Nalbari College, Nalbari

Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr. Dhruba Jyoti Gogoi

Department: Physics

Semester: I

Course Name: Mechanics *(Unit: III, IV, V and VI)*

Course level: PHY-HG-1016 and PHY-RC-1016

Learning Objectives:

This course introduces mathematical physics and mechanics. The basic objectives of the course are

- To introduce the concepts of vectors and coordinate systems in Physics, solve Ordinary Differential Equations, laws of motion and their application to various dynamical situations, inertial reference frames their transformations.
- Concept of conservation of energy, momentum, angular momentum and apply them to basic problems, phenomenon of simple harmonic motion, motion under central force, concept of time dilation, Length contraction using special theory of relativity of dynamics of particles, energy, oscillation and basic properties of matter which will equip students with the tools required for applying the concepts of physics in practical problems
- To train the students with concept visualization through some laboratory practices along with handle measuring instruments like screw gauge, Vernier calipers, travelling microscope.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit III: Momentum and Energy (Lectures 06)			
01	Conservation of momentum	1. Hand written notes 2.Mechanics, D. S. Mathur, S. Chand and Company Limited 3.S. Chand Refresher's course, C.L Arora	Board & chalk
02	Work and energy		
03	Rigid body motion		
04	Conservation of energy.		

05	Motion of rockets		
06	Doubt clearing and problem solving class		
Unit IV: Rotational Motion (Lectures 05)			
07	Introduction & Angular velocity	1. Hand written notes 2.Mechanics, D. S. Mathur, S. Chand and Company Limited 3.S. Chand Refresher's course, C.L Arora	Board & chalk
08	Angular momentum and. Torque		
09	Conservation of angular momentum		
10	*Numerical problem-solving class*		
11	*Numerical problem-solving class*		
Unit V: Gravitation (Lectures 07)			
12	Newton's Law of Gravitation	1. Hand written notes 2.Mechanics, D. S. Mathur, S. Chand and Company Limited 3.S. Chand Refresher's course, C.L Arora	Board & chalk
13	Motion of a particle in a central force field		
14	Cont.		
15	motion is in a plane, angular momentum is conserved, areal velocity is constant		
16	Cont.		
17	Kepler's Laws (statement only)		
18	*Numerical problem-solving class*		
Unit –VI: Oscillations (Lectures 07)			
19	Simple harmonic motion	1. Hand written notes 2.Mechanics, D. S. Mathur, S. Chand and Company Limited 3.S. Chand Refresher's course, C.L Arora	Board & chalk (Laboratory is incorporated for this unit)
20	Differential equation of SHM and its solutions.		
21	Cont.		
22	Kinetic and Potential Energy of SHM		
23	Total Energy and their time averages		
24	Damped oscillations.		
25	Compound pendulum		

Signature of the Teacher

Signature of the HoD

Nalbari College, Nalbari

Teaching Plan for the Session: 2022-23

Name of the Teacher: Ananta Rajbongshi

Department: Physics

Semester: I

Course Name: Mechanics *(Unit: I,II, VII and VIII)*

Course level: PHY-HG-1016 and PHY-RC-1016

Learning Objectives:

This course introduces mathematical physics and mechanics. The basic objectives of the course are

- To introduce the concepts of vectors and coordinate systems in Physics, solve Ordinary Differential Equations, laws of motion and their application to various dynamical situations, inertial reference frames their transformations.
- Concept of conservation of energy, momentum, angular momentum and apply them to basic problems, phenomenon of simple harmonic motion, motion under central force, concept of time dilation, Length contraction using special theory of relativity of dynamics of particles, energy, oscillation and basic properties of matter which will equip students with the tools required for applying the concepts of physics in practical problems
- To train the students with concept visualization through some laboratory practices along with handle measuring instruments like screw gauge, Vernier calipers, travelling microscope.

Sl. No of Lecture	**Topic/ Subtopic**	**Learning Resources**	**Mode of Teaching & ICT Tools**
Unit I: Vectors (Lectures 06)			
01	Vector algebra. Scalar and vector products	1. Hand written notes 2.Mechanics, D. S. Mathur, S. Chand and Company Limited 3.S. Chand Refresher's course, C.L Arora ..	Board & chalk
02	Derivatives of a vector with respect to a parameter		
03	Cont...		
04	Ordinary Differential Equations: 1st order		

	homogeneous differential equations	.	
05	Ordinary Differential Equations: 2nd order homogeneous differential equations with constant coefficients	.	
06	Cont.		
Unit II : Laws of Motion (Lectures 10)			
07	Frames of reference	1. Hand written notes 2.Mechanics, D. S. Mathur, S. Chand and Company Limited 3.S. Chand Refresher's course, C.L Arora	Board & chalk
08	Cont.		
09	Newton's Laws of motion		
10	Cont.		
11	Dynamics of a system of particles		
12	Cont.		
13	Centre of Mass		
14	Cont.		
15	*Numerical problem-solving class*		
16	*Numerical problem-solving class*		
Unit VII : Elasticity (Lectures 08)			
17	Hooke's law - Stress-strain diagram – Elastic modulus	1. Hand written notes 2.Mechanics, D. S. Mathur, S. Chand and Company Limited 3.S. Chand Refresher's course, C.L Arora	Board & chalk (Laboratory is incorporated for this unit)
18	Relation between elastic constants		
19	Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants		
20	Work done in stretching and work done in twisting a wire		
21	Twisting couple on a cylinder		
22	Determination of Rigidity modulus by static torsion - Torsional pendulum		
23	Determination of Rigidity modulus and moment of inertia by Searles method		
24	*Numerical problem-solving class*		
Unit VII : Special Theory of Relativity (Lectures 07)			
25	Constancy of speed of light	1. Hand written notes 2.Mechanics, D. S. Mathur, S. Chand and Company Limited 3.S. Chand Refresher's course, C.L Arora	Board & chalk
26	Postulates of Special Theory of Relativity		
27	Cont.		
28	Length contraction		
29	Time dilation		

30	Relativistic addition of velocities		
31	*Numerical problem-solving class*		

Signature of the Teacher

Signature of the HoD

Nalbari College, Nalbari

Teaching Plan for the Session: 2022-23 (January -June)

Name of the Teacher: Dr. Dhruba Jyoti Gogoi

Department: Physics

Semester: II

Course Name: Waves & Optics *(Unit: I, II, III, IV and V)*

Course level: PHY-HC-2026

Learning Objectives:

This course introduces waves and optics. The basic objectives of the course are

- To understand superposition of harmonic oscillations, different types of wave motions, superposition of harmonic waves etc.
- To introduce the concepts of interference and interferometer, diffraction and holography.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit I: Superposition of Collinear Harmonic Oscillations (Lectures 05)			
01	Linearity and Superposition Principle	1. Hand written notes 2. Waves and optics KK Sharma 3.Fundamental of Optics, A. Kumar	Board & chalk
02	Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies (Beats).		
03	*Cont.*		
04	Superposition of N collinear Harmonic Oscillations with (1) equal phase differences and (2) equal frequency differences.		
05	*Cont.*		
Unit II: Superposition of Two Perpendicular Harmonic Oscillations (Lectures 02)			
06	Analytical Methods. Lissajous Figures with equal an unequal frequency and their uses.	1. Hand written notes 2. Waves and optics KK Sharma 3.Fundamental of Optics, A. Kumar	Board & chalk (Laboratory is incorporated for this unit)
07	Graphical Methods. Lissajous Figures with equal an unequal frequency and their uses.		

Unit III: Wave Motion (Lectures 04)			
08	Plane and Spherical Waves. Longitudinal and Transverse Waves	1. Hand written notes 2. Waves and optics KK Sharma 3.Fundamental of Optics, A. Kumar	Board & chalk
09	Plane Progressive (Travelling) Waves. Wave Equation. Particle and Wave Velocities.		
10	Differential Equation. Pressure of a Longitudinal Wave		
11	Energy Transport		
12	Intensity of Wave. Water Waves: Ripple and Gravity Waves.		
Unit IV: Velocity of Waves (Lectures 06)			
13	Velocity of Transverse Vibrations of Stretched Strings	1. Hand written notes 2. Waves and optics KK Sharma 3.Fundamental of Optics, A. Kumar	Board & chalk
14	Cont.		
15	Velocity of Longitudinal Waves in a Fluid in a Pipe		
16	Cont.		
17	Newton's Formula for Velocity of Sound		
18	Laplace's Correction		
Unit V: Superposition of Two Harmonic Waves (Lectures 07)			
19	Standing (Stationary) Waves in a String: Fixed and Free Ends	1. Hand written notes 2. Waves and optics KK Sharma 3.Fundamental of Optics, A. Kumar	Board & chalk
20	Analytical Treatment. Phase and Group Velocities		
21	Changes with respect to Position and Time		
22	Energy of Vibrating String. Transfer of Energy		
23	Normal Modes of Stretched Strings. Plucked and Struck String		
24	Melde's Experiment. Longitudinal Standing Waves and Normal Modes		
25	Open and Closed Pipes. Superposition of N Harmonic Waves		

Signature of the Teacher

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Nalbari College, Nalbari

Teaching Plan for the Session:2022-23

Name of the Teacher: DR. NIPAN MAZUMDAR

Department: Physics **Semester: II**

Paper Name: Electricity & Magnetism **(Unit-I, III)** **Paper Code: PHY-HC-2016**

Learning Objectives:

1. Understanding of effect of electric and magnetic fields in matter.
2. Understanding of electric potential, electric dipole, capacitance, electrical image etc.
3. Understanding of Curl, Divergence & Vector potential.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
	Unit I: Electric Field and Electric Potential	Book, Google. 1. Introduction to Electrodynamics, D. J. Griffiths, 3rd Edn., 1998, Benjamin Cummings. 2. Electricity and Magnetism by R. Murugeson. 3. Electricity and Magnetism by D. N. Basudev. 4. Magnetostatics by B B Laud.	Chalk & Board.
1	Introduction- Electric Field and Electric Potential		
2	Electric Field		
3	Electric field: Electric field lines		
4	Electric flux. Gauss's Law		
5	Applications of Gauss's Law- Spherical charge distributions		
6	Applications of Gauss's Law-Cylindrical symmetry		
7	Applications of Gauss's Law-Planar symmetry		
8	Conservative nature of Electrostatic Field.		
9	Electrostatic Potential.		
10	Electrostatic Potential.		
11	Electrostatic Potential.		

