



গড়গাঁও মহাবিদ্যালয়
GARGAON COLLEGE

**TEACHING PLAN
DEPARTMENT OF PHYSICS
JULY 2019 - JUNE 2020**

GARGAON COLLEGE
TEACHING PLAN

Course: B. Sc.

Session: Odd semester 2019

Subject: Physics

Name of the Teacher: DILIP BORDOLOI

Designation: Associate Professor

Methods to be applied: Lecture, Assignment and test, Seminar Presentation/Group Discussion/Micro Teaching.

Teaching Materials: Board and Marker, ICT tools like Projector, online platform like Google meet, zoom, Google Classroom etc.

Paper Code/ Title	Allotted Unit/ Topic	No. Of Class required	Detail of the topic to be taught
C2: Mechanics	Fundamentals of Dynamics	6	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.
	Work and Energy	4	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.
		3	Collisions: Elastic and inelastic collisions between particles. Centre of Mass and laboratory frame
	Rotational Dynamics	12	Angular momentum of particles 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.
	Elasticity	2	Relation between Elastic constants. Twisting torque on a Cylinder or Wire.
GE-1: Mechanics	Elasticity	8	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.
	Special Theory of Relativity:	7	Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities
PHYM 30100 : Optics	Unit II: Interference	12	Concept of physical optics, coherent source, interference by division of wavefronts, Young's double slit experiment, interference with white light, displacement of fringes, Fresnel biprism, Lloyd's mirror. Interference by division of amplitude: interference by a plane parallel film, the cosine law, non-reflecting films, expression for the reflected wave, wedge shaped film, colour of thin films, Newton's rings, Michelson interferometer, application in the determination of closely spaced wavelengths, visibility of fringes, Jamin's and Fabry-Perrot interferometer.
PHYG 30100 : Electricity, Magnetism and Electromagnetic theory	Unit II : Magnetism	7	Magnetic potential, field intensity, magnetic shell, magnetic permeability, susceptibility, magnetization, magnetic intensity and their relation.
PHYM 50300 Atomic and Molecular Physics	Unit I: Quantum Theory of Atom	15	Background of Quantum Theory: Bohr's model of the hydrogen atom, origin of spectral lines, Bohr's correspondence principle, Sommerfeld's atom model, designation of spectral term symbol. Vector atom model, space quantization, Larmor precession, the four quantum numbers, spectral terms arising from L-S coupling and j-j coupling, selection rules
	Unit II: Fine Structure of Atom	11	Fine structure of hydrogen spectra, doublet spectra of Na-atom Gyromagnetic ratio for orbital and spin motion, Lande's 'g' factor, strong and weak field effects, Zeeman Effect (normal and anomalous), qualitative ideas of Stark effect
	Unit III: Molecular Spectra and Lasers	14	Molecular spectra: Pure rotation spectra, theory of pure rotation spectra, selection rules, vibration spectra and selection rules, theory of rotation-vibration spectra, P and R branches, Rayleigh and Raman scattering, Raman effect, classical theory of Raman effect Introduction to Lasers: Spontaneous and stimulated emission, population inversion, Einstein's A and B coefficients, qualitative ideas of Ammonia beam maser, ruby laser, He-Ne laser

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Paper Code/ Title	Allotted Unit/ Topic	No. Of Class required	Detail of the topic to be taught
C-3: Electricity and Magnetism	Electrical Circuits	4	AC Circuits: Kirchoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit.
	Network theorems	4	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.
	Ballistic Galvanometer:	3	Torque on a current Loop. Ballistic Galvanometer: Current and Charge Sensitivity. Electromagnetic damping. Logarithmic damping. CDR.
C4: Waves and Optics	Fresnel Diffraction	7	Fresnel's Assumptions. 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's Integral, Fresnel diffraction pattern of a straight edge, a slit and a wire.
	Holography	3	Principle of Holography. Recording and Reconstruction Method. Theory of Holography as Interference between two Plane Waves. Point source holograms.
GE-2: Electricity and Magnetism	Electromagnetic Induction:	6	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.
	Maxwell's equations and Electromagnetic wave propagation	10	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.

