Dr. V.D.Kulkarni,
Dept of Physics
HutatmaRajguruMahavidyalaya,
Rajgurunagar (Pune)

Teaching Plan

(2023-24)

T.Y.B.Sc. PH 333 Classical Mechanics

Sr. No.	Topics	Month
01	**1. Motion of system of a particles** Introduction –Newton's laws	July and Augus-2023
02	Motion of a charged particle in constant electric, magnetic and electromagnetic field	
03	General features of motion, equation of orbit, Deduction of Kepler's laws of planetary motion, Orbits of artificial satellite, Problems	
04	System of particles, Centre of mass, Conservation of linear momentum, angular momentum, Energy of system of particles (statements only) Problems	
09	**2. Motion in Central Force Field** Central force, equivalent one body problem	August-2023
10	Motion in central force field	
11	General features of motion, equation of orbit	
12	Deduction of Kepler's laws of planetary motion Orbits of artificial satellite and Problems	
13	**4.Langrangian and Hamiltonian Formulation** Introduction	Sept.-2023

14	Newton's laws,constraints,Holonomic and nonholonomic constraints,Principle of virtual work, D'Alembert's Principle	
15	Langrange's equation from D'Alembert's Principle Simple Pendulum,Linear Harmonic Oscillator	
16	Hamiltonian and Hamilton's equation	
17	Problems of Hamiltonian	
18	Problems of Langrange's method	
19	Problems of Hamiltonian method	
20	**3.Scattering of Particles** Elastic and inelastic scattering	
21	Properties of Elastic and inelastic scattering	
22	Relation between lab and CM Frame Relation of angles between lab and CM Frame	Sept.-2023
23	Inelastic scattering, Differential cross section, impact parameter ,Total differential cross section	
24	Relation of scattering angles between lab and CM Frame, problems	

T.Y.B.Sc. PH 335: Computational Physics

Sr. No.	Topics	Month
01	**1.Concepts of programming and Introduction to C Programming** Definition and Properties of algorithms, Algorithm development,	Sept.-2023
02	Algorithm development, Flow charts- symbols and simple flowcharts	
03	Flow charts and Algorithms for Kinematic equations, Free	

	fall, Equation of state, Factorial of a number.	
04	Types of programming language: Lower, middle and higher level languages.	
05	Structure of C program, Character set, key words,	
06	Constants andvariables, Variable names,	
07	Data types and their declarations, Symbolic Constants.	
08	Input/output functions: scanf ( ), printf ( ), getchar ( ), putchar ( ), getch ( ), gets ( ), puts ( ).	
09	Operators and Expressions: Arithmetic Operators, Relational Operators, LogicalOperators,	
10	Assignment Operators, Conditional Operator. Formatted input/output	
11	Control statements: If, if else, while, do while for loop, nested control structures	
12	(Nested if, nested loops), break, continue, switch- case statement, goto statement.	
13	Use of Library functions: e.g. mathematical, trigonometric, graphics.	
14	**2. Arrays, Pointers and user defined functions** Arrays: 1-D, 2-D and String	Oct.-2023
15	Examples: Arranging numbers in descending and ascending order,	
16	Sum of matrices, multiplication of matrices.	
17	Concept of Pointers	
18	User defined functions: Definitions and declaration of function, function prototype.	
19	Passing arguments (Call by value, Call by reference).	
20	Storage Classes: Auto, External, Static, Register variables.	
21	**3. Graphics in C**: Some simple graphic commands	

	- Line, Circle, Arc, Ellipse, Bar.,Problems	
22	**4. Computational Physics:**	Oct.-2023
23	Iterative methods: Discussion of algorithm and flowcharts and writing C programs for finding	
24	single root of equation using bi-section method, NewtonRaphson method.	
25	Discussion of algorithm and flowcharts and writing C program for trapezoidal rule and Simpson's 1/3rd rule	

Thermodynamics and Statistical Physics (PH-363)