12	Laplace's and Poisson equations		
13	Laplace's and Poisson equations		
14	Laplace's and Poisson equations, The Uniqueness Theorem		
15	The Uniqueness Theorem		
16	Potential and Electric Field of a dipole		
17	Potential and Electric Field of a dipole		
18	Potential and Electric Field of a dipole		
19	Force and Torque on a dipole		
20	Electrostatic energy of a charged sphere		
21	Conductors in an electrostatic Field. Surface charge and force on a conductor		
22	Surface charge and force on a conductor		
23	Capacitance of a system of charged conductors		
24	Parallel-plate capacitor. Capacitance of an isolated conductor		
25	Capacitance of an isolated conductor, Method of Images		
26	Applications of method of Images to Plane Infinite Sheet		
27	Applications of method of Images to Sphere		
28	Assessment		
	Unit III: Magnetic Field		
1	Magnetic Force on a point charge		
2	Definition and properties of magnetic field Curl and Divergence		
3	Vector potential		
4	Vector potential, Assessment.		

Nipan Mazumdar

Signature of the Teacher

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Nalbari College, Nalbari

Teaching Plan for the Session: 22 - 23

Name of the Teacher: SURAJIT SARMA

Department: Physics

Semester: II

Paper Name: Electricity and magnetism

Paper Code: PHY-HC-2026

Units to be Taught : Unit II, Unit III, Unit VI, Unit VII and Unit VIII

Learning Objectives: After successful completion of this course, students will be able to Understand electric and magnetic fields in matter, Dilectric properties of matter magnetic properties of matter, electromagnetic induction, applications of Kirchhofff's law in different circuits, applications of network theorem in circuits.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit II: Dielectric Properties of Matter (Lectures 08)			
Lect. 1	Introduction Electric Field in matter		
Lect. 2	Polarization, Polarization Charges		
Lect. 3	Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric	Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGrawhills	Notes and Black board
Lect. 4	Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric	Electricity and Magnetism, Edward M. Purcell, 1986 McGraw-Hill Education	
Lect. 5	Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric		
Lect. 6	Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate,		

	spherical, cylindrical) filled with dielectric		
Lect. 7	Displacement vector **D** . Relations between **E**, **P** and **D**, Gauss' Law in dielectrics		
Lect. 8	Discussion and dought clearing session		
Unit III: Magnetic Field (Lectures 09)			
Lect. 1	Magnetic Force on a point charge, definition and properties of magnetic field		
Lect. 2	Curl and Divergence. Vector potential		
Lect. 3	Magnetic Force on (1) a current carrying wire (2) between current elements		
Lect. 4	Torque on a current loop in a uniform magnetic field		
Lect. 5	Biot-Savart's law and its simple application : straight wire and circular loop		
Lect. 6	Biot-Savart's law and its simple application : straight wire and circular loop		
Lect. 7	Current loop as a magnetic dipole and its dipole moment (analogy with electric dipole)		
Lect. 8	Ampere's circuital law and its application to (1) Solenoid (2) Torus		
Lect. 9	Discussion and dought clearing session		
Unit V: Electromagnetic Induction (Lectures 06)			
Lect. 1	Introduction to electromagnetic induction		
Lect. 2	Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance		
Lect. 3	Reciprocity Theorem. Energy stored in a Magnetic Field. Introduction to Maxwell's Equations. Charge Conservation and Displacement current		
Lect. 4	Reciprocity Theorem. Energy stored in a Magnetic Field. Introduction to Maxwell's Equations. Charge Conservation and Displacement current		
Lect. 5	Reciprocity Theorem. Energy stored in a Magnetic Field. Introduction to Maxwell's Equations. Charge Conservation and		

	Displacement current		
Lect. 6	Discussion & dought clearing session		
Unit VI: Electrical Circuits (Lectures 04)			
Lect. 1	Kirchhoff's laws for AC circuits		
Lect. 2	Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) 13 Quality Factor, and (4) Band Width. Parallel LCR Circuit		
Lect. 3	Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) 13 Quality Factor, and (4) Band Width. Parallel LCR Circuit		
Lect. 4	Problem Discussion		
Unit VII: Network Theorems (Lectures 03)			
Lect. 1	Network Theorems (Lectures 03) Ideal Constant-voltage and Constant-current Sources. Network Theorems: Thevenin theorem, Norton theorem		
Lect. 2	Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem. Applications to dc circuits		
Lect. 3	Problem Discussion		
Unit VIII: Ballistic Galvanometer (Lectures 03)			
Lect. 1	Torque on a current Loop. Ballistic Galvanometer		
Lect. 2	Current and Charge Sensitivity. Electromagnetic damping. Logarithmic damping. CDR.		
Lect. 3	Problem Discussion		

Signature of the Teacher

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Nalbari College, Nalbari

Teaching Plan for the Session:

Name of the Teacher: SURAJIT SARMA

Department: Physics

Semester: II

Paper Name: Electricity & Magnetism

Paper Code: PHY-RC/HG-2016

Units to be Taught : Unit I, Unit II, Unit III and Unit IV

Learning Objectives: : Upon completion of this course, students are expected to apply Gauss's law of electrostatics to solve a variety of problems, calculate the magnetic forces that act on moving charges and the magnetic fields due to currents, have brief idea of magnetic materials, understand the concepts of induction, and apply them to solve variety of problems. In the Lab course, students will be able to measure resistance (high and low), Voltage, Current, self and mutual inductance, capacitor, strength of magnetic field and its variation, study different circuits RC, LCR etc.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit III : Magnetism (Lectures 10)			
Lect. 1	Biot-Savart's law & its applications		
Lect. 2	Biot-Savart's law & its applications		
Lect. 3	Biot-Savart's law & its applications		
Lect. 4	Divergence and curl of magnetic field		
Lect. 5	Magnetic vector potential		
Lect. 6	Ampere's circuital law	Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw	Notes and Black board
Lect. 7	Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility		

Lect. 8	Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility		
Lect. 9	Brief introduction of dia, para, and ferro-magnetic materials		
Lect. 10	Problem Discussion		
Unit IV : Electromagnetic Induction (Lectures 06			
Lect. 1	Faraday's laws of electromagnetic induction		
Lect. 2	Lenz's law, self and mutual inductance		
Lect. 3	Lenz's law, self and mutual inductance		
Lect. 4	L of single coil, M of two coils		
Lect. 5	Energy stored in magnetic field.		
Lect. 6	Problem Discussion		
Unit V : Maxwell's Equations and EM Wave (Lectures 10)			
Lect. 1	Introduction to the topic		
Lect. 2	Equation of continuity of current		
Lect. 3	Displacement current, Maxwell's equations		
Lect. 4	Poynting vector, energy density in electromagnetic field		
Lect. 5	Poynting vector, energy density in electromagnetic field		
Lect. 6	electromagnetic wave propagation through vacuum and isotropic dielectric medium		
Lect. 7	electromagnetic wave propagation through vacuum and isotropic dielectric medium		
Lect. 8	transverse nature of EM waves, polarization		
Lect. 9	transverse nature of EM waves, polarization		
Lect. 10	Problem Discussion		

Signature of the Teacher

Signature of the HoD

Nalbari College, Nalbari

Teaching Plan for the Session: 2022-23

Name of the Teacher: Ananta Rajbongshi

Department: Physics

Semester: II

Course Name: Waves & Optics *(Unit: VI, VII, VIII, IX, X and XI)*

Course level: PHY-HC-2026

Learning Objectives:

This course introduces waves and optics. The basic objectives of the course are

- To understand superposition of harmonic oscillations, different types of wave motions, superposition of harmonic waves etc.
- To introduce the concepts of interference and interferometer, diffraction and holography.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit VI: Wave Optics (Lectures 03)			
01	Electromagnetic nature of light	1. Hand written notes 2. Waves and optics KK Sharma 3.Fundamental of Optics, A. Kumar	Board & chalk
02	Definition and properties of wave front		
03	Huygens Principle. Temporal and Spatial Coherence.		
Unit VII: Interference (Lectures 09)			
04	Division of amplitude and wave front	1. Hand written notes 2. Waves and optics KK Sharma 3.Fundamental of Optics, A. Kumar	Board & chalk (Laboratory is incorporated for this unit)
05			
06	Young's double slit experiment		
07	Lloyd's Mirror	〃	
08	Fresnel's Biprism	〃	
09	Phase change on reflection: Stokes' treatment	〃	

10	Interference in Thin Films: parallel and wedge-shaped films	"	
11	Fringes of equal inclination (Haidinger Fringes) and Fringes of equal thickness (Fizeau Fringes)	"	
12	Newton's Rings: Measurement of wavelength and refractive index	"	
Unit VIII: Interferometer (Lectures 04)			
13	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.	1. Hand written notes 2. Waves and optics KK Sharma 3.Fundamental of Optics, A. Kumar	Board & chalk
14	Cont.		
15	Fabry-Perot interferometer.		
16	Cont.	"	
Unit IX: Diffraction (Lectures 09)			
17	Fresnel and Fraunhofer diffraction	1. Hand written notes 2. Waves and optics KK Sharma 3.Fundamental of Optics, A. Kumar . . and.	Board & chalk
18	Fresnel's Half-Period Zones for Plane Wave.		
19	Cont.		
20	Explanation of Rectilinear Propagation of Light.		
21	Theory of a Zone Plate: Multiple Foci of a Zone Plate		
22	Cont.		
23	Fresnel diffraction pattern of a straight edge	"	
24	Fresnel diffraction pattern at a circular aperture	"	
25	Resolving Power of a telescope.	"	
Unit X: Fraunhofer Diffraction (Lectures 08)			
26	Single slit	1. Hand written notes 2. Waves and optics KK Sharma 3.Fundamental of Optics, A. Kumar	Board & chalk
27			
28	Double slit		
29			
30	Multiple slits		
31			
32	Diffraction grating		
33	Resolving power of grating.		

