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LESSON PLAN
2022-2023

DEPARTMENT OF **PHYSICS**

(PG –Even Semester)

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LESSON PLAN
2022-2023

Class : I M.Sc Physics **Semester : II**
Sub. Code : 22OPPH21
Title of the Paper: Mathematical Physics II **Total Hours : 75 Hours**

Month	Unit	Description of the Syllabus	Hours Allocated	Teaching Mode & Methods	Course Teacher Signature
December	I	**Differential equation** First order differential equation by method of separation of variables-solution of linear differential equation of first order and its solution- solution of linear differential equation of first order by the method of integrating factor-Solution of First order differential equation Reducible to linear form(Bernoulli's equation)-Solution of Second order differential equation by power series solution: Frobenius' method	15	Chalk & Talk	S. priyanka
January	II	**Special functions I** The Beta function – The Gamma function – Relation between Beta and Gamma function-Legendre's differentialequation and Legendre's function – The generating function for $P_n(x)$ – Rodrigue's formula for the Legendre's polynomial - The Legendre's coefficients- n th orthogonality $P_n(x)$ – Recurrence Formulae- Hermite Differential Equation and Hermite Polynomials-Generating function of Hermite Polynomials- Recurrence Formulae for Hermite Polynomials.	15	Chalk & Talk	S. priyanka
February	III	**Special functions II** Bessel's differential equation – The Bessel'sfunction of order n of the second kind – Recurrence Formulae – Generating function- Orthonormality of Bessel's Functions:Expansion of an arbitrary function in a Series of Bessel's functions-- Laguerre's Differential equation and Laguerre polynomial-The generating function for Laguerre polynomial - Rodrigue's formula for the Laguerre's polynomial	15	Chalk & Talk	S. priyanka S. Ameer Nisha Bibi
March	IV	**Partial Differential Equation** Partial Differential Equation-Solution of Partial Differential Equation by the method of separation of variables-Solution of laplace's equation in Cartesian coordinates- Solution of heat flow equation: Method of separation of variables- Linear Flow in Semi-infinite solid	15	Chalk & Talk	S. Ameer Nisha Bibi
April	V	**Fourier Series,Fourier &Laplace transforms**Fourier Series- Half Range Series –Complex Form – Change of Interval-Parsevel's theorem- Fourier's Transform – Properties of Fourier's Transform –Fourier Transform of a Derivative – Laplace transform-Properties of Laplace transform	15	Chalk & Talk	S. Ameer Nisha Bibi

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LESSON PLAN
2022-2023

Class : I M.Sc Physics **Semester : II**
Sub. Code : 22OPPH22
Title of the Paper: Thermodynamics and Statistical Mechanics **Total Hours : 75 Hours**

Month	Unit	Description of the Syllabus	Hours Allocated	Teaching Mode & Methods	Course Teacher Signature
December	I	**Thermodynamics:** First law of thermodynamics – The Two specific heats–Latent Heat Equations –Entropy a Point Function –Calculationof entropy change in different process – Maxwell's Thermodynamical Relations –The two Tds equations. **Applications of laws of thermodynamics:** Clausius Clapeyron's latent heat equation – The Triplepoint; Thomson's Theorem– Adiabatic stretching of a wire – Application to Paramagnetic salts; Magneto-Caloric effect –Application to surface Films .	15	Chalk & Talk	S. praveenraj
January	II	**Phase Space:** Phase space-Volume in phase space-Number of phase cells in given energy range of harmonic oscillator-Number of phase cells in given energy range of three dimensional free particle-Ensembles-Canonical Ensemble-MicrocanonicalEnsemble-grand canonical ensemble-uses of ensemble- Liouvilles theorem- Stastical Equilibrium-Thermal Equilibrium-Connection between statistical and thermodynamicquantities.	15	Chalk & Talk	S. praveenraj
February	III	**Method of Ensembles:** Micro Canonical ensemble – perfect gas in micro canonicalensemble –Gibbs paradox – partition function and its correlation with thermodynamic quantities-Gibbs canonical ensemble- Thermodynamic functions for canonical ensemble-Grand canonical ensemble-Partition function and thermodynamic functions for Grand canonical ensemble-Perfect gas in Grand canonical ensemble-comparison of ensembles.	15	Chalk & Talk	S. praveenraj P. R.
March	IV	**Distribution laws:** Identical particles and symmetry requirements –Bose- Einstein statistics –Fermi-Dirac statistics-Maxwell-Boltzmann statistics-Evaluation of constants α and β- Results of threestatistics-Thermodynamic Interpretation of the parameters α and β-Black body radiation and the Planck radiation law.	15	Chalk & Talk	P. R.
April	V	**Bose Einstein and Fermi dirac gas:** Energy and pressure of the gas-Gas degeneracy-Bose Einstein condensation-Liquid Helium-Thermodynamic functions of degenerate Fermi dirac gas-Compressiblity of Fermi gas. **Phase transistions:** Phase transistions- Phase transistions of first and second kind-Phase transistions of the second kind: The Ising model - one dimensional ising model	15	Chalk & Talk	P. R.

