OR, NOT and XOR gates using NAND gates. 20. To design a combinational logic system for a specified Truth Table. 21. To convert a Boolean expression into logic circuit and design it using logic gate ICs. 22. Half Adder, Full Adder and 4-bit binary Adder. 23. Half Subtractor, Full Subtractor, Adder-Subtractor using Full Adder IC. 24. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.	Mr. Jayanta Deka	16		From 20/11/21 to 5/12/21

	25. To build JK Master-slave flip-flop using Flip-Flop ICs . 26. To build a 4-bit Counter using D-type/JK Flip-Flop ICs and study timing diagram. 27. To make a 4-bit Shift Register (serial and parallel) using D-type/JK Flip-Flop ICs. 28. To design an astable multivibrator of given specifications using 555 Timer. 29. To design a monostable multivibrator of given specifications using 555 Timer. 30. Write the following programs using 8085 Microprocessor (a) Addition and subtraction of numbers using direct addressingmode (b) Addition and subtraction of numbers using indirect addressin gmode (c) Multiplication by repeated addition (d) Division by repeated subtraction (e) Handling of 16-bit Numbers (f) Use of CALL and RETURN Instruction (g) Block data				

	handling				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (August –December)

Department	Physics	Semester	Third semester
Subject	Thermal Physics & Statistical Mechanics	Credit	6
Course		Paper No	PHY-HG/RC-3016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I : Laws of Thermodynamics	Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between CP & CV , Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient, Reversible & irreversible processes, Second law & Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible	Mr. Jayanta Deka	22	August	From 1/8/21 to 28/8/21

	processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.				
Unit II : Thermodynamic Potentials	Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations & applications - Joule-Thompson Effect, Clausius- Clapeyron Equation, Expression for (C_P — C_V), C_P/C_V , TdS equations.	Dr. Utpala Baishya	10	August and Septemb er	From 30/8/21to 13/9/21
Unit III : Kinetic Theory of Gases	Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, 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.	Dr. Utpala Baishya	10	Septemb er	From 14/9/21 to 27/9/21
Unit IV : Theory of Radiation	Blackbody radiation, Spectral distribution, 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.	Dr. Chandram a Kalita	6	Septemb er and October	From 25/9/21 to 4/10/21
Unit V : Statistical Mechanics	Phase space, Macrostate and Microstate, Entropy and Thermodynamic probability, Maxwell-Boltzmann law - dis- tribution of velocity –	Dr. Chandram a Kalita	12	October and Novemb er	From 5/10/21 to 30/10/21

	Quantum statistics – Fermi-Dirac distribution law – electron gas – Bose-Einstein distribution law – photon gas – comparison of three statistics.				
Lab	11. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method. 12. Measurement of Planck's constant using black body radiation. 13. To determine Stefan's Constant. 14. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus. 15. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method. 16. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method. 17. To determine the temperature co-efficient of resistance by	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	20	November	From 1/11/21 to 30/11/21

	Platinum resistance thermometer. 18. To study the variation of thermo emf across two junctions of a thermocouple with temperature. 19. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system. 20. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (August –December)

Department	Physics	Semester	Third semester
Subject	Digital Photography & Editing	Credit	4
Course		Paper No	PHY-SE-3044
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Theory of Basic Photography	History of Photography, Introduction to Digital Photography, Digital Camera, dSLR, Advantages and Disadvantages of Digital Photography	Mr. Jayanta Deka	2	August	From 1/8/21 to 16/8/21
Unit II: The Camera-Components and Concepts	Lens, Focal Length, Lens type, Aperture, Depth of Field, Shutter, Shutter Speed, Image sensor, Memory cards, External Flash, File types	Dr. Chandrama Kalita	2	August	From 17/8/21 to 30/8/21
Unit III: Capturing an Image, Hands-on Basics	Elements of Composition: Pattern, Symmetry, Texture, Depth of Field, Lines; Law of Thirds, Camera Shake, Red eye, Lighting, Digital Noise	Dr. Chandrama Kalita	3	August and September	From 31/8/21 to 13/9/21
Unit IV: Exposure	Automatic mode, Manual	Dr. Chandrama	5	September and	From 14/9/21

Modes	mode, aperture mode, shutter mode, Scene mode, Portrait mode, landscape mode, close upmode, sports mode, Twilight mode, Night Mode, Black and white, sepia, Panoramic mode.	Kalita		October	to 22/10/21
Unit V: Conditions in Digital Photography	Lighting, Importance of Natural Light, Best Time of Day to Take Photos, Disable Flash Indoors, Disable Flash in Low Light, Use Flash to Balance Bright Light, Get Closer to the Subject, Crop Your Photo, Choose Better Backgrounds, Pick Proper Orientation, Use Point of View, Frame your Subject, Experiment with Abstract Photography, Holding your DSLR	Dr. Utpala Baishya	7	October and November	From 23/10/21 to 12/11/21
Unit VI: Digital Videography	Various Parts, Contrl and Features of Video Camera, Types of daylight applications, Three points lighting- (a) The key light, (b) The fill light and the back light, (c) Bounce and diffuse light, Framing and shots, Camera angle and camera movements	Dr. Utpala Baishya	4	November	From 13/11/21 to 17/11/21
Unit VII: Post Production	The Digital Workflow: Capturing the Image, Storing the Photo, Cataloging the Image Files,	Mr. Jayanta Deka	7	November	From 18/11/21 to

	Editing the Photo, Sharing, Archiving and Backing Up the Photograph				30/11/21

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (August –December)

Department	Physics	Semester	Fifth semester
Subject	Quantum Mechanics & Applications	Credit	6
Course		Paper No	PHY-HC-5016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Time Dependent Schrödinger Equation	Time dependent Schrödinger equation and dynamical evolution of a quantum state, properties of wave function. Interpretation of wave function. Probability and probability current densities in three dimensions. Conditions for physical acceptability of wave functions. Normalization. Linearity and Superposition Principles. Eigenvalues and eigenfunctions. Position, momentum and	Dr. Chandrama Kalita,	6	August	From 1/8/21 to 9/8/21

	energy operators; commutator of position and momentum operators. Expectation values of position and momentum. wave function of a free particle.				
Unit II: Time Independen t Schrödinger Equation	Hamiltonian, stationary states and energy eigenvalues; expansion of an arbitrary wave function as a linear combination of energy eigenfunctions; General solution of the time dependent Schrödinger equation in terms of linear combinations of stationary states; Application to spread of Gaussian wave-packet for a free particle in one dimension; wave packets, Fourier transforms and momentum space wave function; Position-momentum uncertainty principle.	Dr. Utpala Baishya ,	10	August	From 10/8/21 to 23/8/21
Unit III: Bound States	Continuity of wave function, boundary condition and emergence of discrete energy levels; application to one-dimensional problem-square well potential; Quantum mechanics of	Mr. Jayanta Deka	12	August and September	From 24/8/21 to 6/9/21

	simple harmonic oscillator- energy levels and energy eigenfunctions using Frobenius method; Hermite polynomials; ground state, zero point energy & uncertainty principle.				
Unit IV: Hydrogen-like Atoms	Time independent Schrödinger equation in spherical polar coordinates; separation of variables for second order partial differential equation; angular momentum operator & quantum numbers; Radial wave functions from Frobenius method; shapes of the probability densities for ground & first excited states; Orbital angular momentum quantum numbers l and m; s, p, d, … shells.	Dr. Chandrama Kalita,	10	September	From 7/9/21 to 20/9/21
Unit V: Atoms in Electric & Magnetic	Electron angular momentum. Space quantization. Electron Spin and Spin Angular Momentum. Larmor's Theorem. Spin Magnetic Moment. Stern-Gerlach Experiment. Electron Magnetic Moment and Magnetic Energy, Gyromag- netic Ratio and Bohr Magneton. Zeeman	Dr. Utpala Baishya ,	12	September and October	From 21/9/21 to 21/10/21

	Effect: Normal and Anomalous Zeeman Effect. Paschen-Back Effect and Stark Effect (Qualitative Discussion only).				
Unit VI: Many Electron Atoms	Pauli’s Exclusion Principle. Symmetric & Antisymmetric W ave Functions. Periodic table. Fine structure. Spin orbit coupling. Spectral Notations for Atomic States. Total angular momentum. Vector Model. Spin-orbit coupling in atoms: L − S and j − j couplings. Hund’s Rule. Term symbols. Spectra of Hydrogen and Alkali Atoms (Na etc.).	Mr. Jayanta Deka	10	October and November	From 22/10/21 to 2/11/21
Lab	*Use C/C++/Scilab/FORTRAN/Mathematica/ Python for solving the following problems based on Quantum Mechanics* 1. Solve the s-wave Schrödinger equation for the ground state and the first excited state of the hydrogen atom $\frac{d^2y}{dr^2} = A(r)u(r), A(R)$ $A(r) = \frac{2m}{\hbar^2}[V(r) - E]$ $Where\ V(r) = -\frac{e^2}{r}$ 2. Solve the s-wave radial	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	12	November	From 3/11/21 to 20/11/21

		Schrödinger equation for an atom $\frac{d^2y}{dr^2} = A(r)u(r),$ $A(r) = \frac{2m}{\hbar^2}[V(r) - E]$ Where *m* is the reduced mass of the system (which can be chosen to be the mass of an electron), for the screened Coulomb potential V(r) $=-\frac{e^2 e^{-r/a}}{r}$ Find the energy (in eV) of the ground state of the atom to an accuracy of three significant digits. Also, plot the corresponding wave function. Take *e*=3.795 (eVÅ), and *a*=3 Å, 5 Å, and 7 Å in the units of ħ*c* = 1973(eVÅ) and *m* = 0.511×10^6 eV/c^2. The ground state energy is expected to be above -12 eV in all three cases. 3. Solve the *s*-wave radial Schrödinger equation for a particle of mass *m*				

	$\frac{d^2y}{dr^2} = A(r)u(r), A(R)$ $A(r) = \frac{2m}{\hbar^2}[V(r) - E]$ The anharmonic potential $V(r) = \frac{1kr^2}{2} + \frac{1b}{3}r^3$ for the ground state energy (in MeV) of particle to an accuracy of three significant digits. Also, plot the corresponding wave function. Choose m=940 MeV/c^2, k=100 MeV fm^{-2}, b=0, 10, 30 MeV fm^{-3}. In these units, cħ=197.3 MeV fm. The ground state energy I is expected to lie in between 90 and 110 MeV for all three cases. 4. Solve the *s*-wave radial Schrödinger equation for the vibration of hydrogen molecule $\frac{d^2y}{dr^2} = A(r)u(r),$ $A(r) = \frac{2\mu}{\hbar^2}[V(r) - E]$				

	where μ is the reduced mass of the two-atom system for the Morse potential $V(r) = D(e^{-2\alpha r} - e^{-\alpha r})$ $r^{/} = \frac{r - r_0}{r}$ Find the lowest vibrational energy (in MeV) of the molecule to an accuracy of thee significant digits. Also plot the corresponding wave function. Take m=940×10^6 eV/c^2, D= 0.755501 eV, α=1.44, and r_0=0.131349 Å.				

TEACHING PLAN

DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (August –December)

Department	Physics	Semester	Fifth semester
Subject	Solid State Physics	Credit	6
Course		Paper No	PHY-HC-5026
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Crystal Structure	Amorphous and Crystalline Materials. Lattice Translation Vectors. Symmetry operations, Lattice with a Basis - Central and Non-Central Elements. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Diffraction of X-rays by Crystals. Bragg's Law. Atomic and Geometrical Factor.	Dr. Chandrama Kalita,	10	August	From 1/8/21 to 12/8/21
Unit II: Elementary Lattice Dynamics	Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Qualitative Description of the Phonon Spectrum in Solids. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T^3 law.	Dr. Utpala Baishya ,	10	August	From 13/8/21 to 31/8/21

Unit III: Magnetic Properties of Matter	Dia, Para, Ferri, and Ferromagnetic Materials. Classical Langevin Theory of Dia and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromag- netic Domains. Discussion of B – H Curve. Hysteresis and Energy Loss.	Mr. Jayanta Deka	8	September	From 1/9/21 to 9/9/21
Unit IV: Dielectric Properties of Materials	Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion. Cauchy and Sellmeir relations. Langevin-Debye equation. Complex Dielectric Constant. Optical Phenomena. Application: Plasma Oscillations, Plasma Frequency, Plasmons, T_0 modes.	Dr. Chandrama Kalita,	8	September	From 10/9/21 to 20/9/21
Unit V: Ferroelectric Properties of Materials	Structural phase transition, Classification of	Dr. Utpala Baishya ,	6	September	From 21/9/21 to 30/9/21

	crystals, Piezoelectric effect, Pyroelectric effect, Ferroelectric effect, Electrostrictive effect, Curie-Weiss Law, Ferroelectric domains, *PE* hysteresis loop.				
Unit VI: Free Electron Theory of Metals	Electrical and thermal conductivity of metals, Wiedemann-Franz law. Elementary band theory: Kronig Penny model. Band Gap. Conductor, Semiconductor (*P* and *N* type) and insulator. Conductivity of Semiconductor, mobility, Hall Effect. Measurement of conductivity (4-probe method) & Hall coefficient.	Mr. Jayanta Deka	12	October	From 1/10/21 to 25/10/21
Unit VII: Superconductivity	Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Super-conductors, London's Equation	Dr. Chandrama Kalita,	6	October and November	From 26/10/21 to 1/11/21

	and Penetration Depth. Isotope effect. Idea of BCS theory (No derivation).				
Lab	*A minimum of five experiments to be done.* 1. Measurement of susceptibility of paramagnetic solution (Quinck's Tube Method). 2. To measure the Magnetic susceptibility of Solids. 3. To determine the Coupling Coeffcient of a Piezoelectric crystal. 4. To measure the Dielectric Constant of a dielectric Materials with frequency. 5. To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR). 6. To determine the refractive index of a dielectric layer using SPR. 7. To study the *PE* Hysteresis loop of a Ferroelectric Crystal. 8. To draw the B – H curve of Fe using Solenoid & determine energy loss from Hysteresis. 9. To measure the	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	15	November	From 2/11/21 to 25/11/21

	resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150 °C) and to determine its band gap. 10. To determine the Hall coeffcient of a semiconductor sample.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (August –December)

Department	Physics	Semester	Fifth semester
Subject	Experimental Techniques	Credit	6
Course		Paper No	PHY-HE-5016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Measurements	Accuracy and precision. Significant figures. Error and uncertainty analysis. Types of errors: Gross error, systematic error, random error. Statistical analysis of data (Arithmetic mean, deviation from mean, average deviation, standard deviation, chi-	Dr. Chandrama Kalita,	7	August	From 1/8/21 to 13/8/21

	square) and curve fitting.				
Unit II: Signals and Systems	Periodic and aperiodic signals. Impulse response, transfer function and frequency response of first and second order systems. Fluctuations and Noise in measurement system. S/N ratio and Noise figure. Noise in frequency domain. Sources of Noise: Inherent fluctuations, Thermal noise, Shot noise, 1/f noise.	Dr. Chandrama Kalita,	7	August	From 14/8/21 to 25/8/21
Unit III: Shielding and Grounding	Unit IV: Transducers & industrial instrumentation (working Methods of safety grounding. Energy coupling. Grounding. Shielding:Electrostatic shielding. Electromagnetic Interference Shielding.	Dr. Utpala Baishya ,	4	August and September	From 26/8/21 to 1/9/21
Unit IV: principle, efficiency, applications	Static and dynamic characteristics of measurement Systems. Generalized performance of systems, Zero order first order, second order and higher order systems. Electrical, Thermal and Mechanical systems.	Dr. Utpala Baishya ,	21	September	From 2/9/21 to 30/9/21

	Calibration. Transducers and sensors. Characteristics of Transducers. Transducers as electrical element and their signal conditioning. Temperature transducers: RTD, Thermistor, Thermocouples, Semiconductor type temperature sensors (AD590, LM35, LM75) and signal conditioning. Linear Position transducer: Strain gauge, Piezoelectric. Inductance change transducer: Linear variable differential transformer (LVDT), Capacitance change transducers.				
Unit V: Digital Multimeter	Comparison of analog and digital instruments. Block diagram of digital multimeter, principle of measurement of I, V, C. Accuracy and resolution of measurement.	Mr. Jayanta Deka	5	October	From 1/10/21 to 21/10/21
Unit VI: Impedance Bridges and Q-meter	Block diagram and working principles of RLC bridge. Qmeter and its working operation. Digital LCR bridge.	Mr. Jayanta Deka	4	October	From 22/10/21 to 27/10/21
Unit VII: Vacuum Systems	Characteristics of vacuum: Gas law, Mean free path. Application of	Mr. Jayanta Deka	12	October and November	From 28/10/21 to

	vacuum. Vacuum system- Chamber, Mechanical pumps, Diffusion pump & Turbo Modular pump, Pumping speed, Pressure gauges (Pirani, Penning, ionization).				12/11/21
Lab	*(Minimum number of experiments to be completed is seven)* 1. Determine output characteristics of a LVDT & measure displacement using LVDT 2. Measurement of Strain using Strain Gauge. 3. Measurement of level using capacitive transducer. 4. To study the characteristics of a Thermostat and determine its parameters. 5. Study of distance measurement using ultrasonic transducer. 6. Calibrate Semiconductor type temperature sensor (AD590, LM35, or LM75) 7. To measure the change in temperature of ambient using Resistance Temperature Device (RTD). 8. Create vacuum in a small chamber using a mechanical	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	20	November	From 13/11/21 to 30/11/21

	(rotary) pump and measure the chamber pressure using a pressure gauge. 9. Comparison of pickup of noise in cables of different types (co-axial, single shielded, double shielded, without shielding) of 2m length, understanding of importance of grounding using function generator of mV level & an oscilloscope. 10. To design and study the Sample and Hold Circuit. 11. Design and analyze the Clippers and Clampers circuits using junction diode 12. To plot the frequency response of a microphone. 13. To measure Q of a coil and influence of frequency, using a Q-meter				

SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (August –December)

Department	Physics	Semester	Fifth semester
Subject	Nuclear and Particle Physics	Credit	6
Course		Paper No	PHY-HE-5056
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Months	Date
Unit I: General Properties of Nuclei	Constituents of nucleus and their Intrinsic properties, quantitative facts about mass, radii, charge density (matter density), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/A plot, angular momentum, parity, magnetic moment, electric moments, nuclear excites states.	Dr. Chandrama Kalita,	10	August	From 1/8/21 to 13/8/21
Unit II: Nuclear Models	Liquid drop model approach, semi empirical mass formula and significance of its various terms, condition of nuclear stability, two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers,	Dr. Chandrama Kalita,	12	August	From 14/8/21 to 31/8/21

	basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force.				
Unit III: Radioactivity decay	(a) Alpha decay: basics of α-decay processes, theory of α- emission, Gamow factor, Geiger Nuttall law, α-decay spectroscopy. (b) -decay: energy kinematics for -decay, positron emission, electron capture, neutrino hypothesis. (c) Gamma decay: Gamma rays emission & kinematics, internal conversion.	Dr. Utpala Baishya ,	10	September	From 1/9/21 to 14/9/21
Unit IV: Nuclear *Reactions*	Types of Reactions, Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct Reaction, resonance reaction, Coulomb scattering (Rutherford scattering).	Dr. Utpala Baishya ,	8	September	From 15/9/21 to 24/9/21
Unit V: Interaction of Nuclear Radiation with matter	Energy loss due to ionization (Bethe- Block formula), energy loss of electrons, Cerenkov radiation. Gamma ray interaction through matter, photoelectric effect, Compton scattering, pair production, neutron interaction with matter.	Mr. Jayanta Deka	8	September and October	From 25/9/21 to 8/10/21