Unit XI: Holography (Lectures 03)			
34	Principle of Holography	1. Hand written notes 2. Waves and optics KK Sharma 3.Fundamental of Optics, A. Kumar	Board & chalk
35	Recording and Reconstruction Method. Theory of Holography as Interference between two Plane Waves		
36	Point source holograms		

Signature of the Teacher

Signature of the HoD

Nalbari College, Nalbari

Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr. Dhruba Jyoti Gogoi

Department: Physics

Semester: III

Paper Name: Digital Systems & Applications

Paper Code: PHY-HC-3036

Learning Objectives:

1. Handling of CRO (Cathode Ray Oscilloscope)
2. Developing of logic gates, combinational circuit and sequential circuit.
3. Understanding the microprocessor and memories of computer.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit I: Introduction to CRO (Lectures 03)			
01	Block Diagram of CRO.	1. Book: Advanced practical physics (By B. Ghosh) 2. (2) Ch3 L7 CRO part2 International Edition - YouTube	Board and chalk
02	Electron Gun, Deflection System and Time Base. Deflection Sensitivity.		Board and chalk
03	Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference.		Board & chalk/ Demonstration
Unit II: Integrated Circuits (qualitative treatment only) (Lectures 03)			
04	Active & Passive components. Discrete components.	1. Textbook of digital electronics (By S. S. Bhatti, Rahul Malhotra) 2. (3) Silicon Wafer Processing Animation - YouTube 3.(3) From Sand To Silicon: The	Board & chalk
05	Wafer. Chip. Advantages and drawbacks of ICs. Scale of integration: SSI, MSI, LSI and VLSI (basic idea and definitions only).		

06	Classification of ICs. Examples of Linear and Digital lCs.	Making of a Chip | Intel - YouTube	
Unit III: Digital Circuits (Lectures 06)			
07	Difference between Analog and Digital Circuits.	1. Fundamental of Digital Circuit (By A Anand Kumar) 2. Textbook of digital electronics (By S. S. Bhatti, Rahul Malhotra) 3. Digital electronics (By G.K. Kharate)	Board & chalk/Practical demonstration
08	Binary Numbers. Decimal to Binary and Binary to Decimal Conversion.		
09	BCD, Octal and Hexadecimal numbers.		
10	AND, OR and NOT Gates (realization using Diodes and Transistor).		
11	NAND and NOR Gates as Universal Gates. XOR and XNOR Gates.		
12	*Practice/problem solving*		Class work/test
Unit IV: Boolean Algebra (Lectures 06)			
13	De Morgan's Theorems.	1. Fundamental of Digital Circuit (By A Anand Kumar) 2. Textbook of digital electronics (By S. S. Bhatti, Rahul Malhotra) 3. Digital electronics (By G.K. Kharate)	Board & chalk
14	Boolean Laws. Simplification of Logic Circuit using Boolean Algebra.		
15	Fundamental Products. Idea of Minterms and Maxterms.		
16	Conversion of a Truth table into Equivalent Logic Circuit by (1) Sum of Products Method		
17	Conversion of a Truth table into Equivalent Logic Circuit by (1) Karnaugh Map.		
18	*Practice/problem solving*		Class work/test
Unit V: Data Processing Circuits (Lectures 04)			

19	Basic idea of Multiplexers	1. Fundamental of Digital Circuit (By A Anand Kumar)	Board & chalk
20	Basic idea of De-multiplexers		
21	Basic idea of Decoders		
22	Basic idea of Encoders.		
Unit VI: Arithmetic Circuits (Lectures 05)			
23	Binary Addition	1. Fundamental of Digital Circuit (By A Anand Kumar) 2. Textbook of digital electronics (By S. S. Bhatti, Rahul Malhotra) 3. Digital electronics (By G.K. Kharate)	Board & chalk
24	Binary Subtraction using 2's Complement		
25	Half and Full Adders		
26	Half & Full Subtractors		
27	4-bit binary Adder/Subtractor.		
Unit VII: Sequential Circuits (Lectures 06)			
28	Sequential circuit. SR flip flop	1. Fundamental of Digital Circuit (By A Anand Kumar) 2. Textbook of digital electronics (By S. S. Bhatti, Rahul Malhotra) 3. Digital electronics (By G.K. Kharate)	Board & chalk/power point presentation
29	D, and JK Flip-Flops		
30	Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations		
31	Race- around conditions in JK Flip-Flop		
32	M/S JK Flip-Flop.		
33	*Practice/problem solving*		
Unit VIII: Timers: IC 555 (Lectures 03)			
34	Block diagram and applications: Astable multivibrator	555 Timer IC- Types, Construction, Working & Application – Circuit & Pinout (electricaltechnology.org)	Board & chalk/demonstration
35	Block diagram and applications: Monostable multivibrator.		
36	*Doubt clearing session*		

Unit IX: Shift Registers (Lectures 02)			
37	Serial-in-Serial-out and Serial-in-Parallel-out (only up to 4 bits).	1. Digital electronics (By G.K. Kharate)	Board & chalk
38	Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).		
Unit X: Unit X: Counters (4 bits) (Lectures 04)			
39	Asynchronous counters and Synchronous Counter	1. Fundamental of Digital Circuit (By A Anand Kumar) 2. Textbook of digital electronics (By S. S. Bhatti, Rahul Malhotra) 3. Digital electronics (By G.K. Kharate)	Board & chalk
40	Ring Counter		
41	Decade Counter		
42	*Doubt clearing session*		
Unit XI: Computer Organization (Lectures 06)			
43	Input/Output Devices. (*computer block diagram)*	1. Fundamental of Digital Circuit (By A Anand Kumar) 2. Textbook of digital electronics (By S. S. Bhatti, Rahul Malhotra) 3. Digital electronics (By G.K. Kharate)	Board & chalk
44	Data storage (idea of RAM and ROM)		
45	Computer memory		
46	Memory organization		
47	Memory addressing.		
48	*Doubt clearing session*		
Unit XII: Intel 8085 Microprocessor Architecture (Lectures 08)			
49	Main features of 8085.	1. Fundamental of Digital Circuit (By A Anand Kumar) 2. Textbook of digital electronics	Board & chalk
50	Block diagram of 8085 micro-processor		
51	Pin-out diagram of 8085 micro-processor		

52	Buses. Registers.	(By S. S. Bhatti, Rahul Malhotra)	
53	ALU. Memory. Stack memory	3. Digital electronics (By G.K.	
54	Timing & Control circuitry.	Kharate)	
55	*Doubt clearing session*		
56	*Doubt clearing session*		
Unit XIII: Introduction to Assembly Language (Lectures 04)			
57	1 byte, 2 byte, & 3-byte instructions	1. Digital electronics (By G.K. Kharate) 2. (3) What are 1-byte, 2-byte and 3-byte Instructions in 8085 Microprocessor - YouTube 3. 8085 Data-transfer Instructions (tutorialspoint.com)	Board & chalk/ demonstration
58	*Programme writing*		
59	*Programme writing*		
60	*Programme writing*		

Signature of the Teacher

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Nalbari College, Nalbari

Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr. Hemen Kakati

Department: Physics

Semester: III

Paper Name: Computational Physics Skills

Paper Code: PHY-SE-3024

Learning Objectives:

1. To understand the logic of computing.
2. To construct the algorithm for coding
3. understanding programming language and structure
4. Understanding data and analysis

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools	Experiential / Participating Learning Used
1	Introduction, OS	Book, Google, Application software	Blackboard, Computer, Powerpoint	computer
2	Linux OS such as RedHat, Ubuntu, Scientific Linux,			
3	Usage of Basic linux commands. Text editors such as vi and Emacs.			
4	Algorithms and Flowcharts			
5	Cartesian to Spherical Polar Coordinates, Roots of Quadratic Equation,			
6	Sum of two matrices, Sum and Product of a finite series, calculation of sin(x) as a series,			

7	plotting (1) Lissajous figures and (2) trajectory of a projectile thrown at an angle with the horizontal.			
8	Introduction to HLL, Concepts of a Compiler .			
9	Character Set, Constants and their types, ,			
10	Variables and their types, Keywords,			
11	Variable Declaration instruction			
12	Operators: Arithmetic, Relational, Logical and Assignment Operators.			
13	Expressions: Arithmetic, Relational, Logical, Character and Assignment Expressions			
14	I/O Statements (unformatted/formatted), Executable and Non-Executable Statements			
15	Layout of a Program, concept of coding			
16	Initialization and Replacement Logic. Examples from physics problems			
17	Types of Logic (Sequential, Selection, Repetition			
18	Looping Statements			
19	Implied and Nested DO Loops			
20	Unconditional GOTO, Computed GOTO, Assigned GOTO			
21	Arrays: Types of Arrays			
22	DIMENSION Statement, Reading and Writing Arrays			
23	RETURN, CALL, COMMON and EQUIVALENCE			
24	Structure, Disk I/O Statements, open a file, writing in a file, reading from a file			
25	Statements (Logical IF, Arithmetic IF, Block IF, Nested Block IF)			
26	Introduction to graphical analysis and its limitations. Introduction to Gnuplot.			
27	importance of visualization of computational and computational data, basic Gnuplot commands			
28	simple plots, plotting data from a file, saving and exporting, multiple data sets per file, curve fitting – straight line, polynomials,			

	user defined function			
29	Physics with Gnuplot (equations, building functions, user defined variables and functions)			
30	Understanding data with Gnuplot			

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Teaching Plan for the Session:2022-23

Name of the Teacher: DR. NIPAN MAZUMDAR

Department: Physics **Semester: III**

Paper Name: Mathematical Physics II (Unit IV) **Paper Code: HC-3016**

Learning Objectives:

1. Understanding of matrix.

2. Idea of matrix helps to solve linear algebraic equations, linear transformations, differential equations etc.

3. Matrix helps to solve the system of rigid body problems, theory of representation of groups.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
	Unit IV-Matrix(lec-15)		
1	Introductory class, Idea of matrix.	Book, Google. Mathematical Physics by (1) B. S. Rajput, (2) Goswami, (3) Schaum's Series. (4) H K Dass & Rama Verma. (5) Introduction to Mathematical Physics by Charlie Harper.	Chalk & Board
2	Matrix algebra using index notation, Properties of matrices.		
3	Properties of matrices, Special matrix with their properties		
4	Transpose matrix, complex conjugate matrix.		
5	Hermitian matrix, Anti-Hermitian matrix.		
6	Special square matrix, unit matrix, diagonal matrix.		
7	Co-factor matrix, adjoint of a matrix, self- adjoint matrix.		

