



K.T.S.P.MANDAL'S

HUTATMA RAJGURU MAHAVIDYALAYA, RAJGURUNAGAR

PHYSICS DEPARTMENT

Syllabus Completion Report

2025-26 (2nd term)

PHY-251-MJ : Oscillation, Waves and Sound

Dr.V.B. Deshmukh

Month	period	Chapter	Topic taken
20Dec.25 TO 20Jan.26	12	OSCILLATIONS	Undamped (Free) Oscillation Introduction Simple Harmonic Motion (SHM) and its Properties .Differential equation for undamped oscillations and its solution. Applications of SHM in Day-to-Day Life Examples: Simple Pendulum, Springs (Clocks, Musical Instruments, etc.) Composition of two SHM Lissajous figures and its application Damped Oscillation Introduction .Differential equation for damped oscillations and its solution Applications of damped oscillations in Day-tDay Life Forcd Oscillations Differential Equation for a Forced Oscillator and Its Solution Coupled Oscillation Resonance Types of Resonance Applications of Resonance in Daily Life Log decrement Numerical Problems
21 Jan 26 to20 Feb 26	10	WAVE MOTION	Introduction to Wave Motion Definition of Waves Longitudinal and Transverse Waves Characteristics of Waves Applications of Longitudinal and Transverse Waves in Day-to-Day Life Seismic Waves Qualitative Discussion Applications Gravitational Waves Qualitative Discussion Applications Standing Waves Qualitative Discussion Applications:

			Structural Engineering (Vibrations in Buildings and Bridges) Microwaves in Ovens Musical Instruments (Strings and Air Columns)
21 Feb 26 to March 26	8	SOUND AND DOPPLER EFFECT	Introduction to Sound Definition of Sound Types of Sound Waves: Musical Sound vs. Noise Concept of Reverberation Time and Reverberation in a Hall Sabine's Formula Doppler Effect Explanation of the Doppler Effect Applications: Red Shift and Blue Shift Medical Imaging Radar and Speed Trap Guns Numerical Problems



K.T.S.P.MANDAL'S

HUTATMA RAJGURU MAHAVIDYALAYA, RAJGURUNAGAR

PHYSICS DEPARTMENT

Syllabus Completion Report

2025-26 (2nd term)

PHY-364: Nuclear Physics

Dr.V.B. Deshmukh

Month	period	Chapter	Topic taken
01 Jan.2026 To 20 Jan.26	12	Nuclear Structure, Properties and Radioactivity	Basic Concept of Nucleus: Composition, charge, size, density of nucleus(Revision) Nuclear Angular momentum, Nuclear magnetic dipole moment Electric quadrupole moment, Parity & symmetry, Mass defect and Binding energy, packing fraction, Classification of nuclei, Stability of nuclei (N Vs Z Curve) and problems. Radioactivity: Radioactivity disintegration (concept of natural and artificial radioactivity, Properties of α , β , γ -rays, Laws of radioactive decay, half-life, mean life, Specific activity and its units (Revision) Successive disintegration and equilibriums and radioisotopes. Radiocarbon dating Application of radioactivity (Agricultural, Medical, Industrial, Archaeological
21 Jan26 to 31 Jan 26	06	Particle Accelerator and Radiation Detectors	Particle Accelerators: Introduction and Classification Linear Accelerator (electron/proton LINAC) Cyclic Accelerator (Cyclotron) article Accelerators In India (Discussion only) Nuclear Detector: Classification of Nuclear Detectors Gas filled Detectors (G. M. counter) Solid state detectors (scintillation counter)
01 Feb26 to 20 Feb 26	09	Nuclear forces and Nuclear Models	Nuclear Forces: Classification of Nuclear Forces Meson