Unit VI: Detector for Nuclear Radiations	Gas detectors: estimation of electric field, mobility of particle, for ionization chamber and GM Counter. Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT). Semiconductor Detectors (Si and Ge) for charge particle and photon detection (concept of charge carrier and mobility), neutron detector.	Mr. Jayanta Deka	8	October	From 9/10/21 to 29/10/21
Unit VII: Particle Accelerators	Accelerator facility available in India: Van-de Graaff generator (Tandem accelerator), Linear accelerator, Cyclotron, Synchrotrons.	Dr. Utpala Baishya ,	5	October and November	From 30/10/21 to 5/11/21
Unit VIII: Particle physics	Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model, color quantum number and gluons.	Mr. Jayanta Deka	14	November	From 6/11/21 to 25/11/21

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (August –December)

Department	Physics	Semester	Fifth semester
Subject	WEATHER FORECASTING	Credit	4
Course		Paper No	PHY-SE-5014
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Introduction to atmosphere	Elementary idea of atmosphere: physical structure and composition; compositional layering of the atmosphere; variation of pressure and temperature with height; air temperature; requirements to measure air temperature; atmospheric pressure: its measurement; atmospheric boundary layer and its characteristics; atmospheric convection and inversion; introduction to numerical weather prediction systems.	Dr. Chandrama Kalita,	9	August	From 1/8/21 to 20/8/21
Unit II: Measuring the weather	Wind; forces acting to produce wind; measurement of wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere; radiation laws.	Dr. Utpala Baishya ,	4	August and September	From 21/8/21 to 1/9/21
Unit III: Weather	Global wind systems; air masses and fronts:	Dr. Utpala	3	September	From 2/9/21

systems	classifications; jet streams; local thunderstorms; tropical cyclones: classification; tornadoes; hurricanes, Indian summer monsoon.	Baishya ,			to 10/9/21
Unit IV: Climate and Climate Change	Climate: its classification; causes of climate change; global warming and its outcomes; air pollution; aerosols, ozone depletion, acid rain, environmental issues related to climate.	Dr. Utpala Baishya ,	6	September	From 11/9/21 to 20/9/21
Unit V: Basics of weather forecasting	Weather forecasting: analysis and its historical background; need of measuring weather; types of weather forecasting; weather forecasting methods; criteria of choosing weather station; basics of choosing site and exposure; satellites observations in weather forecasting; weather maps; uncertainty and predictability; probability forecasts.	Mr. Jayanta Deka	8	September and October	From 21/9/21 to 21/10/21
Lab	1. Study of synoptic charts & weather reports, working, principle of weather station. 1. Processing and analysis of weather data (a) To calculate the sunniest time of the year. (b) To study the variation of rainfall amount and intensity by wind direction. (c) To observe the sunniest/driest day of the week.	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	8	October and November	From 22/10/21 to 15/11/21

	(d) To examine the maximum and minimum temperature throughout the year. (e) To evaluate the relative humidity of the day. (f) To examine the rainfall amount month wise. 2. Exercises in chart reading: Plotting of constant pressure charts, surfaces charts, upper wind charts and its analysis. 3. Formats and elements in different types of weather forecasts/ warning (both aviation and non aviation)				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (January -June)

Department	Physics	Semester	Second semester
Subject	Electricity & Magnetism	Credit	6
Course		Paper No	PHY-HC-2016
Remarks		Marks	100

Unit	Course conent	Allotted to	Hours	Month	Date
Unit I: Electric Field and Electric Potential	Electric field: Electric field lines. Electric flux. Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry. Conservative nature of Electrostatic Field. Electrostatic Potential. Laplace's and Poisson equations. The Unique- ness Theorem. Potential and Electric Field of a dipole. Force and Torque on a dipole. Electrostatic energy of system of charges. Electrostatic energy of a charged sphere. Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Parallel-plate capacitor. Capacitance of an isolated conductor. Method of Images and its application to: (1) Plane Infinite Sheet and (2) Sphere.	Dr. Chandrama Kalita,	26	January and February	From 20/1/22 to 14/2/22
Unit II: Dielectric	Electric Field in matter. Polarization, Polarization	Dr. Utpala Baishya ,	8	February And	From 15/2/22

Properties of Matter (Lectures	Charges. Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector $\vec{D}$. Relations between $\vec{E}$, $\vec{P}$ and $\vec{D}$ Gauss' Law in dielectrics.			March	to 2/3/22
Unit III: Magnetic Field	Magnetic Force on a point charge, definition and properties of magnetic field $\vec{B}$. Curl and Divergence. Vector potential $\vec{A}$. Magnetic Force on (1) a current carrying wire (2) between current elements. Torque on a current loop in a uniform magnetic field. Biot-Savart's law and its simple application : straight wire and circular loop. Current loop as a magnetic dipole and its dipole moment (analogy with electric dipole) Ampere's circuital law and its application to (1) Solenoid (2) Torus.	Dr. Utpala Baishya ,	9	March	From 3/3/22 to 16/3/22
Unit IV: Magnetic Properties of Matter	Magnetization vector ($\vec{M}$). Magnetic Intensity ($\vec{H}$). Magnetic Susceptibility and permeability. Relation between $\vec{B}$, $\vec{H}$, $\vec{M}$. Ferromagnetism. B-H curve and hysteresis.	, Dr. Utpala Baishya ,	4	March	From 17/3/22 to 24/3/22
Unit V: Electromagnetic Induction	Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity	Mr. Jayanta Deka	6	March and April	From 25/3/22 to 5/4/22

	Theorem. Energy stored in a Magnetic Field. Introduction to Maxwell's Equations. Charge Conservation and Displacement current.				
Unit VI: Electrical Circuits	AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) 13 Quality Factor, and (4) Band Width. Parallel LCR Circuit.	Mr. Jayanta Deka	4	April	From 6/4/22 to 11/4/22
Unit VII: Network Theorems	Ideal Constant-voltage and Constant-current Sources. Network Theorems: Thevenin theorem, Norton theorem,Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem. Applications to dc circuits.	Mr. Jayanta Deka	3	April	From 12/4/22 to 20/4/22
Unit VIII: Ballistic Galvanometer	Torque on a current Loop. Ballistic Galvanometer: Current and Charge Sensitivity. Electromagnetic damping. Logarithmic damping. CDR.	Dr. Utpala Baishya ,	3	April	From 21/4/22 to 27/4/22
Lab	*A minimum of seven experiments to be done.* 31. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses. 32. To study the characteristics of a series RC	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	14	April and May	From 28/4/22 to 20/5/22

	Circuit. 33. To determine an unknown Low Resistance using Potentiometer. 34. To determine an unknown Low Resistance using Carey Foster's Bridge. 35. To compare capacitances using De' Sauty's bridge. 36. Measurement of field strength $\vec{B}$ and its variation in a solenoid (determine $\frac{dB}{dx}$). 37. To verify the Thevenin and Norton theorems. 38. To verify the Superposition, and Maximum power transfer theorems. 39. To determine self inductance of a coil by Anderson's bridge. 40. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width. 41. To study the response curve of a parallel LCR circuit and determine its (a) Anti- resonant frequency and (b) Quality factor Q. 42. Measurement of charge and current sensitivity and CDR of Ballistic Galvanometer.					—

	43. Determine a high resistance by leakage method using Ballistic Galvanometer. 44. To determine self-inductance of a coil by Rayleigh's method. 45. To determine the mutual inductance of two coils by Absolute method.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (January –June)

Department	Physics	Semester	Second semester
Subject	Waves & Optics	Credit	6
Course		Paper No	PHY-HC-2026
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Superposition of Collinear Harmonic Oscillations	Linearity and Superposition Principle. Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies (Beats). Superposition of N collinear Harmonic Oscillations with (1) equal phase differences and (2) equal frequency differences.	Dr. Chandrama Kalita,	5	January	From 20/1/22 to 28/1/22
Unit II: Superposition of Two Perpendicular	Graphical and Analytical Methods. Lissajous Figures with equal an unequal frequency and	Dr. Chandrama Kalita,	2	January And February	From 29/1/22 to 1/2/22

Harmonic Oscillations	their uses.				
Unit III: Wave Motion	Plane and Spherical Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves. Wave Equation. Particle and Wave Velocities. Differential Equation. Pressure of a Longitudinal Wave. Energy Transport. Intensity of Wave. Water Waves: Ripple and Gravity Waves.	Dr. Chandrama Kalita,	4	February	From 2/2/22 to8/2/22
Unit IV: Velocity of Waves	Velocity of Transverse Vibrations of Stretched Strings. Velocity of Longitudinal Waves in a Fluid in a Pipe. Newton's Formula for Velocity of Sound. Laplace's Correction.	Dr. Chandrama Kalita,	6	February	From 9/2/22 to17/2/22
Unit V: Superposition of Two Harmonic Waves	Standing (Stationary) Waves in a String: Fixed and Free Ends. Analytical Treatment. Phase and Group Velocities. Changes with respect to Position and Time. Energy of Vibrating String. Transfer of Energy. Normal Modes of Stretched Strings. Plucked and Struck	Dr. Utpala Baishya ,	7	February	From 18/2/22 to 28/2/22

	Strings. Melde's Experiment. Longitudinal Standing Waves and Normal Modes. Open and Closed Pipes. Superposition of N Harmonic Waves.				
Unit VI: Wave Optics	Electromagnetic nature of light. Definition and properties of wave front. Huygens Principle. Temporal and Spatial Coherence.	, Dr. Utpala Baishya ,	3	March	From 2/3/22 To 8/3/22
Unit VII: Interference	Division of amplitude and wavefront. Young's double slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. 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.	Dr. Utpala Baishya ,	9	March	From 9/3/22 to 21/3/22
Unit VIII: Interferometer	Michelson Interferometer- (1) Idea of form of fringes (No theory required), (2)	Mr. Jayanta Deka	4	March	From 22/3/22 to 28/3/22

	Determination of Wavelength, (3) Wavelength Difference, (4) Refractive Index, (5) Visibility of fringes. Fabry-Perot interferometer.				
Unit IX: Diffraction	Fresnel and Fraunhofer diffraction. Fresnel's Half-Period Zones for Plane Wave. Explanation of Rectilinear Propagation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel diffraction pattern of a straight edge and at a circular aperture . Resolving Power of a telescope.	, Mr. Jayanta Deka	9	March and April	From 29/3/22 to 11/4/22
Unit X: Fraunhofer Diffraction	Single slit. Double slit. Multiple slits. Diffraction grating . Resolving power of grating.	Mr. Jayanta Deka	8	April	From 12/4/22 to 28/4/22
Unit XI: Holography	Principle of Holography. Recording and Reconstruction Method. Theory of Holography as Interference between two Plane Waves. Point source holograms.	Mr. Jayanta Deka	3	April and May	From 29/4/22 to 3/5/22
Lab	A minimum of seven	Dr.	16	May	From

	experiments to be done. 1. To determine the frequency of an electric tuning fork by Melde's experiment and verify $\lambda 2 - T$ law. 2. To study Lissajous Figures. 3. Familiarization with: Schuster's focusing, determination of angle of prism. 4. To determine refractive index of the Material of a prism using sodium source. 5. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source. 6. To determine wavelength of sodium light using Fresnel Biprism. 7. To determine wavelength of sodium light using Newton's Rings. 8. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film. 9. To determine wavelength of (1) Na source and (2) spectral	Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka			4/5/22 to 25/5/22

	lines of Hg source using plane diffraction grating. 10. To determine dispersive power and resolving power of a plane diffraction grating.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (January –June)

Department	Physics	Semester	Second semester
Subject	Electricity & Magnetism	Credit	6
Course		Paper No	PHY-HG/RC-2016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I : Vector Analysis	Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only).	Dr. Chandrama Kalita,	12	January and February	From 20/1/22 to 6/2/22
Unit II : Electrostatics	Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications	, Dr. Utpala Baishya ,	22	February and March	From 7/2/22 to 7/3/22

	of Gauss theorem – Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.				
Unit III : Magnetism	Magnetostatics: Biot-Savart's law & its applications – straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia, para, and ferro-magnetic materials.	Dr. Chandrama Kalita,	10	March	From 8/3/22 to 21/3/22

Unit IV : Electromagnetic Induction	Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.	Mr. Jayanta Deka	6	March	From 22/3/22 to 31/3/22
Unit V : Maxwell's Equations and EM Wave	Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.	, Mr. Jayanta Deka	10	April	From 2/4/22 to 19/4/22
Lab	21. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses. 22. Ballistic Galvanometer (a) Measurement of charge and current sensitivity (b) Measurement of CDR (c) Determine a high resistance by Leakage Method (d) To determine Self Inductance of a Coil by Rayleigh's Method. 23. To compare capacitances using De'Sauty's bridge.	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	14	April and May	From 20/4/23 to 16/5/23

	24. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx). 25. To study the Characteristics of a Series RC Circuit. 26. To study the a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor 27. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q . 28. To determine a Low Resistance by Carey Foster's Bridge. 29. To verify the Thevenin and Norton theorem. 30. To verify the Superposition, and Maximum Power Transfer Theorem.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Mathematical Physics III	Credit	6
Course		Paper No	PHY-HC-4016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Complex Analysis	Functions of Complex Variables. Analyticity and Cauchy-Riemann Conditions. Examples of analytic functions. Singular functions: poles and branch points, order of singularity.	Dr. Utpala Baishya ,	10	January and February	From 20/1/22 to 10/2/22
Unit II: Complex Integration	Integration of a function of a complex variable. Cauchys Integral formula. Simply and multiply connected region. Laurent and Taylors expansion. Residues and Residue Theorem with numerical application.	Dr. Utpala Baishya ,	10	February	From 11/2/22 to 24/2/22
Unit III: Fourier Transforms	Fourier Transforms: Fourier Integral theorem. Fourier Transform. Examples. Fourier trans- form of trigonometric, Gaussian functions Representation of Dirac delta function as a Fourier Integral. Fourier transform of derivatives, Inverse Fourier transform,	Dr. Utpala Baishya ,	15	February and March	From 25/2/22 to 21/3/22

	Convolution theorem (Statement only). Properties of Fourier transforms (translation, change of scale, complex conjugation).				
Unit IV: Laplace Transforms	Laplace Transform (LT) of Elementary functions. Properties of LTs: Change of Scale Theorem, Shifting Theorem. LTs of 1st and 2nd order Derivatives and Integrals of Functions, Derivatives and Integrals of LTs. LT of Unit Step function, Dirac Delta function, Periodic Functions. Convolution Theorem (Statement only). Inverse LT. Application of Laplace Transforms to 2nd order Differential Equations: Damped Harmonic Oscillator.	Dr. Utpala Baishya ,	15	March and April	From 22/3/22 to 11/4/22
Unit V: Tensor Algebra	Introduction to tensor, Transformation of co-ordinates, Einsteins summation convention. contravariant and co- variant tensor, tensorial character of physical quantities, symmetric and antisymmetric tensors, kronecker delta, Levi-Civita tensor. Quotient law of tensors, Raising and lowering of indices Rules for combination of tensors- addition, subtraction, outer multiplication, contraction and inner multiplications.	Dr. Utpala Baishya ,	10	April	From 12/4/22 to 28/4/22
Lab	12. Solve differential equations $\frac{dy}{dx} = e^{x}\ with\ y = o\ and\ x = 0$	Dr. Utpala Baishya ,	15	April and May	From 29/4/22 to 20/5/22

	$\frac{dy}{dx} + e^{-x}y = x^2\frac{d^2y}{dx^2} + 2\frac{dy}{dx} = -y$ $\frac{d^2y}{dx^2} + e^{-t}\frac{dy}{dx} = -y$ 13. Dirac Delta Function Evaluate the integral I $\frac{1}{\sqrt{2\pi a^2}}\int exp\left[\frac{(x-2)^2}{2a^2}\right](x+3)dx$ 14. Fourier Series Make a program to evaluate $\sum_{n=1}^{\alpha}(0.2)^n$ Evaluate the Fourier coefficients of a given periodic function (square wave) 15. Frobenius method and special Function evaluate $\int_{-1}^{1} P_n(x)P_m(x)dx = d_{n,m}$ Plot $P_n(x), j\nu(x)$ and show the recursion relation 16. Calculation of error for each data point of observations recorded in experiments done in previous semesters (choose any two) 17. Calculation of least				

	square fitting manually without giving weightage to error. Confirmation of least square fitting of data through computer program. 18. Evaluation of trigonometric functions e.g. sinθ, ,given Bessel'sfunctionat N points find its value at an intermediate point. 19. Integrate $\frac{1}{(x^2+2)}$ Numerically in a given interval. 20. Compute the nth roots of unity for n=2, 3, and 4. 21. Find the two square roots of 5+12j. Integral transform Evaluate FFT of e^{-x^2} 22. Solve Kirchoff's current law for any node of an arbitrary circuit using Laplace's transform.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Elements of Modern Physics	Credit	6
Course		Paper No	PHY-HC-4026
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Quantum Theory and Blackbody Radiation	Quantum theory of light; photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment. Wave description of particles by wave packets. group and phase velocities and relation between them. Two-slit experiment with electrons. Probability. wave amplitude and wave functions.	Mr. Jayanta Deka	12	January and February	From 20/1/22 to 9/2/22
Unit II: Uncertainty and Wave-Particle Duality	Position measurement : gamma ray microscope thought experiment; wave-particle duality, Heisenberg uncertainty principle	Mr. Jayanta Deka	5	February	From 10/2/22 to 17/2/22

