Annexure B

FACULTY OF SCIENCES

SYLLABUS
of
Physics
For

Bachelor of Science
(Non-Medical & Computer Science)
(Semester I -IV)

(Under Credit Based Continuous Evaluation Grading System)
(12+3+2 System of Education)

Session: 2025-26

The Heritage Institution
KANYA MAHA VIDYALAYA
JALANDHAR

SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME
Bachelor of Science (Non-Medical/ Computer Science)/ Honours
Session-2025-26

Bachelor of Science (Non-Medical/ Computer Science)/ Honours Semester-I								
Course Code	Course Name	Course Type	Credits	Total Marks	Ext.		CA	Examination time (in Hours)
					L	P		
BSNL/BCSL-1421 BSNL/BCSL-1031 BSNL/BCSL-1431	Punjabi (Compulsory) [1]Basic Punjabi [2]Punjab History and Culture	C	4-0-0	100	70	-	30	3
BSNL/BCSL-1212	English Language Skills-I	AEC	4-0-0	100	70		30	3
BSNL/BCSL-1333	Mathematics (Algebra)	DSC	4-0-0	100	70		30	3
BSNP/BCSP-1333	Algebra Laboratory		0-0-1	50		35	15	3
BSNL-1084	Chemistry (Inorganic Chemistry-I: Atomic Structure and Periodic Table)	DSC	4-0-0	100	70		30	3
BSNP-1084	Inorganic Chemistry-I: Lab Qualitative Analysis		0-0-2	50		35	15	3
BCSM-1134	Computer Science (Computer Fundamentals and PC Software)	DSC	3-0-1	100	40	30	30	3+3
BSNL/BCSL-1395	Physics (Electricity and Magnetism)	DSC	4-0-0	100	70		30	3
BSNP/BCSP-1395	Electricity and Magnetism Lab		0-0-2	50		35	15	3

*VACF-1491	Foundation Course	VAC	2-0-0	50	35		15	1

Kanya Maha Vidyalaya, Jalandhar ***(Autonomous)***

SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR UNDERGRADUATE DEGREE PROGRAMME

Bachelor of Science (Non-Medical/ Computer Science)/ Honours

Session-2025-26

Bachelor of Science (Non-Medical/ Computer Science)/ Honours Semester-II

Course Code	Course Name	Course Type	Credits	Total Marks	Ext.		CA	Examination (in Hours)
					L	P		
BSNL/BCSL-2421 BSNL/BCSL-2031 BSNL/BCSL-2431	Punjabi (Compulsory) [1]Basic Punjabi [2]Punjab History and Culture	C	4-0-0	100	70	-	30	3
BSNL/BCSL-2212	Appreciating English Literature-I	MDC	4-0-0	100	70		30	3
BSNL/BCSL-2333	Mathematics (Advanced Calculus)	DSC	4-0-0	100	70		30	3
BSNP/BCSP-2333	Calculus Laboratory		0-0-1	50		35	15	3
BSNL-2084	Chemistry (Organic Chemistry-I: Hydrocarbons and Alkyl Halides)	DSC	4-0-0	100	70		30	3
BSNP-2084	Organic Chemistry-I: Lab Functional Group Analysis		2	50		35	15	3
BCSM-2134	Computer Science (Introduction to Programming in C)	DSC	3-0-1	100	40	30	30	3
BSNL/BCSL-2395	Physics (Mechanics, Vibrations and Waves)	DSC	4-0-0	100	70		30	3
BSNP/BCSP-2395	Mechanics Lab		0-0-2	50		35	15	3
**BSNM/BCSL-2330	Statistical Analysis Using Spreadsheet	SEC	1-0-0	50	35	30	15	3
**BSNM/BCSP-2330	Statistical Analysis Using spreadsheet Laboratory	SEC	0-0-2	50	0	35	15	3
*VACD-2161	Moral Education with focus on Drug Abuse and Human Rights (Compulsory)	VAC	2-0-0	50	35		15	3

[1] Special paper in lieu of Punjabi (Compulsory) for those who have not studied Punjabi .

[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.

** Student Can opt any one of the given course

C- Compulsory
MDC- Multi Disciplinary Course
DSC-Discipline Specific Course
SEC- Skill Enhancement Course
VAC-Value Added Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME

Bachelor of Science (Non-Medical & Computer Science)

Session-2025-26

Bachelor of Science (Non-Medical/ Computer Science)/ Honours Semester-III								
Course Code	Course Name	Course Type	Credits	Total Marks	ESE		CA	Examination time (in Hours)
					L	P		
BSNL/BCSL-3421 BSNL/BCSL-3031 BSNL/BCSL-3431	Punjabi (Compulsory) [1]Basic Punjabi [2]Punjab History and Culture (From Earliest Times To C 320)	C	4-0-0	100	70	-	30	3
BSNL/BCSL-3212	English Language Skills- II	MDC	4-0-0	100	70		30	3
BSNL/BCSL-3333	Mathematics (Differential Equations)	DSC	4-0-0	100	70		30	3
BSNP/BCSP-3333	Differential equations Lab		0-0-1	50		35	15	3
BSNL-3084	Chemistry -I (Physical states of Matter and Electrochemistry)	DSC	4-0-0	100	70		30	3
BSNP-3084	Physical Chemistry-I Lab		0-0-2	50		35	15	3
BCSM-3134	Computer Science (Computer Oriented Numerical and Statistical Methods)	DSC	3-0-1	100	40	30	30	3+3
BSNL/BCSL-3395	Physics (Statistical Physics and Thermodynamics)	DSC	4-0-0	100	70		30	3
BSNP/BCSP-3395	Optics Lab		0-0-2	50		35	15	3
*VACG-3531	Gender Sensitization	VAC	2-0-0	50	35		15	1

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[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.