PHYM 40100: Mathematical Physics I	Unit III: Matrices	8	Definition, types of matrices, transformation of matrices, characteristic equation, solution of inhomogeneous linear equations, eigen values and eigen vectors, diagonalization of matrices.
PHYG 40100 : Quantum mechanics & Mathematical Physics	Unit II: Schrodinger equation	8	Schrodinger equation, interpretation of wave function, probability density and probability current density, concept of wave packet, expectation values of physical variables, operators, particle in a one-dimensional box.
PHYM 60300 : Nuclear Physics	Unit I : Properties of Atomic Nuclei	10	Introduction, nuclear size and its determination, hypotheses of nuclear composition (proton-electron and proton-neutron hypothesis), mass of nucleus and nuclear atoms, quantum numbers of individual nucleus, quantum properties nuclear states, nuclear angular momentum, nuclear magnetic dipole moment, binding energy of nucleus, mass defect, packing fraction, disintegration energy, semi-empirical mass formula
	Unit II : Nuclear Model	15	Qualitative introduction to the nature of nuclear forces, qualitative discussion of the liquid drop model of the nucleus in relation to the semi-empirical mass formula, qualitative discussion on the Shell model of the nucleus
PHYM 60430: Laser and its Application	Unit I : Introduction to Laser	12	Absorption and emission of radiation, Spontaneous emission of radiation, stimulated emission, Einstein coefficients, significant of Einstein coefficients Basic Laser system requirements, Method of creation of population inversion, optical resonator, Q factor, optical cavity, Standing wave, Threshold condition for laser oscillator
	Unit II: Laser system	8	Laser. Description of Ammonia beam Maser, Ruby Laser, He-Ne Laser, Semi conductor



(Dilip Bordoloi)



GARGAON COLLEGE
TEACHING PLAN

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Subject: Physics

Name of the Teacher: ATUL BORCHETIA

Designation: Associate Professor

Methods to be applied: Lecture, Assignment and test, Seminar Presentation/Group Discussion/Micro Teaching.

Teaching Materials: Board and Marker, ICT tools like Projector, online platform like Google meet, zoom, Google Classroom etc.

Paper Code/ Title	Allotted Unit/ Topic	No. Of Class required	Detail of the topic to be taught
C-1 : Mathematical Physics-1	Calculus	2	Recapitulation: Limits, continuity, average and instantaneous quantities, differentiation. Plotting functions. Intuitive ideas of continuous, differentiable, etc. functions and plotting of curves. Approximation: Taylor and binomial series (statements only). fields.
	First Order and Second Order Differential equations	13	First Order Differential Equations and Integrating Factor. Homogeneous Equations with constant coefficients. Wronskian and general solution. Statement of existence and Uniqueness Theorem for Initial Value Problems. Particular Integral.
GE-1: Mechanics	Momentum and Energy	6	Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets.
	Rotational Motion	5	Angular velocity and angular momentum. Torque. Conservation of angular momentum.
PHYM 30100 : Optics	Unit-I : Geometrical optics	10	Aberrations: chromatic aberration, spherical aberration, methods of minimizing the defects of monochromatic images, coma, astigmatism and curvature of field, distortion, achromatic combination of lenses and prism, eyepieces-Ramsden and Huygen's, use of different telescopes (Ray diagrams for Galilean, Newtonian and Cassegrain telescopes)
	Unit III: Diffraction	10	Fraunhofer diffraction: single slit diffraction-circular and rectangular, two slit diffraction, N-slit diffraction, plane diffraction grating, resolving and dispersive power of a plane diffraction grating, secondary maxima. Fresnel diffraction: Fresnel's integrals, Cornu's spiral, Fresnel diffraction pattern at a straight edge and at a slit, Fresnel's half period zones, zone plate.

