FACULTY OF SCIENCES

SYLLABUS

FOR

M.Sc. (Hons.) PHYSICS

(Semester I-II)

Session: 2019-20

ESTD. 1892

KHALSA COLLEGE AMRITSAR

(An Autonomous College)

(ii) **Subject to change in the syllabi at any time. Please visit the College website time to time.**

Eligibility:

The candidate having passed B.Sc. Hons. Physics Degree (10+2+3 system of education) with at least 50% marks from Guru Nanak Dev University or any other examination recognized equivalent there to by the University/college.

COURSE-SCHEME

Semester-I

Course No.	***Course Title***	***Teaching Hours /Week***	***Assesment***	***Max. Marks***	***Total Marks***
MHP-401	Electronics	4	25	75	100
MHP-402	Mathematical Physics	4	25	75	100
MHP-403	Classical Mechanics	4	25	75	100
MHP-404	Computational Techniques	4	25	75	100
MHP-405	Electronics Lab.	6	25	75	100
MHP-406	Computer Lab	6	25	75	100
					600

Semester-II

Course No.	***Course Title***	***Teaching Hours /Week***	***Assesment***	***Max. Marks***	***Total Marks***
MHP-451	Quantum Mechanics-I	4	25	75	100
MHP-452	Electrodynamics-I	4	25	75	100
MHP-453	Condensed Matter Physics-I	4	25	75	100
MHP-454	Atomic & Molecular Spectroscopy	4	25	75	100
MHP-455	Condensed Matter Lab-I	6	25	75	100
MHP-456	Spectroscopy Lab	6	25	75	100
					600

ELECTRONICS

Course No. MHP-401 **Course Hrs 60**
Time: 3 Hrs. **Max. Marks:75**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 15 marks and is compulsory consisting of eight short answer type questions of 2.5 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III &IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT-I

Electronic Devices and* Microwavedevices*: MESFETs and MOSFETs, Charge Coupled(CCDs) devices, Unijunction transistor (UJT), four layer (PNPN) devices, construction and working of PNPN diode, Semiconductor controlled rectifier (SCR) and Thyristor. Gunn diode, Gunn effect, two valley model, principle and operation of Reflex Klystron and Magnetron.

Lectures 15

UNIT-II

Electronic Circuits: Multivibrators (Bistable Monostable and Astable), Differential amplifier, Operational amplifier (OP-AMP) Ideal, Internal circuit &Practical, OP-AMP as inverting and non-inverting, scalar, instrumentation amplifier, summer, integrator, differentiator. Schmitt trigger and logarithmic amplifier, Electronic analog computation circuits.

Lectures 15

UNIT-III

Digital Principles: Binary and Hexadecimal number system, Binary arithmetic, Logic gates, Boolean equation of logic circuits, Karnaugh map simplifications for digital circuit analysis,and design, Encoders & Decoders, Multiplexers and Demultiplexers, Parity generators andcheckers, Adder-Subractor circuits.

Lectures 15

UNIT-IV

Sequential Circuits: Flip Flops, Registers, Up/Down counters, Basics of semiconductor memories: ROM, PROM, EPROM, and RAM,D/A conversion using binary weighted resistor network, Ladder, D/A converter, A/D converter using counter, Successive approximation A/D converter. **Lectures 15**

Books:

1. Electronic Devices and Circuits- Millman and Halkias-Tata McGraw Hill, 1983.
2. Solid State Electronic Devices - Ben G Streetman-Prentice Hall, New Delhi, 1995.
3. Digital Principles and Applications- A.P.Malvino and D.P.Leach-Tata McGraw Hill, New Delhi, 1986.
4. Digital Computer Electronics- A P Malvino-Tata McGraw Hill, New Delhi, 1986
5. Microelectronics – Millman-Tata McGraw Hill, London, 1979.
6. Digital Electronics - W.H. Gothmann-Prentice Hall, New Delhi, 1975.
7. Microwave Devices and Circuits-Samuel Y Liao-PHI,1991

MATHEMATICAL PHYSICS

Course No. MHP-402 **Course Hrs: 60**

Time: 3 Hrs. **Max. Marks: 75**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 15 marks and is compulsory consisting of eight short answer type questions of 2.5 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III &IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT-I

Fourier Transformation: Fourier decomposition, Fourier series and convolution theorem. Fourier transformations and its applications to wave theory.