	(Uncertainty relations involving Canonical pair of variables): Derivation from wave packets, impossibility of a particle following a trajectory; estimating minimum energy of a confined particle using uncertainty principle; energy-time uncertainty principle- application to virtual particles and range of an interaction.				
Unit III: Schrödinger Equation	Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrödinger equation for non- relativistic particles; expectation value, momentum and energy operators; stationary states; physical interpretation of a wave function, probabilities and normalization; probability and probability current densities in one dimension.	Mr. Jayanta Deka	8	February	From 18/2/22 to 27/2/22
Unit IV: One-dimensional Box and Step Barrier	One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization; quantum dot as example; quantum	Mr. Jayanta Deka	9	February & March	From 28/2/22 to 10/3/22

	mechanical scattering and tunnelling in one dimension-across a step potential and rectangular potential barrier.				
Unit V: Structure of the Atomic Nucleus	Size and structure of atomic nucleus and its relation with atomic weight; impossibility of an electron being in liquid drop model: semi-empirical mass formula and binding energy, nuclear shell model (qualitative discussions) and magic numbers.	Mr. Jayanta Deka	6	March	From 11/3/22 to 21/3/22
Unit VI: Radioactivity	Stability curve and stability of nuclei, Law of radioactive decay, disintegration constant, half life and mean life. Activity unit. Alpha decay – Range energy relation, Fine structure of alpha energy spectrum. Beta decay energy released, continuous beta spectrum and Pauli's prediction of neutrino. Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus.	Mr. Jayanta Deka	8	March and April	From 22/3/22 to 4/4/22
Unit VII : Detection of nuclear radiation	Method of energy loss by charged particles and gamma photons. Photoelectric, Compton and Pair-production processes Gas filled detectors – principle and construction of a gas filled detector, Ionization,	Mr. Jayanta Deka	4	April	From 5/4/22 to 8/4/22

	proportional, GM and spark region.				
Unit VIII: Fission and Fusion	Energy consideration in Nuclear Reaction, Q-value of nuclear reaction, Mass deficit, Einstein's mass-energy equivalence principle and generation of nuclear energy. Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235. Fusion and thermonuclear reactions driving stellar energy (brief qualitative discussions).	Mr. Jayanta Deka	4	April	From 9/4/22 to 18/4/22
Unit IX: Lasers	Einstein's *A* and *B* coefficients. Metastable states. Spontaneous and Stimulated emissions. Optical Pumping and Population Inversion. Three-Level and Four-Level Lasers. Ruby Laser and He-Ne Laser. Basic lasing.	Mr. Jayanta Deka	4	April	From 19/4/22 to 26/4/22
Lab	*A minimum of six experiments to be done.* 14. Measurement of Planck's constant using black body radiation and photo-detector. 15. Photo-electric effect Photo current versus intensity and wavelength of light;	Mr. Jayanta Deka	16	April and May	From 27/4/23 to 25/5/23

		maximum energy of photo-electrons versus frequency of light. 16. To determine work function of material of filament of directly heated vacuum diode. 17. To determine the Planck's constant using LEDs of at least 4 different colours. 18. To determine the wavelength of H − α emission line of hydrogen atom. 19. To determine the ionization potential of mercury. 20. To determine the absorption lines in the rotational spectrum of iodine vapour. 21. To determine the value of e/m by (a) magnetic focusing or (b) bar magnet. 22. To setup the Millikan oil drop apparatus and determine the charge of an electron. 23. To show the tunneling effect in tunnel diode using I − V characteristics. 24. To determine the wavelength of laser source using diffraction of single slit. 25. To determine the wavelength of laser				

	source using diffraction of double slits. 26. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Analog Systems & Applications	Credit	6
Course		Paper No	PHY-HC-4036
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Semiconductor Diodes	P and N type semiconductors. Energy Level Diagram. Conductivity and Mobility, Concept of Drift velocity. PN Junction Fabrication (Simple Idea). Barrier Formation in PN Junction Diode. Static and Dynamic Resistance. Current Flow Mechanism in Forward and Reverse Biased Diode. Drift	Dr. Chandrama Kalita,	10	January and February	From 20/1/22 to 7/2/22

	Velocity. Derivation for Barrier Potential, Barrier Width and Current for Step Junction. Current flow mechanism in Forward and Reverse Biased Diode.				
Unit II: Two-terminal Devices and their Applications	(1) Rectifier Diode: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, C-filter (2) Zener Diode and Voltage Regulation. Principle and structure of (1) LEDs, (2) Photodiode and (3) Solar Cell.	Dr. Chandrama Kalita,	6	February	From 8/2/22 to 14/2/22
Unit III: Bipolar Junction Transistors	$n-p-n$ and $p-n-p$ Transistors. Characteristics of CB, CEand CC Configurations. Current gains α and β. Relations between α and β. Load Line analysis of Transistors. DC Load line and *Q*-point. Physical Mechanism of Current Flow. Active, Cutoff and Saturation Regions.	Dr. Chandrama Kalita,	6	February	From 15/2/22 to 23/2/22
Unit IV: Amplifiers	Transistor Biasing and Stabilization Circuits. Fixed Bias and Voltage Divider Bias. Transistor as 2-port Network. *h*- parameter Equivalent Circuit. Analysis of a single-stage CE	Dr. Chandrama Kalita,	10	February and March	From 24/2/22 to 10/3/22

	amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains. Classification of Class *A*, *B* & *C* Amplifiers.				
Unit V: Coupled Amplifier	Two stage RC-coupled amplifier and its frequency response.	Dr. Chandrama Kalita,	4	March	From 11/3/22 to 25/3/22
Unit VI: Feedback in Amplifiers	Effects of Positive and Negative Feedback on Input Impedance, Output Impedance, Gain, Stability, Distortion and Noise.	Dr. Chandrama Kalita,	4	March	From 26/3/22 to 31/3/22
Unit VII: Sinusoidal Oscillators	Barkhausen's Criterion for self-sustained oscillations. RC Phase shift oscillator, determination of Frequency. Hartley & Colpitts oscillators.	Dr. Chandrama Kalita,	4	April	From 1/4/22 to 6/4/22
Unit VIII: Operational Amplifiers (Black Box approach)	Characteristics of an Ideal and Practical Op-Amp. (IC 741) Open-loop and Closed-loop Gain. Frequency Response. CMRR. Slew Rate and concept of Virtual ground.	Dr. Chandrama Kalita,	9	April	From 7/4/22 to 22/4/22
Unit IX: Applications of Op-Amps	(2) Inverting and non-inverting amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5)	Dr. Chandrama Kalita,	9	April and May	From 23/4/22 to 5/5/22

	Integrator, (6) Log amplifier, (7) Zero crossing detector (8) Wein bridge oscillator.				
Unit X: Convversion	Resistive network (Weighted and R − 2R Ladder). Accuracy and Resolution. A/D Conversion (successive approximation).	Dr. Chandrama Kalita,	3	May	From 6/5/22 to 10/5/22
Lab	*A minimum of eight experiments to be done.* 1. To study V − I characteristics of PN junction diode, and Light emitting diode. 2. To study the V − I characteristics of a Zener diode and its use as voltage regulator. 3. Study of V − I & power curves of solar cells, and find maximum power point & effciency. 4. To study the characteristics of a Bipolar Junction Transistor in CE configuration. 5. To study the various biasing configurations of BJT for normal class A operation. 6. To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias. 7. To study the frequency response of voltage gain of a RC- coupled	Dr. Chandrama Kalita,	9	May	From 11/5/22 to 25/5/22

		transistor amplifier. 8. To design a Wien bridge oscillator for given frequency using an op-amp. 9. To design a phase shift oscillator of given specifications using BJT. 10. To study the Colpitt's oscillator. 11. To design a digital to analog converter (DAC) of given specifications. 12. To study the analog to digital convertor (ADC) IC. 13. To design an inverting amplifier using Op-amp (741/351) for dc voltage of given gain . 14. To design inverting amplifier using Op-amp (741/351) and study its frequency response. 15. To design non-inverting amplifier using Op-amp (741/351) & study its frequency response. 16. To study the zero-crossing detector and comparator. 17. To add two dc voltages using Op-amp in inverting and non-inverting mode. 18. To design a precision Differential amplifier of given I/O specification using Op-amp. 19. To investigate the use of an op-amp as an				

	Integrator. 20. To investigate the use of an op-amp as a Differentiator.					

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Waves & Optics	Credit	6
Course		Paper No	PHY-HG/RC-4016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Superposition of Two Collinear Harmonic Oscillations	Linearity & Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats).	Dr. Chandrama Kalita,	4	January	From 20/1/22 to 27/1/22
Unit II: Superposition of Two Perpendicular Harmonic Oscillations	Graphical and Analytical Methods. Lissajous Figures Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka with equal an unequal frequency and their uses.	Dr. Chandrama Kalita,	2	January and February	From 28/1/22 to 1/2/22

Unit III: Waves Motion	General: Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves, Wave intensity.	Dr. Chandrama Kalita,	7	February	From 2/2/22 to 10/2/22
Unit IV: Fluids	Surface Tension: Synclastic and anticlastic surface – Excess of pressure – Application to spherical and cylindrical drops and bubbles – variation of surface tension with temperature – Jaegar's method. Viscosity – Rate flow of liquid in a capillary tube – Poiseuille's formula – Determination of coefficient of viscosity of a liquid – Variations of viscosity of liquid with temperature – lubrication.	Dr. Chandrama Kalita,	6	February	From 11/2/22 to 21/2/22
Unit V : Sound	Simple harmonic motion - forced vibrations and resonance - Fourier's Theorem - Application to saw tooth wave and square wave - Intensity and loudness of sound - 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.	Dr. Utpala Baishya ,	6	February and March	From 22/2/22 to 2/3/22

Unit VI : Wave Optics	Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle.	Dr. Utpala Baishya , Mr.	3	March	From 3/3/22 to 8/3/22
Unit VII : Interference	Division of amplitude and division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination and Fringes of equal thickness . Newton's Rings: measurement of wavelength . Michelson's Interferometer: Idea of form of fringes (no theory needed), Determination of wavelength, Wavelength difference, Refractive index Visibility of fringes.	Dr. Utpala Baishya ,	10	March	From 9/3/22 to 22/3/22
Unit VIII : Michelson Interferometer	(2) Idea of form of fringes (No theory required), (2) Determination of Wavelength, (3) Refractive Index. (4) Visibility of fringes.	Mr. Jayanta Deka	3	March	From 23/3/22 to 28/3/22
Unit IX : Diffraction	Fresnel and Fraunhofer diffraction . Fresnel's Half-Period Zones for Plane Wave. Explanation of Rectilinear Propa- gation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel diffraction pattern of a straight edge and at a circular aperture . Resolving Power of a telescope.	Mr. Jayanta Deka	14	March and April	From 29/3/22 to 14/4/22

	Fraunhofer diffraction due to a Single slit , Diffraction grating . Resolving power of grating.				
Unit X : Polarization	Transverse nature of light waves. Double Refraction, Plane, circular and elliptically polarized light , Production and analysis of polarized light. Retarding plates.	Mr. Jayanta Deka	5	April	From 13/4/22 to 20/4/22
Lab	*A minimum of five experiments to be done.* 1. To study the variation in liquid column height with diameter of capillary tube and determine the surface tension of the liquid. 2. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify Z^2 — T Law. 3. To determine the coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method) 4. To determine the focal length of a convex mirror with the help of convex lens . 5. To determine the refractive index of a liquid	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	14	April and May	From 21/4/22 to 17/5/22

	by using plane mirror and convex lens. 6. To determine the focal length of two lenses and their combination by displacement method . 7. Familiarization with Schuster's focussing; determination of angle of prism. 8. To determine the Refractive Index of the Material of a Prism using Sodium Light. 9. To determine wavelength of sodium light using Newton's Rings.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Photoshop	Credit	4
Course		Paper No	PHY-SE-4044
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Getting Started with Adobe	Overview of Adobe Photoshop CC, Features of Adobe Photoshop CC	Dr. Chandrama Kalita,	3	January and February	From 20/1/22 To 10/2/22

Photoshop CC					
Unit II: Importance of Adobe Photoshop CC	Overview of Tools Used in Adobe Photoshop CC, Importance of Adobe Photoshop CC	Dr. Chandrama Kalita,	5	February	From 11/2/22 to 21/2/22
Unit III: Working with Typography	Typography, Creating Typographies, Choosing the Right Font and Color	Dr. Chandrama Kalita,	4	February	From 22/2/22 to 27/2/22
Unit IV: Working with Layers and Images	Cropping a Photo, Resizing Images, Basics of Layers, Creating Layers for Print and Digital Media, Aligning Images within Multiple Layers, Merging Layer Techniques	, Dr. Utpala Baishya ,	6	February and March	From 28/2/22 to 16/3/22
Unit V: Working with Filters	Photoshop Filters, Smart Filters, Common Features of Photoshop Filter	Dr. Utpala Baishya ,	4	March	From 17/3/22 to 30/3/22
Unit VI: Digital Painting in Adobe Photoshop CC	Working with Brush Tool, Importance of Using Colors	, Mr. Jayanta Deka	4	March and April	From 31/3/22 to 17/4/22
Unit VII: Masking and File Formats in Adobe Photoshop CC	Introduction to Mask, Creating Vector and Layer Masks, Essential File Formats, Choosing the Right Format for Print and Digital Media	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	4	April	From 18/4/22 to 30/4/22

SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (January –June)

Department	Physics	Semester	Six semester
Subject	Electromagnetic Theory	Credit	6
Course		Paper No	PHY-HC-6016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Maxwell Equations	Review of Maxwell's equations. Displacement Current. Vector and Scalar Potentials. Gauge Transformations: Lorentz and Coulomb Gauge. Boundary Conditions at Interface between Different Media. Wave Equations. Plane Waves in Dielectric Media. Poynting Theorem and Poynting Vector. Electromagnetic (EM) Energy Density. Physical Concept of Electromagnetic Field Energy Density, Momentum Density and Angular Momentum Density.	Dr. Chandrama Kalita	12	January and February	From 20/1/22 to 7/2/22
Unit II: EM Wave Propagation in Unbounded Media	Plane EM waves through vacuum and isotropic dielectric medium, transverse nature of plane EM waves, refractive	Dr. Chandrama Kalita	10	February	From 8/2/22 to 21/2/22

	index and dielectric constant, wave impedance. Propagation through conducting media, relaxation time, skin depth. Wave propagation through dilute plasma, electrical conductivity of ionized gases, plasma frequency, refractive index, skin depth, application to propagation through ionosphere.				
Unit III: EM Wave in Bounded Media	Boundary conditions at a plane interface between two media. Reflection & Refraction of plane waves at plane interface between two dielectric media-Laws of Reflection & Refraction. Fresnel's Formulae for perpendicular & parallel polarization cases, Brewster's law. Reflection & Transmission coefficients. Total internal reflection, evanescent waves. Metallic reflection (normal Incidence).	Dr. Chandrama Kalita	10	February and March	From 22/2/22 to 7/3/22
Unit IV: Polarization of Electromagnetic Waves	Description of Linear, Circular and Elliptical Polarization. Propagation of E.M. Waves in	Dr. Chandrama Kalita	12	March	From 8/3/22 to 23/3/22

	Anisotropic Media. Symmetric Nature of Dielectric Tensor. Fresnel's Formula. Uniaxial and Biaxial Crystals. Light Propagation in Uniaxial Crystal. Double Refraction. Polarization by Double Refraction. Nicol Prism. Ordinary & extraordinary refractive indices. Production & detection of Plane, Circularly and Elliptically Polarized Light. Phase Retardation Plates: Quarter-Wave and Half-Wave Plates. Babinet Compensator and its Uses. Analysis of Polarized Light.				
Unit V: Rotatory Polarization	Optical Rotation. Biot's Laws for Rotatory Polarization. Fresnel's Theory of optical rotation. Calculation of angle of rotation. Experimental verification of Fresnel's theory. Specific rotation. Laurent's half-shade polarimeter. (5 Lectures) Wave Guides: Planar optical wave guides. Planar dielectric wave guide. Condition of continuity at interface.	Dr. Chandrama Kalita	8	March and April	From 24/3/22 to 5/4/22

	Phase shift on total reflection. Eigenvalue equations. Phase and group velocity of guided waves. Field energy and Power transmission.				
Unit VI: Optical Fibres	Numerical Aperture. Step and Graded Indices (Definitions Only). Single and Multiple Mode Fibres (Concept and Definition Only).	Dr. Chandrama Kalita	3	April	From 6/4/22 to 14/4/22

Lab	1. To verify the law of Malus for plane polarized light. 2. To determine the specific rotation of sugar solution using Polarimeter. 3. To analyze elliptically polarized Light by using a Babinet's compensator. 4. To study dependence of radiation on angle for a simple Dipole antenna. 5. To determine the wavelength and velocity of ultrasonic waves in a liquid (Kerosene Oil, Xylene, etc.) by studying the diffraction through ultrasonic grating. 6. To study the reflection, refraction of microwaves. 7. To study Polarization and double slit interference in microwaves. 8. To determine the refractive index of liquid by total internal reflection using Wollaston's air-film.	Dr. Chandrama Kalita	16	April and May	From 15/4/22 to 17/5/22

	9. To determine the refractive Index of (1) glass and (2) a liquid by total internal reflection using a Gaussian eyepiece. 10. To study the polarization of light by reflection and determine the polarizing angle for air-glass interface. 11. To verify the Stefan's law of radiation and to determine Stefan's constant. 12. To determine the Boltzmann constant using V − I characteristics of PN junction diode.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (January –June)

Department	Physics	Semester	Six semester
Subject	Statistical Mechanics	Credit	6
Course		Paper No	PHY-HC-6026
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Classical Statistics	Macrostate & Microstate, Elementary Concept of Ensemble, Phase Space, Entropy and Thermodynamic Probability, Maxwell-Boltzmann Distribution Law, Partition Function, Thermodynamic Functions of an Ideal Gas, Classical Entropy Expression, Gibbs Paradox, Sackur Tetrode equation, Law of Equipartition of Energy (with proof) – Applications to Specific Heat and its Limitations, Thermodynamic Functions of a Two-Energy Levels System, Negative Temperature.	Dr. Chandrama Kalita,	18	January and February	From 20/1/22 to 11/2/22
Unit II: Classical Theory of Radiation	Properties of Thermal Radiation. Blackbody Radiation. Pure temperature dependence. Kirchhoff’s law. Stefan-Boltzmann law: Thermodynamic proof. Radiation Pressure. Wien’s	Dr. Chandrama Kalita,	9	February	From 12/2/22 to 24/2/22

	Displacement law. Wien's Distribution Law. Saha's Ionization Formula. Rayleigh-Jean's Law. Ultraviolet Catastrophe.				
Unit III: Quantum Theory of Radiation	Spectral Distribution of Black Body Radiation. Planck's Quantum Postulates. Planck's Law of Blackbody Radi- ation: Experimental Verification. Deduction of (1) Wien's Distribution Law, (2) Rayleigh-Jeans Law, (3) Stefan- Boltzmann Law, (4) Wien's Displacement law from Planck's law.	Dr. Utpala Baishya ,	5	February and March	From 25/2/22 to 3/3/22
Unit IV: Bose-Einstein Statistics	B-E distribution law, Thermodynamic functions of a strongly Degenerate Bose Gas, Bose Einstein condensation, properties of liquid He (qualitative description), Radiation as a photon gas and Thermodynamic functions of photon gas. Bose derivation of Planck's law.	, Dr. Utpala Baishya ,	13	March	From 4/3/22 to 21/3/22
Unit V: Fermi-Dirac Statistics	Fermi-Dirac Distribution Law, Thermodynamic functions of a Completely and strongly Degenerate Fermi Gas, Fermi Energy, Electron gas in a Metal, Specific Heat of Metals, Relativistic Fermi gas, White Dwarf Stars, Chandrasekhar Mass Limit.	, Mr. Jayanta Deka	15	March and April	From 22/3/22 to 11/4/22
Lab	*Use C/C++/Scilab/other numerical simulations for solving*	Dr. Utpala Baishya ,	16	April and May	From 12/4/22

	the problems based on Statistical Mechanics. 1. Computational analysis of the behavior of a collection of particles in a box that satisfy Newtonian mechanics and interact via the Lennard-Jones potential, varying the total number of particles N and the initial conditions: (a) Study of local number density in the equilibrium state (i) average; (ii) fluctuations. (b) Study of transient behaviour of the system (approach to equilibrium). (c) Relationship of large N and the arrow of time. (d) Computation of the velocity distribution of particles for the system and comparison with the Maxwell velocity distribution. (e) Computation and study of mean molecular speed and its dependence on particle mass. (f) Computation of fraction of molecules in an ideal gas having speed near the most probable speed 2. Computation of the partition function $Z(\beta)$ for examples of systems with a	Mr. Jayanta Deka			to 17/5/22

	finite number of single particle levels (e.g., 2 level, 3 level, etc.) and a finite number of non-interacting particles *N* under Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein statistics: (a) Study of how Z(β), average energy (E), energy fluctuation ΔE, specific heat at constant volumeC_P, depend upon the temperature, total number of particles *N* and the spectrum of single particle states. (b) Ratios of occupation numbers of various states for the systems considered above. *(c)* Computation of physical quantities at large and small temperature *T* and comparison of various statistics at large and small temperature *T*. 3. Plot Planck's law for Black Body radiation and compare it with Raleigh-Jeans Law at high temperature and low temperature. 4. Plot Specific Heat of Solids (a) Dulong-Petit law, (b) Einstein				

	distribution function, (c) Debye distribution function for high temperature and low temperature and compare them for these two cases. 5. Plot the following functions with energy at different temperatures (a) Maxwell-Boltzmann distribution (b) Fermi-Dirac distribution (c) Bose-Einstein distribution				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (January –June)