8	Symmetric matrix, anti-symmetric matrix.		
9	Unitary matrix, orthogonal matrix.		
10	Orthogonal matrix , trace of a matrix.		
11	Trace of a matrix, inverse matrix.		
12	Determinant, Rank, Eigen value.		
13	Eigen value, Eigen vector.		
14	Diagonalisation of matrix.		
15	Assessment.		

Nigam Mazumdar

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Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr. Hemen Kakati

Department: Physics

Semester: III

Paper Name: Mathematical Physics II (Unit I and Unit II) **Paper Code: HC 3016**

Learning Objectives:

1. Understanding Series Solution
2. Understanding partial differential equation and the process to to solve it.
3. To solve different equations using computer programming

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit I		a) Mathematical Physics by Rajput b) Mathematical Physics by Arfken c) NPTEL d) youtube e) Notes	Blackboard Computer
1	Frobenius method		
2	Example Series Solution		
3	Example Series Solution		
4	Singular Point Fuch's theorem		
5	Example Fuch's Theorem		
6	Legendre differential equation		
7	Legendre Polynomial		
8	Generating function Legendre Polynomial		
9	Recurrence Relation		
10	Self Adjoint Equation		
11	Orthogonality of Legendre differential Equation		

12	Hermite Differential Equation		
13	Generating Function of Hermite's polynomial		
14	Orthogonality of Hermite Polynomial		
15	Rodrigue's Formula		
16	Laguerre Differential Equation		
17	Laguerre Polynomial		
18	Exercises of Series Solution		
Unit II			
19	Solutions to partial differential equations,		
20	Separation of variables		
21	Conversion between Cartesian, spherical and cylindrical coordinate		
22	Laplace's Equation (Cartesian)		
23	Laplace's Equation (Spherical)		
24	Laplace's Equation (Cylindrical)		
25	Wave Equation		
26	Vibrational mode of stretched String		
27	Rectangular Membrane		
28	Circular Membrane		
29	Circular Membrane		
30	Diffusion Equation		
31	Exercise PDE		
32	Exercise PDE		

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Teaching Plan for the Session:2022-23

Name of the Teacher: DR. NIPAN MAZUMDAR

Department: Physics **Semester: III**

Paper Name: Thermal Physics & Statistical Mechanics (Unit-III, IV, V)

Paper Code: PHY-RC-3016 (PHY-HG-3016)

Learning Objectives:

1. Understanding of Kinetic theory of gases with different laws.

2. Understanding of mono-atomic and diatomic gases.

3. Understanding of radiation and different laws relating radiations and energy.

4. Understanding of Statistical Mechanics, entropy, thermodynamic probability and different distribution laws.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
	Unit III- Kinetic Theory of Gases(Lec.10)	Book, Google. 1. A Treatise on Heat by Meghnad Saha, and B. N. Srivastava, 2. Thermal Physics by S. Garg, R. Bansal and Ghosh, 3. Statistical Physics by Berkeley Physics Course 4. Statistical Mechanics by B. D. Gupta,	Chalk & Board
1	Introductory class- Kinetic theory of gases.		
2	Maxwell's law of distribution of velocities		
3	Maxwell's law of distribution of velocities and its experimental verification		
4	Mean free path (Zeroth Order), Transport Phenomena		
5	Transport Phenomena: Viscosity, Conduction		
6	Conduction, Diffusion (for vertical case), Law of equipartition of energy		
7	Law of equipartition of energy and its applications to specific heat of gases.		
8	Law of equipartition of energy and its applications to mono-atomic gases.		

9	Law of equipartition of energy and its applications to diatomic gases.	5. Statistical Mechanics by K. K. Sharma & B. S. Satyal	
10	Assessment		
	Unit-IV: Theory of Radiation(lec-6)		
1	Introductory class- Theory of Radiation, Blackbody radiation		
2	Spectral distribution, Concept of Energy Density, Derivation of Planck's law		
3	Derivation of Planck's law		
4	Deduction of Wien's distribution law, Rayleigh-Jeans Law		
5	Stefan Boltzmann Law and Wien's displacement law from Planck's law		
6	Assessment		
	Unit-V: Statistical Mechanics(lec-12)		
1	Introductory class- Statistical Mechanics		
2	Phase space with Position and Momentum space		
3	Macrostate and Microstate		
4	Entropy and Thermodynamic probability Boltzmann's Entropy relation		
5	Entropy and Thermodynamic probability Boltzmann's Entropy relation		
6	Comparison of three statistics(with example)		
7	Maxwell-Boltzmann law - distribution of velocity		
8	Maxwell-Boltzmann law - distribution of velocity		
9	Quantum statistics – Fermi-Dirac distribution law		
10	Fermi-Dirac distribution law, Electron gas, Fermi gas		
11	Bose-Einstein distribution law, Bosons, photon gas		
12	Assessment		

Nipan Mazumdar

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Nalbari College : Nalbari

Teaching Plan for the Session:2022-2023

Name of the Teacher: SURAJIT SARMA

Department: Physics **Semester: III**

Paper Name: Thermal Physics **Paper Code: PHY-HC-3026**

Units to be Taught : Unit V, Unit VI, Unit VII and Unit VIII

Learning Objectives:

Upon successful completion, students will have the knowledge and skills to identify and describe the statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, Thermodynamics potentials, Free energies, Maxwell's relations in thermodynamics, behaviour of real gases and related phenomenon.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit V: Maxwell's Thermodynamic Relations (Lectures 07)			
Lect. 1	Introduction Derivations and applications of Maxwell's Relations		
Lect. 2	Derivations and applications of Maxwell's Relations		
Lect. 3	Maxwell's Relations:(1) Clausius Clapeyron equation, (2) Values of Cp-Cv , (3) TdS Equations, (4) Joule-Kelvin coefficient for Ideal and Van der Waal Gases, (5) Energy equations, (6) Change of Temperature during Adiabatic Process.	Heat and Thermodynamics, M. W. Zemansky, Richard Dittman, 1981, McGraw-Hill	**Lecture note and Black board use**
Lect. 4	Maxwell's Relations:(1) Clausius Clapeyron equation, (2) Values of Cp-Cv , (3) TdS Equations, (4) Joule-Kelvin coefficient for Ideal and Van der Waal Gases, (5) Energy equations, (6) Change of Temperature during Adiabatic Process.	A Treatise on Heat, Meghnad Saha, and B. N.Srivastava, 1958, Indian Press	
Lect. 5	Maxwell's Relations:(1) Clausius Clapeyron equation, (2) Values of Cp-Cv , (3) TdS Equations, (4) Joule-Kelvin		

	coefficient for Ideal and Van der Waal Gases, (5) Energy equations, (6) Change of Temperature during Adiabatic Process.		
Lect. 6	Maxwell's Relations:(1) Clausius Clapeyron equation, (2) Values of Cp-Cv , (3) TdS Equations, (4) Joule-Kelvin coefficient for Ideal and Van der Waal Gases, (5) Energy equations, (6) Change of Temperature during Adiabatic Process.		
Lect. 7	Doubt clearing and Problem solving		
Unit VI: Distribution of Velocities (Lectures 07)			
Lect. 1	Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and its Experimental Verification		
Lect. 2	Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and its Experimental Verification		
Lect. 3	Doppler Broadening of Spectral Lines and Stern's Experiment		
Lect. 4	Doppler Broadening of Spectral Lines and Stern's Experiment		
Lect. 5	Mean, RMS and Most Probable Speeds. Degrees of Freedom		
Lect. 6	Law of Equipartition of Energy (No proof required). Specific heats of Gases.		
Lect. 7	Discussion and doubt clearing session		
Unit VII: Molecular Collisions (Lectures 04)			
Lect. 1	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.		
Lect. 2	Estimates of Mean Free Path. Transport Phenomenon in Ideal Gases: (1) Viscosity		
Lect. 3	(2) Thermal Conductivity and (3) Diffusion. Brownian Motion and its Significance.		
Lect. 4	Problem solving and question discussion.		
Unit VIII: Real Gases (Lectures 10)			
Lect. 1	Behaviour of Real Gases: Deviations from the Ideal Gas Equation		

Lect. 2	The Virial Equation. Andrew's Experiments on CO2 Gas. Critical Constants		
Lect. 3	Continuity of Liquid and Gaseous State.		
Lect. 4	Vapour and Gas. Boyle Temperature. Van der Waal's Equation of State for Real Gases		
Lect. 5	Values of Critical Constants. Law of Corresponding States. Comparison with Experimental Curves		
Lect. 6	Law of Corresponding States. Comparison with Experimental Curves. P-V Diagrams		
Lect. 7	Joule's Experiment. Free Adiabatic Expansion of a Perfect Gas		
Lect. 8	Joule Thomson Porous Plug Experiment. Joule- Thomson Effect for Real and Van der Waal Gases		
Lect. 9	Temperature of Inversion. Joule-Thomson Cooling		
Lect. 10	Discussion and Doubt clearing		

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Nalbari College, Nalbari

Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr. Dhruba Jyoti Gogoi

Department: Physics

Semester: IV

Paper Name: Waves & Optics

Paper Code: PHY-HG/RC- 4016

Learning Objectives:

1. Understanding Simple harmonic oscillation and superposition principle.
2. Study of Lissajous figures and behavior of transverse, longitudinal waves.
3. Understanding the importance of classical wave equation in transverse and longitudinal waves and solving a range of physical systems on its basis.
4. Concept of normal modes in transverse and longitudinal waves: their frequencies and configurations
5. Demonstrate understanding of Interference and diffraction experiments, Polarization.
6. Hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Biprism etc.