Lectures 15

UNIT-II

Coordinate Systems and Group Theory: Curvilinear coordinates, differential vector operators in curvilinear coordinates. Spherical and cylindrical coordinate systems. General coordinate transformation, Tensors: covariant, contravariant and mixed, Algebraic operations on tensors, Illustrative applications. Definition of a group, multiplication table, conjugate elements and classes of groups, direct product. Isomorphism, homeomorphism, permutation group. Definitions of the three dimensional rotation group and SU(2).

Lectures 15

UNIT-III

Differential Equations and Special functions: Second order differential equations. Frobenious method. Wronskian and a second solution, the Sturm Liouville problem. One dimensional Greens function. Gamma function. The exponential integral and related functions. Bessel functions of the first and second kind. Legendre polynomials, associated Legendre polynomials and spherical harmonics. Generating functions for Bessel, Legendre and associated Legendre polynomials.

Lectures 15

UNIT-IV

Complex Analysis: The Cauchy-Reimann conditions, Cauchy integral theorem, Cauchy integral formula. Taylor, and Lorentz series, singularities and residues. Cauchy residue theorem. Calculation of real integrals.

Lectures 15

Books:

1. Mathematical Methods for Physicists: George Arfken-New York Academy, 1970.
2. Advanced Mathematical Methods for Engg. and Science Students: George Stephenson and P.M. Radmore-Cambridge Uni Press, 1990.
3. Applied Mathematics for Engineers & Physicists: Pipes and Harvil

CLASSICAL MECHANICS

Course No. MHP-403 **Course Hrs: 60**
Time: 3 Hrs. **Max. Marks: 75**

Note for paper setter and students:

1. **There will be five sections.**
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3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT-I

Lagrangian Mechanics: Newton's laws of motion, mechanics of a system of particles, constraints, D' Alembert's principle and Lagrange equations of motion. Velocity dependent potentials and dissipation function. Some applications of Lagrangian formulation, Hamiltons principle, derivation of Lagrange equations from Hamilton's principle. Conservation theorems and symmetry properties.

Lectures 15

UNIT-II

Central Force Problem: Two body central force problem, reduction to equivalent one body problem, the equation of motion and first integrals, the equivalent one dimensional problem, and classification of orbits. The differential equation for the orbit and integrable power-law potential. The Kepler problem. Scattering in a central force.

Lectures 15

UNIT-III

Rigid Body Dynamics: The independent coordinates of a rigid body, orthogonal transformation, the Euler's angles. Eulers 's theorem on the motion of rigid body, finite and infinitesimal rotations, rate of change of a vector, angular momentum and kinetic energy about a point for a rigid body, the inertia tensor and moment of inertia, the eigen values of the inertia tensor and the principal axis transformation. Euler's equations of motion, torque free motion of a rigid body.

Lectures 15

UNIT-IV

Canonical Transformations: Legendre transformation and Hamilton equations of motion, cyclic coordinates and conservation theorems, derivation of Hamiltons equations from a variational principle, the principle of least action. The equations of canonical transformation, examples of canonical transformations, Poisson brackets. Equations of motion, infinitesimal canonical transformations and conservation theorems in the Poisson bracket formulation.

Lectures 15

Books:

1. Classical Mechanics: Herbert Goldstein-Narosa Pub. House, New Delhi, 1970.
2. Mechanics : L.D. Landau-Pergamon Press, Oxford, 1982.
3. Classical Mechanics Rana and Joag-Tata McGraw Hill, New Delhi, 1995.