Department	Physics	Semester	Six semester
Subject	Astronomy and Astrophysics	Credit	6
Course		Paper No	PHY-HE-6046
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date

Unit I: Stellar properties	Radiant flux and Luminosity, Magnitude scale. Measurement of astronomical quantities: Stellar distances(parallax), Radii, Mass and Effective Temperature. Equilibrium of stars, Gravity and thermodynamics, virial theorem. Stellar spectral classification – Hertzsprung-Russell (HR) diagram. Introductory idea of stellar evolution: white dwarf, neutron stars and black holes.	Dr. Utpala Baishya ,	15	January and February	From 20/1/22 to 10/2/22
Unit II: The Sun and the solar system	The Sun; properties of photosphere, chromosphere and corona. Solar system's objects: Theory of formation of the solar system (introductory idea only); physical properties of the planets- their distances, atmospheres, asteroid belt, meteorites and the comets – Kuiper belt and the Oort cloud; Introduction to Extra-Solar Planets.	Dr. Utpala Baishya ,	15	February and March	From 11/2/22 to 7/3/22
Unit III: Positional Astronomy	Celestial sphere, spherical geometry and celestial coordinates. Concept of time: universal time, solar time, mean solar time, local sidereal time and Julian day. Introduction to constellations (hands on practice in evening sky with small telescopes or laser pointer), ecliptic and diurnal motion of stars. Solar system's objects : rotation, revolution and	Dr. Utpala Baishya ,	10	March	From 8/3/22 to 21/3/22

	coordinates in the sky.				
Unit IV: Astronomical Techniques	Introduction to telescopes – telescope size and light gathering power, resolving power, f-number. Different types of optical telescopes (reflecting and refracting). Space telescopes. Concept of virtual observatory, on-line tools in astronomy: SDSS, SkyView, SIMBAD, Aladin, AAVSO database etc. Introduction to photometry, spectroscopy and polarimetry.	Dr. Utpala Baishya ,	10	March and April	From 22/3/22 to 4/4/22
Unit V: Galaxies	The Milky Way, properties of the galactic centre. Classification of galaxies, Hubble's tuning fork diagram, normal (spiral, elliptical and lenticular) and active galaxies. Black holes in galaxies.	Dr. Utpala Baishya ,	10	April	From 5/4/22 to 20/4/22
Unit VI: Large Scale Structure and Cosmology	Distance ladder in cosmology, Cepheid variables. Cosmic expansion of the universe and Hubble(- Lemaitre) law. Clusters of galaxies and dark matter - virial theorem. Concept of the Hot Big Bang, Oscillating Universe, Cosmic Microwave Background (CMB).	Dr. Utpala Baishya ,	15	April and May	From 22/4/22 to 17/5/22

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (January –June)

Department	Physics	Semester	Six semester
Subject	PHYSICS-DSE: CLASSICAL DYNAMICS	Credit	6
Course		Paper No	PHY-HE-6056
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Classical Mechanics of Point Particles	Review of Newtonian Mechanics; Application to the motion of a charge particle in external electric and magnetic fields- motion in uniform electric field, magnetic field- gyroradius and gyrofrequency, motion in crossed electric and magnetic fields.constraints, Generalized coordinates and velocities, principle of virtual work, D,Alembert’s principle,Hamilton’sprinciple, Lagrangian and the Euler-Lagrange equations, one-dimensional examples of the Euler-Lagrange equations- one-dimensional Simple Harmonic Oscillations and falling body in uniform gravity; applications to simple systems such as coupled oscillators Canonical momenta & Hamiltonian. Hamilton's	Mr. Jayanta Deka	22	January and February	From 20/1/22 to 21/2/22

	equations of motion. Applications: Hamiltonian for a harmonic oscillator, solution of Hamilton's equation for Simple Harmonic Oscillations; particle in a central force field-conservation of angular momentum and energy.				
Unit II: Small Amplitude Oscillations	Minima of potential energy and points of stable equilibrium, expansion of the potential energy around a minimum, small amplitude oscillations about the minimum, normal modes of oscillations example of N identical masses connected in a linear fashion to (N -1) - identical springs.	Mr. Jayanta Deka	10	February and March	From 21/2/22 to 10/3/22
Unit III: Special Theory of Relativity	Postulates of Special Theory of Relativity. Lorentz Transformations. Minkowski space. The invariant interval, light cone and world lines. Space-time diagrams. Time-dilation, length contraction and twin paradox. Four-vectors: space- like, time-like and light-like. Four-velocity and acceleration. Metric and alternating tensors. Four-momentum and energy-momentum relation. Doppler effect from a four-vector perspective. Concept of four-force. Conservation of four-momentum. Relativistic kinematics. Application to two-	Mr. Jayanta Deka	33	March and April	From 11/3/22 to 25/4/22

	body decay of an unstable particle.				
Unit IV: Fluid Dynamics	Density ρ and pressure *P* in a fluid, an element of fluid and its velocity, continuity equation and mass conservation, stream-lined motion, laminar flow, Poiseuille's equation for flow of a liquid through a pipe, Navier-Stokes equation, qualitative description of turbulence, Reynolds number.	Mr. Jayanta Deka	10	April and May	From 26/4/22 to 10/5/22

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2021-22 (January –June)

Department	Physics	Semester	Six semester
Subject	RENEWABLE ENERGY AND ENERGY HARVESTING	Credit	4
Course		Paper No	PHY-SE-6024
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Fossil fuels and	Fossil fuels and Nuclear Energy, their limitation,	Dr. Chandrama	3	January	From 20/1/22

Alternate Sources of energy	need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.	Kalita,			to 27/1/22
Unit II: Solar energy	Solar energy, its importance, storage of solar energy, solar pond, non-convective solar pond, 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. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.	Dr. Chandrama Kalita,	6	January and Februar y	From 28/1/22 to 7/2/22
Unit III: Wind Energy harvesting	Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind	Dr. Utpala Baishya ,	3	Februar y	From 8/2/22 to 14/2/22

	turbines, Power electronic interfaces, and grid interconnection topologies.				
Unit IV: Ocean Energy	Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices.	, Dr. Utpala Baishya ,	3	February	From 15/2/22 to 21/2/22
Unit V:	Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass.	Dr. Utpala Baishya ,	2	February	From 22/2/22 to 25/2/22
Unit VI: Geothermal Energy	Geothermal Resources, Geothermal Technologies.	Dr. Utpala Baishya ,	2	February and March	From 26/2/22 to 2/3/22
Unit VII: Hydro Energy	Hydropower resources, hydropower technologies, environmental impact of hydro power sources.	Mr. Jayanta Deka	2	March	From 3/3/22 to 7/3/22
Unit VIII: Piezoelectric Energy harvesting	Introduction, Physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modelling piezoelectric generators, Piezoelectric energy harvesting applications, Human power.	Mr. Jayanta Deka	4	March	From 8/3/22 to 15/3/22

Unit IX: Electromagnetic Energy Harvesting	Linear generators, physics mathematical models, recent applications	, Mr. Jayanta Deka	2	March	From 16/3/22 to 25/3/22
Unit X:	Carbon captured technologies, cell, batteries, power consumption	Mr. Jayanta Deka	2	March	From 26/3/22 to 31/3/22
Unit XI:	Environmental issues and Renewable sources of energy, sustainability.	, Mr. Jayanta Deka	1	April	From 1/4/22 to 5/4/22
Demonstrations and Experiments	1. Demonstration of Training modules on Solar energy, wind energy, etc. 2. Conversion of vibration to voltage using piezoelectric materials 3. Conversion of thermal energy into voltage using thermoelectric modules.	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	6	April	From 1/4/22 to 20/4/22

TEACHING PLAN

DEPARTMENT OF PHYSICS

SBMS COLLEGE, SUALKUCHI

Session: 2022-23 (August –December)

Department	Physics	Semester	First semester
Subject	Mathematical Physics I	Credit	6
Course		Paper No	PHY-HC-1016
Remarks		Marks	100

Unit	Course Content	Allotted to	Hours	Month	Date
Unit I: Vector Calculus	Revision: Properties of vectors under rotations. Scalar product and its invariance under rotations. Vector product, Scalar triple product and their interpretation in terms of area and volume respectively. Scalar and Vector fields. Vector Differentiation: Directional derivatives and normal derivative. Gradient of a scalar field and its geometrical interpretation. Divergence and curl of a vector field. Del and Laplacian operators. Vector identities. Vector Integration: Ordinary Integrals of Vectors. Multiple integrals, Jacobian. Notion of infinitesimal line, surface and volume elements. Line, surface and volume integrals of Vector fields. Flux of a vector field. Gauss' divergence theorem, Green's and Stokes Theorems and their applications (no rigorous	Dr. Utpala Baishya	25	August	From 1/8/2022 to 31/8/2022

	proofs).				
Unit II: First and Second order Differential Equations	First Order and Second Order Differential equations: First Order Differential Equations and Integrating Factor. Homogeneous Equations with constant coefficients. Wronskian and general solution. Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor, with simple illustration.	Dr. Utpala Baishya	17	September	From 1/9/2022 to 18/9/2022
Unit III: Orthogonal Curvilinear Coordinates	Orthogonal Curvilinear Coordinates. Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems.	Dr. Utpala Baishya	6	September	19/9/2022 to 25/9/2022
Unit IV: Dirac Delta function and its Properties	Definition of Dirac delta function. Representation as limit of a Gaussian function and rectangular function. Properties of Dirac delta function.	Dr. Utpala Baishya	2	September	From 26/9/2022 to 27/9/2022
Unit V: Introduction to Probability	Independent random variables: Probability distribution functions; binomial, Gaussian and Poisson, with examples. Mean and variance.	Dr. Utpala Baishya	4	September	From 28/9/2022 to 31/9/2022
Unit VI: Theory of Errors	Systematic and Random Errors. Propagation of Errors. Normal Law of Errors. Standard and Probable Error. Least-squares fit.	Dr. Utpala Baishya	6	October	From1/10/ 2022 to 7/10/2022
Lab	Introduction and Overview Computer architecture and organization, memory and Input/output devices Basics of scientific computing Binary and	Dr. Utpala Baishya	30	November	From 8/10/2022 to 15/11/2022

	decimal arithmetic, Floating point numbers, algorithms, Sequence, Selection and Repetition, single and double precision arithmetic, underflow & overflow- emphasize the importance of making equations in terms of dimensionless variables, Iterative methods Review of C & C++/Python/ Matlab/ Mathematica Programming fundamentals Introduction to Programming, constants, variables and data types, operators and Expressions I/O statements, scanf and printf, c in and c out, Manipulators for data formatting, Control statements (decision making and looping statements) (if statement. if-else Statement. Nested if Structure. else-if Statement. Ternary Operator. goto Statement. switch Statement. Uncondi- tional and Conditional Looping. while Loop. do-while Loop. for Loop. Breakand continue Statements. Nested Loops), Arrays (1D & 2D) and strings, user defined functions, Structures and Unions, Idea of classes and objects. Programs Sum & average of a list of numbers, largest of a given list of numbers and its location in the list, sorting of numbers in ascending descending order, Binary search Random number generation Area of circle, area of square, volume of sphere, value of pi (π) Solution of Algebraic and Transcendental equations by Newton Raphson methods Solution of linear and quadratic equation, solving $\alpha = tan\alpha$, $I = I_0(sin\alpha/\alpha)^2$ in optics				

	Interpolation by Newton Gregory Forward and Backward difference formula Evaluation of trigonometric functions e.g. sinθ, cosθ, tanθ etc.Numerical Integration (Trapezoidal and Simpson rules), Monte Carlo method Given Position with equidistant time data to calculate velocity and acceleration and vice versa. Find the area of B-H Hysteresis loop Solution of Ordinary Differential Equations (ODE) First order Differential equation Euler, modifted Euler and Runge-Kutta (RK) second and fourth order methods First order differential equation (a) Radioactive decay (b) Newton's law of cooling.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (August –December)

Department	Physics	Semester	First semester
Subject	Mechanics	Credit	6
Course		Paper No	PHY-HC-1016
Remarks		Marks	100

Unit	Course Content	Allotted to	Hours	Month	Date
Unit I: Fundamentals of Dynamics	Reference frames. Inertial frames; Review of Newton's Laws of Motion. Galilean transformations; Galilean invariance. Momentum of	Dr. Chandrama Kalita	6	August	From 1/8/2022 to 10/8/2022

	variable mass system: motion of rocket. Motion of a projectile in Uniform gravitational field Dynamics of a system of particles. Centre of Mass. Principle of conservation of momentum. Impulse.				
Unit II: Work and Energy	Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Potential Energy. Energy diagram. Stable and unstable equilibrium. Elastic potential energy. Force as gradient of potential energy. Work & Potential energy. Work done by non-conservative forces. Law of conservation of Energy.	Mr. Jayanta Deka	4	August	From 11/8/2022 to 17/8/2022
Unit III: Collisions	Elastic and inelastic collisions between particles. Centre of Mass and Laboratory frames.	Dr. Chandrama Kalita	3	August	From 18/8/2022 to 25/8/2022
Unit IV: Rotational Dynamics	Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. Kinetic energy of rotation. Motion involving both translation and rotation.	Mr. Jayanta Deka	12	August and September	From 26/8/2022 to 12/9/2022
Unit V: Elasticity	Relation between Elastic constants. Twisting torque	Dr. Chandrama	3	September	From 13/9/2022

	on a Cylinder or Wire. Cantilever.	Kalita			to 20/9/2022
Unit VI: Fluid Motion	Kinematics of Moving Fluids: Poiseuille's Equation for Flow of a Liquid through a Capillary Tube.	Dr. Chandrama Kalita	2	September	From 21/9/2022 to 25/9/2022
Unit VII: Gravitation and Central Force Motion	Law of gravitation. Gravitational potential energy. Inertial and gravitational mass. Potential and field due to spherical shell and solid sphere. Motion of a particle under a central force field. Two-body problem and its reduction to one- body problem and its solution. The energy equation and energy diagram. Kepler's Laws.	Dr. Chandrama Kalita	8	September and October	From 26/9/2022 to 13/10/2022
Unit VIII: Oscillations	SHM: Simple Harmonic Oscillations. Differential equation of SHM and its solution. Kinetic energy, potential energy, total energy and their time-average values. Damped oscillation. Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor. Compound Pendulum.	Dr. Chandrama Kalita	8	October	From 14/10/2022 to 23/10/2022
Unit IX: Non-Inertial Systems	Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of Physics in rotating coordinate systems. Centrifugal force.	Mr. Jayanta Deka	4	October and November	From 26/10/2022 to 2/11/2022

	Coriolis force and its applications.				
Unit X: Special Theory of Relativity	Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz Transformations. Simultaneity and order of events. Lorentz contraction. Time dilation. Relativistic transformation of velocity, frequency and wave number. Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy Equivalence. Relativistic Doppler effect. Relativistic Kinematics. Transformation of Energy and Momentum.	Mr. Jayanta Deka	10	November	From 3/11/2022 to 15/11/2022
Lab	*A minimum of seven experiments to be done.* 31. Measurements of length (or diameter) using vernier caliper, screw gauge, Spherometer and travelling micro-scope. 32. To study the Motion of Spring and calculate (a) Spring constant and (b) Rigidity modulus. 33. To determine the Moment of Inertia of a cylinder about two different axes of symmetry by torsional oscillation method. 34. To determine Coefficient of Viscosity of water by	Dr. Chandrama Kalita and Mr. Jayanta Deka	15	November and December	From 16/11/22 to 5/12/2022

	Capillary Flow Method (Poiseuille's method). 35. To determine the Young's Modulus of the material of a wire by Searle's apparatus. 36. To determine the Modulus of Rigidity of a Wire Static method. 37. To determine the value of g using Bar Pendulum. 38. To determine the value of g using Kater's Pendulum. 39. To determine the height of a building using a Sextant. 40. To determine g and velocity for a freely falling body using Digital Timing Technique				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (August –December)

Department	Physics	Semester	First semester
Subject	Mechanics	Credit	6
Course		Paper No	PHY-HG/RC-1016
Remarks		Marks	100

Unit	Course Content	Allotted to	Hours	Month	Date
Unit I : Vectors	Vector algebra. Scalar and vector products. Derivatives	Dr. Utpala Baishya	6	August	From 1/8/2022

	of a vector with respect to a parameter. Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coeffcients				to 7/8/2022
Unit II : Laws of Motion	Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass.	Mr. Jayanta Deka	10	August	From 8/8/2022 to 20/8/2022
Unit III : Momentum and Energy	Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets.	Dr. Chandrama Kalita	6	August	From 21/8/2022 to 28/8/2022
Unit IV : Rotational Motion	Angular velocity and angular momentum. Torque. Conservation of angular momentum	Dr. Chandrama Kalita	5	August and September	From 30/8/2022 to 7/9/2022
Unit V : Gravitation	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). Kepler's Laws (statement only).	Mr. Jayanta Deka	7	September	From 8/9/2022 to 18/9/2022
Unit VI : Oscillations	Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations. Compound pendulum.	Mr. Jayanta Deka	7	September	From 19/9/2022 to 28/9/2022
Unit VII : Elasticity	Hooke's law - Stress-strain diagram – Elastic moduli-	Dr. Chandrama	8	September and	From 29/8/2022

	Relation between elastic constants - Poisson's Ratio- Expression for Poisson's ratio in terms of elastic constants – 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 Searles method.	Kalita		October	to 20/10/2022
Unit VIII : Special Theory of Relativity	Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.	Dr. Utpala Baishya	7	October and November	From 21/10/2022 to 1/11/2022
Lab	*A minimum of five experiments to be done.* 25. Measurements of length (or diameter) using vernier caliper, screw gauge and Spherometer. 26. To determine the Moment of Inertia of a Symmetrical body about an axis by torsional oscillation method. 27. To determine the Young's Modulus of the material of a wire by Searle's apparatus. 28. To determine the Modulus of Rigidity of a Wire Static method. 29. To determine the elastic Constants of a wire by Searle's	Dr. Chandrama Kalita and Mr. Jayanta Deka	16	November	From 2/11/2022 to 20/11/2022

	method. 30. To determine the value of g using Bar Pendulum. 31. To determine the value of g using Kater's Pendulum. 32. To study the Motion of Spring and calculate (a) Spring constant and (b) value of g.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (August –December)

Department	Physics	Semester	Third semester
Subject	Mathematical Physics II	Credit	6
Course		Paper No	PHY-HC-3016
Remarks		Marks	100

Unit	Course conent	Allotted to	Hours	Month	Date
Unit I: Frobenius Method and Special Functions	Singular Points of Second Order Linear Differential Equations and their importance. Frobenius method and its applications to differential equations. Legendre, Hermite and Laguerre Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Generating Function, Orthogonality. Simple recurrence relations. Expansion of function in a series of Legendre	Dr. Utpala Baishya	18	August	From 1/08/22 to 24/08/22