Books to be followed in the course:

1. Waves and Optics --- Kalyani Publication
2. Waves and Optics --- Mahaveer Publications
3. Waves and Vibrations of strings --- Ashok Publications.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources/ Mode of Teaching & ICT Tools	Date	Remarks
	UNIT I: Superposition of Two Collinear Harmonic Oscillations (Lectures 04)			
01	Linearity & Superposition Principle	1. Hand written notes 2. Books Sl no. 1 to 3		
02	Superposition of Two Collinear Harmonic Oscillations having equal frequencies	,,		
03	Superposition of Two Collinear Harmonic Oscillations having different frequencies (Beats).	,,		
04	Cont.	,,		
	UNIT II: Superposition of Two Perpendicular Harmonic Oscillations (Lectures 02)			
01	Superposition of Two Perpendicular Harmonic Oscillations: Graphical and Analytical Methods	,,		
02	Lissajous Figures with equal an unequal frequency and their uses	,,		
	UNIT III: Waves Motion (Lectures 07)			
01	Transverse waves on a string	,,		
02	Travelling and standing waves on a string	,,		
03	Cont.	,,		
04	Normal Modes of a string	,,		
05	Group velocity, Phase velocity	,,		
06	Plane waves. Spherical waves, Wave intensity.	,,		
07	Cont.	,,		
	Unit IV Fluids (Lectures 06)			
01	Surface Tension: Synclastic and anticlastic surface.	,,		
02	Excess of pressure: Application to spherical and cylindrical drops and bubbles	,,		
03	Variation of surface tension with temperature – Jaegar's method	,,		
04	Viscosity – Rate flow of liquid in a capillary tube – Poiseuille's formula	,,		

05	Determination of coefficient of viscosity of a liquid	,,		
06	Variations of viscosity of liquid with temperature – lubrication	,,		
	Unit V Sound (Lectures 06)			
01	Simple harmonic motion - forced vibrations and resonance	,,		
02	Fourier's Theorem - Application to saw tooth wave and square wave	,,		
03	Intensity and loudness of sound - Decibels - Intensity levels - musical notes - musical scale	,,		
04	Acoustics of buildings: Reverberation and time of reverberation	,,		
05	Absorption coefficient - Sabine's formula	,,		
06	Measurement of reverberation time - Acoustic aspects of halls and auditoria	,,		

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Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr. Hemen Kakati

Department: Physics

Semester: IV

Paper Name: Elements of Modern Physics (Unit V, VI, VII, VIII, IX)

Paper Code: PHY-HC-4026

Learning Objectives:

1. To understand the structure of the nucleus
2. To understand the radioactivity
3. Understand the Fission and Fusion Process

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit V: Structure of Atomic Nucleus		Nuclear Physics by S N Ghosal NPTEL Preeti much physics (youtube) Google drive (self-made note)	Blackboard, Lecture videos
1	Size and structure of atomic nucleus its relation with atomic weight		
2	impossibility of an electron being in the nucleus as a consequence of the uncertainty principle.		
3	Atomic Mass Unit. Nature of nuclear force		
4	liquid drop model: semi-empirical mass formula		
5	Derivation of the terms		
6	nuclear shell model (qualitative discussions) and magic numbers.		
Unit VI: Radioactivity			
7	Stability curve and stability of nuclei,		
8	Law of radioactive decay, disintegration constant,		
9	half life and mean life.		

10	Activity unit. Alpha decay – Range energy relation,		
11	Fine structure of alpha energy spectrum		
12	Beta decay energy released, continuous beta spectrum and Pauli's prediction of neutrino.		
13	Gamma ray emission, energy-momentum conservation:		
14	electron-positron pair creation by gamma photons in the vicinity of a nucleus.		
Unit VII: Detection of Nuclear Radiation			
15	Method of energy loss by charged particles and gamma photons.		
16	Photoelectric, Compton and Pair-production processes		
17	Gas filled detectors – principle and construction of a gas filled detector,		
18	Ionization, proportional, GM and spark region.		
Unit VIII: Fission and Fusion			
19	Energy consideration in Nuclear Reaction, Q-value of nuclear reaction,		
20	Fission - nature of fragments and emission of neutrons.		
21	Nuclear reactor: slow neutrons interacting with Uranium 235.		
22	Fusion and thermonuclear reactions driving stellar		
Unit IX: Lasers			
23	Einstein's *A* and *B* coefficients. Metastable states. Spontaneous and Stimulated emissions		
24	Components of Laser		
25	Three-Level and Four-Level Lasers		
26	Ruby Laser and He-Ne Laser. Basic lasing.		

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Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr. Dhruba Jyoti Gogoi

Department: Physics

Semester: IV

Paper Name: Mathematical Physics III

Paper Code: PHY-HC- 4016

Learning Objectives:

1. Complex - number, variable and function.
2. Complex integration.
3. Taylor and Laurant theorem.
4. Fourier transformation and Laplace transformation.
5. Tensor.

Books to be followed in the course:

1. Complex variables --- Mc Graw Hill (Schaum's outlines)
2. Mathematical physics-III --- Vishal Publication
3. Mathematical physics-III --- Kalyani Publication
4. Theory of function of complex variable --- S. Chand

Study materials for the course: (Google class room links of the study materials are given below)

1. https://classroom.google.com/c/NjYyOTA2MzYwMzQ3/m/NjYzNzgzNTY3MzM4/details
2. https://classroom.google.com/c/NjYyOTA2MzYwMzQ3/m/NjYzNzgzMjU4MTYw/details
3. https://classroom.google.com/c/NjYyOTA2MzYwMzQ3/m/NjQ4NzQ2OTEyODUx/details

Sl. No of Lecture	Topic/ Subtopic	Learning Resources/ Mode of Teaching & ICT Tools	Date	Remarks
	UNIT I: COMPLEX ANALYSIS (LECTURES 10)			
01	A brief discussion of the whole syllabus. Important and applications of complex analysis in physics.	Book Serial Number : 01		
02	Graphical representation of Complex Variables (Cartesian, polar and exponential representation)	Book SL No. : 01 & 3		
03	Some basic terminology related to Complex number (region, neighborhood etc.)	Book Serial Number : 01		
04	Function of complex variable.	Study material link : 01		Link provided through Google class room.
05	Analyticity (limit, continuity and differentiation)	,,		,,
06	Examples of analytic functions	,,		,,
07	Derivation of Cauchy-Riemann Conditions	,,		,,
08	Numerical practice and doubt clearing	,,		,,
09	Singular functions: poles and branch points, order of singularity.	,,		,,
10	Class test	*Home Assignment		
	UNIT II: COMPLEX INTEGRATION (LECTURES 10)			
01	Integration of a function of a complex variable.	Study material link : 02		
02	Simply and multiply connected region	,,		
03	Cauchy's Integral formula.	,,		
04	Problem solving	,,		
05	Taylors expansion (derivation)	,,		
06	Laurent expansion (derivation)	,,		
07	Residues and Residue Theorem	,,		
08	Numerical/application (definite integration)	Book Sl. No. 1 to 3		
09	Numerical/application (definite integration)	,,		

10	Class test	*Home Assignment		
	UNIT III: FOURIER TRANSFORMS (LECTURE 15)			
01	Basics of Fourier Transforms	Study material link 03 Book Sl. No. 03		
02	Fourier Integral theorem	,,		
03	Cont...	,,		
04	Fourier Transform examples (Sine and Cosine)	,,		
05	Cont..	,,		
06	Fourier transformation of trigonometric and Gaussian functions	,,		
07	Representation of Dirac delta function as a Fourier Integral	,,		
08	Fourier transform of derivatives, Inverse Fourier transform, Convolution theorem (Statement only)	,,		
09	Cont...	,,		
10	Properties of Fourier transform (translation, change of scale, complex conjugation).	,,		
11	Cont...	,,		
12	Class test			
13	Doubt clearing session	Book Sl. No. 1 to 3.		
14	Previous year question discussion	Previous year question paper from website		
15	Previous year question discussion	,,		

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Teaching Plan for the Session:

Name of the Teacher: SURAJIT SARMA

Department: Physics

Semester: V

Paper Name: Nuclear and Particle Physics

Paper Code: PHY-HE-5056

Units to be Taught: Unit I, Unit VI, Unit VI and Unit VII

Learning Objectives:

Upon completion of this course, students will have the understanding of the sub atomic particles and their properties. They will gain knowledge about the different nuclear techniques and their applications in different branches of Physics and societal application. The course will develop problem based skills and the acquire knowledge can be applied in the areas of nuclear, medical, archeology, geology and other interdisciplinary fields of Physics and Chemistry.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit I: General Properties of Nuclei (Lectures 10)			
Lect. 1	Introductiory class and Constituents of nucleus and their Intrinsic properties		
Lect. 2	Constituents of nucleus and their Intrinsic properties, quantitative facts about mass, radii, charge density (matter density)	Introductory nuclear Physics by Kenneth S. Krane	Notes and Black board
Lect. 3	Constituents of nucleus and their Intrinsic properties, quantitative facts about mass, radii, charge density (matter density)	Nuclear Physics by A.B. Gupta	
Lect. 4	binding energy, average binding energy and its variation with mass number		
Lect. 5	main features of binding energy versus mass number curve, N/A plot,		
Lect. 6	main features of binding energy versus mass number curve, N/A plot,		
Lect. 7	angular momentum, parity		
Lect. 8	magnetic moment, electric moments		