Sr. No.	Topics	Month
01	**Ch-1 - Kinetic Theory of gases** Mean Free Path Theory of gases	Dec.- 2023
02	Transport Phenomena, Viscosity	
03	Thermal conductivity and diffusion	
04	Thermodynamic functions	
05	Enthalpy, Entropy, Internal Energy, Helmholtz Functions	
06	Maxwell's relations	
07	First and Second TdS equations Specific and Latent heat equqtions	
08	Joule – Thomson's effect, Problems	
09	**Ch-2- Elementary Concepts of Statistics** Probability ,Distributions functions,Problems	Jan.-2024
10	Random Walk Problem and Bionomial distribution	
11	Simple Random Problem, Calculation of mean Values	
12	Probability distribution for large N	
13	Gaussian Probability distribution and Problems	
14	**Ch-3- Statistical distribution of system of particles and Ensembles** State of Systems, Statistical Ensembles	

15	Basic Postulates, Probability Calculations	Jan.-2024
16	Behavior of density of states	
17	Thermal. Mechanical Interactions, Problems	
18	Micro canonical Ensembles, Canonical Ensembles	
19	Applications of Canonical Ensembles	
20	Molecules in ideal gas, Mean Values in Canonical Ensembles, Problems	
21	**Ch-4-Introduction to Quantum States** Quantum distribution function	Feb.-2024
22	Maxwell – Boltzman Statistics, Bose – Einstein Statistics	
23	Fermi – Dirac Statistics	
24	Comparisions of B-E,M-B,F-D Statisctics , Applications of Quantum Statstics	
25	Problems	
26	Internal Test	

LASERS (PH-366)

Sr. No.	Topics	Month
01	**Chapter 1: Introduction to Lasers:** Brief history of Lasers, Interaction of radiation with matter, Energy levels, Population density, Boltzmann distribution, Stimulated Absorption, Spontaneous Emission and Stimulated Emission, Einstein's Coefficients, Einstein's relations. Characteristics of Laser: Directionality, Mono-chromaticity, Coherence,	March -2024
02	**Chapter 2: Laser Action**: Population inversion, Condition for light amplification, Gain coefficient, Active medium, metastable states. Pumping schemes: three level and four level	March -2024
03	**Chapter 3: Laser Oscillator**:	March -2024

	Optical feedback, round trip gain, critical population inversion, Optical resonator, condition for steady state oscillations, cavity resonance frequencies.	
04	**Chapter 4: Laser Output**: Line-shape broadening: Lifetime broadening, Collision broadening	March -2024
05	**Chapter 5: Types of Lasers:** Solid State Lasers – Ruby Laser, Diode Laser, Gas Lasers – HeNe Laser, CO2 Laser	April-2024
06	**Chapter 6: Applications of Lasers**: Industrial: welding, cutting, drilling Nuclear Science: laser isotope separation, laser fusion, Medical: eye surgery	April-2024
07	Internal Test	

Teaching Plan

T.Y.B.Sc. Physics (Sem V) **Year: 2023-2024**
PHY-351: Mathematical Methods in Physics-II **Teacher: A.B.Kanawade**

Chapter No.	Month	Contents	Remarks
1	Aug 2023	**1: Curvilinear Co-ordinates** Review of Cartesian, spherical and cylindrical co-ordinate, transformation equation, General Curvilinear co-ordinate system:	

		Co-ordinate surface, co-ordinate lines, length, surfaces and volume elements in curvilinear co-ordinate system. Orthogonal curvilinear co-ordinate system, expressions for gradient, divergence, Laplacian, and curl, special case for gradient, divergence and curl in Cartesian, spherical polar and cylindrical co-ordinate system, Problems.	
2	Oct 2023	**2: The Special Theory of Relativity** Introduction, Newtonian relativity, Galilean transformation equation, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Lorentz transformations, Kinematic effects of Lorentz transformation, Length contraction, Proper time, Problems.	
3	Aug/ Sep 2023	**3: Partial Differential Equations** Introduction to Partial differential equations (PDE), General methods for solving second order PDE, Method of separation of variables in Cartesian,	