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LESSON PLAN
2022-2023

Class : I M.Sc Physics
Sub. Code : 22OPPH23
Title of the Paper: Electromagnetic theory

Semester : II

Total Hours : 75 Hours

Month	Unit	Description of the Syllabus	Hours Allocated	Teaching Mode & Methods	Course Teacher Signature
December	I	**Divergence and curl of electric fields:** Field lines and Gauss law – The divergence of **E** – Applications of Gauss law -The curl of E. Electric potential: Introduction to potential – Comments on potential – Poisson's equations and Laplace equations – The potential of a localized charge distribution – Electrostatic boundary conditions.. **Multiple expansion**: Approximate potentials at large distances – The monopole and dipole terms – Origin of coordinates in multiple expansions – The electric field of a dipole. Gauss law in the presence of dielectrics – Boundary Conditions.	15	Chalk & Talk	B.Subha
January	II	**The divergence and curl of B:** Straight line currents – The divergence and curl of **B** –Applications of Ampere's law – Comparison of magneto staticsand electrostatics – Magnetic vector potential – Magneto static boundary conditions – Multiple expansion of the vector potentials – The auxiliary magnetic field **H**-Boundaryconditions – Ampere's law in magnetized materials– Faraday'slaw – Electromagnetic induction – Inductance – Energy inmagnetic fields.	15	Chalk & Talk	B.Subha
February	III	**Maxwell's equations and potentials:** Maxwell's equations and magnetic charge -Maxwell's equations in matter – Boundary conditions. Potentialformulations: Scalar and vector potentials-Gauge transformations – Coulomb Gauge and Lorentz Gauge–Retarded potentials-Lienard-Wiechert potentials – The fields ofa point charge in motion -Newton's third law in electrodynamics – Poynting's theorem.	15	Chalk & Talk	K.Srisuma
March	IV	**Electromagnetic waves:** The wave equation in one-dimension – Sinusoidal waves- Boundary conditions –Polarization- The wave equationfor E and B –Monochromatic plane waves in vacuum – Energy and momentum of EM waves – Propagation in linear media – Reflection and transmission at normal incidence and oblique incidence-Electromagnetic waves in conductor-Refelection at a conducting surface .	15	Chalk & Talk	K.Srisuma
April	V	**Electromagnetic radiation and relativity:** Dipole radiation — Electric dipole radiation – Magneticdipole radiation – Radiation from arbitrary Source.– Power radiated by a point charge- Radiation reaction – Magnetism as arelativistic phenomenon – The transformation of fields- Relativistic mechanics-Proper time and Proper velocity-Relativistic energy and momentum-The field tensor.	15	Chalk & Talk	B.Subha K.Srisuma

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LESSON PLAN
2022-2023

Class : I M.Sc Physics
Sub. Code : 22OPPHDSE2A
Title of the Paper: Instrumentation