COMPUTATIONAL TECHNIQUES

Course No. MHP-404 **Course Hrs: 60**
Time: 3 Hrs. **Max. Marks: 75**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 15 marks and is compulsory consisting of eight short answer type questions of 2.5 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III &IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT-I

Programming (Fortran) :

Representation of integers, reals, characters, constants and variables, arithmetic expressions and their evaluation using rules of hierarchy. Assignment statements, Logical constants, variables and expressions, control structures, sequencing alternation, arrays, Manipulating vectors and matrices, Subroutines, I/O Statements

Lectures 15

UNIT-II

Interpolation:

Interpolation, Newton's formula for forward and backward interpolation, Divided differences, Symmerty of divided differences, Newton's general interpolation formula, Lagranges interpolation formula.

Lectures 15

UNIT-III

Numerical Differentiation and Integration, Ordinary Differential Equation:

Numerical integration, A general quadrature formula for equidistant ordinates, Simpson, Weddle And Trape rules, Monte- Carlo Method, Euler's method, Modified Euler's method, Runge-Kutta Method.

Lectures 15

UNIT-IV

Roots of Equation :

Approximate values of roots, Bisection Method, Regula-Falsi Method, Newton-Raphson method, Bairstow method. Simultaneous Linear Algebraic Equations: Solution of Simultaneous Linear equations, Gauss elimination method, Gauss-Jordon method, Matrix inversion.

Lectures 15

Books:

1. Ram Kumar-Programming with Fortran-77 (Tata McGraw Hill), 1995.
2. R.S. Dhaliwal - Programming with Fortran-77 (Wiley-Eastern Ltd)
3. James Scarborough-Numerical Mathematical Analysis (Oxford and IBH), 1966.
4. S.D. Conte - Elementary Numerical Analysis (McGraw Hill), 1965.
5. John. H. Methews, Numerical Methods for Mathematics, Science and Engineering

(Prentice Hall of India).

ELECTRONICS LAB.

Course No. MHP-405 **Max. Marks: 75**

1. To Study the D C characteristics and applications of DIAC.
2. To study the D C characteristics and applications of SCR.
3. To study the D C characteristics and applications of TRIAC.
4. Investigation of the D C characteristics and applications of UJT.
5. Investigation of the D C characteristics of MOSFET.
6. Study of bi-stable, mono-stable and astable, multivibrators.
7. Study of Op-Amps and their applications such as an amplifier (inverting, non-inverting), scalar, summer, differentiator and integrator.
8. Study of logic gates using discrete elements and universal gates.
9. Study of encoder, decoder circuit.
10. Study of arithmetic logic unit (ALU) circuit.
11. Study of shift registers.
15. Study of half and full adder circuits.
13. Study of A/D and D/A circuits.
14. Study of pulse width and pulse position modulation.

COMPUTER LAB.

Course No. MHP-406 **Max. Marks :75**

1. Determination of Roots:
(a) Bisection Method
(b) Newton Raphson Method
(c) Secant Method

2. Matrix Manipulation
(a) Matrix Multiplication
(b) Determinant
(c) Gauss Elimination
(d) Matrix Inversion
(e) Gauss Jordan

3. Integration
(a) Trapezoidal rule
(b) Simpson 1/3 and Simpson 3/8 rules
(c) Gaussian Quardrature

4. Differential Equations
(a) Euler's method
(b) Runge Kutta Method

5. Interpolation
(a) Forward interpolation, Backward interpolation
(b) Lagrange's interpolation

6. Applications
(a) Chaotic Dynamics, logistic map
(b) One dimensional Schrondinger Equation
(c) Time period calculation for a potential
(d) Luminous intensity of a perfectly black body vs. temperature

QUANTUM MECHANICS – I

Course No. MHP-451 **Course Hrs. 60**
Time: 3 Hrs. **Max. Marks: 75**
Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 15 marks and is compulsory consisting of eight short answer type questions of 2.5 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III &IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT-I