Lect. 9	, nuclear excites states		
Lect. 10	Doubt clearing and Discussion		
Unit VI: Detector for Nuclear Radiations (Lectures 8)			
Lect. 1	Gas detectors: estimation of electric field, mobility of particle		
Lect. 2	Gas detectors: estimation of electric field, mobility of particle		
Lect. 3	ionization chamber and GM Counter		
Lect. 4	ionization chamber and GM Counter		
Lect. 5	Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT)		
Lect. 6	). Semiconductor Detectors (Si and Ge) for charge particle		
Lect. 7	concept of charge carrier and mobility, neutron detector		
Lect. 8	Discussion		
Unit VII: Particle Accelerators (Lectures 5)			
Lect. 1	Accelerator facility available in India: Van-de Graaff generator (Tandem accelerator)		
Lect. 2	Accelerator facility available in India: Van-de Graaff generator (Tandem accelerator)		
Lect. 3	Linear accelerator		
Lect. 4	Cyclotron, Synchrotrons		
Lect. 5	Cyclotron, Synchrotrons and Discussion		

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Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr. Hemen Kakati

Department: Physics

Semester: IV

Paper Name: Elements of Modern Physics (Unit V, VI, VII, VIII, IX)

Paper Code: PHY-HC-4026

Learning Objectives:

1. To understand the structure of the nucleus
2. To understand the radioactivity
3. Understand the Fission and Fusion Process

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit V: Structure of Atomic Nucleus		Nuclear Physics by S N Ghosal NPTEL Preeti much physics (youtube) Google drive (self-made note)	Blackboard, Lecture videos
1	Size and structure of atomic nucleus its relation with atomic weight		
2	impossibility of an electron being in the nucleus as a consequence of the uncertainty principle.		
3	Atomic Mass Unit. Nature of nuclear force		
4	liquid drop model: semi-empirical mass formula		
5	Derivation of the terms		
6	nuclear shell model (qualitative discussions) and magic numbers.		
Unit VI: Radioactivity			
7	Stability curve and stability of nuclei,		
8	Law of radioactive decay, disintegration constant,		
9	half life and mean life.		

10	Activity unit. Alpha decay – Range energy relation,		
11	Fine structure of alpha energy spectrum		
12	Beta decay energy released, continuous beta spectrum and Pauli's prediction of neutrino.		
13	Gamma ray emission, energy-momentum conservation:		
14	electron-positron pair creation by gamma photons in the vicinity of a nucleus.		
Unit VII: Detection of Nuclear Radiation			
15	Method of energy loss by charged particles and gamma photons.		
16	Photoelectric, Compton and Pair-production processes		
17	Gas filled detectors – principle and construction of a gas filled detector,		
18	Ionization, proportional, GM and spark region.		
Unit VIII: Fission and Fusion			
19	Energy consideration in Nuclear Reaction, Q-value of nuclear reaction,		
20	Fission - nature of fragments and emission of neutrons.		
21	Nuclear reactor: slow neutrons interacting with Uranium 235.		
22	Fusion and thermonuclear reactions driving stellar		
Unit IX: Lasers			
23	Einstein's *A* and *B* coefficients. Metastable states. Spontaneous and Stimulated emissions		
24	Components of Laser		
25	Three-Level and Four-Level Lasers		
26	Ruby Laser and He-Ne Laser. Basic lasing.		

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Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr. Hemen Kakati

Department: Physics

Semester: V

Paper Name: Nuclear and Particle Physics (II, V, VIII) Paper Code: HE 5056

Learning Objectives:

1. To learn the constituents of nucleons.

2. To understand the different model used to describe binding energy and structure of nucleus.

3.To understand the quark model.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit II Nuclear Model		Nuclear Physics by S N Ghosal NPTEL Preeti much physics (youtube) Google drive (self-made note)	Blackboard/youtube video
1	Liquid drop model approach		
2	Semi empirical mass formula		
3	Significance of its various terms		
4	Condition of nuclear stability		
5	Two nucleon separation energies		
6	Fermi gas model (degenerate fermion gas,		
7	Evidence for nuclear shell structure		
8	Nuclear magic numbers,		
9	Basic assumption of shell model		
10	Concept of mean field		
11	Residual interaction		
12	Concept of nuclear force.		

Unit V Interaction of Nuclear radiation with matter			
13	Energy loss due to ionization (Bethe- Block formula		
14			
15	energy loss of electrons		
16	Cerenkov radiation.		
17	Gamma ray interaction through matter,		
18	photoelectric effect,		
19	Compton scattering,		
20	pair production, neutron interaction with matter		
Unit VIII Particle Physics			
21	Particle interactions		
22	basic forces in nature and mediator		
23	types of particles and its families.		
24			
25	Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm		
26			
27			
28	Allowed and forbidden equations with examples		
29	Tutorial		
30	Concept of quark model,		
31	color quantum number		
32	gluons.		

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Sl. No	Name	Signature
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Nalbari College, Nalbari

Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr. Dhruba Jyoti Gogoi

Department: Physics

Semester: V

Paper Name: Physics of Devices and Instruments

Paper Code: PHY-HE- 5046

Learning Objectives:

1. Gain theoretical as well as practical knowledge of devices like MOSFET, JFET, UJT etc.
2. Gain detailed knowledge of IC fabrication.
3. Digital Data serial and parallel Communication Standards along with the understanding of communication systems.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit I: Devices (Lectures 14)			
01	Characteristic and small signal equivalent circuits of UJT	1. Hand written notes 2.Electronic devices and circuit theory by Boylestad	Board & chalk/ Demonstration
02	Characteristic and small signal equivalent circuits of JFET		
03	*Doubt clearing class*		
04	Metal- semiconductor Junction		
05	Metal oxide semiconductor (MOS)device.		
06	Ideal MOS and Flat Band voltage.		
07	SiO2-Si based MOS.		
08	MOSFET– their frequency limits.		
9	Enhancement and Depletion Mode MOSFETS		
10	*Doubt clearing class*		
11	CMOS		
12	Charge coupled devices.		
13	Tunnel diode.		
14	*Doubt clearing class*		

Unit II: Power supply and Filters (Lectures 3)			
15	Block Diagram of a Power Supply	1. Hand written notes 2.Electronic devices and circuit theory by Boylestad	Board & chalk/demonstration
16	Qualitative idea of C and L Filters. IC Regulators		
17	Line and load regulation, Short circuit protection		
Unit III: Active and Passive Filters (Lectures 3)			
18	Low Pass, High Pass	1. Hand written notes 2.Electronic devices and circuit theory by Boylestad 3. Youtube link	Board & chalk/Practical demonstration with computer simulation
19	Band Pass and band Reject Filters		
20	*Doubt clearing class*		
Unit IV: Multivibrator (Lectures 03)			
21	Astable Multivibrators using transistors.	1. Hand written notes 2.Electronic devices and circuit theory by Boylestad 3. Youtube link	Board & chalk/demonstration
22	Monostable Multivibrators using transistors.		
23	*Doubt clearing class*		
Unit V: Phase Locked Loop (PLL) (Lectures 5)			
24	Basic Principles of PLL circuit	1. Hand written notes 2.Electronic devices and circuit theory by Boylestad 3. Youtube link	Board & chalk/ Practical demonstration with computer simulation
25	Phase detector (XOR & edge triggered)		
26	Voltage Controlled Oscillator (Basics, varactor).		
27	Loop Filter–Function, Loop Filter Circuits,		
28	transient response, lock and capture. Basic idea of PLL IC (565 or 4046).		
Unit VI: Processing of Devices (Lectures 12)			
29	Basic process flow for IC fabrication	1. Hand written notes 2.Electronic devices and circuit theory by Boylestad 3. Youtube link	Board & chalk/ Animated video of different steps of processing of IC device (source YouTube)
30	Electronic grade silicon		
31	Crystal plane and orientation		
32	Defects in the lattice		
33	Oxide layer. Oxidation Technique for Si		
34	Metallization technique. Positive and Negative Masks		
35	Optical lithography		
36	Electron lithography		
37	Feature size control and wet anisotropic etching		
38	Lift off Technique		
39	Diffusion and implantation		

40	*Doubt clearing class*		
Unit VII: Digital Data Communication Standards (Lectures 5)			
41	Serial Communications: RS232, Handshaking, Implementation of RS232 on PC	1. Hand written notes 2.Electronic devices and circuit theory by Boylestad 3. Youtube link	Board & chalk/ Animated video of communication (source YouTube)
42	Universal Serial Bus (USB): USB standards, Types and elements of USB transfers.		
43	Devices (Basic idea of UART). Parallel Communications: General Purpose Interface Bus (GPIB), GPIB signals and lines, Handshaking and interface management		
44	Implementation of a GPIB on a PC. Basic idea of sending data through a COM port		
45	*Doubt clearing class*		
Unit VIII: Introduction to communication systems (Lectures 15)			
46	Block diagram of electronic communication system	1. Hand written notes 2.Electronic devices and circuit theory by Boylestad 3. Youtube link	Board & chalk/Animated video of modulation (source YouTube)
47	Need for modulation		
48	Amplitude modulation		
49	Modulation Index. Analysis of Amplitude Modulated wave		
50	Sideband frequencies in AM wave		
51	CE Amplitude Modulator		
52	Demodulation of AM wave using Diode Detector		
53	Basic idea of Frequency and Phase modulation.		
54	Basic idea of Pulse modulation.		
55	Basic idea of digital modulation including ASK, PSK, FSK.		
56	*Doubt clearing class*		
57	*Doubt clearing class*		
58	*Doubt clearing class*		
59	*Doubt clearing class*		
60	*Doubt clearing class*		

Signature of the Teacher

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Nalbari College, Nalbari

Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr. Hemen Kakati

Department: Physics

Semester: VI

Paper Name: Astronomy and Astrophysics (Unit V and VI)

Paper Code: PHY-HE-6046

Learning Objectives:

1. To know the universe and its components.
2. To measure Astronomical distances.
3. To understand the Origin of the Universe.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit V: Galaxies		Introduction to Astrophysics by H L Duarah Notes IITG class notes	Blackboard, powerpoint, Videos
1	The Milky Way		
2	properties of the galactic centre.		
3	Classification of galaxies,		
4	Galaxies		
5	Hubble's tuning fork diagram		
6	normal (spiral, elliptical and lenticular) Galaxies		
7			
8	active galaxies.		
9	Black holes in galaxies		
10	Discussion		

