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NITWET Syllabus

1. For M.Sc (Applied Mathematics) and M.Sc (Mathematics and Scientific Computing) Programs

Modern Algebra-

- Groups
- Subgroups
- Cosets
- Lagrange's Theorem
- Cyclic Groups
- Quotient Groups
- Homomorphism of Groups
- Kernel of a Group
- Permutation Groups
- Rings
- Integral Domains
- Ideals
- Quotient Rings
- Fields
- Euclidean Rings

Linear Algebra-

- Elementary Transformation
- The rank of a Matrix
- Normal Form
- System of Homogeneous and Non-Homogeneous Linear Equations
- Eigen Values
- Eigen Vectors
- Cayley Hamilton Theorem
- Vector Space
- Subspace
- Linear Dependence and Independence
- The span of a Set
- Basis, Dimension
- Linear Transformation
- Rank and Nullity
- Gram-Schmidt Orthogonalisation
- Quadratic Forms

Mathematical Analysis

- Real Numbers
- Sequences
- Series
- Tests of Convergence
- Absolute and Conditional Convergence
- Limits, Continuity, and Differentiability
- Mean Value Theorems
- Taylor's and Maclaurin's Expansions
- Riemann Integration
- Properties of Riemann Integrals

Vector Calculus

- Vector Differentiation
- Gradient, Divergence, and Curl
- Line, Surface, and Volume Integrals
- Stokes', Green's, and Gauss's Divergence Theorems

Coordinate Geometry of Three Dimensions

- Coordinates
- Direction Ratios and Cosines
- Angle Between two Lines
- Plane
- Angle Between Planes
- Lines
- Coplanarity of Lines
- Shortest Distance Between two Lines
- Spheres
- Tangent Planes
- Polar Planes
- Conjugate Planes and Lines

Differential Equations

- Formation of Differential Equation
- First Order and First Degree Differential Equations
- Orthogonal Trajectories
- Linear Differential Equations with Constant Coefficients
- Variation of Parameters
- Simultaneous Linear Differential Equations

2. For M.Sc (Technology) Engineering Physics Program

UNIT – I

Geometrical Optics

- Reflection, Refraction at Plane and Curved Surfaces Mirrors and Lenses
- Thin and Thick Lenses
- Combination of Lenses
- Cardinal Points
- Unit Planes and Nodal Points
- Matrix Method in Paraxial Optics, Defects of the Images
- Chromatic, Achromatic, Monochromatic and Spherical Aberrations, Minimization of Spherical Aberration, Explanation of Coma and its Elimination, Stigmatism and its Removal
- Optical Instruments, Vision Optics
- Dispersion and Scattering of Light
- Velocity of Light

Physical Optics

- Huygen's Wave Theory, Coherence, Superposition of Waves, Displacement of Fringes
 - Phase Change on Reflection
 - Interference by Division of WaveFront
 - Division of Amplitude
 - Young's Interference, Newton's Rings
 - Michelson Interferometer, Fabry Perot Interferometer
 - Thin Films, Interference Filters
 - Diffraction: Integral Theorem of Helmholtz, Fresnel
 - Kirchoff's Theory of Diffraction
 - Fresnel and Fraunhofer Diffraction
 - Slit
 - Circular Apertures
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- Polarization and Double Refraction of Light
 - Matrix Method for Polarization Analysis, Production and Detection of Polarized Light, Nicol prism, Polaroid, Maluslaw
 - The phenomenon of Double Refraction
 - Mathematical Analysis, Refraction of a Plane Wave in a Calcite Crystal, Waveplates, Compensators, Optical Activity, Basics of Lasers, and Holography

UNIT – II

Mechanics, Thermodynamics, Electricity & Magnetism

- The motion of Variable Mass Systems
- Center of Mass Kinematics, Torque, Collisions, Centre of Mass
- Lab Reference Frames
- Motion in Uniformly Accelerated Frames
- Inertial Forces in Non-Inertial Frames
- Euler's Equation, Conservation Laws, Steady Flow, Bernoulli's Equation-Applications
- Einstein's Special Theory of Relativity and Concepts
- Damped Oscillations, Q-factor, Forced Oscillations, Resonance, Mechanical Impedance, Coupled Oscillators, Wave Equation
- Laws of Thermodynamics, Entropy Changes
- Thermodynamic Potentials
- Thermodynamics of Low Temperatures
- Black Body Radiation
- Different Fitment Formulae. Maxwell
- Boltzmann, Fermi-Dirac, and Bose
- Einstein Statistics

- Electrostatics, Magnetostatics, Current
- Electricity, Ohm's law, Kirchoff's Laws, Potentiometer, Wheatstone Bridge
- Capacitance, Dielectrics, Ampere's Law, Biot
- Savart Law
- Faraday's Laws of Electro
- Magnetic Induction
- Inductance, Transformer
- RC, LC, LR & LCR Circuits, Thermoelectricity, Crystal Systems, X-Ray Diffraction, Types of Magnetism, IH BH Curves, Magnetic Materials
- Maxwell Equations and Electromagnetic Waves
- Hard and Soft Super Conductors

UNIT – III

Modern Physics

- Photoelectric Effect, Compton Effect
- Uncertainty Principle
- Atomic Spectra, Bohr's Theory of Hydrogen Spectra, Vector Atom Model
- Zeeman and Stark Effects
- X-Rays and their Applications
- Radio Activity and its Uses
- Nuclear Detectors
- Particle Accelerators
- Fission
- Fusion
- Nuclear Reactors

- Thermo Nuclear Reactions, Cosmic Rays

Electronics

- Basic Electronics, Band Theory of Solids, Conductors, Semi-Conductors, and Insulators
- Intrinsic and Extrinsic Semi-Conductors
- Hall Effect, Fermi Levels
- Types of PN Junction, Junction Diode, Zener diode, Varicap, Tunnel Diode, Metal Semiconductor Diode, Photodiode, PN Diode SCR
- CE Configuration as a Two-Port Network, 'H' Parameter Equivalent Circuit, Amplifiers Based on Frequency Ranges
- Biasing and Load Line Analysis, Thermal Runway, Types of Feed Back
- Effect of Feedback on Gain, Noise, and Band Width
- Phase Shift and Weinbridge Oscillators
- Hartley and Colpitts Oscillators, Crystal Oscillators and Frequency Stability
- Relaxation Oscillator
- CRT, CRO

3. For M.Sc Chemistry (Organic Chemistry) and M.Sc Chemistry (Analytical Chemistry)

Inorganic Chemistry

- S-Block Elements; Group I-A, II-A, P-Block Elements: Group III-B, IV-B, V-B, VI-B, VII-B, Group Zero Elements, Metallurgy; D-Block Elements; F-Block Elements; Coordination Compounds; Nuclear Chemistry

Organic Chemistry

- Structure of Organic Molecules; Reactivity of Organic Molecules; Nomenclature of Organic Compounds; Alkanes, Cyclo Alkanes, Alkenes, Alkynes, Arenes, Halogen Compounds, Hydroxy Compounds, Ethers, Carbonyl Compounds, Monocarboxylic Acids, and their Derivative; Organic Synthesis based on Carbanions, Nitrogen Compounds, Optical Isomerism, Amino Acids; Carbohydrates; Heterocyclic Compounds. Drugs, Spectroscopy (UV, Visible, NMR, and MS).

Physical Chemistry

- Atomic Structure, Chemical Equilibrium; Colloids; Adsorption; Gaseous State; Liquids, Solids, Solutions; Phase Rules; Colligative Properties; Thermodynamics; Electro Chemistry; Chemical Kinetics.