	Polynomials.				
Unit II: Partial Differential Equations	Solutions to partial differential equations, using separation of variables: Laplace's Equation in problems of rectangular, cylindrical and spherical symmetry. Wave equation and its solution for vibrational modes of a stretched string, rectangular and circular membranes. Diffusion Equation.	Dr. Utpala Baishya	14	August and September	From 25/08/22 to 10/09/22
Unit III: Some Special Integrals	Beta and Gamma Functions and Relation between them. Expression of Integrals in terms of Gamma Functions.	Dr. Utpala Baishya	4	September	From 11/09/22 to 16/09/22
Unit IV: Matrix	Matrix algebra using index notation, Properties of matrices, Special matrix with their properties: Transpose matrix, complex conjugate matrix, Hermitian matrix, Anti-Hermitian matrix, special square matrix, unit matrix, diagonal matrix, co-factor matrix, adjoint of a matrix, self- adjoint matrix, symmetric matrix, anti-symmetric matrix, unitary matrix, orthogonal matrix, trace of a matrix, inverse matrix. Determinant, Rank, Eigen value, Eigen vector and diagonalisation of matrix.		15	September and October	From 17/09/22 to 13/10/22
Unit V: Fourier Series	Periodic functions. Orthogonality of sine and cosine functions, Dirichlet Conditions (Statement only). Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coeffcients. Complex representation of Fourier series. Expansion of functions with arbitrary period. Application to square and triangular waves.	Dr. Utpala Baishya	9	October	From 14/10/22 to 18/10/22

Lab	The aim of this Lab is to use the computational methods to solve physical problems. Course will consist of lectures (both theory and practical) in the Lab. Evaluation done not on the programming but on the basis of formulating the problem. Introduction to Numerical computation softwares Introduction to Scilab/Mathematica/Matlab/Python, Advantages and disadvantages, Scilab / Mathematica / Matlab/ Python environment, Command window, Figure window, Edit window, Variables and arrays, Initialising variables in Scilab / Mathematica / Matlab/ Python, Multidimensional ar- rays, Subarray, Special values, Displaying output data, data file, Scalar and array operations, Hierarchy of operations, Built in Scilab / Mathematica / Matlab/Python functions, Introduction to plotting, 2D and 3D plotting. Curve fttting, Least square fit, Goodness of fit, standard deviation Ohms law to calculate R, Hooke's law to calculate spring constant. Solution of Linear system of equations Solution of Linear system of equations by Gauss elimination method and Gauss Seidal method. Diagonalisation of matrices, Inverse of a matrix, Eigen vectors, eigenvalues prob- lems. Solution of mesh equations of electric circuits (3 meshes) Solution of coupled spring mass systems (3 masses). Generation of Special functions Generation of Special functions using User defined functions in	Dr. Utpala Baishya	15	October and November	From 29/10/22 to 15/11/22

	Scilab / Math- ematica / Matlab. Generating and plotting Legendre Polynomials Generating and plotting Hermite function. First order ODE Solution of first order Differential equation Euler, modified Euler and Runge-Kutta second order methods. First order differential equation (a) Current in RC, LC circuits with DC source (b) Classical equations of motion. Second order ODE Second order differential equation. Fixed difference method. Second order Differential Equation Harmonic oscillator (no friction) (b) Damped Harmonic oscillator (c) Over damped (d) Critical damped. Partial Differential Equation (PDE) Solution of Partial Differential Equation: (a) Wave equation (b) Heat equation.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (August –December)

Department	Physics	Semester	Third semester
Subject	Thermal Physics	Credit	6
Course		Paper No	PHY-HC-3026
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: *Zeroth and First*	Extensive and intensive Thermodynamic Variables, Thermodynamic Equilibrium,	Dr. Chandrama Kalita	8	August	From 1/08/22 to 12/08/22

Law of Thermodynamics	Zeroth Law of Thermodynamics & Concept of Temperature, Concept of Work & Heat, State Functions, First Law of Thermodynamics and its differential form, Internal Energy, First Law & various processes, Applications of First Law: General Relation between C_P and C_V, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Coefficient.				
Unit II: *Second Law of Thermodynamics*	Reversible and Irreversible process with examples. Conversion of Work into Heat and Heat into Work. Heat Engines. Carnot's Cycle, Carnot engine & effciency. Refrigerator & coeffcient of performance, 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Carnot's Theorem. Applications of Second Law of Thermodynamics: Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale.	Dr. Chandrama Kalita	10	August	From 13/08/22 to 28/08/22
Unit III: *Entropy*	Concept of Entropy, Clausius Theorem. Clausius Inequality,	Dr. Chandrama	7	August and	From 29/08/22

	Second Law of Thermodynamics in terms of Entropy. Entropy of a perfect gas. Principle of Increase of Entropy. Entropy Changes in Reversible and Irreversible processes with examples. Entropy of the Universe. Entropy Changes in Reversible and Irreversible Processes. Principle of Increase of Entropy. Temperature–Entropy diagrams for Carnot's Cycle. Third Law of Thermodynamics. Unattainability of Absolute Zero.	Kalita		September	to 7/09/22
Unit IV: *Thermodynamic Potentials*	Thermodynamic Potentials: Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy. Their Definitions, Properties and Applications. Surface Films and Variation of Surface Tension with Temperature. Magnetic Work, Cooling due to adiabatic demagnetization, First and second order Phase Transitions with examples, Clausius Clapeyron Equation and Ehrenfest equations.	Dr. Chandrama Kalita	7	September	From 8/09/22 To 20/09/22
Unit V: *Maxwell's Thermodynamic Relation*	Derivations and applications of Maxwell's Relations, Maxwell's Relations:(1) Clausius Clapeyron equation, (2) Values of C_p-C_v, (3) TdS	Dr. Chandrama Kalita	7	September	From 21/09/22 to 30/09/22

s	Equations, (4) Joule-Kelvin coefficient for Ideal and Van der Waal Gases, (5) Energy equations, (6) Change of Temperature during Adiabatic Process.				
Unit VI: *Distribution of Velocities*	Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and its Experimental Verification. Doppler Broadening of Spectral Lines and Stern's Experiment. Mean, RMS and Most Probable Speeds. Degrees of Freedom. Law of Equipartition of Energy (No proof required). Specific heats of Gases.	Dr. Chandrama Kalita	7	September and October	From 31/09/22 to 10/10/22
Unit VII: *Molecular Collisions*	Mean Free Path. Collision Probability. Estimates of Mean Free Path. Transport Phenomenon in Ideal Gases: (1) Viscosity, (2) Thermal Conductivity and (3) Diffusion. Brownian Motion and its Significance.	Dr. Chandrama Kalita	4	October	From 11/10/22 to 15/10/22
Unit VIII: *Real Gases*	Behaviour of Real Gases: Deviations from the Ideal Gas Equation. The Virial Equation. Andrew's Experiments on CO2 Gas. Critical Constants. Continuity of Liquid and Gaseous State. Vapour and Gas. Boyle Temperature. Van der Waal's Equation of State for Real Gases. Values of Critical Constants. Law of Corresponding States. Comparison with Experimental Curves. P-V	Dr. Chandrama Kalita	10	October	From 16/10/22 to 30/10/22

	Diagrams. Joule's Experiment. Free Adiabatic Expansion of a Perfect Gas. Joule- Thomson Porous Plug Experiment. Joule- Thomson Effect for Real and Van der Waal Gases. Temperature of Inversion. Joule-Thomson Cooling.				
Lab	15. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method. 16. To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus. 17. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method. 18. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method. 19. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT). 20. To study the variation of Thermo-emf of a Thermocouple with Difference of Temperature of its Two Junctions. 21. To calibrate a thermocouple to measure temperature in a specified Range using (1) Null Method, (2) Direct measurement using Op-Amp difference	Dr. Chandrama Kalita	14	October and November	From 31/10/22 to 20/11/22

	amplifier and to determine Neutral Temperature				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (August –December)

Department	Physics	Semester	Third semester
Subject	Digital Systems & Applications	Credit	6
Course		Paper No	PHY-HC-3036
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Introduction to CRO	Block Diagram of CRO. Electron Gun, Deflection System and Time Base. Deflection Sensitivity. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference.	Mr. Jayanta Deka	3	August	From 1/08/22 to 4/08/22
Unit II: Integrated Circuits (qualitative treatment only)	Active & Passive components. Discrete components. Wafer. Chip. Advantages and drawbacks of ICs. Scale of integration: SSI, MSI, LSI and VLSI	Mr. Jayanta Deka	3	August	From 5/08/22 to 10/08/22

	(basic idea and definitions only). Classification of ICs. Examples of Linear and Digital lCs.				
Unit III: Digital Circuits	Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion. BCD, Octal and Hexadecimal numbers. AND, OR and NOT Gates (realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates.	Mr. Jayanta Deka	6	August	From 11/08/22 to 20/08/22
Unit IV: Boolean Algebra	De Morgan’s Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Idea of Minterms and Maxterms. Conversion of a Truth table into Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map.	Mr. Jayanta Deka	6	August	From 21/08/22 to 30/08/22
Unit V: Data Processing Circuits	Basic idea of Multiplexers, De-multiplexers, Decoders, Encoders.	Mr. Jayanta Deka	4	August and September	From 31/08/22 to 5/09/22
Unit VI: Arithmetic	Binary Addition. Binary	Mr. Jayanta	5	September	From 6/09/22

Circuits	Subtraction using 2's Complement. Half and Full Adders. Half & Full Subtractors, 4-bit binary Adder/Subtractor.	Deka			to 13/09/22
Unit VII: Sequential Circuits	SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race- around conditions in JK Flip-Flop. M/S JK Flip-Flop.	Mr. Jayanta Deka	6	September	From 14/09/22 to 25/09/22
Unit VIII: Timers:	Block diagram and applications: Astable multivibrator and Monostable multivibrator.	Mr. Jayanta Deka	3	September	From 26/09/22 to 31/09/22
Unit IX: Shift Registers	Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to4 bits).	Mr. Jayanta Deka	2	October	From 11/10/22 to 15/10/22
Unit X: Counters	Ring Counter, Asynchronous counters, Decade Counter. Synchronous Counter.	Mr. Jayanta Deka	4	October	From 16/10/22 to 20/10/22
Unit XI: Computer Organization	Input/Output Devices. Data storage (idea of RAM and ROM). Computer memory. Memory organization & addressing.	Mr. Jayanta Deka	6	October and November	From 21/10/22 to 1/11/22
Unit XII: Intel 8085 Microproces	Main features of 8085. Block diagram. Components.	Mr. Jayanta Deka	8	November	From 2/11/22 to

sor Architecture	Pin-out diagram. Buses. Registers. ALU. Memory. Stack memory. Timing & Control circuitry.				12/11/22
Unit XIII: Introduction to Assembly Language	1 byte, 2 byte, & 3 byte instructions.	Mr. Jayanta Deka	4	November	From 13/11/22 to 19/11/22
Lab	*A minimum of eight experiments to be done.* 31. To measure (a) Voltage, and (b) Time period of a periodic waveform using CRO. 32. To test a Diode and Transistor using a Multimeter. 33. To design a switch (NOT gate) using a transistor. 34. To verify and design AND, OR, NOT and XOR gates using NAND gates. 35. To design a combinational logic system for a specified Truth Table. 36. To convert a Boolean expression into logic circuit and design it using logic gate ICs. 37. Half Adder, Full Adder and 4-bit binary Adder. 38. Half Subtractor, Full Subtractor, Adder-Subtractor using Full Adder IC.	Mr. Jayanta Deka	16		From 20/11/22 to 1/12/22

	39. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates. 40. To build JK Master-slave flip-flop using Flip-Flop ICs . 41. To build a 4-bit Counter using D-type/JK Flip-Flop ICs and study timing diagram. 42. To make a 4-bit Shift Register (serial and parallel) using D-type/JK Flip-Flop ICs. 43. To design an astable multivibrator of given specifications using 555 Timer. 44. To design a monostable multivibrator of given specifications using 555 Timer. 45. Write the following programs using 8085 Microprocessor (a) Addition and subtraction of numbers using direct addressingmode (b) Addition and subtraction of numbers using indirect addressin gmode (c) Multiplication by repeated addition (d) Division by repeated subtraction (e) Handling of 16-bit				

		Numbers (f) Use of CALL and RETURN Instruction (g) Block data handling				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (August –December)

Department	Physics	Semester	Third semester
Subject	Thermal Physics & Statistical Mechanics	Credit	6
Course		Paper No	PHY-HG/RC-3016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I : Laws of Thermodynamics	Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between CP & CV , Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient,	Mr. Jayanta Deka	22	August	From 1/8/22 to 26/8/22

	Reversible & irreversible processes, Second law & Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.				
Unit II : Thermodynamic Potentials	Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations & applications - Joule-Thompson Effect, Clausius- Clapeyron Equation, Expression for (C_P — C_V), C_P/C_V , TdS equations.	Dr. Utpala Baishya	10	August and Septemb er	From 27/8/22 to 10/9/22
Unit III : Kinetic Theory of Gases	Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, 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.	Dr. Utpala Baishya	10	Septemb er	From 11/9/22 to 24/9/22
Unit IV : Theory of Radiation	Blackbody radiation, Spectral distribution, 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.	Dr. Chandram a Kalita	6	Septemb er and October	From 25/9/22 to 12/10/22

Unit V : Statistical Mechanics	Phase space, Macrostate and Microstate, Entropy and Thermodynamic probability, Maxwell-Boltzmann law - dis- tribution of velocity – Quantum statistics – Fermi-Dirac distribution law – electron gas – Bose-Einstein distribution law – photon gas – comparison of three statistics.	Dr. Chandrama Kalita	12	October and November	From 13/10/22 to 2/11/22
Lab	21. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method. 22. Measurement of Planck's constant using black body radiation. 23. To determine Stefan's Constant. 24. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus. 25. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method. 26. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	20	November	From 3/11/22 to 25/11/22

	27. To determine the temperature co-efficient of resistance by Platinum resistance thermometer. 28. To study the variation of thermo emf across two junctions of a thermocouple with temperature. 29. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system. 30. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (August –December)

Department	Physics	Semester	Third semester
Subject	Digital Photography & Editing	Credit	4
Course		Paper No	PHY-SE-3044
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Theory of Basic Photography	History of Photography, Introduction to Digital Photography, Digital Camera, dSLR, Advantages and Disadvantages of Digital Photography	Mr. Jayanta Deka	2	August	From 1/8/22 to 15/8/22
Unit II: The Camera- Components and Concepts	Lens, Focal Length, Lens type, Aperture, Depth of Field, Shutter, Shutter Speed, Image sensor, Memory cards, External Flash, File types	Dr. Chandrama Kalita	2	August	From 16/8/22 to 30/8/22
Unit III: Capturing an Image, Hands-on Basics	Elements of Composition: Pattern, Symmetry, Texture, Depth of Field, Lines; Law of Thirds, Camera Shake, Red eye, Lighting, Digital Noise	Dr. Chandrama Kalita	3	August and September	From 31/8/22 to 12/9/22
Unit IV: Exposure Modes	Automatic mode, Manual mode, aperture mode, shutter mode, Scene mode, Portrait mode, landscape mode, close up mode, sports mode, Twilight mode, Night Mode, Black	Dr. Chandrama Kalita	5	September and October	From 13/9/22 to 20/10/22

	and white, sepia, Panoramic mode.				
Unit V: Conditions in Digital Photography	Lighting, Importance of Natural Light, Best Time of Day to Take Photos, Disable Flash Indoors, Disable Flash in Low Light, Use Flash to Balance Bright Light, Get Closer to the Subject, Crop Your Photo, Choose Better Backgrounds, Pick Proper Orientation, Use Point of View, Frame your Subject, Experiment with Abstract Photography, Holding your DSLR	Dr. Utpala Baishya	7	October and November	From 21/10/22 to 10/11/22
Unit VI: Digital Videography	Various Parts, Contrl and Features of Video Camera, Types of daylight applications, Three points lighting- (a) The key light, (b) The fill light and the back light, (c) Bounce and diffuse light, Framing and shots, Camera angle and camera movements	Dr. Utpala Baishya	4	November	From 11/11/22 to 17/11/22
Unit VII: Post Production	The Digital Workflow: Capturing the Image, Storing the Photo, Cataloging the Image Files, Editing the Photo, Sharing, Archiving and Backing Up the Photograph	Mr. Jayanta Deka	7	November	From 18/11/22 to 30/11/22

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (August –December)

Department	Physics	Semester	Fifth semester
Subject	Quantum Mechanics & Applications	Credit	6
Course		Paper No	PHY-HC-5016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Time Dependent Schröding er Equation	Time dependent Schrödinger equation and dynamical evolution of a quantum state, properties of wave function. Interpretation of wave function. Probability and probability current densities in three dimensions. Conditions for physical acceptability of wave functions. Normalization. Linearity and Superposition Principles. Eigenvalues and eigenfunctions. Position, momentum and energy operators; commutator of position and momentum operators. Expectation values of position and momentum. wave function of a free particle.	Dr. Chandrama Kalita,	6	August	From 1/8/22 to 8/8/22
Unit II: Time	Hamiltonian, stationary	Dr. Utpala Baishya ,	10	August	From 9/8/22 to

Independent Schrödinger Equation	states and energy eigenvalues; expansion of an arbitrary wave function as a linear combination of energy eigenfunctions; General solution of the time dependent Schrödinger equation in terms of linear combinations of stationary states; Application to spread of Gaussian wave-packet for a free particle in one dimension; wave packets, Fourier transforms and momentum space wave function; Position-momentum uncertainty principle.				22/8/22
Unit III: Bound States	Continuity of wave function, boundary condition and emergence of discrete energy levels; application to one-dimensional problem-square well potential; Quantum mechanics of simple harmonic oscillator-energy levels and energy eigenfunctions using Frobenius method; Hermite polynomials; ground state, zero point energy & uncertainty principle.	Mr. Jayanta Deka	12	August and September	From 22/8/22 to 4/9/22
Unit IV: Hydrogen-like Atoms	Time independent Schrödinger equation in spherical polar coordinates;	Dr. Chandrama Kalita,	10	September	From 5/9/22 to 18/9/22

	separation of variables for second order partial differential equation; angular momentum operator & quantum numbers; Radial wave functions from Frobenius method; shapes of the probability densities for ground & first excited states; Orbital angular momentum quantum numbers l and m; s, p, d, … shells.				
Unit V: Atoms in Electric & Magnetic	Electron angular momentum. Space quantization. Electron Spin and Spin Angular Momentum. Larmor's Theorem. Spin Magnetic Moment. Stern-Gerlach Experiment. Electron Magnetic Moment and Magnetic Energy, Gyromag-netic Ratio and Bohr Magneton. Zeeman Effect: Normal and Anomalous Zeeman Effect. Paschen-Back Effect and Stark Effect (Qualitative Discussion only).	Dr. Utpala Baishya ,	12	September and October	From 19/9/22 to 12/10/22
Unit VI: Many Electron Atoms	Pauli's Exclusion Principle. Symmetric & Antisymmetric W ave Functions. Periodic table. Fine structure. Spin orbit coupling. Spectral Notations for Atomic States. Total angular momentum. Vector Model. Spin-orbit	Mr. Jayanta Deka	10	October	From 13/10/22 to 27/10/22

	coupling in atoms: L − S and j − j couplings. Hund's Rule. Term symbols. Spectra of Hydrogen and Alkali Atoms (Na etc.).				
Lab	*Use C/C++/Scilab/FORTRAN/ Mathematica/ Python for solving the following problems based on Quantum Mechanics* 5. Solve the *s*-wave Schrödinger equation for the ground state and the first excited state of the hydrogen atom $\frac{d^2y}{dr^2} = A(r)u(r), A(R)$ $A(r) = \frac{2m}{\hbar^2}[V(r) - E]$ $Where\ V(r) = -\frac{e^2}{r}$ 6. Solve the *s*-wave radial Schrödinger equation for an atom $\frac{d^2y}{dr^2} = A(r)u(r),$ $A(r) = \frac{2m}{\hbar^2}[V(r) - E]$ Where *m* is the reduced mass of the system (which can be chosen to be the mass of an electron), for the screened Coulomb potential V(r) $= -\frac{e^2 e^{-r/a}}{r}$	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	12	October and November	From 28/10/22 to 15/11/22