PHYG 30100 : Electricity, Magnetism and Electromagnetic theory	Unit I : Electricity	12	Gauss's law and its application to calculation of fields due to hollow and solid sphere, energy density in electric field capacitance and dielectrics, RC-circuits, charging and discharging of a capacitor, time constants, AC through R, C, and L, L-C-R circuits and resonance DB GS
PHYM 50100: Mathematical Physics	Unit I: Differential equation and Special function	15	Classification of differential equations, homogenous and non-homogeneous equations, solutions in simple cases of ordinary differential equations of second order, linear differential equations with constant and variable coefficients, Forbenius' method. Special functions: Legendre's polynomials, beta, gamma and error functions and their inter relations.
	Unit II: Complex variables	15	Graphical representation of complex numbers, functions of complex variables, limit and continuity, analytic functions, Cauchy-Riemann conditions and applications, singularities, contour integration, Cauchy's theorem, Cauchy's integral formula, Taylor's and Laurent's expansion, residue theorem and its application in evaluation of integrals.

GARGAON COLLEGE
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Teaching Materials: Board and Marker, ICT tools like Projector, online platform like Google meet, zoom, Google Classroom etc.

Paper Code/ Title	Allotted Unit/ Topic	No. Of Class required	Detail of the topic to be taught
C-3: Electricity and Magnetism	Magnetic Field	9	Magnetic force between current elements and definition of Magnetic Field \mathbf{B} . Biot-Savart's Law and its simple applications: 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 and (2) Toroid. Properties of \mathbf{B} : curl and divergence. Vector Potential. Magnetic Force on (1) point charge (2) current carrying wire (3) between current elements. Torque on a current loop in a uniform Magnetic, Field.
	Magnetic Properties of Matter	4	Magnetization vector (\mathbf{M}). Magnetic Intensity (\mathbf{H}). Magnetic Susceptibility and permeability. Relation between \mathbf{B} , \mathbf{H} , \mathbf{M} . Ferromagnetism. B-H curve and hysteresis.
	Electromagnetic Induction:	6	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.
GE-2: Electricity and Magnetism	Electrostatics	22	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..
PHYM 40100: Mathematical	Unit I : Vector calculus	13	Scalar and vector fields, differentiation of a

Physics I			vector with respect to a scalar, unit tangent vector, normal vector. Derivatives of vectors: gradient of a scalar, flux of a vector field, divergence and curl of a vector field, ideas of line, surface and volume integration, Gauss's Stoke's Laplacian in B Cop Cartesian, spherical and cylindrical coordinate system
PHYG 40100 : Quantum mechanics & Mathematical Physics	Unit III: Vector calculus	5	Scalar and vector fields, Gradient of scalar field, Divergence of a vector field, Curl of a vector field, idea of line, surface and volume integration, Gauss' and Stokes' theorems.
PHYM 60200 : Condensed Matter physics	Unit I: Crystal structure	13	Crystal structure, idea of a lattice, unit cell, Bravais' lattice, primitive lattice vectors, translational lattice vectors, Wigner-Seitz cell, Miller indices, some simple crystal structures (sc, bcc, fcc, hcp, diamond, zinc blend, NaCl, CsCl structures). X-ray diffraction, Bragg's equation, reciprocal lattice for sc, bcc and fcc lattice, concept of Brillouin zone, lattice energy of ionic crystals, Born's theory, Madelung constant
	Unit II: Properties of solid	12	Electrical and thermal conductivity of metals from classical free electron theory, Ohm's law, Wiedemann-Franz's law Free electron Fermi gas, electron gas in one dimension and three dimensions, density of states, E-k diagram, Fermi-Dirac distribution and Fermi level of energy. Band theory of solids, formation of bands in a solid, classification of solids into metal, insulator and semiconductor, crystal potential due to periodic array of atoms, one dimensional Bloch theorem, Kronig-Penney model (qualitative idea only), important conclusions from the model, energy band diagram in reduced zone representation, effective mass
PHYM 60430: Laser and its Application	Unit III: Properties of Laser radiation	8	Intensity, Monochromaticity, Coherence properties of Laser radiation, spatial, and Temporal Coherence, Purity of spectral line and Temporal Coherence relation with Coherence, visibility of fringes and degree of coherence relation between visibility and coherence.