		Spherical polar and cylindrical co-ordinate system (two dimensional Laplace's equation, one dimensional Wave equation), Singular points ($x = x_0$), Solution of differential equation-Statement of Fuch's theorem, Frobenius method of series solution.	
4	Sep/ Oct 2023	**4: Special Functions** Introduction, generating function for Legendre Polynomials: Pn(x), Properties of Legendre Polynomials, Generating function for Hermite Polynomials: Hn(x), Properties of Hermite Polynomials, Bessel function of first kind: Jn (x), Bessel function of first kind: Jn (x), Properties of Bessel function of first kind, Problems.	

Teaching Plan

T.Y.B.Sc. Physics (Sem V) **Year: 2023-2024**
PHY-356(D): Renewable Energy Sources **Teacher: A.B.Kanawade**

Chapter No.	Month	Contents	Remarks
1.	Sep/ Oct 2023	**1: An Introduction to Energy Sources: (10L)** 1. Energy: Definition, Classifications of energy sources 2. Conventional and non-conventional energy sources. 3. Sun: The source of energy (Structure,	

2.	Oct 2023	Characteristics and Composition) 4. Solar Constant 5. Electromagnetic Energy Spectrum. 6. Solar radiations outside earth atmosphere. 7. Solar radiation at the earth surface. 8. Problems. **2: Photothermal Applications: (10L)** 1. Photothermal devices: Solar Insolation, Selective Coating, Glass Cover, Heat Conductor and Heat Insulation. 2. Solar water heating systems: Types, construction and working of Liquid Flat Plate Collector (FPC) and Evacuated Tube Collector (ETC) 3. Energy Balance Equation (without thermal Analysis). 4. Concentrating collectors: Flat plate collector with plane reflector, Cylindrical parabolic, Compound parabolic, Collector with fixed circular concentrators and moving receiver, paraboloid concentrator. 5. Comparative study between flat plate collector and solar concentrators. 6. Solar distillation, Solar dryer, Solar cooker (box type)	
3.	Oct/ Nov 2023	**3: Photovoltaic systems: (10L)** 1. Introduction to Photovoltaic effect and Photovoltaic Conversion. 2. Basic photovoltaic system for power generation 3. Basics of Solar Cell, PV modules, Arrays, 4. Solar Cell: I-V characteristics, Power output and conversion efficiency. 5. Factors affecting on photovoltaic efficiency. (Change in amount of input light, solar cell area, Change in angle, Change in operating Temperature etc.) 6. Types of solar cells: p-n junction solar cell, p-i-n	

4.	Nov 2023	diode solar cell, cadmium sulphide solar cell, Gallium arsenide solar cell, Indium phosphide solar cell, nano-crystalline solar cell. 7. Application of solar photovoltaic systems. **4: Energy Storage: (06L)** 1. Importance and Needs of Energy storage in Conventional and Nonconventional Energy Systems. 2. Various forms of Energy Storage 3. Electrical Energy: Super capacitors 4. Electrochemical Energy: Battery 5. Chemical Energy: Hydrogen Production and storage	

Teaching Plan

S.Y.B.Sc. (Physics) (Sem III) **Year: 2023-2024**
PHY-232(A): Electronics-I **Teacher: A.B.Kanawade**

Chapter No.	Month	Contents	Remarks
1.	Jul/ Aug 2023	**1. Network Theorem:** 1.1 Krichhoff's Law 1.2 Voltage and current Divider Circuit 1.3 Thevenin's Theorem	