			<p>theory of nuclear forces, Properties Of nuclear forces, properties of deuteron system, Elementary particles, Quarks model for elementary particles</p> <p>Shell Model: Assumptions, Evidences, and Spin and Parity limitations.</p> <p>Liquid drop model: Assumptions Semi-empirical B.E. formula</p>
21 Feb 26 to Mar 26	09	Nuclear Reactions and Reactor Theory	<p>Introduction to Nuclear reactions: Nuclear Reaction, Conservation laws (Revision) The Q-value equation, Exothermic and Endothermic reaction Compound nucleus, Threshold energy Nuclear cross-section Nuclear fission , nuclear fusion stellar energy, chain reaction and critical mass,</p> <p>Nuclear reactor and its basic components, homogeneous and heterogeneous reactors, power reactor, fast breeders</p> <p>Nuclear Reactors In India (Discussion only)</p>



K.T.S.P.MANDAL'S

HUTATMA RAJGURU MAHAVIDYALAYA, RAJGURUNAGAR

PHYSICS DEPARTMENT

Syllabus Completion Report

2025-26 (2nd term)

PHY-3611 SEC (AB): Instrumentation for Agriculture

Dr.V.B. Deshmukh

Month	period	Chapter	Topic taken
01 Jan26 to 08 Jan 26	2	Introduction	Necessity of instrumentation and control for agriculture, sensor requirement, remote sensing, bio sensors in agriculture
09 Jan 26 20 Jan 26	4	Soil Properties & Sensing	Properties of soil: fundamentals definitions and relationship, index properties of soil, permeability & seepage analysis, shear strength, Mohr's circle of stress, active & passive earth pressures, stability & slopes, Sensors: introduction to sonic anemometers, hygrometers, fine wire thermocouples, open & close path gas analyzers
21 Jan 26 to 06 Feb 26	4	Instrumentation in Continuous & Batch process	Flow diagram of sugar plant, sensors & instrumentation setup, Flow diagram of fermenter & control (batch process), flow diagram of dairy industry & instrumentation setup for it, Juice extraction control process & instrumentation setup
07 Feb 26 to 20 Feb 26	4	Instrumentation in Irrigation	Water distribution and management control, Auto drip and sprinkler irrigation system, upstream & downstream control concept, SCADA for DAM parameters & contro
21 Feb 26 to 15 Mar 26	4	Greenhouse Parameters & Instrumentation	Greenhouse effect, Concept and construction of greenhouse, merits & demerits, ventilation, cooling & heating, wind speed, temperature & humidity, soil moisture, rain gauge, carbon dioxide enrichment measurement & control, Leaf area length <i>evapotranspiration</i> , temperature, wetness & respiration measurement & data logging, electromagnetic radiations photosynthesis



K.T.S.P.MANDAL'S

HUTATMA RAJGURU MAHAVIDYALAYA, RAJGURUNAGAR

PHYSICS DEPARTMENT

Syllabus Completion Report

2025-26 (2nd term)

TYBSC PH-342: Quantum Mechanics

MONTHS	TOPICS	LECTURE	
1st Jan-9th Jan	Origin of Quantum Mechanics:(10L) 1. Historical Background a) Review of Black body radiation, b) Review of photoelectric effects. 2. Matter waves - De Broglie hypothesis. Davisson and Germer experiment. 3. Wave particle duality 4. Wave function of a particle having definite momentum. 5. Concept of wave packet, phase velocity, group velocity and relation between them 6. Heisenberg's uncertainty principle with thought experiment. - Electron diffraction experiment, different forms of uncertainty.	10L	

<p>9th Jan- 6th March</p>	<p>2. The Schrodinger equation: (15 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. Definition of an operator in Quantum mechanics. - Eigen function and Eigen values. 7. Expectation value – Ehrenfest’s theorem</p>	<p>15L</p>	
<p>6th March - 11th March</p>	<p>3. Applications of Schrodinger Steady state equation: (12 L) 1. Free particle. 2. Particle in infinitely deep potential well (one - dimension). 3. Particle in three dimension rigid box. 4. Step potential. 5. Potential barrier. (Qualitative discussion).Barrier penetration and tunneling effect. 6. Harmonic oscillator (one-dimension), correspondence principle</p>	<p>12L</p>	
<p>16th March-20th March</p>	<p>4. Operators in Quantum Mechanics: (05 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. Raising and lowering angular momentum operator. 7. Concept of parity, parity operator and its Eigen values.</p>	<p>5L</p>	