Basic Formulation and quantum Kinematics: Stern Gerlach experiment as a tool to introduce quantum ideas, analogy of two level quantum system with polarisation states of light. Complex linear vector spaces, ket space, bra space and inner product, operators and properties of operators. Eigen kets of an observable, eigen kets as base kets, matrix representations. Measurement of observable, compatible vs. incompatible observable, commutators and uncertainty relations. Change of basis and unitary transformations. Diagonalisation of operators. Position, momentum and translation, momentum as a generator of translations, canonical commutation relations. Wave functions as position representation of ket vectors. Momentum operator in position representation, momentum space wave function. **Lectures 15**

UNIT-II

Quantum Dynamics: Time evolution operator and Schorodinger equation, special role of the Hamiltonian operator, energy eigen kets, time dependence of expectation values, spin precession. Schrodinger vs. Heisenberg picture, unitary operators, state kets and observable in Schrodinger and Heisenberg pictures, Heisenberg equations of motion, Ehrenfest's theorem. **Lectures 15**

UNIT-III

One Dimenstional Systems: Potential Step, potential barrier, potential well. Scattering vs. Bounds states. Simple harmonic oscillator, energy eigen states, wave functions and coherentstates. **Lectures 15**

UNIT-IV

Spherical Symmetric Systems and Angular momentum: Schrodinger equation for a spherically symmetric potential. Orbital angular momentum commutation relations. Eigenvalue problem for L_2, spherical harmonics. Three dim harmonic oscillator, three dimensional potential well and the hydrogen atom. Angular momentum algebra, commutation relations. Introduction to the concept of representation of the commutation relations in different dimensions. Eigen vectors and eigen functions of J_2 and J_z. Addition of angular momentum and C.G. coefficients. **Lectures 15**

Recommended Books:

1. Modern Quantum Mechnics: J.J. Sakurai-Pearson Educaton Pvt. Ltd., New Delhi, 2502.
2. Quantum Mechanics :L I Schiff-Tokyo McGraw Hill, 1968.
3. Feynmann lectures in Physics Vol. III-Addison Wesly, 1975.
4. Quantum Mechanics :Powel and Craseman-Narosa Pub. New Delhi, 1961.
5. Quantum Mechanics :Merzbacher-John Wiley & Sons, New York, 1970.

ELECTRODYNAMICS-I

Course No: MHP-452 **Course Hrs: 60**

Time: 3 Hrs. **Max. Marks: 75**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 15 marks and is compulsory consisting of eight short answer type questions of 2.5 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III &IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT-I

Electrostatics: Coulomb's law, Guass's law, Poisson's equation, Laplace equation. Solution of boundary value problem: Green's function, method of images and calculation of Green's function for the image charge problem in the case of a sphere, Laplace equation, uniqueness theorem. Electrostatics of dielectric media, multipole expansion. Boundary value problems in dielectrics; molecular polarisability, electrostatic energy in dielectric media.

Lectures 15

UNIT-II

Magnetostatics: Biot and Savart's law. The differential equation of Magnetostatics and Ampere's law, vector potential and magnetic fields of a localised current distribution. Magnetic moment, force and torque on a magnetic dipole in an external field. Megnetic materials, Magnetisation and microscopic equations.

Lectures 15

UNIT-III

Time-varying fields: Time varying fields, Maxwell's equations, conservation laws: Faraday's law of induction, Energy in a magnetic field. Maxwell's displacement current, vector and scalar potential, Gauge transformations; Lorentz gauge and Coulomb gauge. Poynting theorem, conservation laws for a system of charged particles and electromagnetic field, continuity equation.

Lectures 15

UNIT-IV

Electromagnetic Waves: Plane wave like solutions of the Maxwell equations. Polarisation, linear and circular polarisation. Superposition of waves in one dimension. Group velocity. Illustration of propagation of a pulse in dispersive medium. Reflection and refraction of electromagnetic waves at a plane surface between dielectrics. Polarisation by reflection and total internal reflection. Waves in conductive medium, Simple model for conductivity.

