ANNEXURE D
Faculty of Sciences
Syllabus for

Master of Science (FYIP) Physics

(Semester I -II)
(Under Credit Based Continuous Evaluation Grading System)
(12+3+2 System of Education)
Session: 2024-25

Kanya Maha Vidyalaya, Jalandhar
(Autonomous)
The Heritage Institution

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF FIVE YEAR INTEGRATED PROGRAMME

Master of Science (FYIP) Physics

Session-2024-25

Semester-I									
Sr. No.	**Course Code**	**Course Type**	**Course Title**	**Credits**	**Max Marks**				**Exam time in Hours)**
					Total	**Ext**		**CA**	
				L-T-P		**L**	**P**		
1.	FPHL-1421 FPHL-1031 FPHL-1431	C	Punjabi(Compulsory [1]Basic Punjabi [2]Punjab History and Culture	2-0-0	50	40		10	3
2.	FPHL-1102	AEC	Communicative English-I	2-0-0	50	40		10	3
3.	FPHL-1393	DSC	Mechanics	4-0-0	100	80	-	20	3
4.	FPHL-1394	DSC	Thermal Physics	4-0-0	100	80	-	20	3
5.	FPHL-1335	C	Mathematics-I	4-0-0	100	80	-	20	3
6.	FPHL-1086	C	Organic Chemistry	3-0-0	75	60	-	15	3
7.	FPHP-1397	DSC	Physics Lab-I	0-0-3	75	-	60	15	3
8.	FPHP-1088	C	Qualitative Organic Analysis	0-0-1	25	-	20	5	3
9.	VACFF-1492	VAC	*Foundation Course	2-0-0	50	40		10	1

[1] Special paper in lieu of Punjabi (Compulsory) for those who have not studied Punjabi upto 8th/ 10th Class. .

[2] Special paper in lieu of Punjabi (Compulsory) for those students who are not domicile of Punjab.

***credits/ grade points of these courses will not be added in SGPA/ CGPAof the semester/ Programme and only grades will be provided.**

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF FIVE YEAR INTEGRATED PROGRAMME

Master of Science (FYIP) Physics

Session-2024-25

Semester II

Sr. No.	Course Code	Course Type	Course Title	Credits	Max Marks				Examination time in Hours)
					Total	Ext		CA	
				L-T-P		L	P		
1	FPHL-1421 FPHL-1031 FPHL-1431	C	Punjabi(Compulsory)-II [1]Basic Punjabi [2]Punjab History and Culture	2-0-0	50	40	-	10	3
2	FPHM-2102	AEC	Communicative English-II	3-0-1	50	25	15	10	3
3	FPHL-2393	DSC	Electricity and Magnetism	4-0-0	100	80	-	20	3
4	FPHL-2394	DSC	Waves and Oscillations	4-0-0	100	80	-	20	3
5	FPHL- 2335	C	Mathematics-II	4-0-0	100	80	-	20	3
6	FPHL-2086	C	Inorganic Chemistry	3-0-0	75	60	-	15	3
7	FPHP-2397	DSC	Physics Lab-II	0-0-3	75	-	60	15	3
8	FPHP-2088	C	Inorganic Chemistry Lab	0-0-1	25	-	20	5	3
9.	VACD-1161	VAC	*Drug Abuse: Problem Management & Prevention (Compulsory)	2-0-0	50	40	-	10	3

[1] Special paper in lieu of Punjabi (Compulsory) for those who have not studied Punjabi upto 8th/ 10th Class. .

[2] Special paper in lieu of Punjabi (Compulsory) for those students who are not domicile of Punjab.

***credits/ grade points of these courses will not be added in SGPA/ CGPAof the semester/ Programme and only grades will be provided.**

PROGRAM SPECIFIC OUTCOMES (PSOs)

Programme Specific Outcomes of Master of Science (Five Year Integrated Programme) Physics (M.Sc. (FYIP) Physics)

Upon completion of M.Sc. (FYIP) Physics, the students will be able to:

PSO 1. Develop proficient analytic and critical thinking abilities by integrating knowledge across diverse branches of physics.

PSO 2. Cultivate and sustain intellectual curiosity, fostering a lifelong commitment to learning, encompassing both traditional and contemporary issues relevant to physics and broader societal concerns.

PSO 3. Acquire skills and knowledge necessary to pursue diverse and fulfilling careers within the field of physics.

PSO 4. Demonstrate competency in conducting fundamental, applied, and collaborative research endeavors.

PSO 5. Enhance scientific writing skills utilizing modern methodologies to effectively communicate complex ideas and findings in regional and international language.

PSO 6. Attain a competitive edge at national and international levels, demonstrating proficiency and adaptability in a globalized scientific community using regional and international language.

PSO 7. Foster entrepreneurial insight and a commitment to frequent expression of their thoughts in regional and international language, to navigate evolving professional landscapes.

PSO 8. Embrace social and promote ethical and responsible conduct in scientific practice and contributing positively to society.