		Find the energy (in eV) of the ground state of the atom to an accuracy of three significant digits. Also, plot the corresponding wave function. Take e=3.795 (eVÅ), and a=3 Å, 5 Å, and 7 Å in the units of $\hbar c$ = 1973(eVÅ) and m = 0.511×10^{6} eV/c^{2}. The ground state energy is expected to be above -12 eV in all three cases. 7. Solve the s-wave radial Schrödinger equation for a particle of mass m $\frac{d^2y}{dr^2} = A(r)u(r), A(R)$ $A(r) = \frac{2m}{\hbar^2}[V(r) - E]$ The anharmonic potential $V(r) = \frac{1kr^2}{2} + \frac{1b}{3}r^3$ for the ground state energy (in MeV) of particle to an accuracy of three significant digits. Also, plot the corresponding wave				

	function. Choose m=940 MeV/c^2, k=100 MeV fm^{-2}, b=0, 10, 30 MeV fm^{-3}. In these units, cħ=197.3 MeV fm. The ground state energy I is expected to lie in between 90 and 110 MeV for all three cases. 8. Solve the s-wave radial Schrödinger equation for the vibration of hydrogen molecule $\frac{d^2y}{dr^2} = A(r)u(r),$ $A(r) = \frac{2\mu}{\hbar^2}[V(r) - E]$ where μ is the reduced mass of the two-atom system for the Morse potential $V(r) = D(e^{-2\alpha r} - e^{-\alpha r})$ $r' = \frac{r - r_0}{r}$ Find the lowest vibrational energy (in MeV) of the molecule to an accuracy of thee significant digits. Also plot the corresponding wave function. Take m=940×10^6 eV/c^2, D= 0.755501 eV, α=1.44,				

	and r_0=0.131349 Å.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (August –December)

Department	Physics	Semester	Fifth semester
Subject	Solid State Physics	Credit	6
Course		Paper No	PHY-HC-5026
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Crystal Structure	Amorphous and Crystalline Materials. Lattice Translation Vectors. Symmetry operations, Lattice with a Basis - Central and Non-Central Elements. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Diffraction of X-rays by Crystals. Bragg's Law. Atomic and Geometrical Factor.	Dr. Chandrama Kalita,	10	August	From 1/8/22 to 13/8/22

Unit II: Elementary Lattice Dynamics	Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Qualitative Description of the Phonon Spectrum in Solids. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T^3 law.	Dr. Utpala Baishya ,	10	August	From 14/8/22 to 28/8/22
Unit III: Magnetic Properties of Matter	Dia, Para, Ferri, and Ferromagnetic Materials. Classical Langevin Theory of Dia and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromag- netic Domains. Discussion of B – H Curve. Hysteresis and Energy Loss.	Mr. Jayanta Deka	8	August and September	From 29/8/22 to 9/9/22
Unit IV: Dielectric Properties of Materials	Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion. Cauchy	Dr. Chandrama Kalita,	8	September	From 10/9/22 to 20/9/22

	and Sellmeir relations. Langevin-Debye equation. Complex Dielectric Constant. Optical Phenomena. Application: Plasma Oscillations, Plasma Frequency, Plasmons, T_0 modes.				
Unit V: Ferroelectric Properties of Materials	Structural phase transition, Classification of crystals, Piezoelectric effect, Pyroelectric effect, Ferroelectric effect, Electrostrictive effect, Curie-Weiss Law, Ferroelectric domains, *PE* hysteresis loop.	Dr. Utpala Baishya ,	6	September	From 21/9/22 to 30/9/22
Unit VI: Free Electron Theory of Metals	Electrical and thermal conductivity of metals, Wiedemann-Franz law. Elementary band theory: Kronig Penny model. Band Gap. Conductor, Semiconductor (*P* and *N* type) and insulator. Conductivity of Semiconductor, mobility, Hall Effect.	Mr. Jayanta Deka	12	September and October	From 31/9/22 to 25/10/22

	Measurement of conductivity (4-probe method) & Hall coefficient.				
Unit VII: Superconductivity	Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Super-conductors, London's Equation and Penetration Depth. Isotope effect. Idea of BCS theory (No derivation).	Dr. Chandrama Kalita,	6	October and November	From 26/10/22 to 1/11/22
Lab	*A minimum of five experiments to be done.* 11. Measurement of susceptibility of paramagnetic solution (Quinck's Tube Method). 12. To measure the Magnetic susceptibility of Solids. 13. To determine the Coupling Coeffcient of a Piezoelectric crystal. 14. To measure the Dielectric Constant of a dielectric Materials with frequency. 15. To determine the complex dielectric	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	15	November	From 2/11/22 to 20/11/22

	constant and plasma frequency of metal using Surface Plasmon resonance (SPR). 16. To determine the refractive index of a dielectric layer using SPR. 17. To study the *PE* Hysteresis loop of a Ferroelectric Crystal. 18. To draw the B − H curve of Fe using Solenoid & determine energy loss from Hysteresis. 19. To measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150 °C) and to determine its band gap. 20. To determine the Hall coeffcient of a semiconductor sample.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (August –December)

Department	Physics	Semester	Fifth semester
Subject	Experimental Techniques	Credit	6
Course		Paper No	PHY-HE-5016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Measurements	Accuracy and precision. Significant figures. Error and uncertainty analysis. Types of errors: Gross error, systematic error, random error. Statistical analysis of data (Arithmetic mean, deviation from mean, average deviation, standard deviation, chi-square) and curve fitting.	Dr. Chandrama Kalita,	7	August	From 1/8/22 to 13/8/22
Unit II: Signals and Systems	Periodic and aperiodic signals. Impulse response, transfer function and frequency response of first and second order systems. Fluctuations and Noise in measurement system. S/N ratio and Noise figure. Noise in frequency domain. Sources of Noise: Inherent fluctuations, Thermal noise, Shot noise, 1/f noise.	Dr. Chandrama Kalita,	7	August	From 14/8/22 to 25/8/22
Unit III: Shielding and Grounding	Unit IV: Transducers & industrial instrumentation (working Methods of safety grounding. Energy coupling.	Dr. Utpala Baishya ,	4	August and September	From 26/8/22 to 1/9/22

	Grounding. Shielding:Electrostatic shielding. Electromagnetic Interference Shielding.				
Unit IV: principle, efficiency, applications	Static and dynamic characteristics of measurement Systems. Generalized performance of systems, Zero order first order, second order and higher order systems. Electrical, Thermal and Mechanical systems. Calibration. Transducers and sensors. Characteristics of Transducers. Transducers as electrical element and their signal conditioning. Temperature transducers: RTD, Thermistor, Thermocouples, Semiconductor type temperature sensors (AD590, LM35, LM75) and signal conditioning. Linear Position transducer: Strain gauge, Piezoelectric. Inductance change transducer: Linear variable differential transformer (LVDT), Capacitance change transducers.	Dr. Utpala Baishya ,	21	September	From 2/9/22 to 31/9/22
Unit V: Digital Multimeter	Comparison of analog and digital instruments. Block	Mr. Jayanta Deka	5	October	From 1/10/22 to

	diagram of digital multimeter, principle of measurement of I, V, C. Accuracy and resolution of measurement.				18/10/22
Unit VI: Impedance Bridges and Q-meter	Block diagram and working principles of RLC bridge. Qmeter and its working operation. Digital LCR bridge.	Mr. Jayanta Deka	4	October	From 19/10/22 to 27/10/22
Unit VII: Vacuum Systems	Characteristics of vacuum: Gas law, Mean free path. Application of vacuum. Vacuum system- Chamber, Mechanical pumps, Diffusion pump & Turbo Modular pump, Pumping speed, Pressure gauges (Pirani, Penning, ionization).	Mr. Jayanta Deka	12	October and November	From 28/10/22 to 12/11/22
Lab	*(Minimum number of experiments to be completed is seven)* 14. Determine output characteristics of a LVDT & measure displacement using LVDT 15. Measurement of Strain using Strain Gauge. 16. Measurement of level using capacitive transducer. 17. To study the characteristics of a Thermostat and determine its parameters.	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	20	November	From 13/11/22 to 30/11/22

	18. Study of distance measurement using ultrasonic transducer. 19. Calibrate Semiconductor type temperature sensor (AD590, LM35, or LM75) 20. To measure the change in temperature of ambient using Resistance Temperature Device (RTD). 21. Create vacuum in a small chamber using a mechanical (rotary) pump and measure the chamber pressure using a pressure gauge. 22. Comparison of pickup of noise in cables of different types (co-axial, single shielded, double shielded, without shielding) of 2m length, understanding of importance of grounding using function generator of mV level & an oscilloscope. 23. To design and study the Sample and Hold Circuit. 24. Design and analyze the Clippers and Clampers circuits				

	using junction diode 25. To plot the frequency response of a microphone. 26. To measure Q of a coil and influence of frequency, using a Q-meter				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (August –December)

Department	Physics	Semester	Fifth semester
Subject	Nuclear and Particle Physics	Credit	6
Course		Paper No	PHY-HE-5056
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Months	Date
Unit I: General Properties of Nuclei	Constituents of nucleus and their Intrinsic properties, quantitative facts about mass, radii, charge density (matter density), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/A plot,	Dr. Chandrama Kalita,	10	August	From 1/8/22 to 13/8/22

	angular momentum, parity, magnetic moment, electric moments, nuclear excites states.				
Unit II: Nuclear Models	Liquid drop model approach, semi empirical mass formula and significance of its various terms, condition of nuclear stability, two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force.	Dr. Chandrama Kalita,	12	August	From 14/8/22 to 31/8/22
Unit III: Radioactivity decay	(a) Alpha decay: basics of α-decay processes, theory of α- emission, Gamow factor, Geiger Nuttall law, α-decay spectroscopy. (b) -decay: energy kinematics for -decay, positron emission, electron capture, neutrino hypothesis. (c) Gamma decay: Gamma rays emission & kinematics, internal conversion.	Dr. Utpala Baishya ,	10	September	From 1/9/22 to 14/9/22
Unit IV: Nuclear *Reactions*	Types of Reactions, Conservation Laws, kinematics of reactions, Q-value, reaction rate,	Dr. Utpala Baishya ,	8	September	From 15/9/22 to 25/9/22

	reaction cross section, Concept of compound and direct Reaction, resonance reaction, Coulomb scattering (Rutherford scattering).				
Unit V: Interaction of Nuclear Radiation with matter	Energy loss due to ionization (Bethe- Block formula), energy loss of electrons, Cerenkov radiation. Gamma ray interaction through matter, photoelectric effect, Compton scattering, pair production, neutron interaction with matter.	Mr. Jayanta Deka	8	September and October	From 26/9/22 to 14/10/22
Unit VI: Detector for Nuclear Radiations	Gas detectors: estimation of electric field, mobility of particle, for ionization chamber and GM Counter. Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT). Semiconductor Detectors (Si and Ge) for charge particle and photon detection (concept of charge carrier and mobility), neutron detector.	Mr. Jayanta Deka	8	October	From 15/10/22 to 27/10/22
Unit VII: Particle Accelerators	Accelerator facility available in India: Van-de Graaff generator (Tandem accelerator), Linear accelerator, Cyclotron, Synchrotrons.	Dr. Utpala Baishya ,	5	October and November	From 28/10/22 to 5/11/22
Unit VIII: Particle	Particle interactions;	Mr.	14	November	From 6/11/22

physics	basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model, color quantum number and gluons.	Jayanta Deka			to 25/11/22

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (August –December)

Department	Physics	Semester	Fifth semester
Subject	WEATHER FORECASTING	Credit	4
Course		Paper No	PHY-SE-5014
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Introduction to atmosphere	Elementary idea of atmosphere: physical structure and composition; compositional layering of the atmosphere; variation of pressure and temperature with height; air temperature; requirements to measure air temperature; atmospheric pressure: its measurement;	Dr. Chandrama Kalita,	9	August	From 1/8/22 to 20/8/22

	atmospheric boundary layer and its characteristics; atmospheric convection and inversion; introduction to numerical weather prediction systems.				
Unit II: Measuring the weather	Wind; forces acting to produce wind; measurement of wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere; radiation laws.	Dr. Utpala Baishya ,	4	August and September	From 21/8/22 to 1/9/22
Unit III: Weather systems	Global wind systems; air masses and fronts: classifications; jet streams; local thunderstorms; tropical cyclones: classification; tornadoes; hurricanes, Indian summer monsoon.	Dr. Utpala Baishya ,	3	September	From 2/9/22 to 10/9/22
Unit IV: Climate and Climate Change	Climate: its classification; causes of climate change; global warming and its outcomes; air pollution; aerosols, ozone depletion, acid rain, environmental issues related to climate.	Dr. Utpala Baishya ,	6	September	From 11/9/22 to 19/9/22
Unit V: Basics of weather forecasting	Weather forecasting: analysis and its historical background; need of measuring weather; types of weather forecasting; weather forecasting methods; criteria of choosing weather station; basics of choosing site and exposure;	Mr. Jayanta Deka	8	September and October	From 20/9/22 to 20/10/22

	satellites observations in weather forecasting; weather maps; uncertainty and predictability; probability forecasts.				
Lab	2. Study of synoptic charts & weather reports, working, principle of weather station. 4. Processing and analysis of weather data (a) To calculate the sunniest time of the year. (b) To study the variation of rainfall amount and intensity by wind direction. (c) To observe the sunniest/driest day of the week. (d) To examine the maximum and minimum temperature throughout the year. (e) To evaluate the relative humidity of the day. (f) To examine the rainfall amount month wise. 5. Exercises in chart reading: Plotting of constant pressure charts, surfaces charts, upper wind charts and its analysis. 6. Formats and elements in different types of weather forecasts/ warning (both aviation and non aviation)	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	8	October and November	From 21/10/22 to 15/11/22

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (January -June)

Department	Physics	Semester	Second semester
Subject	Electricity & Magnetism	Credit	6
Course		Paper No	PHY-HC-2016
Remarks		Marks	100

Unit	Course conent	Allotted to	Hours	Month	Date
Unit I: Electric Field and Electric Potential	Electric field: Electric field lines. Electric flux. Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry. Conservative nature of Electrostatic Field. Electrostatic Potential. Laplace's and Poisson equations. The Unique- ness Theorem. Potential and Electric Field of a dipole. Force and Torque on a dipole. Electrostatic energy of system of charges. Electrostatic energy of a charged sphere. Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Parallel-plate capacitor. Capacitance of an isolated conductor. Method of Images and its application to: (1) Plane Infinite Sheet and (2) Sphere.	Dr. Chandrama Kalita,	26	January and February	From 20/1/23 to 14/2/23

Unit II: Dielectric Properties of Matter (Lectures	Electric Field in matter. Polarization, Polarization Charges. Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector $\vec{D}$. Relations between $\vec{E}$, $\vec{P}$ and $\vec{D}$ Gauss' Law in dielectrics.	Dr. Utpala Baishya ,	8	February	From 15/2/23 to 27/2/23
Unit III: Magnetic Field	Magnetic Force on a point charge, definition and properties of magnetic field $\vec{B}$. Curl and Divergence. Vector potential $\vec{A}$. Magnetic Force on (1) a current carrying wire (2) between current elements. Torque on a current loop in a uniform magnetic field. Biot-Savart's law and its simple application : straight wire and circular loop. Current loop as a magnetic dipole and its dipole moment (analogy with electric dipole) Ampere's circuital law and its application to (1) Solenoid (2) Torus.	Dr. Utpala Baishya ,	9	February and March	From 28/2/23 to 14/3/23
Unit IV: Magnetic Properties of Matter	Magnetization vector ($\vec{M}$). Magnetic Intensity ($\vec{H}$). Magnetic Susceptibility and permeability. Relation between $\vec{B}$, $\vec{H}$, $\vec{M}$. Ferromagnetism. B-H curve and hysteresis.	, Dr. Utpala Baishya ,	4	March	From 15/3/23 to 24/3/23
Unit V:	Faraday's Law. Lenz's Law.		6	March	From

Electromagnetic Induction	Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field. Introduction to Maxwell's Equations. Charge Conservation and Displacement current.	Mr. Jayanta Deka		and April	25/3/23 to 5/4/23
Unit VI: Electrical Circuits	AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) 13 Quality Factor, and (4) Band Width. Parallel LCR Circuit.	Mr. Jayanta Deka	4	April	From 6/4/23 to 11/4/23
Unit VII: Network Theorems	Ideal Constant-voltage and Constant-current Sources. Network Theorems: Thevenin theorem, Norton theorem,Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem. Applications to dc circuits.	Mr. Jayanta Deka	3	April	From 12/4/23 to 20/4/23
Unit VIII: Ballistic Galvanometer	Torque on a current Loop. Ballistic Galvanometer: Current and Charge Sensitivity. Electromagnetic damping. Logarithmic damping. CDR.	Dr. Utpala Baishya ,	3	April	From 21/4/23 to 27/4/23
Lab	*A minimum of seven experiments to be done.* 46. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses.	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta	14	April and May	From 28/4/23 to 15/5/23

	47. To study the characteristics of a series RC Circuit. 48. To determine an unknown Low Resistance using Potentiometer. 49. To determine an unknown Low Resistance using Carey Foster’s Bridge. 50. To compare capacitances using De’ Sauty’s bridge. 51. Measurement of field strength $\vec{B}$ and its variation in a solenoid (determine $\frac{dB}{dx}$). 52. To verify the Thevenin and Norton theorems. 53. To verify the Superposition, and Maximum power transfer theorems. 54. To determine self inductance of a coil by Anderson’s bridge. 55. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width. 56. To study the response curve of a parallel LCR circuit and determine its (a) Anti- resonant frequency and (b) Quality factor Q.	Deka			—

	57. Measurement of charge and current sensitivity and CDR of Ballistic Galvanometer. 58. Determine a high resistance by leakage method using Ballistic Galvanometer. 59. To determine self-inductance of a coil by Rayleigh's method. 60. To determine the mutual inductance of two coils by Absolute method.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (January –June)

Department	Physics	Semester	Second semester
Subject	Waves & Optics	Credit	6
Course		Paper No	PHY-HC-2026
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Superposition of Collinear Harmonic Oscillations	Linearity and Superposition Principle. Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies (Beats). Superposition of N collinear Harmonic Oscillations with (1) equal phase differences and (2) equal frequency differences.	Dr. Chandrama Kalita,	5	January	From 20/1/23 to 27/1/23