K.T.S.P.MANDAL'

HUTATMA RAJGURU MAHAVIDYALAYA, RAJGURUNAGAR

PHYSICS DEPARTMENT

Syllabus Completion Report

2025-26 (2nd term)

T.Y.B.Sc PHY-346: Elective II

Prof .V.R.Sonawane

MONTH	TOPICS	LECTURE
10th Jan -24th Jan	1. Introduction to Lasers: *Ordinary light and Lasers, Brief history of Lasers, Interaction of radiation with matter, *Energy levels, Population density, Boltzmann distribution, Transition Lifetimes, Allowed and Forbidden Transitions, Stimulated Absorption, *Spontaneous Emission and Stimulated Emission, Einstein's Coefficients, Einstein's relations.	(08 L)
3rd Feb - 17th Feb	2. Laser Action: *Condition for large stimulated emission, Population inversion Condition for light amplification, Gain coefficient Active medium, Metastable states Pumping schemes: three level and four level	(06 L)
17th Feb -24th Feb	3. Laser Oscillator: *Optical feedback, round trip gain, threshold gain, critical population inversion, Optical resonator, condition for steady state oscillations, cavity resonance frequencies	(07 L)
4th March -7th March	4. Laser Output: *Lineshape broadening: - Lifetime broadening - Collision broadening - Doppler broadening	(03L)

<p>7th March - 16th March</p>	<p>5. Characteristics of Laser: Directionality, Monochromatic Coherence Brightness</p>	<p>(04 L)</p>
<p>20th March</p>	<p>6. Types of Lasers: *Solid State Lasers – Ruby Laser, Diode Laser *Gas Lasers – He Ne Laser, CO2 Laser *Liquid Lasers: Tunable dye laser *Applications of Lasers *Industrial – welding, cutting, drilling Nuclear Science – laser isotope separation, laser fusion</p>	<p>(12 L)</p>



K.T.S.P.MANDAL'

HUTATMA RAJGURU MAHAVIDYALAYA, RAJGURUNAGAR

PHYSICS DEPARTMENT

Syllabus Completion Report

2025-26 (2nd term)

F.Y.B.Sc. PHY 151-T

Prof .V.R.Sonawane

MONTH	TOPIC	LECTURES
12thJan-9th Feb	1. Thermal Physics 1.1 Concepts of Heat and Temperature 1.2 Zeroth Law of Thermodynamics 1.3 Thermodynamics Variables 1.4 Van der Waal's Equation of State 1.5 First Law of Thermodynamics and its differential form (Revision) 1.6 Application of the First Law of Thermodynamics 1.7 Second Law of Thermodynamics (Kelvins and Clausius' Statements) 1.8 Carnot's Cycle and its Efficiency 1.9 Concept of Entropy, Principle of Increase of Entropy. Entropy of Steam 1.10 Application of Second Law of thermodynamics 1.11 Third law of Thermodynamics 1.12 Application of Third Law of Thermodynamics 1.13 Numerical Problems	8L

<p>9th Feb-10th March</p>	<p>2. Electrostatics</p> <p>2.1 Concept of Electric Charge, Electrostatic Forces (Coulomb's law)</p> <p>2.2 Electric Lines, Field and Its Physical Significance</p> <p>2.3 Concept of Electric Flux</p> <p>2.4 Gauss's Law in Electrostatics and Its Applications</p> <p>2.5 Concept of Electric Potential</p> <p>2.6 Concept of Electrostatic Energy</p> <p>2.7 The Four Quantities for Point Charges</p> <p>2.8 Relationship between Electric Field, Electric Force, Electric Potential, and Electric Potential Energy</p> <p>2.9 Concept of Electric Dipole & Dipole moment</p> <p>2.10 Torque on a Dipole Placed in an Electric Field</p> <p>2.11 Concept of Dielectric & Polarization</p> <p>2.12 Electric Vectors and Their Relations</p> <p>2.13 Gauss Law in Dielectric</p> <p>2.14 Concept of Capacitor, Capacitance and its applications</p> <p>2.15 Numerical Problem</p>	<p>8L</p>
<p>10th March - 17th March</p>	<p>3. Magnetostatics</p> <p>3.1 Magnetic Field Lines, Magnetic Force & Its Properties.</p> <p>3.2 Biot-Savart's Law and Its Applications</p> <p>3.3 Ampere's Circuital Law and Its Applications</p> <p>3.4 Introduction to Magnetization</p> <p>3.5 Types of Magnetic Materials</p> <p>3.6 Numerical Problems</p>	<p>7L</p>