2.	Aug 2023	1.4 Norton's Theorem 1.5 Superposition Theorem 1.6 Maximum Power transfer theorem (With proof) 1.7 Problems **2. Study of Transistor** **2.1 Bijunction Transistor** 1. Revision of bipolar Junction Transistor, Types, Symbol and basic action. 2. Configuration (Common Base, Common Emitter and Common Collector) 3. Current Gain Factors (α and β) and their relations 4. Input, Output and transfer Characteristic of CE Configuration 5. Biasing method and Voltage Divider 6. DC Load line (CE), Operating Point (Q-point) 7. Transistor as a switch 8. Problems **2.2 Uniunction Transistor:** 1. Symbol, Types, Construction, Working Principle, I-V characteristics, Specifications and parameters of Unijunction Transistor (UJT) 2. UJT as a relaxation Oscillator.	
3.	Sep/ Oct 2023	**3.Operational Amplifiers and Application** **3.1 Operational Amplifiers:** 1. Introduction 2. Ideal and practical Characteristics 3. Operational Amplifier: IC741-Block Diagram and Pin diagram 4. Concept of Virtual Ground 5. Inverting and Non-inverting operational amplifiers with concept of gain 6. Operational amplifier as an adder and subtractor	

4.	Oct 2023	7. Problems **3.2 Oscillators:** 1. Concept of Positive and negative feed back 2. Barkhausein Criteria for an oscillator 3. Construction, working and application of phase shift oscillator using IC741 4. Problems **4. Number System and Logic Gates** 1. Number System: Binary, Binary coded Decimal (BCD), Octal, Hexadecimal 2. Addition and Subtraction of binary numbers and binary fractions using one's and two's complement 3. Basic Logic gates (OR, AND, NOT) 4. Derived gates: NOR, NAND, EXOR, EXNOR, with symbols and truth table 5. Boolean Algebra 6. De Morgan's theorem and its verification 7. Problems	

Teaching Plan

T.Y.B.Sc. Physics (Sem VI) **Year: 2023-2024**

PHY-361: Solid State Physics **Teacher: A.B.Kanawade**

Chapter No.	Month	Contents	Remarks
1	Jan2024	**1: The Crystalline Structures (10 L)** Lattice, Basis, Translational Vectors, Primitive Unit Cell, Symmetry Operations, Different types of lattices: 2D and 3D (Bravais lattices) Miller indices, Inter Planer Distances, SC, BCC and FCC structures, Packing Fraction, Crystal structures NaCl, diamond, CsCl,	

		ZnS, HCP, Concept of Reciprocal Lattice and its properties, Problems	
2	Jan 2024	**2: X ray Diffraction and Experimental Methods (9 L)** Bragg's Diffraction, Bragg's Law, Experimental X-ray diffraction Methods: The Laue Method, Bragg's Spectrometer, The Powder Crystal Method, Analysis of cubic structure by Powder Method, Ewald's Construction, Bragg's Diffraction condition in direct and reciprocal lattice, Problems	
3	Mar 2024	**3: Free Electron and Band Theory of Metals (9L)** Assumptions of Classical and Somerfield Free Electron model, Energy levels and Density of States (One and Three Dimensions), Nearly free electron model, Fermi energy, Fermi level, Hall Effect, Mobility, Hall Angle Band Theory of Solids: Origin of energy gap, Energy bands in Solids, Distinction between metal, semiconductor and insulator, Problems	
4	Mar/Apr 2024	**4: Magnetism (8L)** Diamagnetism, Langevin theory of Diamagnetism, Paramagnetism, Langevin theory of Paramagnetism, Ferromagnetism, Antiferromagnetism, Ferromagnetic Domains, Hysteresis, Curie temperature, Neel temperature, Superconductivity, Problems	

Teaching Plan

T.Y.B.Sc. Physics (Sem VI) **Year: 2023-2024**
PHY-362: Quantum Mechanics **Teacher: A.B.Kanawade**

Chapter No.	Month	Contents	Remarks
1	Jan 2024	**Origin of Quantum Mechanics: (08 L)** 1. Historical Background: Review of Black body radiation, photoelectric effect 2. Matter waves - De Broglie hypothesis. - Davisson and Germer experiment. 3. Wave particle duality 4. Concept of wave function, wave packet, phase velocity, group velocity and relation between them	