Unit II: Superposition of Two Perpendicular Harmonic Oscillations	Graphical and Analytical Methods. Lissajous Figures with equal an unequal frequency and their uses.	Dr. Chandrama Kalita,	2	January	From 28/1/23 to 30/1/23
Unit III: Wave Motion	Plane and Spherical Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves. Wave Equation. Particle and Wave Velocities. Differential Equation. Pressure of a Longitudinal Wave. Energy Transport. Intensity of Wave. Water Waves: Ripple and Gravity Waves.	Dr. Chandrama Kalita,	4	February	From 1/2/23 to7/2/23
Unit IV: Velocity of Waves	Velocity of Transverse Vibrations of Stretched Strings. Velocity of Longitudinal Waves in a Fluid in a Pipe. Newton's Formula for Velocity of Sound. Laplace's Correction.	Dr. Chandrama Kalita,	6	February	From 8/2/23 to16/2/23
Unit V: Superposition of Two Harmonic Waves	Standing (Stationary) Waves in a String: Fixed and Free Ends. Analytical Treatment. Phase and Group Velocities. Changes with respect to Position and Time. Energy of Vibrating String.	Dr. Utpala Baishya ,	7	February	From 17/2/23 to 26/2/23

	Transfer of Energy. Normal Modes of Stretched Strings. Plucked and Struck Strings. Melde's Experiment. Longitudinal Standing Waves and Normal Modes. Open and Closed Pipes. Superposition of N Harmonic Waves.				
Unit VI: Wave Optics	Electromagnetic nature of light. Definition and properties of wave front. Huygens Principle. Temporal and Spatial Coherence.	, Dr. Utpala Baishya ,	3	February and March	From 27/2/23 to5/3/23
Unit VII: Interference	Division of amplitude and wavefront. Young's double slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. 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.	Dr. Utpala Baishya ,	9	March	From 6/3/23 to 20/3/23

Unit VIII: Interferometer	Michelson Interferometer- (1) Idea of form of fringes (No theory required), (2) Determination of Wavelength, (3) Wavelength Difference, (4) Refractive Index, (5) Visibility of fringes. Fabry-Perot interferometer.	Mr. Jayanta Deka	4	March	From 21/3/23 to 25/3/23
Unit IX: Diffraction	Fresnel and Fraunhofer diffraction. Fresnel's Half-Period Zones for Plane Wave. Explanation of Rectilinear Prop-agation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel diffraction pattern of a straight edge and at a circular aperture . Resolving Power of a telescope.	, Mr. Jayanta Deka	9	March and April	From 26/3/23 to 10/4/23
Unit X: Fraunhofer Diffraction	Single slit. Double slit. Multiple slits. Diffraction grating . Resolving power of grating.	Mr. Jayanta Deka	8	April	From 11/4/23 to 28/4/23
Unit XI: Holography	Principle of Holography. Recording and Reconstruction Method. Theory of Holography as Interference between	Mr. Jayanta Deka	3	April	From 29/4/23 to 20/4/23

	two Plane Waves. Point source holograms.				
Lab	A minimum of seven experiments to be done. 1. To determine the frequency of an electric tuning fork by Melde's experiment and verify $\lambda 2 - T$ law. 2. To study Lissajous Figures. 3. Familiarization with: Schuster's focusing, determination of angle of prism. 4. To determine refractive index of the Material of a prism using sodium source. 5. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source. 6. To determine wavelength of sodium light using Fresnel Biprism. 7. To determine wavelength of sodium light using Newton's Rings. 8. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	16	April and May	From 21/4/23 to 15/5/23

	wedge-shaped Film. 9. To determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating. 10. To determine dispersive power and resolving power of a plane diffraction grating.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (January –June)

Department	Physics	Semester	Second semester
Subject	Electricity & Magnetism	Credit	6
Course		Paper No	PHY-HG/RC-2016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I : Vector Analysis	Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume	Dr. Chandrama Kalita,	12	January and February	From 20/1/23 to 6/2/23

	integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only).				
Unit II : Electrostatics	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 and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.	, Dr. Utpala Baishya ,	22	February and March	From 7/2/23 to 5/3/23
Unit III : Magnetism	Magnetostatics: Biot-Savart's law & its applications – straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. Magnetic	Dr. Chandrama Kalita,	10	March	From 6/3/23 to 18/3/23

	properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia, para, and ferro-magnetic materials.				
Unit IV : Electromagnetic Induction	Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.	Mr. Jayanta Deka	6	March	From 19/3/23 to 27/3/23
Unit V : Maxwell's Equations and EM Wave	Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.	, Mr. Jayanta Deka	10	March and April	From 28/3/23 to 17/4/23
Lab	31. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses. 32. Ballistic Galvanometer (a) Measurement of charge and current sensitivity (b) Measurement of CDR (c) Determine a high resistance by	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	14	April and May	From 18/4/23 to 15/5/23

	Leakage Method (d) To determine Self Inductance of a Coil by Rayleigh's Method. 33. To compare capacitances using De'Sauty's bridge. 34. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx). 35. To study the Characteristics of a Series RC Circuit. 36. To study the a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor 37. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q . 38. To determine a Low Resistance by Carey Foster's Bridge. 39. To verify the Thevenin and Norton theorem. 40. To verify the Superposition, and Maximum Power Transfer Theorem.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Mathematical Physics III	Credit	6
Course		Paper No	PHY-HC-4016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Complex Analysis	Functions of Complex Variables. Analyticity and Cauchy-Riemann Conditions. Examples of analytic functions. Singular functions: poles and branch points, order of singularity.	Dr. Utpala Baishya ,	10	January and February	From 20/1/23 to 6/2/23
Unit II: Complex Integration	Integration of a function of a complex variable. Cauchys Integral formula. Simply and multiply connected region. Laurent and Taylors expansion. Residues and Residue Theorem with numerical application.	Dr. Utpala Baishya ,	10	February	From 7/2/23 to 20/2/23
Unit III: Fourier Transforms	Fourier Transforms: Fourier Integral theorem. Fourier Transform. Examples. Fourier trans- form of trigonometric, Gaussian functions Representation of Dirac delta	Dr. Utpala Baishya ,	15	February and March	From 21/2/23 to 10/3/23

	function as a Fourier Integral. Fourier transform of derivatives, Inverse Fourier transform, Convolution theorem (Statement only). Properties of Fourier transforms (translation, change of scale, complex conjugation).				
Unit IV: Laplace Transforms	Laplace Transform (LT) of Elementary functions. Properties of LTs: Change of Scale Theorem, Shifting Theorem. LTs of 1st and 2nd order Derivatives and Integrals of Functions, Derivatives and Integrals of LTs. LT of Unit Step function, Dirac Delta function, Periodic Functions. Convolution Theorem (Statement only). Inverse LT. Application of Laplace Transforms to 2nd order Differential Equations: Damped Harmonic Oscillator.	Dr. Utpala Baishya ,	15	March	From 11/3/23 to 29/3/23
Unit V: Tensor Algebra	Introduction to tensor, Transformation of co-ordinates, Einsteins summation convention. contravariant and co- variant tensor, tensorial character of physical quantities, symmetric and antisymmetric tensors, kronecker delta, Levi-Civita tensor. Quotient law of tensors, Raising and lowering of indices Rules for combination of tensors- addition, subtraction, outer multiplication, contraction and inner multiplications.	Dr. Utpala Baishya ,	10	March and April	From 30/3/23 to 20/4/23
Lab	23. Solve differential equations	Dr. Utpala	15	April and	From

		$\frac{dy}{dx} = e^x \; with \; y = o \; and \; x = 0$ $\frac{dy}{dx} + e^{-x} y = x^2 \frac{d^2y}{dx^2} + 2\frac{dy}{dx} = -y$ $\frac{d^2y}{dx^2} + e^{-t}\frac{dy}{dx} = -y$ 24. Dirac Delta Function Evaluate the integral I $\frac{1}{\sqrt{2\pi}a^2}\int exp\left[\frac{(x-2)^2}{2a^2}\right](x+3)dx$ 25. Fourier Series Make a program to evaluate $\sum_{n=1}^{\alpha}(0.2)^n$ Evaluate the Fourier coefficients of a given periodic function (square wave) 26. Frobenius method and special Function evaluate $\int_{-1}^{1} P_n(x)P_m(x)dx = d_{n,m}$ Plot $P_n(x), j\nu(x)$ and show the recursion relation 27. Calculation of error for each data point of observations recorded in experiments done in previous semesters (choose any two) 28. Calculation of least square fitting manually	Baishya ,		May	21/4/23 to 10/5/23

	without giving weightage to error. Confirmation of least square fitting of data through computer program. 29. Evaluation of trigonometric functions e.g. sinθ, ,given Bessel'sfunctionat *N* points find its value at an intermediate point. 30. Integrate $\frac{1}{(x^2+2)}$ Numerically in a given interval. 31. Compute the nth roots of unity for n=2, 3, and 4. 32. Find the two square roots of 5+12j. Integral transform Evaluate FFT of e^{-x^2} 33. Solve Kirchoff's current law for any node of an arbitrary circuit using Laplace's transform.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Elements of Modern Physics	Credit	6
Course		Paper No	PHY-HC-4026
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Quantum Theory and Blackbody Radiation	Quantum theory of light; photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment. Wave description of particles by wave packets. group and phase velocities and relation between them. Two-slit experiment with electrons. Probability. wave amplitude and wave functions.	Mr. Jayanta Deka	12	January and February	From 20/1/23 to 6/2/23
Unit II: Uncertainty and Wave-Particle Duality	Position measurement : gamma ray microscope thought experiment; wave-particle duality, Heisenberg uncertainty principle (Uncertainty relations involving Canonical pair of	Mr. Jayanta Deka	5	February	From 7/2/23 to 16/2/23

	variables): Derivation from wave packets, impossibility of a particle following a trajectory; estimating minimum energy of a confined particle using uncertainty principle; energy-time uncertainty principle- application to virtual particles and range of an interaction.				
Unit III: Schrödinger Equation	Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrödinger equation for non- relativistic particles; expectation value, momentum and energy operators; stationary states; physical interpretation of a wave function, probabilities and normalization; probability and probability current densities in one dimension.	Mr. Jayanta Deka	8	February and March	From 17/2/23 to 1/3/23
Unit IV: One-dimensional Box and Step Barrier	One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization; quantum dot as example; quantum mechanical scattering and tunnelling in one dimension-	Mr. Jayanta Deka	9	March	From 2/3/23 to 16/3/23

	across a step potential and rectangular potential barrier.				
Unit V: Structure of the Atomic Nucleus	Size and structure of atomic nucleus and its relation with atomic weight; impossibility of an electron being in liquid drop model: semi-empirical mass formula and binding energy, nuclear shell model (qualitative discussions) and magic numbers.	Mr. Jayanta Deka	6	March	From 17/3/23 to 25/3/23
Unit VI: Radioactivity	Stability curve and stability of nuclei, Law of radioactive decay, disintegration constant, half life and mean life. Activity unit. Alpha decay – Range energy relation, Fine structure of alpha energy spectrum. Beta decay energy released, continuous beta spectrum and Pauli's prediction of neutrino. Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus.	Mr. Jayanta Deka	8	March and April	From 26/3/23 to 10/4/23
Unit VII : Detection of nuclear radiation	Method of energy loss by charged particles and gamma photons. Photoelectric, Compton and Pair-production processes Gas filled detectors – principle and construction of a gas filled detector, Ionization, proportional, GM and spark region.	Mr. Jayanta Deka	4	April	From 11/4/23 to 25/4/23

Unit VIII: Fission and Fusion	Energy consideration in Nuclear Reaction, Q-value of nuclear reaction, Mass deficit, Einstein's mass-energy equivalence principle and generation of nuclear energy. Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235. Fusion and thermonuclear reactions driving stellar energy (brief qualitative discussions).	Mr. Jayanta Deka	4	April and May	From 26/4/23 to 6/5/23
Unit IX: Lasers	Einstein's *A* and *B* coefficients. Metastable states. Spontaneous and Stimulated emissions. Optical Pumping and Population Inversion. Three-Level and Four-Level Lasers. Ruby Laser and He-Ne Laser. Basic lasing.	Mr. Jayanta Deka	4	May	From 7/5/23 to 12/5/23
Lab	*A minimum of six experiments to be done.* 27. Measurement of Planck's constant using black body radiation and photo-detector. 28. Photo-electric effect Photo current versus intensity and wavelength of light; maximum energy of photo-electrons	Mr. Jayanta Deka	16	May	From 13/5/23 to 30/5/23

		versus frequency of light. 29. To determine work function of material of filament of directly heated vacuum diode. 30. To determine the Planck's constant using LEDs of at least 4 different colours. 31. To determine the wavelength of H − α emission line of hydrogen atom. 32. To determine the ionization potential of mercury. 33. To determine the absorption lines in the rotational spectrum of iodine vapour. 34. To determine the value of e/m by (a) magnetic focusing or (b) bar magnet. 35. To setup the Millikan oil drop apparatus and determine the charge of an electron. 36. To show the tunneling effect in tunnel diode using I − V characteristics. 37. To determine the wavelength of laser source using diffraction of single slit. 38. To determine the wavelength of laser source using diffraction of double slits.				

	39. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Analog Systems & Applications	Credit	6
Course		Paper No	PHY-HC-4036
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Semiconductor Diodes	P and N type semiconductors. Energy Level Diagram. Conductivity and Mobility, Concept of Drift velocity. PN Junction Fabrication (Simple Idea). Barrier Formation in PN Junction Diode. Static and Dynamic Resistance. Current Flow Mechanism in Forward and Reverse Biased Diode. Drift Velocity. Derivation for	Dr. Chandrama Kalita,	10	January and February	From 20/1/23 to 6/2/23

	Barrier Potential, Barrier Width and Current for Step Junction. Current flow mechanism in Forward and Reverse Biased Diode.				
Unit II: Two-terminal Devices and their Applications	(1) Rectifier Diode: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, C-filter (2) Zener Diode and Voltage Regulation. Principle and structure of (1) LEDs, (2) Photodiode and (3) Solar Cell.	Dr. Chandrama Kalita,	6	February	From 7/2/23 to 20/2/23
Unit III: Bipolar Junction Transistors	$n-p-n$ and $p-n-p$ Transistors. Characteristics of CB, CEand CC Configurations. Current gains α and β. Relations between α and β. Load Line analysis of Transistors. DC Load line and *Q*-point. Physical Mechanism of Current Flow. Active, Cutoff and Saturation Regions.	Dr. Chandrama Kalita,	6	February and March	From 20/2/23 to 1/3/23
Unit IV: Amplifiers	Transistor Biasing and Stabilization Circuits. Fixed Bias and Voltage Divider Bias. Transistor as 2-port Network. *h*- parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid	Dr. Chandrama Kalita,	10	March	From 2/3/23 to 15/3/23

	Model. Input and Output Impedance. Current, Voltage and Power Gains. Classification of Class *A*, *B* & *C* Amplifiers.				
Unit V: Coupled Amplifier	Two stage RC-coupled amplifier and its frequency response.	Dr. Chandrama Kalita,	4	March	From 16/3/23 to 23/3/23
Unit VI: Feedback in Amplifiers	Effects of Positive and Negative Feedback on Input Impedance, Output Impedance, Gain, Stability, Distortion and Noise.	Dr. Chandrama Kalita,	4	February and March	From 24/3/23 to 31/3/23
Unit VII: Sinusoidal Oscillators	Barkhausen's Criterion for self-sustained oscillations. RC Phase shift oscillator, determination of Frequency. Hartley & Colpitts oscillators.	Dr. Chandrama Kalita,	4	April	From 1/4/23 to 10/4/23
Unit VIII: Operational Amplifiers (Black Box approach)	Characteristics of an Ideal and Practical Op-Amp. (IC 741) Open-loop and Closed-loop Gain. Frequency Response. CMRR. Slew Rate and concept of Virtual ground.	Dr. Chandrama Kalita,	9	April	From 11/4/23 to 27/4/23
Unit IX: Applications of Op-Amps	(3) Inverting and non-inverting amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator, (6) Log	Dr. Chandrama Kalita,	9	April and May	From 28/4/23 to 10/5/23

	amplifier, (7) Zero crossing detector (8) Wein bridge oscillator.				
Unit X: Convversion	Resistive network (Weighted and R − 2R Ladder). Accuracy and Resolution. A/D Conversion (successive approximation).	Dr. Chandrama Kalita,	3	May	From 11/5/23 to 15/5/23
Lab	*A minimum of eight experiments to be done.* 1. To study V − I characteristics of PN junction diode, and Light emitting diode. 2. To study the V − I characteristics of a Zener diode and its use as voltage regulator. 3. Study of V − I & power curves of solar cells, and find maximum power point & effciency. 4. To study the characteristics of a Bipolar Junction Transistor in CE configuration. 5. To study the various biasing configurations of BJT for normal class A operation. 6. To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias. 7. To study the frequency response of voltage gain of a RC- coupled transistor amplifier.	Dr. Chandrama Kalita,	9	May	From 15/5/23 to 25/5/23

	8. To design a Wien bridge oscillator for given frequency using an op-amp. 9. To design a phase shift oscillator of given specifications using BJT. 10. To study the Colpitt's oscillator. 11. To design a digital to analog converter (DAC) of given specifications. 12. To study the analog to digital convertor (ADC) IC. 13. To design an inverting amplifier using Op-amp (741/351) for dc voltage of given gain . 14. To design inverting amplifier using Op-amp (741/351) and study its frequency response. 15. To design non-inverting amplifier using Op-amp (741/351) & study its frequency response. 16. To study the zero-crossing detector and comparator. 17. To add two dc voltages using Op-amp in inverting and non-inverting mode. 18. To design a precision Differential amplifier of given I/O specification using Op-amp. 19. To investigate the use of an op-amp as an Integrator.					

	20. To investigate the use of an op-amp as a Differentiator.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Waves & Optics	Credit	6
Course		Paper No	PHY-HG/RC-4016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Superposition of Two Collinear Harmonic Oscillations	Linearity & Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats).	Dr. Chandrama Kalita,	4	January	From 20/1/23 to 27/1/23
Unit II: Superposition of Two Perpendicular Harmonic Oscillations	Graphical and Analytical Methods. Lissajous Figures Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka with equal an unequal frequency and their uses.	Dr. Chandrama Kalita,	2	January and February	From 28/1/23 to 1/2/23

Unit III: Waves Motion	General: Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves, Wave intensity.	Dr. Chandrama Kalita,	7	February	From 2/2/23 to 10/2/23
Unit IV: Fluids	Surface Tension: Synclastic and anticlastic surface – Excess of pressure – Application to spherical and cylindrical drops and bubbles – variation of surface tension with temperature – Jaegar's method. Viscosity – Rate flow of liquid in a capillary tube – Poiseuille's formula – Determination of coefficient of viscosity of a liquid – Variations of viscosity of liquid with temperature – lubrication.	Dr. Chandrama Kalita,	6	February	From 11/2/23 to 21/2/23
Unit V : Sound	Simple harmonic motion - forced vibrations and resonance - Fourier's Theorem - Application to saw tooth wave and square wave - Intensity and loudness of sound - 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.	Dr. Utpala Baishya ,	6	February and March	From 22/2/23 to 1/3/23

Unit VI : Wave Optics	Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle.	Dr. Utpala Baishya , Mr.	3	March	From 2/3/23 to 8/3/23
Unit VII : Interference	Division of amplitude and division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination and Fringes of equal thickness . Newton's Rings: measurement of wavelength . Michelson's Interferometer: Idea of form of fringes (no theory needed), Determination of wavelength, Wavelength difference, Refractive index Visibility of fringes.	Dr. Utpala Baishya ,	10	March	From 9/3/23 to 22/3/23
Unit VIII : Michelson Interferomete r	(3) Idea of form of fringes (No theory required), (2) Determination of Wavelength, (3) Refractive Index. (4) Visibility of fringes.	Mr. Jayanta Deka	3	March	From 23/3/23 to 26/3/23
Unit IX : Diffraction	Fresnel and Fraunhofer diffraction . Fresnel's Half-Period Zones for Plane Wave. Explanation of Rectilinear Propa- gation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel diffraction pattern of a straight edge and at a circular aperture . Resolving Power of a telescope.	Mr. Jayanta Deka	14	March and April	From 27/3/23 to 12/4/23

	Fraunhofer diffraction due to a Single slit , Diffraction grating . Resolving power of grating.				
Unit X : Polarization	Transverse nature of light waves. Double Refraction, Plane, circular and elliptically polarized light , Production and analysis of polarized light. Retarding plates.	Mr. Jayanta Deka	5	April	From 13/4/23 to 20/4/23
Lab	*A minimum of five experiments to be done.* 1. To study the variation in liquid column height with diameter of capillary tube and determine the surface tension of the liquid. 2. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify Z^2 — T Law. 3. To determine the coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method) 4. To determine the focal length of a convex mirror with the help of convex lens . 5. To determine the refractive index of a liquid	Dr. Chandra ma Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	14	April and May	From 21/4/23 to 15/5/23

	by using plane mirror and convex lens. 6. To determine the focal length of two lenses and their combination by displacement method . 7. Familiarization with Schuster's focussing; determination of angle of prism. 8. To determine the Refractive Index of the Material of a Prism using Sodium Light. 9. To determine wavelength of sodium light using Newton's Rings.					