Unit VI: Cosmology			
11	Distance ladder in cosmology,		
12	Parallax Method		
13	Cepheid variables.		
14	Cosmic expansion of the universe and Hubble(-Lemaitre) law.		
15	Clusters of galaxies and dark matter		
16			
17	virial theorem		
18			
19	Concept of the Hot Big Bang		
20	Oscillating Universe		
21	Cosmic Microwave Background (CMB).		
22			
23	Discussion		
24	Discussion		
25	Discussion		

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Nalbari College, Nalbari

Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr. Hemen Kakati

Department: Physics

Semester: VI

Paper Name: Classical Dynamics (Unit III) **Paper Code:** PHY-HE-6056

Learning Objectives:

1. Learn special theory of relativity and and its implications.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Assessment for CIE
1	Postulates of Special Theory of Relativity.	Mechanics by D S Mathur	Home Assignment, Unit Test,
2	Lorentz Transformations.		
3			
4	Minkowski space		
5	The invariant interval		
6	Light cone		
7	World lines		
8	Space-time diagrams		
9	Time-dilation		
10	Length contraction		
11	Twin paradox.		
12	Four-vectors: spacelike, time-like and light-like.		
13			
14	Four-velocity and acceleration		

15			
16	Metric and alternating tensors.		
17			
18	Four-momentum and energy-momentum relation.		
19			
20	Doppler effect from a four-vector perspective.		
21			
22	Concept of four-force.		
23	Conservation of four-momentum.		
24	Relativistic kinematics.		
25			
26	Application to two-body decay of an unstable particle.		
27	Discussion		
28	light cone discussion		
29	Web resources		
30	Lorentz transformation discussion		
31	Discussion on length contraction		
32	Discussion on postulates of relativity		
33	Discussion Minkowski space		

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Nalbari College, Nalbari

Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr. Dhruba Jyoti Gogoi

Department: Physics

Semester: IV

Paper Name: Mathematical Physics III

Paper Code: PHY-HC- 4016

Learning Objectives:

1. Complex - number, variable and function.
2. Complex integration.
3. Taylor and Laurant theorem.
4. Fourier transformation and Laplace transformation.
5. Tensor.

Books to be followed in the course:

1. Complex variables --- Mc Graw Hill (Schaum's outlines)
2. Mathematical physics-III --- Vishal Publication
3. Mathematical physics-III --- Kalyani Publication
4. Theory of function of complex variable --- S. Chand

Study materials for the course: (Google class room links of the study materials are given below)

1. https://classroom.google.com/c/NjYyOTA2MzYwMzQ3/m/NjYzNzgzNTY3MzM4/details
2. https://classroom.google.com/c/NjYyOTA2MzYwMzQ3/m/NjYzNzgzMjU4MTYw/details
3. https://classroom.google.com/c/NjYyOTA2MzYwMzQ3/m/NjQ4NzQ2OTEyODUx/details

Sl. No of Lecture	Topic/ Subtopic	Learning Resources/ Mode of Teaching & ICT Tools	Date	Remarks
	UNIT I: COMPLEX ANALYSIS (LECTURES 10)			
01	A brief discussion of the whole syllabus. Important and applications of complex analysis in physics.	Book Serial Number : 01		
02	Graphical representation of Complex Variables (Cartesian, polar and exponential representation)	Book SL No. : 01 & 3		
03	Some basic terminology related to Complex number (region, neighborhood etc.)	Book Serial Number : 01		
04	Function of complex variable.	Study material link : 01		Link provided through Google class room.
05	Analyticity (limit, continuity and differentiation)	,,		,,
06	Examples of analytic functions	,,		,,
07	Derivation of Cauchy-Riemann Conditions	,,		,,
08	Numerical practice and doubt clearing	,,		,,
09	Singular functions: poles and branch points, order of singularity.	,,		,,
10	Class test	*Home Assignment		
	UNIT II: COMPLEX INTEGRATION (LECTURES 10)			
01	Integration of a function of a complex variable.	Study material link : 02		
02	Simply and multiply connected region	,,		
03	Cauchy's Integral formula.	,,		
04	Problem solving	,,		
05	Taylors expansion (derivation)	,,		
06	Laurent expansion (derivation)	,,		
07	Residues and Residue Theorem	,,		
08	Numerical/application (definite integration)	Book Sl. No. 1 to 3		
09	Numerical/application (definite integration)	,,		

10	Class test	*Home Assignment		
	UNIT III: FOURIER TRANSFORMS (LECTURE 15)			
01	Basics of Fourier Transforms	Study material link 03 Book Sl. No. 03		
02	Fourier Integral theorem	,,		
03	Cont...	,,		
04	Fourier Transform examples (Sine and Cosine)	,,		
05	Cont..	,,		
06	Fourier transformation of trigonometric and Gaussian functions	,,		
07	Representation of Dirac delta function as a Fourier Integral	,,		
08	Fourier transform of derivatives, Inverse Fourier transform, Convolution theorem (Statement only)	,,		
09	Cont...	,,		
10	Properties of Fourier transform (translation, change of scale, complex conjugation).	,,		
11	Cont...	,,		
12	Class test			
13	Doubt clearing session	Book Sl. No. 1 to 3.		
14	Previous year question discussion	Previous year question paper from website		
15	Previous year question discussion	,,		

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Nalbari College, Nalbari

Teaching Plan for the Session:

Name of the Teacher: SURAJIT SARMA

Department: Physics

Semester: V

Paper Name: Nuclear and Particle Physics

Paper Code: PHY-HE-5056

Units to be Taught: Unit I, Unit VI, Unit VI and Unit VII

Learning Objectives:

Upon completion of this course, students will have the understanding of the sub atomic particles and their properties. They will gain knowledge about the different nuclear techniques and their applications in different branches of Physics and societal application. The course will develop problem based skills and the acquire knowledge can be applied in the areas of nuclear, medical, archeology, geology and other interdisciplinary fields of Physics and Chemistry.

Sl. No of Lecture	Topic/ Subtopic	Learning Resources	Mode of Teaching & ICT Tools
Unit I: General Properties of Nuclei (Lectures 10)			
Lect. 1	Introductiory class and Constituents of nucleus and their Intrinsic properties		
Lect. 2	Constituents of nucleus and their Intrinsic properties, quantitative facts about mass, radii, charge density (matter density)	Introductory nuclear Physics by Kenneth S. Krane	Notes and Black board
Lect. 3	Constituents of nucleus and their Intrinsic properties, quantitative facts about mass, radii, charge density (matter density)	Nuclear Physics by A.B. Gupta	
Lect. 4	binding energy, average binding energy and its variation with mass number		
Lect. 5	main features of binding energy versus mass number curve, N/A plot,		
Lect. 6	main features of binding energy versus mass number curve, N/A plot,		
Lect. 7	angular momentum, parity		
Lect. 8	magnetic moment, electric moments		

Lect. 9	, nuclear excites states		
Lect. 10	Doubt clearing and Discussion		
Unit VI: Detector for Nuclear Radiations (Lectures 8)			
Lect. 1	Gas detectors: estimation of electric field, mobility of particle		
Lect. 2	Gas detectors: estimation of electric field, mobility of particle		
Lect. 3	ionization chamber and GM Counter		
Lect. 4	ionization chamber and GM Counter		
Lect. 5	Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT)		
Lect. 6	). Semiconductor Detectors (Si and Ge) for charge particle		
Lect. 7	concept of charge carrier and mobility, neutron detector		
Lect. 8	Discussion		
Unit VII: Particle Accelerators (Lectures 5)			
Lect. 1	Accelerator facility available in India: Van-de Graaff generator (Tandem accelerator)		
Lect. 2	Accelerator facility available in India: Van-de Graaff generator (Tandem accelerator)		
Lect. 3	Linear accelerator		
Lect. 4	Cyclotron, Synchrotrons		
Lect. 5	Cyclotron, Synchrotrons and Discussion		

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Nalbari College, Nalbari

Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr Hangshadhar Rajbongshi

Department: Physics

Semester: 6th

Course Name: Electromagnetic Theory **Course Code: PHY-HC-6016**

Course Outcome(COS):

On successful completion of the course students will acquire the concepts of Maxwell's equations, propagation of electromagnetic (EM) waves in different homogeneous-isotropic as well as anisotropic unbounded and bounded media, production and detection of different types of polarized EM waves, general information as waveguides and fibre optics.

LECTURE SCHEDULE

Unit I: Maxwell Equations (Lecture 12)

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LECT-1 Review of Maxwell's equations. Displacement Current.
LECT-2 Vector and Scalar Potentials
LECT-3 LECT-4. Gauge Transformations: Lorentz and Coulomb Gauge
LECT-5 & 6 Boundary Conditions at Interface between Different Media.
LECT 7 Wave Equations.
LECT 8 Plane Waves in Dielectric Media
LECT 9 Poynting Theorem and Poynting Vector.
LECT 10 Electromagnetic (EM) Energy Density. Physical Concept of Electromagnetic Field Energy Density
LECT 11 Momentum Density and Angular Momentum Density
LECT 12 unit test-1

Unit II: EM Wave Propagation in Unbounded Media (Lecture 10)

LECT-1; Plane EM waves through vacuum and isotropic dielectric medium
LECT-2 transverse nature of plane EM waves,
LECT-3 refractive index and dielectric constant, wave impedance
LECT-4 & 5 Propagation through conducting media;
LECT- 6 Application to spread of Gaussian wave-packet for a free particle in one dimension;
LECT-7 , relaxation time, skin depth.
LECT-8 & 9 ; Wave propagation through dilute plasma, electrical conductivity of ionized gases, plasma frequency, refractive index, skin depth, application to propagation through ionosphere.
Lect 10 Unit Test-2 and Question paper discussion

Unit III: EM Wave in Bounded Media (Lecture 10)

LECT-1&2 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.
LECT-3,4, 5 Fresnel's Formulae for perpendicular & parallel polarization cases,
LECT- 6,Brewster's law. Reflection & Transmission coefficients
LECT- 7, 8 Total internal reflection, evanescent waves.
LECT-9, Metallic reflection (normal Incidence).
LECT-10 Unit Test-3

Unit IV: Polarization of Electromagnetic Waves (Lecture 12)