		5. Heisenberg's uncertainty principle with Electron diffraction experiment, different forms of uncertainty. Problems	
2	Feb 2024	**The Schrodinger equation: (10 L)** 1. Physical interpretation of Wave function 2. Schrodinger time dependent equation. 3. Schrodinger time independent equation (Steady state equation). 4. Requirements of wave function. 5. Probability current density, equation of continuity and its physical significance. 6. An operator in Quantum mechanics. - Eigen function and Eigen values. 7. Expectation value – Ehrenfest's theorem(omly statements), Problems	
3	Feb/Mar 2024	**Applications of Schrodinger Steady state equation: (14 L)** 1. Free particle. 2. Step Potential 3. Potential barrier(Qualitative discussion), Barrier potential and tunneling effect. 4. Particle in infinitely deep potential well (one - dimension). 5. Schroedinger equation in spherical polar coordinate system 6. Rigid rotator (Free axis) 7. Problems	
5	Mar/Apr 2024	**Operators in Quantum Mechanics: (04 L)** 1. Hermitian operator. 2. Position, Momentum operator, angular momentum operator, and total energy operator (Hamiltonian). 3. Commutator brackets- Simultaneous Eigen functions. 4. Commutator algebra. 5. Commutator brackets using position, momentum and angular momentum operator. 6. Concept of parity according to quantum mechanics, parity operator and its Eigen values. 7. Applications of operators in quantum mechanics 8. Problems	

Teaching Plan

S.Y.B.Sc. Physics (Sem IV) **Year: 2023-2024**

PHY-242: Optics **Teacher: A.B.Kanawade**

Chapter No.	Month	Contents	Remarks
1	Jan/Feb 2024	**1. Geometrical optics: (08L)** 1.1 Introduction to lenses and sign conventions. 1.2 Thin lenses: Lens equation for convex lens 1.3 Lens maker equation 1.4 Concept of magnification, deviation and power of a thin lens 1.5 Equivalent focal length of two thin lenses 1.6 Concept of cardinal points 1.7 Problems	
2	Mar 2024	**2. Lens Aberrations: (08L)**	

		2.1 Introduction 2.2 Types of aberrations: Monochromatic and Chromatic 2.3 Types of Monochromatic Aberrations and their Reductions 2.4 Types of Chromatic Aberrations 2.5 Achromatism: Lenses in Contact and Separated by a finite Distance 2.6 Problems	
3	Mar/Apr 2024	**3. Optical Instruments: (06L)** 3.1 Introduction 3.2 Simple Microscope 3.3 Compound Microscope 3.4 Ramsden's eye piece 3.5 Huygens eye piece 3.6 Problems.	
4	Apr 2024	**4. Interference and Diffraction: (08L)** 4.1 Introduction 4.2 Phase change on reflection (Stokes treatment) 4.3 Interference due to Wedge shaped thin film 4.4 Newton's ring 4.5 Diffraction Types:Fresnel's Diffraction and Fraunhoffer's Diffraction 4.6 Fraunhoffer's diffraction at a single slit 4.7 Plane Diffraction grating , Rayleigh criterion for resolution 4.8 Problems	
5	Apr 2024	**4. Polarization: (6L)** 5.1 Introduction to polarization 5.2 Brewster's law 5.3 Law of Malus 5.4 Polarization by double refraction 5.5 Nicol Prism 5.6 Problems	