C- Compulsory
AEC-Ability Enhancement Course
DSC-Discipline Specific Course
VAC-Value Added Course

Kanya Maha Vidyalaya, Jalandhar *(Autonomous)*

SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR YEAR UNDERGRADUATE DEGREE PROGRAMME

Bachelor of Science (Non-Medical/ Computer Science)/ Honours

Session-2025-26

Bachelor of Science (Non-Medical/ Computer Science)/ Honours Semester-IV

Course Code	Course Name	Course Type	Credits	Total Marks	ESE		CA	Examination time (in Hours)
					L	P		
BSNL/BCSL-4421 BSNL/BCSL-4031 BSNL/BCSL-4431	Punjabi (Compulsory) [1]Basic Punjabi [2]Punjab History and Culture	C	4-0-0	100	70	-	30	3
BSNL/BCSL-4212	Appreciating English Literature -II	AEC	4-0-0	100	70		30	3
BSNL/BCSL-4333	Mathematics Analysis	DSC	4-0-0	100	70		30	3
BSNP/BCSP-4333	Analysis Laboratory		0-0-1	50		35	15	3
BSNL-4084	Inorganic Chemistry-II (Periodic Table and Coordination)	DSC	4-0-0	100	70		30	3
BSNP-4084	Inorganic Chemistry-II Lab		0-0-2	50		35	15	3
BCSM-4134	Computer Science (Data Structures and file processing using C++)	DSC	4-0-0	100	40	30	30	3+3
BSNL/BCSL-4395	Physics (Quantum Physics)	DSC	4-0-0	100	70		30	3
BSNP/BCSP-4395	THERMAL & MODERN PHYSICS LAB		0-0-2	50		35	15	3
**BSNM/BCSM-4390	Applied Optics	SEC	3-0-0	100	70		30	3
*VACE-4221	Environment studies (Compulsory)	VAC	2-0-0	50	20	15	15	3

[1] Special paper in lieu of Punjabi (Compulsory) for those who have not studied Punjabi .

[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.

** Student Can opt any one of the given course

C- Compulsory
MDC- Multi Disciplinary Course
DSC-Discipline Specific Course
SEC- Skill Enhancement Course
VAC-Value Added Course

PROGRAM SPECIFIC OUTCOMES (PSOs)

Programme Specific Outcomes of Bachelor of Science (Non-Medical/ Computer Science)/ Honours

PSO 1: Scientific Knowledge and Application:
Develop a comprehensive understanding of foundational and advanced concepts in Physics, Chemistry, Mathematics, and Computer Science. Apply this knowledge to real-world problems and scientific investigations.

PSO 2: Problem-Solving Skills:
Employ critical thinking and mathematical reasoning to analyze scientific problems and implement appropriate solutions using theoretical and practical approaches.

PSO 3: Laboratory Proficiency:
Gain hands-on experience through well-structured laboratory courses that develop experimental, observational, analytical, and documentation skills.

PSO 4: Programming and Computational Skills:
Acquire skills in computer programming (e.g., in C language) and computational tools (e.g., Excel, data analysis software), preparing students for research, industry, or further studies in data and computer sciences.

PSO 5: Effective Communication:
Enhance communication skills through compulsory language courses, presentations, report writing, and collaborative project work.

PSO 6: Multidisciplinary Integration:
Learn to integrate knowledge across multiple disciplines such as literature, computer science, and chemistry, enabling a holistic educational experience.

PSO 7: Ethical and Social Responsibility:
Engage with Value-Added Courses (VAC) such as Moral Education, Gender Sensitization, and Environment Studies, instilling awareness of ethical, social, and environmental responsibilities.

PSO 8: Digital and Analytical Skills:
Use modern tools like Excel for statistical analysis and simulation, equipping students with workplace-ready digital skills.

Bachelor of Science (Semester System) (12+3+1 System of Education)
(**Session-2025-26)**

Bachelor of Science (SEMESTER–I)

Course Title: Physics (Electricity And Magnetism)

Course code: BSNL-1395 for Bachelor of Science (Non Medical)
BCSL-1395 for Bachelor of Science (Computer Science)

COURSE OUTCOMES:

After passing this course, 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: They will be able to find the electric potential and electric field of various charge distributions with the help of methods of images. Students will understand the conduction of electric current in conductors by studying Ohm's law and equation of continuity.