Lectures 15

Books:

1. Classical Electrodynamics - J.D. Jackson-John & Wiley Sons Pvt. Ltd. New York, 2504.
2. Introduction to Electrodynamics - D.J. Griffiths-Pearson Education Ltd., New Delhi, 1991.
3. Classical Electromagnetic Radiation - J.B. Marion-Academic Press, New Delhi, 1995.

CONDENSED MATTER PHYSICS-I

Course No. MHP-453 **Course Hrs.60**
Time: 3 Hrs. **Max. Marks: 75**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 15 marks and is compulsory consisting of eight short answer type questions of 2.5 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III &IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT-I

Dia-Para and Ferromagnetism:

Classification of magnetic materials, the origin of permanent magnetic dipoles, diamagnetic susceptibility, classical theory of para magnetism, Quantum theory of paramagnetism, Quenching of orbital angular momentum, cooling by adiabatic demagnetization. Paramagnetic susceptibility of conduction electrons. Ferromagnetism, the Weiss molecular field, the interpretation of the Weiss field. Ferromagnetic domains, Spin waves, quantization of spin waves, Thermal excitations of magnons. **Lectures 15**

UNIT-II

Antiferro-Ferrimagnetism and Superconductivity:

The two sublattice model, super exchange interaction, the structure of ferrites, saturation magnetisation, Neel's theory of ferrimagnetism, Curie temperature and susceptibility of ferrimagnets. Superconductivity, zero resistivity, critical temperature, Meissner effect, Type Iand Type II superconductors, specific heat and thermal conductivity, BCS theory, Ginzsburg-Landou theory, Josephson effect: dc Josephson effect, ac Josephson effect, high temperature superconductivity (elementary). **Lectures 15**

UNIT-III

Defects and Diffusion in Solids:

Point defects: Impurities, Vacancies- Schottky and Frankel vacancies, Color centers and coloration of crystals, F-centres, Line defects (dislocations), Edge and screw dislocations, Berger Vector, Planar (stacking) Faults, Grain boundaries, Low angle grain boundaries, the Hydration energy of ions, Activation energy for formation of defects in ionic crystals, Ionic conductivity inpure alkali halides. **Lectures 15**

UNIT-IV

Lattice Vibrations and Phonons:

Vibrations of one dimensional linear monoatomic lattice, Normal modes of vibrations in a finite length of the lattice, The linear diatomic lattice, Excitation of optical branch in ionic crystals –the infra red absorption, Quantization of lattice vibrations – concept of phonons, Phonon momentum, Inelastic scattering of photons by phonons, Inelastic scattering of neutrons by phonons. **Lecture 15**

Books Recommended:

1. An Introduction to Solid State Physics: C. Kittel-WielyEstem Ltd., New Delhi, 1979.
2. Solid State Physics-A.J. Dekkar-Maemillan India Ltd., New Delhi, 2504.
3. Principles of Solid State Physics-R.A. Levy-New York Academy, 1968.
4. Introduction to Solids-Azaroff-Tata McGraw Hill, New Delhi, 1992.
5. Elementary Solid State Physics-Omar, Addison Wesly, 1975.
6. Solid State Physics-Aschroft and Mermin-New York Holt, 1976

ATOMIC AND MOLECULAR SPECTROSCOPY

Course No. MHP-454 **Course Hrs.60**
Time: 3 Hrs. **Max. Marks: 75**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 15 marks and is compulsory consisting of eight short answer type questions of 2.5 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III &IV respectively and will consist of two questions of 15 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT-I

Spectra of one and two valance electron systems:
Magnetic dipole moments; Larmor's theorem; Space quantization of orbital, spin and total angular momenta; Vector model for one and two valance electron atoms; Spin-orbit interaction and fine structure of hydrogen, Lamb shift, Spectroscopic terminology; Spectroscopic notations for L-S and J-J couplings; Spectra of alkali and alkaline earth metals; Interaction energy in L-Sand J-J coupling for two electron systems; Selection and Intensity rules for doublets and triplets