(Atul Borchetia)



HOD
Department of Physics
Gargaon College

GARGAON COLLEGE
TEACHING PLAN

Course: B. Sc.

Session: Odd semester 2019

Subject: Physics

Name of the Teacher: MR. DIGANTA KONWAR

Designation: Associate Professor

Methods to be applied: Lecture, Assignment and test, interaction and discussion.

Teaching Materials: Board and Marker, ICT tools like Projector, online platform like zoom, Google Classroom etc.

Paper Code/ Title	Allotted Unit/ Topic	No. Of Class required	Detail of the topic to be taught
C-2: Mechanics	i. Fluid Motion	3	Kinematics of Moving Fluids: Poiseuille's Equation for Flow of a Liquid through a Capillary Tube
	ii. Gravitation and Central Force Motion	9	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. Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS).
	iii. Oscillations	7	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
	iv. Non-Inertial Systems:	4	Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of Physics in rotating coordinate systems. Centrifugal force. Coriolis force and its applications. Components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems
GE-1: Mechanics	i. Gravitation	8	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). Satellite in circular orbit and applications. Geosynchronous orbits. Basic idea of global positioning system (GPS). Weightlessness. Physiological effects on astronauts.
	ii. Oscillations	6	Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations.
PHYM 30200 : Electricity and Magnetism	Unit-II : Current Electricity	10	Kirchhoff's law and its applications, moving coil and moving magnet galvanometers, de bridges, Kelvin's double bridge, measurement of high resistance, measurement of very low emfs, thermoelectric effects, Seebeck effect, Peltier effect, Thomson effect, measurement of thermo emf, growth and

			decay of current in L-R, C-R and LCR circuit.
	Unit IV: Electromagnetic Induction	10	Electromagnetic induction, Faraday's law and Lenz's law, self and mutual inductance, methods of measurements. AC and DC generators and motors, transformer, relation between maximum, average and virtual or effective (rms) values of current, AC through resistance (R), inductance (L) and capacitance (C), AC through RL, RC and LCR circuits, phasor diagrams, measurements of self inductance by Anderson's bridge, measurements of mutual inductance by ballistic galvanometer, power in AC circuits.
PHYG 30100 : Electricity, Magnetism and Electromagn etic theory	Unit IV : Waves	5	Superposition Equation of motion of a progressive wave, longitudinal and transverse wave, superposition of waves, standing waves, transverse waves on a string, velocity of sound in a medium (solid, liquid and gas) Doppler effect
PHYM 50400 : Electronics	Unit I: Semiconducto r	13	Charged particles, electronic structure of elements, energy band theory of crystals, conductors, semiconductors and insulators, electrons and holes in semiconductor, donor and acceptor impurity, generation and recombination of charge, diffusion, continuity equation. Junction diode characteristics: the open circuited P-N junction, I-V characteristics of P-N diode, breakdown diodes, diode as a rectifier, half-wave and full-wave rectifier with resistance load, ripple factor, smoothing filters, DC power supply
	Unit II: Transistor and Amplifier	10	Transistors: NPN and PNP transistors, transistor action, common emitter, common base and common collector connections, transistor biasing (fixed bias, base-resistor, voltage divider) and thermal stabilization, amplifier equivalent circuits, hybrid parameters, small signal transistor voltage amplifier, RC coupled, LC coupled amplifier, power amplifier (Class A and Class B), distortion in amplifier, amplifier with negative feedback, effect of negative feedback on gain, output impedance and distortions
	Unit III: Oscillation and Integrated circuit	8	Oscillators: transistor as sinusoidal oscillator, Barkhausen criterion, tuned collector, Hartley, RC, Wein Bridge and crystal oscillator. AB mode Integrated Circuit: basic ideas, differential amplifier, operational amplifiers, common mode rejection ratio, inverting, non-inverting, basic mathematical operations- addition, differentiation, integration.