K.T.S.P.MANDAL'S

HUTATMA RAJGURU MAHAVIDYALAYA, RAJGURUNAGAR

PHYSICS DEPARTMENT

Syllabus Completion Report

2025-26 (2nd term)

S.YBSc PHY-252-MJ:PAPER-2

Prof .V.R.Sonawane

MONTH	TOPICS	LECTURE
2th Jan - 20th feb	1. Geometrical optics and Lens aberrations (a) Geometrical optics: 1.1 Introduction to lenses and sign conventions. 1.2 Thin lenses: Lens equation for single 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 lens system 1.6 Concept of cardinal points 1.7 Problems (b) Lens Aberrations: 1.8 Introduction to Aberration 1.9 Types of aberration: Monochromatic and Chromatic Aberration (Only discussion)	12L
20th Feb-14th March	2. Optical Instruments 2.1 Introduction to optical instruments 2.2 Types of optical instruments: Simple Microscope, Compound Microscope and Astronomical telescope (only construction and working) 2.3 Eyepiece: Ramsden's eye piece (Expression), Huygens eye piece and Gauss's eyepiece (only qualitative discussion) 2.4 Problems.	6L

14th March – 20th March	3. Interference and Diffraction (a) Interference: 3.1 Introduction to interference 3.2 Types of Interference (only discussion) 3.3 Phase change on reflection (Stokes treatment). 3.4 Interference due to reflected light 3.5 Interference due to transmitted light. 3.6 Newton's ring (to calculate wavelength)	12L
--	--	------------

Teaching Report

2025-2026

DEPARTMENT OF PHYSICS

SEM VI

T.Y.B.Sc.

Name: Mr. Barne N.D.

PHY-3610 SEC (Z): Calibration Techniques

Months	Topic taken	Periods
31 Dec. 2025- 15 Jan. 2026	Unit-1: Principles of Calibration 1. Introduction and Importance of Calibration 2. Traceability in Calibration 3. Calibration Uncertainty 4. Various Calibration Methods 5. Factors Affect Calibration 6. Instrument Classification and Instrument Identification	04
15 Jan. 2026- 20 Jan. 2026	Unit-2: Pressure Calibration 1. Introduction to pressure calibration 2. Pressure unit conversion standards 3. Types of Pressure Gauges 4. Calibration of Pressure Gauges a. Accuracy b. Pressure Media c. Contamination d. Height Difference e. Leak test of Piping f. Adiabatic Effect g. Torque Force h. Calibration Position i. Generating Pressure j. Pressurizing the Gauge k. Reading the Pressure Value l. Number of Calibration Points m. Hysteresis (deviation of calibration points)	06

	<ul style="list-style-type: none"> n. Number of Calibration cycles 5. Instruments required for calibration: <ul style="list-style-type: none"> a. Pressure comparator b. Master Gauge 6. Pressure Calibration with Example 	
31 Jan. 2026	Internal Exam	
5 Feb 2026 - 18 Feb. 2026	Unit-3: Calibration of Electronic Instruments <ul style="list-style-type: none"> 1. Identification of Components 2. Equipment required for calibration 3. Procedure of Calibration <ul style="list-style-type: none"> 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
21Feb. 2026 - 3 March 2026	Unit-4: Temperature Calibration <ul style="list-style-type: none"> 1. Temperature units and Conversions 2. Temperature Sensors 3. Calibration of temperature sensors <ul style="list-style-type: none"> 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