CO4: They will be able to find the relationship between electric fields from two different inertial frames of reference. They will learn the origin of magnetism and properties of various kinds of magnetic materials.

Bachelor of Science (Semester System) (12+3+1 System of Education)
(Session-2025-26)
Bachelor of Science (SEMESTER–I)
Course Title: Physics (Electricity And Magnetism)
Course code: BSNL-1395 for Bachelor of Science (Non Medical)
BCSL-1395 for Bachelor of Science (Computer Science)

Credits: 4-0-0 **Max Marks: 100 (ESE Marks: 70, CA: 30)**
Examination Time: 3 Hours **Pass Mark: 25**

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. Each question carries 14 marks.

UNIT-I

Basic ideas of Vector Calculus Gradient, Divergence, curl and their physical significance. Laplacian in rectangular, cylindrical and spherical coordinates. Coulomb's Law for point charges and continuous distribution of charges. Electric field due to dipole, line charge and sheet of charge. Electric flux, Gauss's Law and its applications. Gauss's divergence theorem and differential form of Gauss's Law. Green's theorem.

UNIT-II

Work and potential difference. Potential difference as line integral of field. Electric potential due to a point charge, a group of point charges, dipole and quadrupole moments, long uniformly charged wire, charged disc. Stokes' Theorem and its applications in the Electrostatic field, curl E=0. Electric fields as gradient of scalar potential. Calculation of E due to a point charge and dipole from potential. Potential due to arbitrary charge distribution and multipole moments.

UNIT-III

Poisson and Laplace's equation and their solutions in Cartesian and spherical coordinates. Concept of electrical images. Calculation of electric potential and field due to a point charge placed near an infinitely conducting sheet. Current and current density, equation of continuity. Microscopic form of Ohm's Law ($J=\sigma E$) and conductivity, Failure of Ohm's Law.

UNIT-IV

Interaction between moving charges and force between parallel currents. Behaviour of various substances in the magnetic field. Definition of M and H and their relation to free and bound currents. Permeability and susceptibility and their interrelationship. Orbital motion of electrons and diamagnetism, Paramagnetism and Ferromagnetism, Maxwell's equations, boundary conditions, electromagnetic induction and applications.

Books Suggested:

1. Fundamentals of Electricity and Magnetism: Arthur F. Kipp.
2. Electricity and Magnetism, Berkeley Physics Course: Vol. II, E.M. Purcell.
3. Introduction to Classical Electrodynamics: David Griffith.
4. EM Waves and Radiating System: Edward C. Jordan and K.G. Balmain.
5. Fields and Waves Electromagnetic: David K. Cheng.

Bachelor of Science (Semester System) (12+3+1 System of Education)
SEMESTER–I
(**Session-2025-26)**
Course Title: Electricity and Magnetism Lab
Course Code: BSNP-1395 for Bachelor of Science (Non Medical)
BCSP-1395 for Bachelor of Science (Computer Science)

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.

Bachelor of Science (Semester System) (12+3+1 System of Education)
SEMESTER–I
(Session-2025-26)
Course Title: Electricity and Magnetism Lab
Course code: BSNP-1395 for Bachelor of Science (Non Medical)
BCSP-1395 for Bachelor of Science (Computer Science)

Credits: 0-0-2 **Max Marks: 50 (ESE Marks: 35, CA: 15)**
Examination Time: 3 Hours **Pass Mark: 13**

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

The distribution of marks is as follows :

i) One experiment 15 Marks
ii) Brief Theory 7 Marks
iii) Viva–Voce 7 Marks
iv) Record (Practical file) 6 Marks

II. There will be one session of 2 hours duration. The paper will have one session. Paper 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. The number of candidates in a group for practical examination should not exceed 12.

IV. In a single group, no experiment should be allotted to more than three examinees.

LIST OF EXPERIMENTS

1. To determine low resistance with Carey-Foster's Bridge.
2. To study the magnetic field produced by a current carrying solenoid using a search coil and calculate permeability of air.
3. To study the induced e.m.f. as a function of the velocity of the magnet.
4. Study of phase relationships using impedance triangle for LCR circuit and calculate impedance.
5. Resonance in a series LCR circuits for different R–value and calculate Q–value.
6. Resonance in parallel LCR circuits for different R-value and calculate Q-value.
7. Capacitance by flashing and quenching a neon lamp.
8. To compare capacitance of two capacitors by de–Sauty's bridge.
9. To determine L using Anderson Bridge.
10. To find the value of BH, the horizontal component of earth's magnetic field in the lab using a deflection & vibration magnetometer.
11. To study the variation of the magnetic field with distance along the axis of a coil carrying current by plotting a graph.

Bachelor of Science (Semester System) (12+3+1 System of Education)
SEMESTER-II
(Session-2025-26)
Course code: BSNL-2395 for Bachelor of Science (Non-Medical)
BCSL-2395 for Bachelor of Science (Computer Science)
COURSE TITLE: PHYSICS (MECHANICS, VIBRATIONS & WAVES)

COURSE OUTCOMES:

After passing this course,

CO1: Students will master the principles of classical mechanics, including coordinate systems, conservation laws, central forces, Kepler's laws, inertial and non-inertial frames, Coriolis force, collisions, rigid body dynamics, and gyroscopic motion, equipping them to solve complex physical problems and analyze real-world applications.