Semester : II

Total Hours : 75 Hours

Month	Unit	Description of the Syllabus	Hours Allocated	Teaching Mode & Methods	Course Teacher Signature
December	I	**Oscilloscope** Introduction-Block Diagram of Oscilloscope – Simple CRO – Vertical Amplifier – Horizontal Deflecting System – TriggeredSweep CRO – Trigger Pulse Circuit – Delay Line in Triggered Sweep – Typical CRT Connections – High Frequency CRT – Dual Beam CRO -Measurement of Frequency by Lissajous Method	15	Chalk & Talk	
January	II	**Signal Generators** Introduction – Variable AF Oscillator – Basic Standard Signal Generator-Modern Laboratory Signal Generator – AF Sine and Square Wave Generator – Function Generator – Square and Pulse Generator – Random Noise Generator - Video Pattern Generator – Color Bar Generator.	15	Chalk & Talk	
February	III	**Measuring instruments** Introduction – Output Power Meters – Field Strength Meter – Stroboscope – Phase Meter –Q Meter: factors errors- - impedance measurement – Susceptance method- RX Meters – Analog pH Meter.	15	Chalk & Talk	
March	IV	**Recorders** Introduction – Strip Chart Recorder – Galvanometer Type Recorder – Null Type Recorder – Circular Chart Recorder – X-Y Recorder – Magnetic Recorders – Frequency Modulation Recording – Digital Data Recording.	15	Chalk & Talk	
April	V	**Transducers** Introduction – Electrical Transducer – Selecting a Transducer – Resistive Transducer – Resistive Position Transducer – Resistive Thermometer – Thermistor – Piezo Electrical Transducer – Photo Electric Transducer.	15	Chalk & Talk	

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LESSON PLAN
2022-2023

Class : I M.Sc Physics
Sub. Code : 22OPPH1D2
Semester : I
Title of the Paper: Astronomy & Astrophysics
Total Hours : 30 Hours

Month	Unit	Description of the Syllabus	Hours Allocated	Teaching Mode & Methods	Course Teacher Signature
December	I	**History of astronomy** – Ancient Astronomy-Surya sidhanta-Modern Astronomy- Tycho Brahe- John Kepler- Galileo- Sir Isaac Newton – Edmund Halley- M.Leavitt	6	Chalk & Talk	
January	II	**The earth** - The zones of earth- shape of the earth- radius of the earth- rotation of earth-Foucault's pendulum experiment-gyroscopeexperiment	6	Chalk & Talk	
February	III	**The moon-** Introduction- phases of moon- successive phases of moon- lunar librations- summer and winter full moons- path of the moon with respect to the sun- Surface structure of the moon- The tides	6	Chalk & Talk	
March	IV	**The solar system**-Introduction- The sun- Mercury-Venus-Mars-Jupiter- Satrurn- Uranus-Neptune	6	Chalk & Talk	
April	V	**The stellar universe And Stars**-Introduction-Stellar motion- Solar motion- Constellation- The milky way-survey of constellations-spring constellations-summer constellations - Distance of stars- Magnitude of stars- Absolute magnitudes- The colour and size of the stars- Star clusters.	6	Chalk & Talk	

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LESSON PLAN
2022-2023

Class : II M.Sc Physics **Semester : IV**
Sub. Code : 21OPP41
Title of the Paper: Solid State Physics II **Total Hours : 75 Hours**