PSO 9. Demonstrate proficiency in mathematics and the mathematical concepts needed for a proper understanding of physics using regional and international Language.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–I)

COURSE TITLE: MECHANICS

COURSE CODE: FPHL-1393

COURSE OUTCOMES:

After passing this course, students will be able to:

CO1: Understand the concept of inertial frames and calculations of displacement, velocity and acceleration in various coordinate systems. Students will be able to know the laws of motion and relative motion by using Galilean transformations. They will learn various conservation laws and their application to variable mass systems.

CO2: They will understand elastic scattering in the lab and centre of mass systems. They will understand the physics of the rotational motion of a body by studying Euler's equations and the Moment of inertia tensor.

CO3: Learn the effects of gravitational force and other fundamental forces of nature. They will learn the concept of the centre of mass, central forces, and the motion of particles under a central force, as well as determine the turning points of orbit. They will be able to understand planetary motion by solving differential equations of orbits and studying Kepler's laws.

CO4: They will understand the origin of fictitious forces in non-inertial frames and their consequences on acceleration due to gravity, the motion of a particle on earth, and Foucault's pendulum as a real-life illustration of fictitious forces.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–I)

COURSE TITLE: MECHANICS

COURSE CODE: FPHL-1393

Examination Time: 3 Hours	**Max Marks: 100**	**Ext Marks: 80**
Credits: 4-0-0	**CA: 20**	**Pass Mark: 28**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks. **Note:** Students can use Non-Scientific calculators or logarithmic tables.

Unit- I

Co-ordinate Systems and Motion of a particle: Reference frames, Inertial frames; Displacement, velocity& acceleration in Cartesian, Plane polar, Spherical& Cylindrical coordinate systems Area and Volume in these coordinate systems. Solid angle. Review of Newton's Laws of Motion. Galilean transformations; Galilean invariance of space &time intervals, Newton's laws of motion and conservation laws.

Fundamentals of Dynamics: Momentum of variable-mass system: motion of the rocket. Dynamics of a system of particles: internal & external forces and momentum conservation, Centre of Mass, Impulse.

Unit- II

Collisions: Elastic and inelastic collisions between particles, Relationship of velocities, angles and energiesof the colliding particles in the Centre of Mass and Laboratory frames.

Rotational Dynamics: Angular momentum of a particle and system of particles and torques due to internal forces. Principle of conservation of angular momentum, Rotation about a fixed axis, Moment of Inertia.Kinetic energy of rotation, Motion involving both translation and rotation, Rotational motion of a rigid body in general, Rotation of angular momentum vector about a fixed axis, Angular momentum and kinetic energy of a rigid body about principal axes, Euler's equations, Precession and Elementary Gyroscope.Motion of a spinning top.

Unit- III

Gravitation Fields and Potentials: Law of gravitation. Gravitational potential energy, Inertial and gravitational mass. Potential energy and force between a point mass and spherical shell, a point mass and solid sphere. Gravitational and electrostatic self-energy, Gravitational energy of uniform sphere.

Central Force Motion: Forces in nature (Qualitative). Conservative forces. Central Forces.Motion of a particle under a central force field, Two-body problem and its reduction to one-body problem and its solution, Reduced mass, Equation of motion of a reduced mass under central force and energy. Differential equation of the orbit, Equation of orbit under inverse square force field, turning points, Kepler's Laws, Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness.

Unit- IV

Non-Inertial Systems: Non-inertial frames. Fictitious forces in non-inertial frames having translational and uniform rotational motion. Laws of Physics in rotating coordinate systems. Centrifugal force. Effect of rotation of earth on acceleration due to gravity, Effect of Coriolis force on a particle falling freely under gravity.Effect of Coriolis force on a particle moving on the surface of earth, Foucault's pendulum and its equation of motion.

Reference Books:

1. An introduction to Mechanics, D. Kleppner, R.J. Kolenkow, 2012, McGraw-Hill.
2. Mechanics, Berkeley Physics, Vol.1, C.Kittel, W.Knight, et. al. 2007, Tata McGraw-Hill.
3. Physics, Resnick, Halliday and Walker 9/e. 2010, Wiley.
4. Analytical Mechanics, G.R.Fowles and G.L. Cassiday. 2005, Cengage Learning.
5. Feynman Lectures, Vol.1, R.P. Feynman, R.B. Leighton, M.Sands, 2008, Pearson Education.
6. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–I)

COURSE TITLE: THERMAL PHYSICS

COURSE CODE: FPHL-1394

COURSE OUTCOMES

After passing this course the students will be able to:

CO1: Understand thermodynamic systems, properties, and equilibrium. Apply energy conservation principle through the First Law. Analyze heat and work interactions. Explore reversible and irreversible processes, Carnot cycle, and efficiency. Grasp the Second Law and its implications for temperature scales and thermodynamic processes.

CO2: Comprehend entropy, its implications on thermodynamic processes, and the Second Law. Analyze thermodynamic potentials, their properties, and applications in various systems. Apply thermodynamic concepts to phase transitions and equilibrium conditions.

CO3: Apply Maxwell's relations to derive thermodynamic properties and relationships. Analyze gas behavior using Maxwell-Boltzmann distribution, equipartition theorem, and degrees of freedom. Connect theoretical concepts to experimental observations and real-world applications.