CO2: Students will understand the fundamentals of special relativity, including Newtonian relativity, Galilean and Lorentz transformations, relativistic effects like time dilation, length contraction, and velocity addition, as well as key experiments such as Michelson-Morley and Fizeau's. They will also explore mass-energy equivalence, relativistic momentum, energy transformations, and phenomena like starlight aberration and the Doppler effect, enabling them to analyze the principles governing modern physics.

CO3: Students will understand the principles of simple harmonic motion (SHM), energy of an SHO, and oscillatory systems like compound and torsional pendulums. They will analyze electrical and transverse vibrations, the superposition of SHMs, and the effects of damping, including the determination of damping coefficient, relaxation time, logarithmic decrement, and Q-factor, enabling them to solve real-world vibration and oscillation problems.

CO4: Students will understand the dynamics of forced mechanical and electrical oscillators, resonance, and energy variations with frequency. They will analyze coupled oscillators, normal modes, wave equations, and wave behavior at boundaries, including reflection, transmission, and impedance matching. Additionally, they will explore standing waves, energy of vibrating strings, and wave and group velocity, equipping them with the skills to solve advanced wave and oscillation problems.

Bachelor of Science (Semester System) (12+3+1 System of Education)
SEMESTER-II
(Session-2025-26)
Course code: BSNL-2395 for Bachelor of Science (Non-Medical)
BCSL-2395 for Bachelor of Science (Computer Science)
COURSE TITLE: PHYSICS (MECHANICS, VIBRATIONS and WAVES)
Credits: 4-0-0 **Max Marks: 100 (ESE Marks: 70, CA: 30)**
Examination Time: 3 Hours **Pass Mark: 25**

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

UNIT-I

Cartesian and spherical polar co–ordinate systems, area, volume, velocity and acceleration in these systems. Solid angle, relationship of conservation laws and symmetries of space and time. Various forces in nature (Brief introduction) centre of mass, equivalent one-body problem, central forces, equation of motion under central force, equation of orbit and turning points. Kepler's Laws. Inertial frame of reference. Galilean transformation and invariance. Non-inertial frames, Coriolis force and its applications. Variation of acceleration due to gravity with latitude. Foucault pendulum, elastic collision in Lab and C.M. system, Rigid body motion; rotational motion, principal moments and axes, moments of Inertia, Euler's equations, precession and elementary gyroscope.

Lectures 15

UNIT-II

Newtonian relativity and Galilean transformations, attempts to locate the absolute frame of reference; Fizeau's experiment; Michelson-Morley experiment & ether drag hypothesis; Lorentz-Fitzgerald contraction; Einstein's basic postulates of relativity and geometric derivation of Lorentz transformations; length contraction; relativity of simultaneity; synchronization and time dilation; Einstein's velocity addition rule; transformation of acceleration; Aberration (relativistic) of star light and relativistic Doppler effect; variation of mass with velocity; mass-energy equivalence; relativistic formulae for momentum and energy; transformation of momentum, energy and force.

Lectures 15

UNIT-III

Simple harmonic motion, energy of an SHO. Compound pendulum. Torsional pendulum Electrical oscillations, Transverse vibrations of a mass on string, superposition of two perpendicular SHMs having periods in the ratio 1:1 and 1:2, Decay of free Vibrations due to damping. Differential equation of damped harmonic motion, types of motion, types of damping. Determination of damping coefficient logarithmic decrement, relaxation time and Q–Factor. **Lectures 15**

UNIT-IV

Differential equation for forced mechanical and electrical oscillators. Transient and steady state behaviour. Displacement and velocity variation with driving force frequency, variation of phase with frequency, resonance. Power supplied to an oscillator and its variation with frequency. Coupled oscillators, Normal co–ordinates and normal modes of vibration. Inductive coupling of electrical oscillators.Types of waves, wave equation (transverse) and its solution, characteristic impedance of a string. Impedance matching. Reflection and transmission of waves at boundary. Reflection and transmission of energy. Reflected and transmitted energy coefficients. Standing waves on a string of fixed length. Energy of vibrating string. Wave and group velocity.

Lectures 15

Books Suggested:-

1. Mechanics, Berkeley Vol.–I, C. Kittle.
2. Mechanics, H.S. Hans & S.P. Puri
3. Introduction to Relativity, Robert Resnick
4. Special Relativity by A. P. French
5. Fundamentals of Vibrations and Waves: S.P. Puri.

6. Physics of Vibrations and Waves: H. J. Pain
7. Vibrations and Wave by A. P. French

Bachelor of Science (Semester System) (12+3+1 System of Education)

SEMESTER–II

(**Session-2025-26)**

COURSE TITLE: Mechanics Lab

Course code: BSNP-2395 for Bachelor of Science (Non Medical)
BCSP-2395 for Bachelor of Science (Computer Science)

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.