Month	Unit	Description of the Syllabus	Hours Allocated	Teaching Mode & Methods	Course Teacher Signature
December	I	**Superconductivity** Experimental survey– Occurrence and Destruction of Superconductivity - Meissner effect – Heat capacity-energy gap – Micro wave and infrared properties and isotope effect- Theoretical survey- London equation –BCS theory of superconductivity – Type II superconductors-High temperature superconducting (HTC) materials.	15	Chalk & Talk	E. Uthra Monica
January	II	**Diamagnetism, Para magnetism** Langevin diamagnetism equation – Quantum theory of diamagnetism of mononuclear systems –Paramagnetism- Quantum theory of paramagnetism – Hund Rules- Spectroscopic splitting factor- Van Vleck temperature-independent paramagnetism - Cooling by isentropic demagnetization- Paramagnetism susceptibility of conduction electrons.	15	Chalk & Talk	E. Uthra Monica
February	III	**Ferro and Anti Ferro magnetism** Ferromagnetic order–Curie point and the exchange integral - Magnons- Quantization of spin waves - Neutron magnetic scattering-Ferrimagnetic order- Curie temperature and susceptility - Antiferromagnetic order- Susceptibility below the Neel temperature - Ferromagnetic Domains-Single domain particles.	15	Chalk & Talk	E. Uthra Monica B. Subha
March	IV	**Plasmons, Polaritons and Polarons** Dielectric function of the electron gas –Plasmons- Electrostatic screening –Polaritons - Electron – Electron interaction - Electron – phonon interaction – Polarons – Peierls instability of linear- Metals. **Optical processes and Excitons:** Optical reflectance - Kramers-Kronig relations - Exciton– Weakly bound excitons - Raman effect in crystals- Electron spectroscopy with X-rays – Energy loss of fast particles in a solid.	15	Chalk & Talk	B. Subha
April	V	**Point defects** Lattice vacancies – Schottky defects – Frenkel defects – Diffusion - metals – Color centers –F centers –Other centers in alkali halides .**Dislocations:** Shear strength of single crystals – Slip- Dislocations - Burgers vectors- Stress field of dislocations - Low-angle grain boundaries – dislocation densities - Strength of alloys- Dislocation and crystal growth	15	Chalk & Talk	B. Subha

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LESSON PLAN
2022-2023

Class : II M.Sc Physics
Sub. Code : 21OPP42
Title of the Paper: Quantum Mechanics II

Semester : IV

Total Hours : 75 Hours

Month	Unit	Description of the Syllabus	Hours Allocated	Teaching Mode & Methods	Course Teacher Signature
December	I	**Time independent approximation:** Variation method-Expectation value of the energy-Application to excited states- Ground state of helium-Stationary perturbation theory-Non degenerate case-First order perturbation–second order perturbation–Perturbation of an oscillator-Zeeman effect without electron spin-First order stark effect in hydrogen.	15	Chalk & Talk	S.pranoj
January	II	**Time dependent approximation:** Time-Dependent perturbation theory-First order perturbation-Harmonic perturbation-transition probability-second order perturbation-Adiabatic approximation-Sudden approximation.	15	Chalk & Talk	S.pranoj
February	III	**Identical Particles andspin** Physical meaning of identity-Symmetric and Antisymmetric wave functions-Construction from unsymmetrized functions- The symmetric group-Distinguishability of identical particles-The exclusion principle-Connection with statistical mechanics – Connection between spin and statistics- Spin matrices and eigen functions-Collision of identical particles- Electron spin functions.	15	Chalk & Talk	S.pranoj
March	IV	**Atoms, Molecules and Atomic Nuclei** Central field approximation-Periodic system of elements-Thomas Fermi Statistical Method-Hatree's self consistent field-Molecules-Classification of Energy levels-wave equation-The hydrogen molecule-potential energy function.	15	Chalk & Talk	
April	V	**Relativistic Wave Equations** Schrodinger's Relativistic Equation-Free particle-Electromagnetic potentials-Separation of the equation – Energy levels in a coulomb field-Dirac's relativistic equation-Matrices-Free particle solutions-charge and current densities- Dirac's `equation for a central field-Spin angular momentum - Spin orbit energy-Negative energy states.	15	Chalk & Talk	

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LESSON PLAN
2022-2023

Class : II M.Sc Physics
Sub. Code : 21OPP43
Title of the Paper: Molecular spectroscopy