Lectures 15

UNIT-II

Breadth of spectral line and effects of external fields:
The Doppler effect; Natural breadth from classical theory; natural breadth and quantum mechanics; External effects like collision damping, asymmetry and pressure shift and stark broadening; The Zeeman Effect for two electron systems; Intensity rules for the Zeeman effect; The calculations of Zeeman patterns; Paschen-Back effect; LS coupling and Paschen–Backeffect; Lande's factor in LS coupling; Stark effect. **Lectures 15**

UNIT-III

Microwave and Infra-Red Spectroscopy:
Types of molecules, Rotational spectra of diatomic molecules as a rigid and non-rigid rotator, Intensity of rotational lines, Effect of isotopic substitution, Microwave spectrum of poly atomic molecules, Microwave oven, The vibrating diatomic molecule as a simple harmonic and anharmonic oscillator, Diatomic vibrating rotator, The vibration-rotation spectrum of carbonmonoxide, The interaction of rotation and vibrations, Outline of technique and instrumentation, Fourier transform spectroscopy. **Lectures 15**

UNIT-IV

Raman and Electronic Spectroscopy:
Quantum and classical theories of Raman Effect, Pure rotational Raman spectra for linear and polyatomic molecules, Vibrarional Raman spectra, Structure determination from Raman and infra-red spectroscopy, Electronic structure of diatomic molecule, Electronic spectra of diatomic molecules, Born Oppenheimer approximation- The Franck-Condon principle, Dissociation and pre-dissociation energy, The Fortrat diagram, example of spectrum of molecular hydrogen.

Lectures 15

Books:

1. Introduction to Atomic Spectra: H.E. White-Auckland McGraw Hill, 1934
2. Fundamentals of Molecular spectroscopy: C.B. Banwell-Tata McGraw Hill, 1986.
3. Spectroscopy Vol. I, II & III: Walker &Straughen
4. Introduction to Molecular Spectroscopy: G.M.Barrow-Tokyo McGraw Hill, 1962.
5. Spectra of Diatomic Molecules: Herzberg-New York, 1944.
6. Molecular Spectroscopy: Jeanne L McHale-NewJersy Prentice Hall, 1999.
7. Molecular Spectroscopy: J.M. Brown-Oxford University Press, 1998.
8. Spectra of Atoms and Molecules: P.F. Bermath-New York, Oxford University Press, 1995.
9. Modern Spectroscopy: J.M. Holias

CONDENSED MATTER LAB-I

Course No. MHP-455 **Max. Marks: 75**

1. To determine Hall coefficient by Hall Effect.
2. To determine the band gap of a semiconductor using p-n junction diode..
3. To determine the magnetic susceptibility of a material using Quinke's method.
4. To determine the g-factor using ESR spectrometer.
5. To determine the energy gap and resistivity of the semiconductor using four probe method.
6. To trace hysteresis loop and calculate retentivity, coercivity and saturation magnetization.
7. To determine dielectric constant.
8. To study the series and parallel characteristics of a photovoltaic cell.
9. To study the spectral characteristics of a photovoltaic cell.

SPECTROSCOPY LAB.

Course No. MHP-456 **Max. Marks: 75**

1. To find the wavelength of monochromatic light using Febry Perot interferometer.
2. To find the wavelength of sodium light using Michelson interferometer.
3. To calibrate the constant deviation spectrometer with white light and to find the wavelength of unknown monochromatic light.
4. To find the grating element of the given grating using He-Ne laser light.
5. To find the wavelength of He-Ne laser using Vernier calipers.
6. To verify the existence of Bohr's energy levels with Frank-Hertz experiment.
7. To determine the charge to mass ratio (e/m) of an electron with normal Zeeman Effect
8. To determine the velocity of ultrasonic waves in a liquid using ultrasonic interferometer