Bachelor of Science (Semester System) (12+3+1 System of Education)

SEMESTER–II

(Session-2025-26)

COURSE TITLE: Mechanics Lab

Course code: BSNP-2395 for Bachelor of Science (Non Medical)
BCSP-2395 for Bachelor of Science (Computer Science)

Credits: 0-0-2 **Max Marks: 50 (ESE Marks: 35, CA: 15)**
Examination Time: 3 Hours **Pass Mark: 13**

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

The distribution of marks is as follows :

i) One experiment 15 Marks
ii) Brief Theory 7 Marks
iii) Viva–Voce 7 Marks
iv) Record (Practical file) 6 Marks

II. There will be one session of 2 hours duration. The paper will have one session. Paper 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. The number of candidates in a group for practical examination should not exceed 12.

IV. In a single group, no experiment should be allotted to more than three examinees.

LIST OF EXPERIMENTS

1. To study the dependence of moment of inertia on distribution of mass (by noting time periods of oscillations using objects of various geometrical shapes but of same mass).
2. To establish a relationship between torque and angular acceleration using a flywheel.
3. To find the moment of inertia of a flywheel.
4. Study of bending of beams and determination of Young's modulus.
5. Determination of Poisson's ratio for rubber.
6. To determine energy transfer, coefficient of restitution and verify laws of conservation of linear momentum and kinetic energy in elastic collisions using one dimensional collisions of hanging spheres.
7. To verify the laws of vibrating strings by Melde's experiment.
8. Measure time period as a function of distance of center of suspension (oscillation) from center of mass, plot relevant graphs, determine radius of gyration and acceleration due to gravity.
9. Find the value of 'g' by Kater's pendulum.
10. Measure time period of oscillation of a Maxwell needle and determine modulus of rigidity of the material of a given wire.
11. To measure logarithmic decrement, coefficient of damping, relaxation time, and quality factor of a damped simple pendulum.
12. To determine the moment of inertia of a rectangular bar about an axis through its C.G. by the method of coincidence
13. To study one dimensional elastic collision using two hanging spheres.

14. To determine the frequency of a tuning fork using a sonometer.
15. To verify the laws of transverse vibrations of stretched strings using a sonometer.

Bachelor of Science (Semester System) (12+3 System of Education)

SEMESTER-III

(Session-2025-26)

PHYSICS (STATISTICAL PHYSICS AND THERMODYNAMICS)

Course code: BSNM-3395 (I) for Bachelor of Science (Non Medical)
BCSM-3395 (I) for Bachelor of Science (Computer Science)

COURSE OUTCOMES:

After passing this course, students will be able to:

CO1: Understand and explain the foundational concepts of statistical physics, including microstates, macrostates, thermodynamic probability, and equilibrium in systems of distinguishable particles.

CO2: Apply the principles of classical and quantum statistics, including Maxwell-Boltzmann (MB), Bose-Einstein (BE), and Fermi-Dirac (FD) statistics, to analyze the behavior of ideal gases and radiation.

CO3: Evaluate the concept of entropy from a statistical viewpoint and describe its implications for reversible and irreversible processes, including applications to thermodynamic systems such as the Carnot cycle.

CO4: Analyze and derive Maxwell's thermodynamic relations, explain the Joule-Thomson effect, and understand thermodynamic processes like adiabatic expansion and compression.

Bachelor of Science (Semester System) (12+3 System of Education)

SEMESTER-III

(Session-2025-26)

PHYSICS (STATISTICAL PHYSICS AND THERMODYNAMICS)

Course code: BSNL-3395 for Bachelor of Science (Non Medical)
BCSL-3395 for Bachelor of Science (Computer Science)

Credits: 4-0-0 **Max Marks: 100 (ESE Marks: 70, CA: 30)**
Examination Time: 3 Hours **Pass Mark: 25**

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. Each question carries 14 marks.

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

UNIT–I

Basic ideas of Statistical Physics, Scope of Statistical Physics, Basic ideas about probability, Distribution of four distinguishable particles into compartments of equal size. Concept of macro states, microstates, Thermodynamic Probability, Effects of constraints on the system. Distribution of particles in two compartments, Deviation from the state of maximum probability. Equilibrium state of dynamic system, Distribution of distinguishable n particles in k compartments of unequal sizes.

UNIT–II

Phase space and division into elementary cells. Three kinds of statistics. The basic approach in three statistics. Maxwell Boltzmann (MB) statistics applied to an ideal gas in equilibrium. Experimental verification of the law of distribution of molecular speeds. Need for Quantum Statistics – B.E. Statement of Planck's law of Radiation Wien's Displacement and Stefan's law. Fermi Dirac (FD) statistics. Comparison of M.B, B.E and F.D statistics.