19 March 2026 –22 March 2026	Activity: <ol style="list-style-type: none">1. RTD calibration check2. Calibration of digital balance3. Calibration of PH/Conductivity meter4. Calibration of Volt meter5. Calibration of Current meter6. Calibration of Oscilloscopes	18
------------------------------------	--	----

Teaching Report

2025-2026

DEPARTMENT OF PHYSICS

SEM VI

T.Y.B.Sc.

Name: Mr. Barne N.D.

PHY-361: Solid State Physics

Months	Topic taken	Periods
31 Dec. 2025-20 Jan. 2026	1: The Crystalline Structures 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	10
25 Jan. 2026 - 09 Feb. 2026	2: X ray Diffraction and Experimental Methods 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	09
27 Jan. 2026	Internal Exam	
04 March 2026- 17 March 2026	3: Free Electron and Band Theory of Metals Assumptions of Classical and Sommerfeld 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.	09

<p>18 March 2026- 21 March 2026</p>	<p>4: Magnetism</p> <p>Diamagnetism, Langevin theory of Diamagnetism, Paramagnetism, Langevin theory of Paramagnetism, Ferromagnetism, Antiferromagnetism, Ferromagnetic Domains, Hysteresis, Curie temperature, Neeltemperature, Superconductivity, Problems</p>	<p>08</p>
---	--	-----------

Teaching Report

2025-2026

DEPARTMENT OF PHYSICS

SEM VI

T.Y.B.Sc.

Name: Mr. Barne N.D.

PHY-363: Thermodynamics and Statistical Physics

Months	Topic taken	Periods
19 Jan. 2026 - 25 Jan. 2026	Unit-1: Transport phenomenon and Maxwell's relations: Mean free path, Transport phenomenon, Viscosity, Thermal conductivity and diffusion. Thermodynamic functions: Internal Energy, Enthalpy, Helmholtz function, Gibb's function, Derivation of Maxwell Relations, Specific heat and latent heat equations, Joule Thomson effect (ThrottlingProcess), Problems.	09
24 Jan. 2026 – 21 Feb. 2026	Unit-2: Elementary Concepts of Statistics: Probability, distribution functions, Random Walk and Binomial distribution, Simple random walk problem, Calculation of mean values, Probability distribution for large-scale N, Gaussian probability distributions, Problems.	09
28 Jan. 2026	Internal Exam	
21 Feb. 2025 - 3 March 2025	Unit-3: Statistical Distribution of System of Particles and Ensembles: Specification of state of system, Statistical ensembles, Basic Postulates, Probability calculations, Behavior of density of states, Thermal, Mechanical and general interactions Micro canonical Ensemble (Isolated System), Canonical ensembles, simple application of canonical ensemble, Molecules in Ideal gas, Calculation of mean values in canonical ensemble. Problems.	12

Date: 23/04/2026

To,
The Principal,
Hutatma Rajguru Mahavidyalaya,
Rajgurunagar.

Subject: -Submission of syllabus completion report for academic year-2025-2026

Reference: - Your notice on staff notice board.

Respected Sir,

Here I submitted syllabus completion report for academic year 2025-2026.

In this academic year theory workload is 12 lectures and 16 lectures for practical and 04 lectures for project. I taught the following paper in this term

Sr. No.	Class	Name of Paper	No. of lectures allotted per week
1	T.Y.B.Sc.	PHY-365 (A): Electronics-II	03
2	T.Y.B.Sc.	PHY-3610 SEC (Z): Calibration Techniques	03
3	T.Y.B.Sc.	PHY-361: Solid State Physics	03
4	T.Y.B.Sc.	PHY-363: Thermodynamics and Statistical	03
5	T.Y.B.Sc.	Projects	04
6	F.Y.B.Sc.	Practical's	16

Thanking You,

Mr. Barne N. D.