.LECT-1 Description of Linear, Circular and Elliptical Polarization.
LECT -2 Propagation of E.M. Waves in Anisotropic Media
LECT- 3 &4 Symmetric Nature of Dielectric Tensor. Fresnel's Formula. Uniaxial and Biaxial Crystals
LECT 5 Light Propagation in Uniaxial Crystal. Double Refraction. Polarization by Double Refraction.
LECT-6 Nicol Prism. Ordinary & extraordinary refractive indices.
LECT-7 Production & detection of Plane, Circularly and Elliptically Polarized Light
LECT- 8 Phase Retardation Plates: Quarter-Wave and Half-Wave Plates
LECT -9&10 . Babinet Compensator and its Uses. Analysis of Polarized Light.
LECT -11 unit test -4
LECT-12 Sessional Examination

Unit V: Rotatory Polarization (Lecture 08)

LECT-1 Optical Rotation. Biot's Laws for Rotatory Polarization.
LECT-2&3 Fresnel's Theory of optical rotation. Calculation of angle of rotation. Experimental verification of Fresnel's theory.
LECT- 4 Specific rotation. Laurent's half-shade polarimeter
LECT-5 Wave Guides: Planar optical wave guides. Planar dielectric wave guide. Condition of continuity at interface
LECT-6. Phase shift on total reflection. Eigenvalue equations
Lect -7 Phase and group velocity of guided waves. Field energy and Power transmission.
Lect 8 Unit Test -5

Unit VI: Optical Fibres (Lecture 03)

LECT-1 Introduction to optical fibre and its principle
LECT-2. Numerical Aperture. Step and Graded Indices (Definitions Only).
LECT-3 Single and Multiple Mode Fibres (Concept and Definition Only). And question discussion.

TEACHING METHOD FOR EACH UNIT:

Unit I : Lecture using CHALK AND BOARD

Unit II: Lecture using CHALK AND BOARD

Unit III : Lecture using CHALK AND BOARD AND PPT
Unit IV : Lecture using CHALK AND BOARD AND PPT
Unit V: Lecture using CHALK AND BOARD AND PPT
Unit VI: Lecture using CHALK AND BOARD AND PPT

ASSESSMENT METHOD FOR EACH UNIT

Unit I: Home assignment and unit test

Unit II: Unit Test

Unit III: Unit test

Unit IV: Home Assignment and unit test

Unit V: Unit Test

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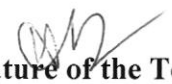

Signature of the Teacher

Nalbari College, Nalbari

Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr Hangshadhar Rajbongshi

Department: Physics

Semester: 4th

Course Name: Elements of Modern Physics **Course Code: PHY-HC-4026**

(Unit: I,II, III , IV)

Course Outcome (COS):

On completion of the course students will be able to understand modern development in Physics, Starting fron Planck's law, it development of the idea of probability interpretation and the formulation of Schrodinger equation Students will also get preliminary idea of structure of nucleus, radioactivity Fission and Fusion and Lase

Sl. No of Lecture	Unit	Topic/ Subtopic (Part A)	Learning Resources	Mode of Teaching & ICT Tools	Mode of Assessment for CIE(continuous internal evaluation)
1	**Unit I: Quantum Theory and Blackbody Radiation (Lecture 12)**	Development of Quantum theory	Book	Lecture using chalk and board	Though MCQ
2		. Quantum theory of light		Lecture using chalk and board	
3		; photo-electric effect		Lecture using chalk and board	
4		Compton scattering			
5		. De Broglie wavelength and matter waves			
6		Davisson-Germer experiment.			
7		Wave description of particles by wave packets			
8		. group and phase velocities and relation between them			
9		Two-slit experiment with electrons			
10		. Probability. wave amplitude and wave functions.			
11		Question Discussion			
12		Unit Test-1			
13	**Unit II: Uncertainty and Wave-Particle Duality (Lecture 05)**	Position measurement : gamma ray microscope thought experiment;	Book and UTube Video	Lecture using chalk and board	Home Assignment MCQ
14		wave-particle duality, Heisenberg uncertainty principle (Uncertainty relations involving Canonical pair of variables):			

15		Derivation from wave packets			
16		, 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.			
17		Unit test-2 and question discussion			
18	**Unit III: Schrödinger Equation (Lecture 8)**	Two slit interference experiment with photons, atoms and particles;	Book and Youtube Video	Lecture using chalk and board	MCQ
19		linear superposition principle as a consequence			
20		Matter waves and wave amplitude			
21		Schrödinger equation for non- relativistic particles			
22		expectation value, momentum and energy operators;			
23		stationary states; physical interpretation of a wave function,			
24		probabilities and normalization; probability and probability current densities in one dimension			
25		Unit Test-3			
26	***Unit IV: One-dimensional Box and Step Barrier (Lecture 9)***	One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization	Book and UTube Video	Lecture using chalk and board	MCQ
27		Continued above			
28		quantum dot as example			
29		quantum mechanical scattering and tunnelling in one dimension-across a step potential			
30		continued			

31		continued			
32		continued			
33		potential and rectangular potential barrier.			
34		continued			
35		Unit Test 4			

Signature of the HoD

Signature of the Teacher

Nalbari College, Nalbari

Teaching Plan for the Session: 2022-23

Name of the Teacher: Dr Hangshadhar Rajbongshi

Department: Physics

Semester: 5th

NAME OF THE COURSE: Quantum Mechanics & Applications

COURSE CODE : PHY-HC-5016

Course Outcome (COS): On successful completion of this particular paper (course) students will be able to understand the principles in quantum mechanics, such as the Schrödinger equation, the wave function, the uncertainty principle, stationary and non-stationary states, time evolution of solutions, as well as the relation between quantum mechanics and linear algebra. Students will be able to solve the Schrödinger equation for hydrogen atom. Students will have the concepts of angular momentum and spin, as well as the rules for quantization and addition of these, spin-orbit coupling and Zeeman Effect.

LECTURE SCHEDULE

Unit I: Time Dependent Schrödinger Equation (Lectures 06)

LECT-1 Time dependent Schrödinger equation and dynamical evolution of a quantum state
LECT-2 properties of wave function. Interpretation of wave function. Probability and probability current densities in three dimensions.
LECT-3 Conditions for physical acceptability of wave functions. Normalization. Linearity and Superposition Principles.
LECT-4 Eigenvalues and eigenfunctions. Position, momentum and energy operators; commutator of position and momentum operators.
LECT-5 Expectation values of position and momentum. wave function of a free particle.
LECT 6 ASSIGNMENT Questin Discussion

Unit II: Time Independent Schrödinger Equation (Lectures 10)

LECT-1 Hamiltonian, stationary states and energy eigenvalues;
LECT-2 expansion of an arbitrary wave function as a linearcombination of energy eigenfunctions;
LECT-3 &4 General solution of the time dependent Schrödinger equation in terms of linear combinations of stationary states;
LECT-5 & 6 Application to spread of Gaussian wave-packet for a free particle in one dimension;
LECT-7 CLASS TEST-1
LECT-8 wave packets, Fourier transforms and momentum space wave function;
LECT-9 Position-momentum uncertainty principle.
Lect 10 Unit Test-1 and Question paper discussion

Unit III: Bound States (Lectures 12)

Lect-1&2 Continuity of wave function, boundary condition and emergence of discrete energy levels;
Lect-3,4, 5 application to onedimensional problem-square well potential;
Lect 6, 7, 8 Quantum mechanics of simple harmonic oscillator-energy levels and energy eigenfunctions using Frobenius method;
Lect 9, 10 Hermite polynomials; ground state, zero point energy & uncertainty principle.
Lect 11 UNIT TEST -2

Lect 12 Question paper discussion

Unit IV: Hydrogen-like Atoms (Lectures 10)

Lect 1 Time independent Schrödinger equation in spherical polar coordinates;
Lect-2 separation of variables for second order partial differential equation;
Lect 3 angular momentum operator & quantum numbers;
Lect 4&5 Radial wave functions from Frobenius method;
Lect 6 shapes of the probability densities for ground & first excited states;
Lect 7 Orbital angular momentum quantum numbers l and m s, p d, f ⋯_shells.
Lect 8 Sessional EXAM
Lect 9 Home Assignment
LECT 10 Question discussion

Unit V: Atoms in Electric & Magnetic Fields (Lectures 12)

Lect-1 Electron angular momentum. Space quantization.
Lect 2&3 Electron Spin and Spin Angular Momentum. Larmor's Theorem.
Lect 4,5&6 Spin Magnetic Moment. Stern-Gerlach Experiment.
Lect 7&8 Electron Magnetic Moment and Magnetic Energy, Gyromagnetic Ratio and Bohr Magneton.
Lect 9,&10 Zeeman Effect: Normal and Anomalous Zeeman Effect.
Lect 11 Paschen-Back Effect and Stark Effect (Qualitative Discussion only).
Lect 12 Unit Test

Unit VI: Many Electron Atoms (Lectures 10)

Lect 1&2 Pauli's Exclusion Principle. Symmetric & Antisymmetric W ave Functions.
Lect 3 Periodic table.
Lect 4 &5 Fine structure. Spin orbit coupling. Spectral Notations for Atomic States. Total angular momentum.
Lect 6 Vector atom Model.
Lect 7 Spin-orbit coupling in atoms: L– S and J–J couplings.
Lect 8 &9 Hund's Rule. Term symbols. Spectra of Hydrogen and Alkali Atoms (Na etc.).
Lect 10 Unit Test

TEACHING METHOD FOR EACH UNIT:

Unit I: Lecture using CHALK AND BOARD

Unit II: Lecture using CHALK AND BOARD

Unit III: Lecture using CHALK AND BOARD AND PPT

Unit IV: Lecture using CHALK AND BOARD AND PPT

Unit V: Lecture using CHALK AND BOARD AND PPT

Unit VI : Lecture using CHALK AND BOARD AND PPT

ASSESSMENT METHOD FOR EACH UNIT

Unit I: Home assignment
Unit II: Unit Test
Unit III: Unit test
Unit IV: Home Assignment
Unit V: Unit Test
Unit VI: Unit Test

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