UNIT–III

Statistical definition of entropy, Change of entropy of system, additive nature of entropy, Law of increase of entropy, Reversible and irreversible processes, and their examples, work done in reversible process, examples of increase in entropy in natural processes, entropy and disorder, Brief review of Terms, Laws of Thermodynamics, Carnot Cycle, Entropy changes in Carnot cycle, , Applications of thermodynamics to thermoelectric effect, change of entropy along reversible path in P-V diagram. Heat death of universe.

UNIT–IV

Derivation of Maxwell Thermodynamics relations, Cooling produced by adiabatic stretching, A diabetic Compression, change of internal energy with volume, Specific heat and constant pressure and constant volume. , Joule-Thomson effect, Expression for C_P-C_V, Change of state and Clapeyron equation.

Text Reference Books:

1. Statistical Mechanics: B.B. Laud, (Macmillan India Ltd.) 1981.
2. Statistical Physics: J. K. Bhattacharjee, (Allied Pub., Delhi) 2000.
3. Statistical Physics and Thermodynamics: V.S. Bhatia
4. A Treatise on Heat: M.N. Saha & B.N. Srivastava (The Indian Press Pvt. Ltd., Allahabad), 1965.
5. Heat and Thermodynamics, Mark Zemansky and Richard Dittman McGraw Hill and Co.
6. Thermal and Statistical Physics-Concepts and Applications : S. Sharma, (Ane Books Pvt. Ltd. 2021)

Bachelor of Science (Semester System) (12+3 System of Education)

SEMESTER-III

(Session-2025-26)

Course code: BSNP-3395 for Bachelor of Science (Non Medical)

BCSP-3395 for Bachelor of Science (Computer Science)

OPTICS LAB

COURSE OUTCOMES:

After passing this course, students will be able to:

CO1: Demonstrate the ability to set up and conduct optical experiments such as determining the refractive index, Cauchy's constants, and wavelength of light using instruments like the spectrometer, Newton's rings, and diffraction gratings.

CO2: Analyze and interpret interference and diffraction patterns to determine key physical parameters such as wavelength, dispersive power, and resolving power of optical instruments.

CO3: Apply geometrical optics principles to measure accessible and inaccessible heights using a sextant, reinforcing practical understanding of angular measurement techniques.

CO4: Understand and verify statistical principles through experiments like the coin toss, and apply Young's double-slit experiment to study wave nature of light and laser wavelength determination.

Bachelor of Science (Semester System) (12+3 System of Education)

SEMESTER-III

OPTICS LAB

(PRACTICAL)

(Session-2025-26)

Course code: BSNM-3395(P) for Bachelor of Science (Non Medical)
BCSM-3395(P) for Bachelor of Science (Computer Science)

Credits: 0-0-2 **Max Marks: 50 (ESE Marks: 35, CA: 15)**
Examination Time: 3 Hours **Pass Mark: 13**

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

The distribution of marks is as follows :

i) One experiment 15 Marks
ii) Brief Theory 7 Marks
iii) Viva–Voce 7 Marks
iv) Record (Practical file) 6 Marks

II. There will be one session of 2 hours duration. The paper will have one session. Paper 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. The number of candidates in a group for practical examination should not exceed 12.

IV. In a single group, no experiment should be allotted to more than three examinees.

List of Experiments

1. To determine the refractive index of glass/ liquid using a spectrometer.
2. To determine the Cauchy's constants.
3. To study the refractive index of a doubly refracting prism.
4. To set up Newton's rings to determine wavelength of sodium light.
5. To determine the wavelength by using plane diffraction grating (Use Hg source)
6. To determine dispersive power of plane diffraction grating.
7. To determine resolving power of a telescope.
8. To determine resolving power of a grating.
9. To measure an accessible (Horizontal and vertical) height using sextant.
10. To measure inaccessible height by using sextant.
11. Verify laws of probability distribution by throwing similar coins.
12. To determine the wavelength of given laser source using Young's double slit experiment

Bachelor of Science (Semester System) (12+3 System of Education)

SEMESTER-IV

PHYSICS (QUANTUM PHYSICS)

(**Session-2025-26)**

Course code: BSNL-4395 for Bachelor of Science (Non Medical)

BCSL-4395 for Bachelor of Science (Computer Science)

COURSE OUTCOMES:

After passing this course, students will be able to:

CO1: Understand and explain the fundamental principles leading to the development of quantum mechanics, including wave-particle duality, the De Broglie hypothesis, uncertainty principle, and the photoelectric and Compton effects.

CO2: Apply the operator formalism in quantum mechanics to calculate expectation values, understand the Ehrenfest theorem, and work with Hermitian operators, eigenfunctions, and eigenvalues.

CO3: Solve one-dimensional quantum mechanical problems using the Schrödinger equation, such as step potentials, potential barriers, and particle in a box, and explain phenomena like quantum tunneling.

CO4: Analyze three-dimensional quantum systems, including the particle in a 3D box, the 3D harmonic oscillator, and the hydrogen atom, using Cartesian and spherical coordinate solutions of the Schrödinger equation.