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C-4: Wave and Optics	i. Superposition of Collinear Harmonic oscillations	5	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.
	ii. Superposition of two perpendicular Harmonic Oscillations	2	Graphical and Analytical Methods. Lissajous Figures with equal and unequal frequency and their use.
	iii. Wave Motion	4	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.
	iv. Velocity of Waves	6	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.
	v. Superposition of Two Harmonic Waves	7	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 Harmonic Waves.
GE-2: Electricity and Magnetism	i. Electrostatics	22	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.
C-10: Analog system and Applications	i. Semiconductor Diodes	10	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.
	ii. Two-terminal Devices and their Applications	6	(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.
	iii. Bipolar Junction transistors	6	n-p-n and p-n-p Transistors. Characteristics of CB, CE and 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.
	iv. Amplifiers	10	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.
	v. Coupled amplifiers	4	Two stage RC coupled Amplifier and its frequency response.
	vi. Feedback in Amplifiers	4	Effect of positive and negative feedback on Input impedance, Output impedance, Gain, Stability, Distortion and noise.
GE4: Wave and Optics	Superposiyion of waves	6	Superposition of two collinear harmonic oscillations, Superposition of two perpendicular harmonic oscillations, Wave motion-General.
PHYM 60200 : Condensed Matter physics	Unit III: Semiconductor materials and Superconductivity	12	Semiconductor materials, intrinsic and extrinsic semiconductors, carrier concentration in an intrinsic semiconductor, Fermi energy, position of Fermi level in intrinsic and extrinsic semiconductors (qualitative ideas only), conductivity in semiconductor in terms of mobility. Superconductivity: electrical and magnetic properties in the superconducting state, Meisner effect, type I and type II superconductors

PHYM 60300 : Nuclear Physics	Unit III: Nuclear reaction and cosmic rays	10	Nuclear reactions, qualitative discussion on induced radioactivity, spontaneous and proton induced reaction, alpha induced reaction, sustained nuclear chain reaction, nuclear fission and fusion, particle accelerators-van de Graph generators, linear accelerators, cyclotron.
	Unit IV: Elementary particles	5	Cosmic ray and elementary particles: discovery and properties of cosmic rays, classification of elementary particles, qualitative introduction to leptons, quarks and gauge bosons
PHYM 60430: Laser and its Application	Unit IV: Laser application	6	Introduction: Basic principle of Fiber optics, structure and classification, acceptance angle and numerical aperture, Intermodal dispersion in a step index fiber, Ray path in index fiber Advantages of fiber optics communication.



(Diganta Konwar)



H.O.D. Physics

GARGAON COLLEGE**TEACHING PLAN**

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Session: Odd semester 2019

Subject: Physics**Name of the Teacher:** GUNA KANTA SONOWAL**Designation:** Assistant Professor**Methods to be applied:** Lecture, Assignment and test, Seminar Presentation/Group Discussion/Micro Teaching.**Teaching Materials:** Board and Marker, ICT tools like Projector, online platform like Google meet, zoom, Google Classroom etc.

Paper Code/ Title	Allotted Unit/ Topic	No. Of Class required	Detail of the topic to be taught
C-1 : Mathematical Physics-1	i. Recapitulation of vectors	5	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.
	ii. Vector Differentiation	8	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.
	iii. Vector Integration	14	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).
GE-1: Mechanics	i. Vectors	3	Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter.
	ii. Ordinary Differential Equations	7	1 st order homogeneous differential equations. 2 nd order homogeneous differential equations with constant coefficients.
PHYM 30100 : Optics	Unit-IV: Polarization and Dispersion	8	Polarization: production of polarized light, Brewster's law, Malus' law, double Srefraction, circular and elliptical polarization, analysis of polarized light, optical rotation, polarimeter. Dispersion: normal and anomalous dispersion
PHYM 30200: Electricity and Magnetism	Unit III: Magnetism	8	Magnetic field due to a circular current loop and solenoid, Gauss' theorem in magnetism and its applications, magnetic permeability and susceptibility, magnetization, magnetic intensity and their relation, dia-, para-, ferromagnetism
PHYG 30100 : Electricity, Magnetism and Electromagnetic theory	Unit III : Electromagnetic theory	7	Dielectric medium, displacement current, Biot-Savart law, Ampere's circuital law, vector potential, Maxwell's equations, Poynting vector, energy density in electromagnetic field,