CO4: Understand and differentiate between free expansion and throttling processes. Apply Joule-Thomson effect to real gases, including inversion temperature and cooling. Analyze adiabatic demagnetization as a cooling technique.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–I)

COURSE TITLE: THERMAL PHYSICS

COURSE CODE: FPHL-1394

Examination Time: 3 Hours	**Max Marks: 100**	**Ext Marks: 80**
Credits: 4-0-0	**CA: 20**	**Pass Mark: 28**

Instructions for the Paper Setters:
Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.
Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I

Zeroth and First Law of Thermodynamics: Extensive and Intensive Thermodynamic Variables, Thermodynamic Equilibrium, Zeroth Law of Thermodynamic & Concept of Temperature, Concept of Work & Heat, State Functions, First Law of Thermodynamics and its differential Form, Internal Energy, First Law & Various Processes, Applications of First Law: General Relation between CpAndCv, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Co-efficient.

Second Law of Thermodynamics: Reversible and Irreversible process with examples. Conversion of Work into Heat and Heat into Work. Heat Engines.Carnot's Cycle, Carnot engine & efficiency, Refrigerator & coefficient of performance, 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Carnot's Theorem. Application of Second Law of Thermodynamics: Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale.

UNIT–II

Entropy: Concept of Entropy, Clausius Theorem, Clausius Inequality, Second Law of Thernodynamics in terms of Entropy, Entropy of a perfect gas, Principle of increase of Entropy, Entropy Changes in Reversible and Irreversible processes with examples, Entropy Changes in Reversible and Irreversible Processes, Principle of Increase of Entropy, Temperature-Entropy diagrams for Carnot's Cycle, Third Law of Thermodynamics Unattainability of Absolute Zero

Thermodynamic Potentials: Thermodynamic Potentials: Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy, Their Definitions, Properties and Applications, Surface Films and Variation of Surface Tension with Temperature, Magnetic Work, First and second order Phase Transitions with examples, Clausius Clapeyron Equation and Ehrenfest equations.

UNIT–III

Maxwell's Thermodynamic Relations: Derivations and applications of Maxwell's Relations, Maxwell's Relations: (1) Clausius Clapeyron equation, (2) Values of Cp-Cv, (3) TdS Equations, (4) Joule-Kelvin Coefficient for Ideal and Van-der Wall Gasses, (5) Energy Equations, (6) Change of Temperature during Adiabatic Process.

Distribution of Velocities: Maxwell-Boltzmann Law of Distribution of Velocities in anIdeal Gas and its Experimental Verification. Doppler Broadening of Spectral Lines andStern's Experiment Mean, RMS and Most Probable Speeds.Degrees of Freedom Law of Equi-partition of Energy. Specific heats of Gases

UNIT–IV

Joule's Experiment Free Adiabatic Expansion of a Perfect Gas. Joule-Thomson Porous Plug Experiment Joule Thomson Effect for Real and Van der Waal Gases. Temperature of Inversion. Joule Thomson Cooling.Adiabatic demagnetization.

Text and Reference Books:

1. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, 1981, McGraw-Hill.
2. A Treatise on Heat, Meghnad Saha, and B.N.Srivastava, 1958, Indian Press

3. Thermal Physics, S. Garg, R. Bansal and Ghosh, 2nd Edition, 1993, Tata McGraw-Hill
4. Thermodynamics, Kinetic Theory & Statistical Thermodynamics, Sears & Salinger. 1988, Narosa.
5. Heat Thermodynamics & Statistical Physics, Brij Lal and Subramaniam, 1st Edn., 2008, S. Chand.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–I)

COURSE TITLE: Mathematics-I

COURSE CODE: FPHL-1335

Course outcomes

After the completion of this course, students should be able to :

CO 1: Give argument related to limits, continuity and derivative of a function and to understand the concept of maxima and minima of a function of a single variable.

CO 2: Explain the significance of Roll's theorem, Mean Value theorem, and Taylor's and Maclaurin's theorem to find the expansions of functions.

CO 3: Demonstrate the geometrical meaning of integral calculus as an area and volume.

CO 4: Introduce the concept of different types of Matrices and to understand the meaning of eigen values and eigen vectors with the process of diagonalization of Matrices.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–I)

COURSE TITLE: MATHEMATICS-I

COURSE CODE: FPHL-1335

Examination Time: 3 Hours	**Max Marks: 100**	**Ext Marks: 80**
Credits: 4-0-0	**CA: 20**	**Pass Mark: 28**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.