Bachelor of Science (Semester System) (12+3 System of Education)

SEMESTER–IV

(**Session-2025-26)**

PHYSICS (QUANTUM PHYSICS)

Course code: BSNL-4395 for Bachelor of Science (Non Medical)
BCSL-4395 for Bachelor of Science (Computer Science)

Credits: 4-0-0 **Max Marks: 100 (ESE Marks: 70, CA: 30)**
Examination Time: 3 Hours **Pass Mark: 25**

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. Each question carries 14 marks.

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

UNIT–I

Formalism of Wave Mechanics:

Brief introduction to need and development of quantum mechanics, photoelectric effect, Compton effect, Wave particle duality, De broglie hypothesis, Uncertainty principle, Gaussian wave packet, Operator correspondence, Normalization and probability interpretation of wave function, Superposition principle.

UNIT–II

Expectation value, Probability current and conservation of probability, Admissibility conditions of wave function, Ehrenfest theorem, Eigen function and Eigen value, Operator formalism, orthogonal system, expansion in eigen functions, Hermitian operator, simultaneous eigen function, equation of motion.

UNIT–III

Application of Schrodinger wave equation to one dimensional problems:

Application of Schrodinger Equation for solving one dimensional problems: Fundamental postulates of wave mechanics, Schrodinger's wave equation for a free particle and equation of a particle subject to forces. One dimensional step potential for $E>V_0$, one dimensional step potential for $0<E<V_0$, one dimensional potential barrier of finite height and width, Quantum mechanical tunnelling effect, particle in one dimensional box with infinitely hard walls, one dimensional square well of finite depth

UNIT–IV

Application of Schrodinger equation to three dimensional problems:

Free particle in three dimensional rectangular box, Eigen wave function, Eigenvalues of momentum, energy and degeneracy, three dimensional harmonic oscillator (Cartesian coordinates) wave function, energy levels, degeneracy, Schrodinger's wave equation in spherical polar coordinates, Schrodinger wave equation for spherically symmetric potential for hydrogen atom, wave function of H atom, solution of R(r),∪( ),√( ) equations.

Text Reference Books:

1. A Text book of Quantum Mechanics by P.M. Mathews and K. Venkatesan,(Tata McGraw Hill Pub. Co. Delhi) 2002.
2. Quantum Mechanics by J.L. Powell and B. Craseman (Narosa Pub. House, New Delhi) 1997.
3. Concepts of Modern Physics by Arthur Beiser (McGraw Hill Pub. Co., New Delhi, 9th Ed.) 1995.
4. Elements of Modern Physics by S.H. Patil (McGraw Hill), 1998.
5. Quantum Mechanics by E. Merzbacher (John Wiley, 2nd Edition)
6. Fundamentals of Molecular Spectroscopy by C.N. Banwell (Tata McGraw Hill Pub. Co.Delhi), 2001.
7. Atomic Spectra by H.G. Kuhn (Longmans), 2nd Ed., 1969.
8. Introduction to Quantum Mechanics by L. Pauling and E.B. Wilson (Tata McGraw Hill Pub. Co., Delhi), 2002.
9. Quantum Mechanics by W. Greiner (Springer Verlag), 1994.
10. Fundamentals of Molecular Spectroscopy by C.B. Banwell-Tata McGraw Hill, 1986.
11. Molecular Spectroscopy: Jeanne L McHale.

Bachelor of Science (Semester System) (12+3 System of Education)

SEMESTER–IV

(Session-2025-26)

Course Title: THERMAL & MODERN PHYSICS LAB (PRACTICAL)

Course code: BSNP-4395 for Bachelor of Science (Non Medical)

BCSP-4395 for Bachelor of Science (Computer Science)

COURSE OUTCOMES:

After passing this course, students will be able to:

CO1: Perform and analyze thermal experiments to determine physical properties such as thermal conductivity, adiabatic expansion, and heating efficiency, using methods like Lee's method and controlled electric heating.

CO2: Investigate thermoelectric and optical phenomena by plotting the calibration curve of a thermocouple, studying the absorption spectra of iodine vapors, and analyzing the inverse square law using a photovoltaic cell.

CO3: Explore the principles of quantum physics by conducting experiments related to the photoelectric effect, determining Planck's constant, and measuring the ionization potential of mercury.

CO4: Demonstrate understanding of polarization and optical activity by using a polarimeter to measure the rotation of the plane of polarization and determine the specific rotation of sugar.

Bachelor of Science (Semester System) (12+3 System of Education)

SEMESTER–IV

(Session-2025-26)

THERMAL & MODERN PHYSICS LAB (PRACTICAL)

Course code: BSNP-4395 for Bachelor of Science (Non Medical)

BCSP-4395 for Bachelor of Science (Computer Science)

Credits: 0-0-2 **Max Marks: 50 (ESE Marks: 35, CA: 15)**

Examination Time: 3 Hours **Pass Mark: 13**

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

The distribution of marks is as follows :

i) One experiment 15 Marks

ii) Brief Theory 7 Marks

iii) Viva–Voce 7 Marks

iv) Record (Practical file) 6 Marks

II. There will be one session of 2 hours duration. The paper will have one session. Paper 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. The number of candidates in a group for practical examination should not exceed 12.