			electromagnetic waves, Hertz experiment.
PHYM 50200: Electrodynamics and Special Relativity.	Unit I: Electromagnetic fields	15	Electromagnetic induction, displacement current, Maxwell's field equations and their interpretations (integral and differential forms), electromagnetic potentials, (scalar and vector potential) Derivation of Maxwell's wave equations, waves in free space, relation between wave vector and fields, Lorentz and Coulomb gauge, field energy and field momentum (Poynting vector and Poynting theorem), Radiation from accelerated charge, radiation from electric dipole
	Unit II: Propagation of electromagnetic waves		Plane waves in non-conducting media, polarization, plane waves in a conducting medium, skin effect. Boundary conditions, Reflection and refraction of a plane wave at a plane interface (normal and oblique incidence) between two dielectrics, Fresnel's formula, total internal reflection, Brewster's angle.

GARGAON COLLEGE
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Methods to be applied: Lecture, Assignment and test, Seminar Presentation/Group Discussion/Micro Teaching.

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Paper Code/ Title	Allotted Unit/ Topic	No. Of Class required	Detail of the topic to be taught
C-3: Electricity and Magnetism	i. Electric Field and	6	Electric field lines. Electric flux. Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry.
	ii. Electric Potential	6	Conservative nature of Electrostatic Field. Electrostatic Potential. Laplace's and Poisson equations. The Uniqueness Theorem. Potential and

			Electric Field of a dipole. Force and Torque on a dipole.
	iii. Electrostatic energy	10	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.
	iv. Dielectric Properties of Matter	8	Electric Field in matter. Polarization, Polarization Charges. Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector D . Relations between E,P and D . Gauss' Law in dielectrics.
GE-2: Electricity and Magnetism	i. Vector Analysis	12	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).
PHYM 40200 : Quantum Mechanics	Unit I : Introduction	14	Inadequacies of classical physics, Planck's quantum hypothesis, wave particle duality, photoelectric effect, Compton effect, de-Broglie hypothesis, phase and group velocity of de-Broglie waves, experimental verification of de-Broglie hypothesis (Davison- Germer experiment), Bohr's complimentarity principle, Young's double slit experiment- electron interference, Heisenberg's uncertainty principle, gamma ray microscope experiment to illustrate the uncertainty principle.
	Unit II : Application of Schrodinger equation	5	Applications of Schrödinger's equation to simple problems: 1) free particle, 2) particle in a one-dimensional box with rigid walls, 3) step potential, calculation of transmission and reflection coefficients.
PHYG 40100 : Quantum mechanics & Mathematical Physics	Unit IV: Differential equation	5	Classifications of differential equations, Variables are separable, homogeneous and non-homogeneous equations, linear equations, simple cases of ordinary differential equation of second order.
PHYM 60100: Statistical Mechanics	Unit I: Classical statistical physics	10	Postulates of classical statistical mechanics, phase space, Liouville's theorem, Ensembles: micro canonical, canonical and grand canonical, Maxwell-Boltzmann (MB) distribution laws, thermodynamic interpretation of the Lagrange's undetermined multipliers appearing in the distribution laws
	Unit II: Entropy and partition	8	Postulates of classical statistical mechanics, phase space, Liouville's theorem, Ensembles:

	function		micro canonical, canonical and grand canonical, Maxwell-Boltzmann (MB) distribution laws, thermodynamic interpretation of the Lagrange's undetermined multipliers appearing in the distribution laws
PHYM 60430: Laser and its Application	Unit V: Magneto- Optics and Electro Optics	6	Faraday effect- Determination of magnetic rotation, Classical theory of Faraday Effect, Kerr electro Optic effect, Harmonic generation, second harmonic generation



(Guna Kanta Sonowal)



HOD
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