UNIT –I

Functions and Derivatives: Limit, continuity and derivative of a function of one variable, geometrical significance of derivative, successive differentiation, Leibnitz theorem, maxima and minima of a function of single variable, partial derivatives, total derivative, chain rule. 15 Hours

UNIT –II

Differential Calculus: Rolle's theorem, mean value theorem, Taylor and Maclaurin formulas, Taylor series; concavity, point of inflexion, asymptotes. 15 Hours

UNIT-III

AAnti derivatives: Indefinite integral as an anti derivative, method of substitution, partial fractions, integration by parts; reduction formulae; Definite integrals. Definite integral as a limit of a sum, geometrical interpretation; double and triple integrals. 15 Hours

UNIT-IV

Matrices: Orthogonal matrices, Hermitian matrices, Unitary matrices; Cayley Hamilton theorem and its applications; rank of a matrix, consistency of a system of linear equations, eigen values and eigenvectors, diagonalization of matrices. 15 Hours

Text and Reference Books:

1. Differential Calculus: Shanti Narayan, New Delhi, Shyam Lal,1983.
2. Integral Calculus: Shanti Narayan, Delhi, S. Chand,1968.
3. Higher Engineering Mathematics: B.S. Grewal, Delhi, Khanna,1995.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–I)

COURSE TITLE: ORGANIC CHEMISTRY

COURSE CODE: FPHL-1086

Course outcomes:

Students will be able to

CO1: learn about the basic chemistry of organic chemistry.

CO2: interpret the reactions and properties of alcohols and Phenols and provide basic knowledge of organic reaction mechanisms.

CO3: understand preparations and reactions of ethers and epoxides, understand cleavages in ethers, the ring opening reactions of epoxides.

CO4: to resolve the different enantiomers and differentiate between dextrorotatory-leavorotatory chiral and achiral compounds,understand the concept of isomerism, conformation and configuration.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–I)

COURSE TITLE: ORGANIC CHEMISTRY

COURSE CODE: FPHL-1086

Examination Time: 3 Hours	**Max Marks: 75**	**Ext Marks: 60**
Credits: 3-0-0	**CA: 15**	**Pass Mark: 26**

Instructions for the Paper Setters: Eight questions of equal marks (Sixteen marks each) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

UNIT-I

Basics concepts of Organic Chemistry: Classification and Nomenclature of organic compounds. Electronic Effects: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation. Reactive intermediates: carbocations, carbanions, free radicals. Electrophiles and Nucleophiles. Nucleophilicity and basicity. Relative strengths of acids and bases, concept of p*K*a, effect of substituents and steric effects of substituents.

UNIT-II

Chemistry of functional groups–I: Selective methods of preparation: dehydration of alcohols, dehydrohalogenation of alkyl halides with complete mechanistic discussion. (E mechanism), Saytzeff's rule. Reactions: addition of hydrogen halides (Markovnikov's and anti-Markovnikov's addition), halogen addition to alkenes, epoxidation of alkenes. Acidity of acetylene, Birch reduction, addition of hydrogen halides and water to alkynes, Diels-Alder reaction.

UNIT-III

Chemistry of functional groups–II: Ethers and Epoxides: methods of their formation, Chemical reactions Cleavage and autoxidation, Zeisel's method, Acids and base catalysed ring opening of epoxide, Alkyl Halides, Types of Nucleophilic Substitution (SN1, SN2) reactions, solvent effect, substitution and elimination as competing reactions. Principles of nucleophilic addition to carbonyl groups: acetal formation, cyanohydrins formation; reactions with primary and secondary amines, Witting reaction, aldol condensation

UNIT-III

Stereochemistry: Introduction, Conformations of ethane and butane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Configuration: Geometrical and Optical isomerism, Molecular chirality, optical activity, absolute and relative configuration, the Cahn-Ingold

Perlog R-S notional system, physical properties of enantiomers, naming stereo isometric alkenes by the E/Z system.

Books suggested

1. R.T. Morison and R.N Boyd, Organic Chemistry.

2. I.L. Finar, Organic Chemistry, Vol. I- IV

3. J. March, Advanced Organic Chemistry, Reactions Mechanism and Structure.

4. F.A. Carey, Organic Chemistry.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–I)

COURSE TITLE: PHYSICS LAB-I

COURSE CODE: FPHP-1397

COURSE OUTCOMES:

After passing this course, students will be able to:

CO1: Students will demonstrate the ability to conduct a specific experiment from a given list, applying theoretical knowledge and practical skills to accurately complete the procedure and obtain reliable results.

CO2: Students will be able to articulate the theoretical background and principles underlying the chosen experiment.

CO3: Students will demonstrate their understanding of the experiment through oral questioning and discussion.

CO4: Students will maintain a well-organized and accurate practical file documenting all experiments conducted.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–I)

COURSE TITLE: PHYSICS LAB-I

COURSE CODE: FPHP-1397

Examination Time: 3 Hours	**Max Marks: 75**	**Ext Marks: 60**
Credits: 0-0-3	**CA: 15**	**Pass Mark: 26**

Instructions to Practical Examiner

Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar

General Guidelines for Practical Examination

I. The distribution of marks is as follows:

i) One experiment 30 Marks

ii) Brief Theory 10 Marks

iii) Viva–Voce 15 Marks

iv) Record (Practical file) 5 Marks

II. There will be one session of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 20.

IV. In a single group no experiment be allotted to more than three examinee in any group.

LIST OF EXPERIMENTS

1. Use of Vernier calliper, screw gauge and travelling microscope.
2. To determine the Moment of Inertia of a Flywheel.
3. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille‟s method).
4. To determine the Modulus of Rigidity of a Wire by Maxwell‟s needle.
5. To determine the value of g using Bar Pendulum.
6. To determine the value of g using Kater‟s Pendulum.
7. To determine mechanical equivalent of heat, J, by Callender and Barne‟S Constant flow method.
8. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton disc method.
9. To determine the temperature coefficient of resistance by Platinum Resistance Thermometer (Prt).
10. To Study the variation of Thermo-Emf of a thermocouple with difference of temperature of its two Junctions using a null method and also calibrate the thermocouple in a specified temperature range.
11. To calibrate a thermocouple to measure temperature in a specified range using Op-Amp difference amplifier and to determine neutral temperature.