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HUTATMA RAJGURU MAHAVIDYALAYA, RAJGURUNAGAR

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DEPARTMENT OF PHYSICS

Teaching Plan

Academic Year-2023-2024

Sem- I

F.Y.B.Sc. CBCS Pattern

Name: Mr. Barne N.D. PHY-111 Mechanics and Properties of Matter

Sr. No.	Months	Topics	Lectures
01	Third week of July 2023 - Second week of Aug. 2023	**1. Motion:** Introduction to motion, Types of motion, Displacement, Velocity, Acceleration, Inertia, Newton's laws of motion with their explanations, Various types of forces in nature, Frames of reference (Inertial and Non inertial), Laws of motion and it's real life applications, Problems	09
02	Third week of Aug. 2023 - Second week of Sept. 2023	**2. Work and Energy:** Kinetic energy, Work Energy Theorem, Work done with constant force, Work done with varying force (spring force), Conservative and Non conservative forces, Potential energy, Law of energy conservation, Gravitational potential energy, Problems	07
03	Third week of Sept. 2023 – Second week Oct. 2023	**3. Fluid Mechanics:** Concept of viscous force and viscosity, Coefficient of viscosity, Steady and Turbulent flow, Reynolds number, Equation of continuity, Bernoulli's Principle, Applications of Bernoulli's Principle (Ventury Meter, PitotTube), Applications of viscous fluids, Problems.	08
04	Third week of Oct.2023 - First week of Nov. 2023	**4. Properties of Matter:** Surface tension, Angle of contact, Factors affecting surface tension, Jaeger's method for determination of surface tension, Applications of surface tension. Stress and Strain, Hook's law and Coefficient of elasticity, Young's modulus, Bulk modulus, Modulus of rigidity, Work done during longitudinal strain, Volume strain, Shearing strain.	12

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DEPARTMENT OF PHYSICS

Teaching Plan

Academic Year-2023-2024

Sem- V

T.Y.B.Sc.

Name: Mr. Barne N.D. **Subject: PH-352 Electrodynamics**

Months	Topics	Lectures
Third week of Aug. 2023- First week of Sept. 2023	**1. Electrostatics:** 1.1. Coulomb's law, Gauss law, Electric field, Electrostatic Potential 1.2. Potential energy of system of charges. 1.3. Statement of Poisson's equation, Boundary Value problems in electrostatics-solution of Laplace equation in Cartesian system, 1.4. Method of image charges: Point charge near an infinite grounded conducting plane, Point charge near grounded conducting sphere. 1.5. Polarization P, Electric displacement D, Electric susceptibility and dielectric constant, bound volume and surface charge densities. 1.6. Electric field at an exterior and interior point of dielectric.	**12**
First week of Sept. 2023- First week of Oct. 2023	**2.Magnetostatics:** 2.1. Concepts of magnetic induction, magnetic flux and magnetic field 2.2. Magnetic induction due to straight current carrying conductor, Energy density in magnetic field, magnetization of matter. Relationship between B,H and M. 2.3 Biot-Savart's law, Ampere's law for force between two current carrying loops, Ampere's circuital law, 2.4Equation of continuity, Magnetic vector potential A. 2.5. Magnetic susceptibility and permeability, Hysteresis	**12**

	loss, B-H curve.	
First week of Oct. 2023 – First week of Nov. 2023	**3. Electrodynamics:** 3.1.Concept of electromagnetic induction, Faradays law of induction, Lenz's law, displacement current, generalization of Amperes' law 3.2. Maxwell's equations (Differential and Integral form) and their physical significance 3.3. Polarization, reflection & refraction of electromagnetic waves through media 3.4. Wave equation and plane waves in free space. 3.5.Poynting theorem &Poynting vector, Polarizations of plane wave. 3.6. Microscopic form of ohm's law (J=σ.E**)**	**12**

Mr. Barne N. D.

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DEPARTMENT OF PHYSICS

Teaching Plan

Academic Year-2023-2024

Sem- III

S.Y.B.Sc.

Name: Mr. Barne N.D. **Subject: PHY 231 MMP-I**

Months	Topics	Lectures
Third week of Aug. 2023- First week of Sept. 2023	1. **Complex Numbers:** 1.1 Introduction to complex numbers 1.2 Rectangular, polar and exponential forms of complex numbers 1.3 Argand diagram 1.4 Algebra of complex numbers using Argand diagram 1.5 De-Moivre's Theorem (Statement only) 1.6 Power, root and log of complex numbers 1.7 Trigonometric, hyperbolic and exponential functions 1.8 Applications of complex numbers to determine velocity and acceleration in curved motion. 1.9 Problems.	**09**
First week of Sept. 2023- First week of Oct. 2023	**2. Partial Differentiation:** 2.1 Definition of partial differentiation 2.2 Successive differentiation 2.3 Total differentiation 2.4 Exact differential 2.5 Chain rule 2.6 Theorems of differentiation 2.7 Change of variables from Cartesian to polar co-ordinates 2.8 Conditions for maxima and minima (without proof) 2.9 Problems	**09**
First week of	**3. Vector Algebra and Analysis:** 3.1 Introduction to scalars and vectors, dot product and	**12**