Semester : IV

Total Hours : 75 Hours

Month	Unit	Description of the Syllabus	Hours Allocated	Teaching Mode & Methods	Course Teacher Signature
December	I	**Microwave Spectroscopy** The Rotation of Molecules-Rotational Spectra – The Rigid Diatomic Molecule –The intensities of spectral lines –The effect of Isotopic substitution Polyatomic molecules: linear molecules-symmetric top molecule-Asymmetric top molecules – Techniques and Instrumentation – Chemical Analysis by Microwave Spectroscopy.	15	Chalk & Talk	P. RLi
January	II	**Infrared Spectroscopy** The vibrating Diatomic molecule – The simple harmonic oscillator-The Anharmonic oscillator-Diatomic vibrating Rotator-The vibration of Polyatomic molecules- Fundamental vibrations and their symmetry-The Influence of Rotation on the spectra of Polyatomic molecules-Linear molecules-Symmetric top molecules-skeletal vibrations-Group frequencies-Techniques and instrumentation –Fourier Transform spectrocopy	15	Chalk & Talk	P. RLi
February	III	**Raman Spectroscopy** Introduction – Quantum theory of Raman effect-classical theory of Raman effect:Molecular polarizability-Pure Rotational Raman Spectra- Symmetric top molecules-spherical top molecules – Raman activity of vibrations-Rule of mutual Exclusion- overtone and combination vibrations-vibrational raman spectra-Rotational fine structure-Polarization of light and the Raman Effect – Vibrations of spherical top molecules-Structure Determination from Raman and infrared Spectroscopy-Techniques and Instrumentation	15	Chalk & Talk	S. priyanka
March	IV	**Electronic Spectroscopy of Molecules** Electronic Spectra of Diatomic molecules: The Born Oppenheimer Approximation – Vibrational coarse structure: Progressions-Intensity of Vibrational-Electronic Spectra; the Franck Condon Principle-Dissociation Energy and dissociation products – Rotational fine structure of electronic vibration transitions – the Fortrat diagram – Pre dissociation.	15	Chalk & Talk	S. priyanka
April	V	**Spin resonance Spectroscopy** Spin and an applied field – Interaction between spin and a magnetic field-population of energy levels-The larmor procession-Relaxation times-Fourier transform spectroscopy in NMR-Nuclear magnetic resonance spectroscopy :Hydrogen nuclei-The chemical shift-The coupling constant-coupling between several nuclei-chemical analysis by N.M.R.Techniques-Exchange phenomena.	15	Chalk & Talk	P. RLi S. priyanka

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LESSON PLAN
2022-2023

Class : II M.Sc Physics | **Semester : IV**

Sub. Code : 21OPPE4A | **Total Hours : 75 Hours**

Title of the Paper: Microprocessor

Month	Unit	Description of the Syllabus	Hours Allocated	Teaching Mode & Methods	Course Teacher Signature
December	I	**The 8085 Programming model** 8085 Hardware Model – 8085 programming model - Instruction Classification – the 8085 Instruction Set - Instruction, Data format and Storage – Instruction word size – Opcode Format – Data Format - How to write, Assembly, and Executive a simple program - Micro processor architecture and its operations – Memory Classification.	15	Chalk & Talk	
January	II	**Basic Operations** Data Transfer operations – Addressing modes –Data Transfer from register to output –Data transfer to control output devices - Arithmetic Operations –Addition – Addition and Increment – Subtraction – Subtraction of two unsigned numbers - Logic Operations –Logic AND –Data Masking with Logic AND – OR, Exclusive-OR and NOT- ORing Data from two Input Ports – Branch Operations-unconditional jump – conditional jumps – Writing Assembly Language Programs – debugging a program.	15	Chalk & Talk	
February	III	**Counters and time delays** Time delay using One Register - Time delay using a Register pair – time delay using a loop with in a loop Technique – Counter design with time delay – Illustrative programs – Hexa decimal counters – 0 to 9 Counter – Generative pulse wave form – Debugging: Counters and Time delay program - Stack – Subroutines.	15	Chalk & Talk	
March	IV	**Binary conversion and 8085 Interrupts** BCD to Binary conversion –Binary to BCD conversion - BCD to seven segment – Binary-to-ASCII and ASCII –to –binary code conversion –BCD addition – BCD subtraction - Multiplication – Subtraction with carry- The 8085 interrupts-RST(Reset) Instruction-Multiple Interrupts and Priorities.	15	Chalk & Talk	
April	V	**8051 Microcontroller** Introduction - MCS -51 Architecture – Register in MCS-51-8051 pin description – 8051 Connections – 8051 Parallel I/O ports – Memory Organization – 8051 Addressing modes – MCS-51 Instruction set – 8051 Instructions and Simple Programs – Using Stack Pointers.	15	Chalk & Talk	

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