Reference Books:

1. Practical Physics, C.L. Arora, S. Chand & Co.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–I)

COURSE TITLE: QUALITATIVE ORGANIC ANALYSIS LAB-I

COURSE CODE: FPHP-1088

COURSE OUTCOMES

Students will be able to analyze the given organic compound through

CO1:understand the basics of Qualitative analysis

CO2: detection of elements (N, S and halogens) in organic compounds.

CO3:detection of functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines,amides, nitro and anilide) in simple organic compounds

CO4: preparation of their derivatives

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–I)

COURSE TITLE: QUALITATIVE ORGANIC ANALYSIS LAB-I

COURSE CODE: FPHP-1088

Examination Time: 2 Hours	**Max Marks: 25**	**Ext Marks: 20**
Credits: 0-0-1	**CA: 5**	**Pass Mark: 9**

Instruction for practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

General Guidelines for Practical Examination

The preliminary examination of physical and chemical characteristics (Physical state, colour and odour), elemental analysis (nitrogen, sulphur, chlorine, bromine, iodine), solubility tests including acid-base reactions, classification tests involving functional reactivity other than acid-base test. The following categories of compounds should be analysed: phenols, carboxylic acids, carbonyl compounds- ketones and aldehydes, aromatic amines, amides.

Suggested Book:

1. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
2. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. Practical Organic Chemistry, 5 th Ed. Pearson (2012)
3. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).
4. Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press (2000).

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–II)

COURSE TITLE: ELECTRICITY AND MAGNETISM

COURSE CODE: FPHL-2393

COURSE OUTCOMES

Course Outcomes: Electricity and Magnetism-

After passing this course the students will be able to:

CO1: understand vector calculus and vector algebra and its applications in electricity and magnetism. The students will be able to solve the electrostatic problems with the help of Gauss law and Coulomb's law.

CO2: understand the applications of scalar potential for the calculation of electric field and electric potential due to an arbitrary charge distribution.

CO3: solve the problems with the help of method of images and understand the conduction of electric current and fundamental laws of electricity and relate the electric and magnetic fields in two inertial frames of reference.

CO4: able to understand electric field, potential and polarization of different media and related quantities.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–II)

COURSE TITLE: ELECTRICITY AND MAGNETISM

COURSE CODE: FPHL-2393

Examination Time: 3 Hours	**Max Marks: 100**	**Ext Marks: 80**
Credits: 4-0-0	**CA: 20**	**Pass Mark: 28**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT-I

Calculus of vectors: Introduction to gradient, divergence and curl; their physical significance. Rules for vector derivatives, useful relations involving gradient, divergence and curl. Fundamental theorem for gradients, Gauss's and Stoke's theorems(statements only). Electric Field and Electric Potential: Conservation and quantization of charge. Coulomb's law.

Electric field: Electric field lines, Electric flux. Gauss's law with applications to charge distributions with spherical, cylindrical and planar symmetry. Conservative nature of Electrostatic field. Electrostatic potential. Potential as line integral of field, potential difference.Derivation of the field from the potential. Potential of a point and line charge distribution, uniformly charged disc, spherical shell and solid sphere. Energy associated with an electric field. Electrostatic energy of a system of charges and of a charged sphere. The Uniqueness Theorem.Differential form of Gauss's law. Laplace's and Poisson's equations.Potential and electric field of a dipole. Force and torque on a dipole.

UNIT-II

Electric Fields Around Conductors: Conductors in an electrostatic field. Equipotential Surfaces.Method of Electrical Images for finding the potential and its application to Plane Infinite Sheet.

Dielectric Properties of Matter: Dielectrics.Effect of electric field on dielectrics. Electric field due to polarisation of dielectric, Polarisationvector. Dielectricconstant, Relation between electrical Susceptibility and Dielectric constant.Capacitor (parallel-plate, spherical and cylindrical) filled with dielectric. Dipole moment of an atom. Atomic polarizability, polarizing field in Dielectric.Clausius- Mosotti formula, Gauss's law for dielectrics.Permittivity of dielectric.Energy stored in a capacitor. Electric energy density. Displacement vector D. Relation between E, P and D.