Oct. 2023 - Second week of Oct. 2023	cross product of two vectors and their physical significance. (Revision) 3.2 Scalar triple product and its geometrical interpretation 3.3 Vector triple product and its proof 3.4 Scalar and vector fields 3.5 Differentiation of vectors with respect to scalar 3.6 Vector differential operator and Laplacian operator 3.7 Gradient of scalar field and its physical significance 3.8 Divergence of scalar field and its physical significance 3.9 Curl of vector field and its physical significance. 3.10 Vector Identities. a. $\nabla \times (\nabla\Phi) = 0$ b. $\nabla.(\nabla \times V) = 0$ c. $\nabla.(\nabla\Phi) = \nabla 2\Phi$ d. $\nabla.(\Phi A) = \nabla\Phi.A+\Phi(\nabla.A)$ e. $\nabla \times (\Phi A) = \Phi (\nabla \times A) + (\nabla\Phi) \times A$ f. $\nabla.(A \times B) = B.(\nabla \times A) - A(\nabla \times B)$ 3.11 Problems.	
Third week of Oct. 2023- First week of Nov. 2023	**4. Differential Equation:** 4.1 Degree, order, linearity and homogeneity of differential equation. 4.2 Concept of Singular points. Example of singular points ($x = 0$, $x = x0$ and $x = \infty$) of differential equation. 4.3 Problems.	**06**

Mr. Barne N. D.

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HUTATMA RAJGURU MAHAVIDYALAYA, Rajgurunagar

Teaching Plan

Academic Year- 2023-24

DEPARTMENT OF PHYSICS

SEM II

F.Y.B.Sc.

Name: Mr. Barne N.D. **PHY-121 Heat and Thermodynamics**

Months	Topic taken	Periods
First week of Dec.2023- Fourth week of Dec. 2023	**1. Fundamentals of Thermodynamics** Concept of thermodynamic state, Equation of state, Van der Waal's equation of state, Thermal equilibrium, Zeroth law of thermodynamics, Thermodynamic processes: Adiabatic, Isothermal, Isobaric and Isochoric changes, Indicator diagram, Work done during isothermal change, Adiabatic relations, Work done during adiabatic change, Internal energy, Internal energy as state function, First law of thermodynamics, Reversible and Irreversible changes, Problems.	10
First week of Jan. 2024- Fourth week of Feb. 2024	**2. Applied Thermodynamics** Conversion of heat into work and it's converse, Second law of thermodynamics, Concept of entropy, Temperature - entropy diagram, T-dS equations, Clausius - Clapeyron latent heat equations, Problems.	09
	Unit Test	
First week of March 2024- Second week of	**3. Heat Transfer Mechanisms** Carnot's cycle and Carnot's heat engine and its efficiency, Heat Engines: Otto cycle & its efficiency, Diesel cycle & its efficiency, Refrigerators: General principle and coefficient of performance of refrigerator, Simple structure of Vapor compression refrigerator, Air Conditioning:	09

March 2024	Principle and it's applications, Problems	
	INERNAL EXAM	
Second week of March 2024- Third week of March 2024	**4. Thermometry** Concept of heat & temperature, Principle of thermometry, Temperature scales & inter-conversions, Principle, Construction and Working: (Liquid thermometers, Liquid filled thermometers, Gas filled thermometers, Bimetallic thermometers, Platinum resistance thermometer, Thermocouple), Problems	08

Mr. Barne N. D.

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HUTATMA RAJGURU MAHAVIDYALAYA, Rajgurunagar

Teaching Plan

2023-2024

DEPARTMENT OF PHYSICS

SEM VI

T.Y.B.Sc.