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (January –June)

Department	Physics	Semester	Fourth semester
Subject	Photoshop	Credit	4
Course		Paper No	PHY-SE-4044
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Getting Started with Adobe Photoshop CC	Overview of Adobe Photoshop CC, Features of Adobe Photoshop CC	Dr. Chandrama Kalita,	3	January	From 20/1/23 to 27/1/23
Unit II: Importance of Adobe Photoshop CC	Overview of Tools Used in Adobe Photoshop CC, Importance of Adobe Photoshop CC	Dr. Chandrama Kalita,	5	January and February	From 28/1/23 to 2/2/23
Unit III: Working with Typography	Typography, Creating Typographies, Choosing the Right Font and Color	Dr. Chandrama Kalita,	4	February	From 3/2/23 to 7/2/23
Unit IV: Working with Layers and Images	Cropping a Photo, Resizing Images, Basics of Layers, Creating Layers for Print and Digital Media, Aligning Images within Multiple Layers, Merging Layer Techniques	, Dr. Utpala Baishya ,	6	February	From 8/2/23 to 16/2/23
Unit V: Working with Filters	Photoshop Filters, Smart Filters, Common Features of Photoshop Filter	Dr. Utpala Baishya ,	4	February	From 8/2/23 to 16/2/23
Unit VI: Digital Painting in Adobe Photoshop CC	Working with Brush Tool, Importance of Using Colors	, Mr. Jayanta Deka	4	February	From 17/2/23 to 20/2/23
Unit VII: Masking and File Formats in Adobe Photoshop CC	Introduction to Mask, Creating Vector and Layer Masks, Essential File Formats, Choosing the Right Format for Print and Digital Media	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	4	February and March	From 21/2/23 to 5/3/23

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (January –June)

Department	Physics	Semester	Six semester
Subject	Electromagnetic Theory	Credit	6
Course		Paper No	PHY-HC-6016
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Maxwell Equations	Review of Maxwell's equations. Displacement Current. Vector and Scalar Potentials. Gauge Transformations: Lorentz and Coulomb Gauge. Boundary Conditions at Interface between Different Media. Wave Equations. Plane Waves in Dielectric Media. Poynting Theorem and Poynting Vector. Electromagnetic (EM) Energy Density. Physical Concept of Electromagnetic Field Energy Density,	Dr. Chandrama Kalita	12	January and February	From 20/1/23 to 5/2/23

	Momentum Density and Angular Momentum Density.				
Unit II: EM Wave Propagation in Unbounded Media	Plane EM waves through vacuum and isotropic dielectric medium, transverse nature of plane EM waves, refractive index and dielectric constant, wave impedance. Propagation through conducting media, relaxation time, skin depth. Wave propagation through dilute plasma, electrical conductivity of ionized gases, plasma frequency, refractive index, skin depth, application to propagation through ionosphere.	Dr. Chandrama Kalita	10	February	From 6/2/23 to 21/2/23
Unit III: EM Wave in Bounded Media	Boundary conditions at a plane interface between two media. Reflection & Refraction of plane waves at plane interface between two dielectric media-Laws of Reflection & Refraction. Fresnel's Formulae for perpendicular & parallel polarization cases, Brewster's law. Reflection & Transmission coefficients. Total	Dr. Chandrama Kalita	10	February and March	From 22/2/23 to 5/3/23

	internal reflection, evanescent waves. Metallic reflection (normal Incidence).				
Unit IV: Polarization of Electromagnetic Waves	Description of Linear, Circular and Elliptical Polarization. Propagation of E.M. Waves in Anisotropic Media. Symmetric Nature of Dielectric Tensor. Fresnel’s Formula. Uniaxial and Biaxial Crystals. Light Propagation in Uniaxial Crystal. Double Refraction. Polarization by Double Refraction. Nicol Prism. Ordinary & extraordinary refractive indices. Production & detection of Plane, Circularly and Elliptically Polarized Light. Phase Retardation Plates: Quarter-Wave and Half-Wave Plates. Babinet Compensator and its Uses. Analysis of Polarized Light.	Dr. Chandrama Kalita	12	March	From 6/3/23 to 20/3/23
Unit V: Rotatory Polarization	Optical Rotation. Biot’s Laws for Rotatory Polarization. Fresnel’s Theory of optical rotation. Calculation of angle of rotation. Experimental verification	Dr. Chandrama Kalita	8	March and April	From 21/3/23 to 5/4/23

	of Fresnel's theory. Specific rotation. Laurent's half-shade polarimeter. (5 Lectures) Wave Guides: Planar optical wave guides. Planar dielectric wave guide. Condition of continuity at interface. Phase shift on total reflection. Eigenvalue equations. Phase and group velocity of guided waves. Field energy and Power transmission.				
Unit VI: Optical Fibres	Numerical Aperture. Step and Graded Indices (Definitions Only). Single and Multiple Mode Fibres (Concept and Definition Only).	Dr. Chandrama Kalita	3	April	From 6/4/23 to 12/4/23

Lab		13. To verify the law of Malus for plane polarized light. 14. To determine the specific rotation of sugar solution using Polarimeter. 15. To analyze elliptically polarized Light by using a Babinet's compensator. 16. To study dependence of radiation on angle for a simple Dipole antenna. 17. To determine the wavelength and velocity of ultrasonic waves in a liquid (Kerosene Oil, Xylene, etc.) by studying the diffraction through ultrasonic grating. 18. To study the reflection, refraction of microwaves. 19. To study Polarization and double slit interference in microwaves. 20. To determine the refractive index of liquid by total internal	Dr. Chandrama Kalita	16	April and May	From 13/4/23 to 15/5/23

	reflection using Wollaston's air-film. 21. To determine the refractive Index of (1) glass and (2) a liquid by total internal reflection using a Gaussian eyepiece. 22. To study the polarization of light by reflection and determine the polarizing angle for air-glass interface. 23. To verify the Stefan's law of radiation and to determine Stefan's constant. 24. To determine the Boltzmann constant using V − I characteristics of PN junction diode.				

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (January –June)

Department	Physics	Semester	Six semester
Subject	Statistical Mechanics	Credit	6
Course		Paper No	PHY-HC-6026
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Classical Statistics	Macrostate & Microstate, Elementary Concept of Ensemble, Phase Space, Entropy and Thermodynamic Probability, Maxwell-Boltzmann Distribution Law, Partition Function, Thermodynamic Functions of an Ideal Gas, Classical Entropy Expression, Gibbs Paradox, Sackur Tetrode equation, Law of Equipartition of Energy (with proof) – Applications to Specific Heat and its Limitations, Thermodynamic Functions of a Two-Energy Levels System, Negative Temperature.	Dr. Chandrama Kalita,	18	January and February	From 20/1/23 to 12/2/23
Unit II: Classical Theory of Radiation	Properties of Thermal Radiation. Blackbody Radiation. Pure temperature dependence. Kirchhoff's law. Stefan-Boltzmann law: Thermodynamic proof. Radiation Pressure. Wien's	Dr. Chandrama Kalita,	9	February	From 13/2/23 to 24/2/23

	Displacement law. Wien's Distribution Law. Saha's Ionization Formula. Rayleigh-Jean's Law. Ultraviolet Catastrophe.				
Unit III: Quantum Theory of Radiation	Spectral Distribution of Black Body Radiation. Planck's Quantum Postulates. Planck's Law of Blackbody Radi- ation: Experimental Verification. Deduction of (1) Wien's Distribution Law, (2) Rayleigh-Jeans Law, (3) Stefan- Boltzmann Law, (4) Wien's Displacement law from Planck's law.	Dr. Utpala Baishya ,	5	February and March	From 25/2/23 to 3/3/23
Unit IV: Bose-Einstein Statistics	B-F distribution law, Thermodynamic functions of a strongly Degenerate Bose Gas, Bose Einstein condensation, properties of liquid He (qualitative description), Radiation as a photon gas and Thermodynamic functions of photon gas. Bose derivation of Planck's law.	, Dr. Utpala Baishya ,	13	March	From 4/3/23 to 20/3/23
Unit V: Fermi-Dirac Statistics	Fermi-Dirac Distribution Law, Thermodynamic functions of a Completely and strongly Degenerate Fermi Gas, Fermi Energy, Electron gas in a Metal, Specific Heat of Metals, Relativistic Fermi gas, White Dwarf Stars, Chandrasekhar Mass Limit.	, Mr. Jayanta Deka	15	March and April	From 21/3/23 to 10/4/23
Lab	*Use C/C++/Scilab/other numerical simulations for solving*	Dr. Utpala Baishya ,	16	April and May	From 11/4/23

	the problems based on Statistical Mechanics. 1. Computational analysis of the behavior of a collection of particles in a box that satisfy Newtonian mechanics and interact via the Lennard-Jones potential, varying the total number of particles N and the initial conditions: (a) Study of local number density in the equilibrium state (i) average; (ii) fluctuations. (b) Study of transient behaviour of the system (approach to equilibrium). (c) Relationship of large N and the arrow of time. (d) Computation of the velocity distribution of particles for the system and comparison with the Maxwell velocity distribution. (e) Computation and study of mean molecular speed and its dependence on particle mass. (f) Computation of fraction of molecules in an ideal gas having speed near the most probable speed 2. Computation of the partition function $Z(\beta)$ for examples of systems with a	Mr. Jayanta Deka			to 10/5/23

	finite number of single particle levels (e.g., 2 level, 3 level, etc.) and a finite number of non-interacting particles *N* under Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein statistics: (a) Study of how Z(β), average energy (E), energy fluctuation ΔE, specific heat at constant volumeC_P, depend upon the temperature, total number of particles *N* and the spectrum of single particle states. (b) Ratios of occupation numbers of various states for the systems considered above. *(c)* Computation of physical quantities at large and small temperature *T* and comparison of various statistics at large and small temperature *T*. 3. Plot Planck's law for Black Body radiation and compare it with Raleigh-Jeans Law at high temperature and low temperature. 4. Plot Specific Heat of Solids (a) Dulong-Petit law, (b) Einstein				

	distribution function, (c) Debye distribution function for high temperature and low temperature and compare them for these two cases. 5. Plot the following functions with energy at different temperatures (a) Maxwell-Boltzmann distribution (b) Fermi-Dirac distribution (c) Bose-Einstein distribution					

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (January –June)

Department	Physics	Semester	Six semester
Subject	Astronomy and Astrophysics	Credit	6
Course		Paper No	PHY-HE-6046
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Stellar properties	Radiant flux and Luminosity, Magnitude scale. Measurement of astronomical quantities: Stellar distances(parallax), Radii, Mass and Effective Temperature. Equilibrium of stars, Gravity and thermodynamics, virial theorem. Stellar spectral classification – Hertzsprung-Russell (HR) diagram. Introductory idea of stellar evolution: white dwarf, neutron stars and black holes.	Dr. Utpala Baishya ,	15	January and February	From 20/1/23 to 10/2/23
Unit II: The Sun and the solar system	The Sun; properties of photosphere, chromosphere and corona. Solar system's objects: Theory of formation of the solar system (introductory idea only); physical properties of the planets- their distances, atmospheres, asteroid belt, meteorites and the comets – Kuiper belt and the Oort cloud; Introduction to Extra-Solar Planets.	Dr. Utpala Baishya ,	15	February and March	From 11/2/23 to 5/3/23
Unit III: Positional Astronomy	Celestial sphere, spherical geometry and celestial coordinates. Concept of time: universal time, solar time, mean solar time, local sidereal time and Julian day. Introduction to constellations (hands on practice in evening sky with small telescopes or laser pointer), ecliptic and diurnal motion of stars. Solar system's objects :	Dr. Utpala Baishya ,	10	March	From 6/3/23 to 18/3/23

	rotation, revolution and coordinates in the sky.				
Unit IV: Astronomical Techniques	Introduction to telescopes – telescope size and light gathering power, resolving power, f-number. Different types of optical telescopes (reflecting and refracting). Space telescopes. Concept of virtual observatory, on-line tools in astronomy: SDSS, SkyView, SIMBAD, Aladin, AAVSO database etc. Introduction to photometry, spectroscopy and polarimetry.	Dr. Utpala Baishya ,	10	March and April	From 19/3/23 to 1/4/23
Unit V: Galaxies	The Milky Way, properties of the galactic centre. Classification of galaxies, Hubble's tuning fork diagram, normal (spiral, elliptical and lenticular) and active galaxies. Black holes in galaxies.	Dr. Utpala Baishya ,	10	April	From 2/4/23 to 20/4/23
Unit VI: Large Scale Structure and Cosmology	Distance ladder in cosmology, Cepheid variables. Cosmic expansion of the universe and Hubble(- Lemaitre) law. Clusters of galaxies and dark matter - virial theorem. Concept of the Hot Big Bang, Oscillating Universe, Cosmic Microwave Background (CMB).	Dr. Utpala Baishya ,	15	April and May	From 21/4/23 to 15/5/23

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (January –June)

Department	Physics	Semester	Six semester
Subject	PHYSICS-DSE: CLASSICAL DYNAMICS	Credit	6
Course		Paper No	PHY-HE-6056
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Classical Mechanics of Point Particles	Review of Newtonian Mechanics; Application to the motion of a charge particle in external electric and magnetic fields- motion in uniform electric field, magnetic field- gyroradius and gyrofrequency, motion in crossed electric and magnetic fields.constraints, Generalized coordinates and velocities, principle of virtual work, D,Alembert's principle,Hamilton'sprinciple, Lagrangian and the Euler-Lagrange equations, one-dimensional examples of the Euler-Lagrange equations- one-dimensional Simple Harmonic Oscillations and falling body in uniform gravity; applications to	Mr. Jayanta Deka		January and February	From 20/1/23 to 20/2/23

	simple systems such as coupled oscillators Canonical momenta & Hamiltonian. Hamilton's equations of motion. Applications: Hamiltonian for a harmonic oscillator, solution of Hamilton’s equation for Simple Harmonic Oscillations; particle in a central force field- conservation of angular momentum and energy.				
Unit II: Small Amplitude Oscillations	Minima of potential energy and points of stable equilibrium, expansion of the potential energy around a minimum, small amplitude oscillations about the minimum, normal modes of oscillations example of N identical masses connected in a linear fashion to (N -1) - identical springs.	Mr. Jayanta Deka	10	February and March	From 21/2/23 to 10/3/23
Unit III: Special Theory of Relativity	Postulates of Special Theory of Relativity. Lorentz Transformations. Minkowski space. The invariant interval, light cone and world lines. Space-time diagrams. Time-dilation, length contraction and twin paradox. Four-vectors: space- like, time-like and light-like. Four-velocity and acceleration. Metric and alternating tensors. Four-momentum and energy-momentum relation. Doppler effect from a four-vector perspective. Concept of four-	Mr. Jayanta Deka	33	March and April	From 11/3/23 to 25/4/23

	force. Conservation of four-momentum. Relativistic kinematics. Application to two-body decay of an unstable particle.				
Unit IV: Fluid Dynamics	Density ρ and pressure *P* in a fluid, an element of fluid and its velocity, continuity equation and mass conservation, stream-lined motion, laminar flow, Poiseuille's equation for flow of a liquid through a pipe, Navier-Stokes equation, qualitative description of turbulence, Reynolds number.	Mr. Jayanta Deka	10	April and May	From 25/4/23 to 10/5/23

TEACHING PLAN
DEPARTMENT OF PHYSICS
SBMS COLLEGE, SUALKUCHI
Session: 2022-23 (January –June)

Department	Physics	Semester	Six semester
Subject	RENEWABLE ENERGY AND ENERGY HARVESTING	Credit	4
Course		Paper No	PHY-SE-6024
Remarks		Marks	100

Unit	Course content	Allotted to	Hours	Month	Date
Unit I: Fossil fuels and Alternate Sources of energy	Fossil fuels and Nuclear Energy, their limitation, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.	Dr. Chandrama Kalita,	3	January	From 20/1/23 to 27/1/23
Unit II: Solar energy	Solar energy, its importance, storage of solar energy, solar pond, non-convective solar pond, 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. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.	Dr. Chandrama Kalita,	6	January and Februar y	From 28/1/23 to 6/2/23

Unit III: Wind Energy harvesting	Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies.	Dr. Utpala Baishya ,	3	February	From 7/2/23 to 13/2/23
Unit IV: Ocean Energy	Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices.	, Dr. Utpala Baishya ,	3	February	From 14/2/23 to 20/2/23
Unit V:	Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass.	Dr. Utpala Baishya ,	2	February	From 20/2/23 to 25/2/23
Unit VI: Geothermal Energy	Geothermal Resources, Geothermal Technologies.	Dr. Utpala Baishya ,	2	February and March	From 26/2/23 to 1/3/23
Unit VII: Hydro Energy	Hydropower resources, hydropower technologies, environmental impact of hydro power sources.	Mr. Jayanta Deka	2	March	From 2/3/23 to 5/3/23
Unit VIII: Piezoelectric Energy harvesting	Introduction, Physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modelling	Mr. Jayanta Deka	4	March	From 6/3/23 to 15/3/23

	piezoelectric generators, Piezoelectric energy harvesting applications, Human power.				
Unit IX: Electromagnetic Energy Harvesting	Linear generators, physics mathematical models, recent applications	, Mr. Jayanta Deka	2	March	From 16/3/23 to 20/3/23
Unit X:	Carbon captured technologies, cell, batteries, power consumption	Mr. Jayanta Deka	2	March	From 21/3/23 to 29/3/23
Unit XI:	Environmental issues and Renewable sources of energy, sustainability.	, Mr. Jayanta Deka	1	March	From 30/3/23 to 31/3/23
Demonstrations and Experiments	4. Demonstration of Training modules on Solar energy, wind energy, etc. 5. Conversion of vibration to voltage using piezoelectric materials 6. Conversion of thermal energy into voltage using thermoelectric modules.	Dr. Chandrama Kalita, Dr. Utpala Baishya , Mr. Jayanta Deka	6	April	From 1/4/23 to 20/4/23