UNIT-III

Magnetic Field: Definition of Magnetic Field B.Force on a (1) point charge (2) current carrying wire in a magnetic field. Torque on a current loop in a uniform magnetic field.Biot-Savart's Law and its simple applications: straight wire and circular loop. Current loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole).Magnetic force between current elements.Ampere's Circuital law and its application to (i) Solenoid and (ii) Toroid. Properties of B: curl and divergence. Vector Potential. **Magnetic Properties of Matter**: Response of various substances to magnetic fields. Magnetic dipole moment of current loop, Energy of magnetic dipole in external magnetic field.Magnetic dipole moment of atom.Orbital magnetic moment of an electron.Bohr Magneton. Types of magnetic materials.Properties of diamagnetic, paramagnetic and ferromagnetic substances. Magnetisation vector (M), Magnetic Intensity(H), Magnetic Susceptibility and Permeability.Relation between B, H, M. B-H curve and hysteresis.

UNIT-IV

Electrical Circuits: AC circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR circuit.

Fields of Moving Charges: Measurement of charge in motion, Electric field in different frames of references. Electric field due to moving charge. Relation between electric fields in two inertial frames, Interaction between moving charges.

Reference Books:

1. Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhary, 2012, Tata McGraw
2. Electricity and Magnetism, Edward M. Purcell, 1986 McGraw-Hill Education
3. Introduction to Electrodynamics, D.J. Griffiths, 3rdEdn., 1998, Benjamin Cummings.
4. Feynman Lectures Vol.2, R.P. Feynman, R.B Leighton, M. Sands,2008, Pearson Education
5. Elements of Electromagnetics, M.N.O. Sadiku, 2010, Oxford University Press
6. Electricity and Magnetism, J.H.Fewkes&J.Yarwood, Vol.I, 1991, Oxford Univ. Press
7. Electricity and Magnetism: A.K. Sikri. Pradeep Publications. 8. Electricity and Magnetism: A.S Mahajan and A.A Rangwala. Tata McGraw Hill

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–II)

COURSE TITLE: WAVES AND OSCILLATIONS

COURSE CODE: FPHL-2394

COURSE OUTCOMES

After passing this course the student will be able to:

CO1: demonstrate Lissajous figures by mechanical and analytical method with different cases.

CO2: understand fundamental description of harmonic oscillator, damped, forced and N- coupled oscillators with real examples from everyday life i.e. vibration isolation, shocker etc.

CO3: solve differential equations of forced oscillations & to obtain related quantities.

CO4: understand the concept of coupled oscillators and wave motion. Students will also be able to apply the concept of waves and oscillations to any type of waves like e. m. waves, mechanical waves.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(**Session-2024-25)**

Master of Science (FYIP) PHYSICS (SEMESTER–II)

COURSE TITLE: VIBRATIONS AND WAVES

COURSE CODE: FPHL-2394

Examination Time: 3 Hours **Max Marks: 100** **Ext Marks: 80**
Credits: 4-0-0 **CA: 20** **Pass Mark: 28**

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A- D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

UNIT-I

Damped Oscillations: Superposition of two SHM by vector addition, superposition of two perpendicular SHM, Polarization, Lissajous figures–superposition of many SHMs, complex number notation and use of exponential series. Damped motion of mechanical and electrical oscillator, heavy damping, critical damping. Damped single harmonic oscillator, amplitude decay, logarithmic decrement, relaxation time, energy decay, Q value, rate of energy decay equal to work rate of damping force, problems. **15 Lectures**

UNIT-II

Forced Oscillations: Transient and steady state behaviour of a forced oscillator, Variation of displacement and velocity with frequency of driving force, frequency dependence of phase angle between force and (a) displacement, (b) velocity, Vibration Insulation – Power supplied to oscillator, Q-value as a measure of power absorption bandwidth, Q-value as amplification factor of low frequency response.

15 Lectures

UNIT-III

Coupled Oscillations: Stiffness (or Capacitance) coupled oscillators, normal coordinates, degrees of freedom, normal modes of vibration, general method of finding normal modes, forced vibrations of two coupled oscillators, linear oscillations (two masses coupled by three springs) and their normal modes, transverse oscillations (one mass coupled with two springs, two masses coupled with three springs) and respective normal modes, N-coupled oscillators (longitudinal and vertical oscillations) and their normal modes and properties, inductance coupling of electrical oscillators, wave motion as the limit of coupled oscillations. **15 Lectures**

UNIT-IV

Wave Motion: The wave equation, transverse waves on a string, the string as a forced oscillator, characteristic impedance of a string, reflection and transmission of transverse waves at a boundary , impedance matching, insertion of quarter wave element, standing waves on a string of fixed length, normal modes and eigen frequencies. Energy in a normal mode of oscillation, wave groups, group velocity, dispersion, wave group of many components, bandwidth theorem, Doppler effect, sound waves in gases..

15 Lectures

Reference Books:

1. The Physics of Vibrations and Waves- H.J. Pain, John Wiley, Chichester, 1999
2. Vibrations and Waves in Physics- I.G. Main-Cambridge University, Cambridge, 1993.
3. Berkeley Physics Course Vol. III (Waves)-Frank S Crawford Jr-Frank S. Crawfold Jr, 1970.
4. Vibrations and Waves, George C King, Wiley Publication 2009.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(**Session-2024-25)**

Master of Science (FYIP) PHYSICS (SEMESTER–II)

COURSE TITLE: MATHEMATICS-II

COURSE CODE: FPHL-2335

Course outcomes

CO 1: Understand the concept of transformation and rotation of axes with the brief introduction of Conic section.