IV. In a single group, no experiment should be allotted to more than three examinees.

List of Experiments

1. To study adiabatic expansion of gas and hence to calculate the value of Volume.
2. To find the coefficient of Thermal Conductivity of a bad conductor by Lee's method.
3. To plot a calibration curve of a given thermocouple (copper constantan) using a potentiometer.
4. To study the photoelectric effect and determine the value of Planck's constant.
5. To determine the ionization potential of mercury.
6. Study of variation of light intensity with distance using photovoltaic cell
(Inverse Square Law)
7. To determine the heating efficiency of an electric kettle with varying voltage.
8. To study the absorption spectra of iodine vapours.
9. To study the rotation of the plane of polarization by using a polarimeter.
10. To determine the specific rotation of sugar using Laurent's half shade polarimeter
11. To study the characterizations of Photovoltaic cells.

Bachelor of Science (Semester System) (12+3 System of Education)

SEMESTER-III

(Session-2025-26)

Course code: BSNM-4390 for Bachelor of Science (Non Medical)

BCSM-4390 for Bachelor of Science (Computer Science)

APPLIED OPTICS

PHYSICS SKILL ENHANCEMENT COURSE (SEC-1)

COURSE OUTCOMES:

After passing this course, students will be able to:

CO1: Understand and analyze the principles of interference of light, including the formation of interference patterns using Young's double slit, Fresnel biprism, thin films, Newton's rings, and interferometers such as Michelson, Fabry-Perot, and Mach-Zehnder.

CO2: Apply Fresnel and Fraunhofer diffraction theory to analyze diffraction patterns through rectangular and circular apertures, and evaluate the resolving power of optical instruments like telescopes, microscopes, and diffraction gratings.

CO3: Demonstrate understanding of light polarization through various phenomena including reflection, double refraction, and use of Nicol prisms and retardation plates, and analyze the production and analysis of polarized light using optical devices.

CO4: Explain the working principles of lasers by understanding stimulated emission, Einstein coefficients, population inversion, laser types (e.g., Ruby, Nd:YAG, He-Ne, CO_2), and their applications in holography and optical fiber communication.

Bachelor of Science (Semester System) (12+3 System of Education)

SEMESTER-IV

(**Session-2025-26)**

Course code: BSNM-4390 for Bachelor of Science (Non Medical)

BCSM-4390 for Bachelor of Science (Computer Science)

APPLIED OPTICS

PHYSICS SKILL ENHANCEMENT COURSE (SEC-1)

Credits: 3-0-0 **Max Marks: 100 (ESE Marks: 70, CA: 30)**

Examination Time: 3 Hours **Pass Mark: 25**

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. Each question carries 14 marks.

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

UNIT–I

Interference of Light:

Superposition of light waves and interference, Young's double slit experiment, Conditions for sustained interference pattern, Coherent sources of light, spatial and temporal coherence Interference pattern by division of wave front, Fresnel Biprism, Displacement of fringes, Change of phase on reflection, Interference in thin films due to reflected and transmitted light, Newton's Rings. Michelson Interferometer, Fabry Perot and Mach Zehnder Interferometer.

UNIT–II

Diffraction:

Fresnel theory of diffraction, half-period zones, Zone plate, Distinction between Fresnel and Fraunhoffer diffraction. Fraunhoffer diffraction at rectangular and circular apertures, Resolving power of telescope in diffraction grating, its use as a spectroscopic element and its resolving power, Resolving power of microscope

UNIT–III

Polarization:

Plane Polarized light, Elliptically polarized light, wire grid polarizer, Sheet polarizer, Mauls' Law, Brewester Law, Polarization by reflection and scattering, Double reflection, Nicol prism, Retardation plates, Production and Analysis of polarized light, Quarter and half wave plates.

UNIT–IV

Laser Fundamentals:

Derivation of Einstein relations, Concept of stimulated emission and population inversion, broadening of spectral lines, three level and four level laser schemes, elementary theory of optical cavity, longitudinal and transverse modes, Components of laser devices, condition for laser action, types of lasers, (Ruby and Nd:YAG lasers, He-Ne and CO2 lasers) construction, mode of creating population inversion and output characteristics, application of lasers –a general outline. Holography and its applications, Optical fibres, design, basic principle, numerical aperture, applications of fibres in optical communication.

Text Reference Books:

1.Fundamentals of Optics: F.A. Jenkins and Harvey E White, (Megraw Hill) 4th Edition, 2001.

2. Optics: Ajoy Ghatak, (McMillan India) 2nd Edition, 7th Reprint, 1997

3. Optics: Born and Wolf, (Pergamon Press) 3rd Edition, 1965.

4. Laser Fundamentals: W.T. Silfvast (Foundation Books), New Delhi, 1996.

5. Laser and Nonlinear Optics: B.B. Laud (New Age Pub.) 2002

6. Laser: Svelto, Plenum Press) 3rd Edition, New York.

7. Optical Electronics, K. Thyagrajan and Ajoy K. Ghatak, Cambridge University Press