Name: Mr. Barne N.D. **PHY-365 (A): Electronics-II**

Months	Topic taken	Periods
First week of Jan 2024- Fourth week of Jan2024	**1: Semiconductor Devices:** a. LED and Photodiode, Optocoupler. (Working Principles) Problems. Ref. 1. b. BJT: Transistor amplifier classifications - Class A, B, C and AB (working only), Differential amplifier (transistorized), Problems. Ref. 1. c. Field Effect Transistor: JFET (Introduction, classification, principle, working and IV characteristics) MOSFETs (DE-MOSFET and E only MOSFET). Problems.	09
First week of Feb. 2024- Fourth week of Feb. 2024	**2: Applications of Semiconductor Devices:** a. Three Pin Regulators: Block diagram of 3-pin IC regulator, study of IC-78XX, 79XX. Dual Power Supply using IC-78XX, 79XX. Ref. 1 b. Switching Regulators (SMPS): Introduction, Block diagram, Advantages and Disadvantages. Ref. 4 c. Modulation and Demodulation : Concept of Carrier Wave, Need of Modulation and Demodulation, Methods of Modulation like AM, FM, PM (Concepts Only), d. Concept of Modulation Index, Upper and Lower Side Band Frequencies in AM. Problems	09
First week	**3: Integrated Circuits:** a. Integrated Circuits: Introduction, Scale of Integration, Advantages	09

of March 2024- Second week of March 2024	and drawbacks of IC Ref.4 b. OP-AMP Applications as Integrator, Differentiator, Comparator. Ref. 1 c. Timer IC-555: Block diagram, Astable, monostable multivibrator (working and design). Problems	
	INERNAL EXAM	
Fourth week of March 2024- First week of April 2024	**4: Combinational and Sequential Circuits:** a. Combinational Circuits: Introduction to SOP and POS equation. Concept of Standard SOP and POS equation. Concept of K-map and their use in reduction of Boolean expressions, design of half adder, full adder, half subtract, Study of binary to gray and gray to binary code conversion. Problems. Ref. 2 b. Sequential Circuits: RS flip flop using NAND/NOR, clocked RS, D, JK and T-flip flops. Application of flip flops in Sequential Circuits as Counters and Registers. Asynchronous and Synchronous Counters. (3-bit Counter), Shift Registers and their types of operation -SISO, SIPO, PISO, PIPO (Concepts only).	09

Mr. Barne N. D.

KTSP Mandal's

HUTATMA RAJGURU MAHAVIDYALAYA, Rajgurunagar

Teaching Plan

2023-2024

DEPARTMENT OF PHYSICS

SEM VI

T.Y.B.Sc.

Name: Mr. Barne N.D. **PHY-3610 SEC (Z): Calibration Techniques**

Months	Topic taken	Periods
Second week of Feb. 2024 – Fourth week of Feb. 2024	**Unit-3: Calibration of Electronic Instruments** 1. Identification of Components 2. Equipment required for calibration 3. Procedure of Calibration a. Read operational Specifications b. Sequence of events c. Identification of common Faults 4. Electronic Calibration with Examples (Oscilloscopes, Multimeters, Function Generators, Signal Generators)	04
	INERNAL EXAM	

Fourth week of March 2024- First week of Apr. 2024	**Unit-4: Temperature Calibration** 1. Temperature units and Conversions 2. Temperature Sensors 3. Calibration of temperature sensors a. Handling temperature sensor b. Preparations c. Temperature sources d. Reference Temperature Sensor e. Immersion Depth f. Stabilization g. Temperature sensor handle h. Calibrated temperature range i. Calibration Points j. Adjusting/trimming a temperature sensor 4. Examples:	04
First week of Jan 2024 – Fourth week of Jan 2024	**Activity:** 1. RTD calibration check 2. Calibration of digital balance 3. Calibration of PH/Conductivity meter 4. Calibration of Volt meter 5. Calibration of Current meter 6. Calibration of Oscilloscopes	18

Barne N.D.