CO 2: Enhance their knowledge in the field of Solid Geometry.

CO 3: Explain the significance and Relation between the roots and co-efficients of polynomial equations and to identify the Solutions of biquadratic polynomial equations by Descartes and Ferrari's methods.

CO 4: Demonstrate the concept of Binary operations, Groups, Subgroups, Group table, Circle Group, Dihedral groups, Cyclic groups, Conjugate elements and Conjugacy classes,

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(**Session-2024-25)**

Master of Science (FYIP) PHYSICS (SEMESTER–II)

COURSE TITLE: MATHEMATICS-II

COURSE CODE: FPHL-2335

Examination Time: 3 Hours	**Max Marks: 100**	**Ext Marks: 80**
Credits: 4-0-0	**CA: 20**	**Pass Mark: 28**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries **16 marks.**

Note: Students can use Non-Scientific calculators or logarithmic tables**.**

UNIT –I

Coordinates Geometry(2D): Transformation of axes, shifting of origin, Rotation of axes, Parabola, Ellipse, Hyperbola and their properties; Tangent and normal, pair of tangents, Chord of contact for alltheconics; Identifications of curves represented by second degree equation (without derivation).

15 Hours

UNIT –II

Solid Geometry: Straight line and planes in Intersection of two and three planes, Intersection of a line and plane; Sphere, Section of a sphere by a plane, Intersection of a line and asphere, Intersection of two spheres; Right circular Cone, Right circular Cylinder, Tangent lines, Tangent planes, and normal lines to these surfaces. 15 Hours

UNIT –III

Polynomial equations: Relation between the roots and co-efficients of polynomial equations (in one variable), Horner's method, Transformation of equations and symmetric functions of roots, Descartes rule of signs, Newton's method of divisors, Cardano's method, Solutions of biquadratic polynomial equations by Descartes and Ferrari's methods. 15 Hours

UNIT –IV

Introduction to Groups: Binary operations, Groups, Subgroups, Group table, SU(2), SU(3), Heisenberg's Group, Circle Group, The Torus Group, Dihedral groups, Cyclic groups, Order of an element of a group, Conjugate elements and Conjugacy classes, Group Homomorphism and Isomorphism, Algebraic property, some standard algebraic properties (without proofs). 15 Hours

Text and Reference Books:

1. S. Narayan, Coordinate Geometry, Sultan Chand &Sons(2005).
2. S. Narayan, Analytical Solid Geometry, Sultan Chand &Sons(2005).
3. B.S. Grewal, Higher Engineering Mathematics: Khanna Publishers, Delhi (1995).
4. Mohan Singh, Topics in Maths, Lakshmi Publication, New Delhi,(1997)
5. N. S. Gopalakrishnan.: University Algebra, New Age International Publishers.(2007)

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(**Session-2024-25)**

Master of Science (FYIP) PHYSICS (SEMESTER–II)

COURSE TITLE: INORGANIC CHEMISTRY

COURSE CODE: FPHL-2086

COURSE OUTCOMES:

Students will be able to

CO1: Describe VBT, VSEPR theory and predicts the geometry of simple molecules & molecular orbital theory of homonuclear diatomic molecules, explain, predict & draw structures of simple ionic compounds.

CO2: To enrich the factual knowledge of chemistry related to theories of coordination complexes and calculation of C.F.S.E.

CO3: To develop an understanding of the concepts of structure and bonding of inorganic

complexes and calculate microstates and spectroscopic terms.

CO4: To familiarize with p-acid ligands.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) PHYSICS (SEMESTER–II)

COURSE TITLE: INORGANIC CHEMISTRY

COURSE CODE: FPHL-2086

Examination Time: 3 Hours	**Max Marks: 75**	**Ext Marks: 60**
Credits: 3-0-0	**CA: 15**	**Pass Mark: 26**

Instructions for the Paper Setters:
Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. **Each question carries 12 marks.**

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT- I

Introduction, Werner's coordination theory, naming of co-ordinate complexes. Co-ordination numbers 1-12 and their stereo-chemistries. Factors affecting co-ordination number and stereochemistry. Configurational Isomers, Conformational isomerism, VSPER theory, molecular orbital theory applied to homo-nuclear diatomic molecules. Bonding in metal complexes, Valence bond theory for co-ordinate complexes, inner and outer orbital complexes, Electro-neutrality and back bonding, limitations of V.B. theory. 12 Hours

UNIT- II

Stability of coordination compoundsIntroduction, Stability constant, stepwise stability constant, overall stability constant. Factors affecting the stability of metal ion complexes with general ligands, HSAB principle.Crystal field theory- Splitting of d-orbitals in octahedral, tetrahedral, cubic and square planar fields of ligands. Calculation of C.F.S.E. in high spin and low spin octahedral and High spin tetrahedral complexes, factors affecting the 10 Dq Value. Structural effects of crystal field splitting- Jahn-Teller distortion, variation of Ionic radii with increase in atomic number. Paramagnetism, diamagnetism, ferro and anti ferromagnetism. 12 Hours

UNIT- III

Microstates and spectroscopic terms, a calculation of spectroscopic terms for d1 - d10 electronic configurations, L S coupling, Hund's rule for finding the ground state terms, Electronic spectral properties of Ist transition series, Orgel Diagrams for d1 - d10 systems, for weak field octahedral and tetrahedral complexes, limitations of C.F.T. 11 Hours

UNIT- IV

p -Acid Ligands definition Carbon monoxide complexes, bonding in linear MCO groups, polynuclear metal carbonyls, vibrational spectra, carbonyl hydrides and halides. Metal-metal bonding, metal metal multiple bonding, Structure of high nuclearity carbonyl clusters, counting of electrons in carbonyl clusters.

10 Hours

Text and Reference Books:

1. J.E. Huheey, Inorganic Chemistry, 3rd Ed.
2. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry.
3. B.E. Douglas and D.H. McDaniel, Concepts and Models of Inorganic Chemistry

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(**Session-2024-25)**

Master of Science (FYIP) PHYSICS (SEMESTER–II)

COURSE TITLE: PHYSICS LAB-II

COURSE CODE: FPHP-2397

COURSE OUTCOMES:

After passing this course, students will be able to:

CO1: Students will demonstrate the ability to conduct a specific experiment from a given list, applying theoretical knowledge and practical skills to accurately complete the procedure and obtain reliable results.

CO2: Students will be able to articulate the theoretical background and principles underlying the chosen experiment.

CO3: Students will demonstrate their understanding of the experiment through oral questioning and discussion.

CO4: Students will maintain a well-organized and accurate practical file documenting all experiments conducted.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(**Session-2024-25)**

Master of Science (FYIP) PHYSICS (SEMESTER–II)

COURSE TITLE: PHYSICS LAB-II

COURSE CODE: FPHP-2397

Examination Time: 3 Hours	**Max Marks: 75**	**Ext Marks: 60**
Credits: 0-0-3	**CA: 15**	**Pass Mark: 26**

General Guidelines for Practical Examination

I. The distribution of marks is as follows:

i) One experiment 30 Marks

ii) Brief Theory 10 Marks

iii) Viva–Voce 15 Marks

iv) Record (Practical file) 5 Marks

II. There will be one session of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. In a single group no experiment be allotted to more than three examinee in any group.

LIST OF EXPERIMENTS

1. Use a Multimeter for measuring (a) Resistance, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses.
2. To study the characteristics of a RC Circuit.
3. To compare capacitances using De Sauty's bridge.
4. Measurement of field strength and its variation in a solenoid.
5. To verify the Thevenin and Norton theorems.
6. To verify the Superposition, and Maximum power transfer theorems.
7. To determine self-inductance of a coil by Anderson's bridge.
8. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q And (d) Band width
9. To study the response curve of a parallel LCR circuit and determine its a Anti resonant frequency and (b) Quality factor Q
10. To study C.R.O as a display and measuring device by reading sine and square waves.
11. To determine the capacity of a capacitor by discharging through voltmeter.
12. To find the capacity of a capacitor using flashing and quenching of a neon lamp.
13. To determine the frequency of an electric tuning fork by Melde‟s experiment and verifyλz–T law.
14. To investigate the motion of coupled oscillators.
15. To study Lissajous Figures.

Reference Books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. A Text Book of Practical Physics, I. Prakash& Ramakrishna, 11th Ed., 2011, KitabMahal
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinmann Educational Publishers
4. Engineering Practical Physics, S. Panigrahi and B. Mallick, 2015, Cengage Learning
5. A Laboratory Manual of Physics for undergraduate classes, D.P. Khandelwal, 1985, Vani Pub.
6. Practical Physics, C.L. Arora, S. Chand & Company.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(**Session-2024-25)**

Master of Science (FYIP) PHYSICS (SEMESTER–II)

COURSE TITLE: INORGANIC CHEMISTRY LAB

COURSE CODE: FPHP-2088

Course outcomes:

Students will be able

CO1: To develop technical skills relevant to quantitative analysis.

CO2: Will have knowledge of cationa and anions.

CO3: To separate and identify the various ions present in the mixture.

CO4: To perform confirmatory tests of various ions present in the mixture.

Master of Science (Semester System) (12+3+2 System of Education with multiple Entries and Exits)

(**Session-2024-25)**

Master of Science (FYIP) PHYSICS (SEMESTER–II)

COURSE TITLE: INORGANIC CHEMISTRY LAB

COURSE CODE: FPHP-2088

Examination Time: 3 Hours	**Max Marks: 25**	**Ext Marks: 20**
Credits: 0-0-1	**CA: 5**	**Pass Mark: 9**

1. Identification of cations and anions in a mixture which may contain four ions (cations and anions).

2. Perform systematic group analyses to identify the cations in the mixture. Any cation from Group I, Group II (Group IIA and IIB) Group IV, Group V and Group VI may be present.

Reference Books:

Vogel's book on Inorganic Qualitative Analysis