DEPARTMENT OF POLITICAL SCIENCE

H.N.B. G.P.G. COLLEGE KHATIMA

BACHOLER OF ARTS

B.A. I Year		
	Paper I – Principles of Political Science	The students will get basic knowledge of Political Science and various ideologies of political thinkers.
	Paper-II- Theories of Modern Government	Students will be able to get knowledge of Major Political systems and constitutions of various special countries
B. A. II Year		
	Paper I – Political thought	The Student will be able to understand various Political thoughts of some kind of world special and famous ancient Political thinkers.
	Paper II- Indian Government and Politics	The student will get basic knowledge of their fundamental rights, duties, and the Indian constitution.
B. A. III Year		
	Paper I – International Relations	The students can acquire knowledge of various countries' policies and the basic diplomatic rules and relations between each other countries.
	Paper-II Elements of Public Administration	Students will get basic knowledge of the organization and its important role in the budget, requirement, promotion, punishment, motivation, training, and also Lokpal and Lokayukta.

MA. 1ST SEM.

PAPER I	Western Political thought (from Plato to Bodin)	Students will able to get knowledge about the ideology of famous ancient and medival western political thinkers.
PAPER II	Comparative Politics	By studying this paper students can get knowledge of comparative elements of democracy such as political system, approach, structural functional approach, political culture, socialization, development, modernization, pressure group, electoral system and public opinion etc.
PAPER III	Public Adminitration	Student will get basic knowledge and difference of public and private administration.
PAPER IV	Indian Political system	Basic knowledge of Indian political system and basics of Indian constitution.
PAPER V	International Politics	The students can acquire the knowledge of various country's policies and the basic diplomatic rules and relations between each other country's.

MA. 2nd SEM.

PAPER I	**Political thought (from Hobbes to Marx)**	Students will able to get knowledge about the ideology of famous modern political thinkers.
PAPER II	**Indian Administration**	Student will get basic knowledge and difference of public and private administration with reference to India.
PAPER III	**State politics in India with special reference to Uttarakhand**	Stuents can get the knowledge of state politics in the context of Uttarakhand.
PAPER IV	**Indian Political Dynamics**	Students can get the knowledge of main factors of Indian politics such as caste, communism, secularism, regionalism, gender, corruption etc.
PAPER V	**Dissertation**	Students can get the knowledge of basics of research.

M.A. 3rd SEM.

PAPER I	**Indian Political thought**	Students can get the ideology of Indian political thinkers.
PAPER II	**Political Ideology**	This paper helps the students to understand the knowledge of the world's famous ideologies.
PAPER III	**Political thought (from Lenin to Rawls)**	The Student will be able to get the knowledge of the ideology of famous communist thinkers.
PAPER IV	**Gandhian Discourse in Politics**	The Student will get knowledge of the main elements of Gandhian ideologies.
PAPER V	**Human Rights / Local self Government/ India in World Affairs**	The Students will learn to take an overview on Human Rights, Local self Government and India in World Affairs

M.A. 4th SEM.

PAPER I	**Contemporary Political Philosophy**	The students will be able to understand contemporary political ideologies.
PAPER-II	**Environmentalism**	The Student will get the knowledge of environmentalism from political angle.
PAPER III	**Post-Cold War International Relations**	Students can get the knowledge of the new world order and issues after the post-cold war international relations.
PAPER IV	**International Organization**	Students can get the knowledge of emerging history and objectives of international military and non-military organization.
PAPER V	**Research Methodology/Ethics and Politics**	Students can get the basic knowledge of keen factors related with research methods.
PAPER VI	**Viva- Voce**	To improve the personality development for future prospective.

DEPARTMENT OF ENGLISH

PROGRAMME OUTCOME

The main programme outcomes of M. A. in English are:

- Students shall be able to read, interpret, understand and write about adiverse range of texts in English analytically and critically
- Students shall be able to analyze texts of a variety of literary genres in terms of style, figurative language and convention.
- Students shall be able to understand the process of communicating and interpreting human experiences through literary representation using historical contexts and disciplinary methodologies.
- Students shall be able to apply critical and theoretical approaches tothe reading and analysis of literary and cultural texts in multiple genres.
- Students shall be able to ethically gather, understand, evaluate and synthesize information from a variety of written and web sources.
- Students shall be able to understand the growth of literature in India in English translation from classical to modern times.
- Students shall be able to use literature in English and Indian regionallanguages as a means of understanding and countering marginalization on the basis of region, class, caste, creed and gender.
- Students shall be educated in both artistry and utility of Englishlanguage through the study of literature and other contemporaryforms of culture.
- The course shall help the students in the development of intellectual flexibility, creativity and cultural literacy so that they may engage in life-long learning.
- Students shall become good human beings as the course shall teach them the true

philosophy of life.

DEPARTMENT OF CHEMISTRY

Program specification outcome and Course Outcome are assessed by focusing on the outcome of internal as well as external examination. The marks obtained by the students in the semester/year examination, assignments, practical examination, etc. are reflective/ indicative of Programme/ Course outcomes. This offers information about the achievements of the students to the respective course teachers. Besides this, each department organizes Presentations, Quizzes, Chart/ Poster competitions to motivate the students to exert a little bit of extra effort for improving their performance. The POS is evaluated by the number of students getting selected in various institutions for higher or specialization studies and gettingplacement after the course.

Graduation:

Program outcome: The U.G. program provides the understanding of fundamental chemistry from core to their basic application in daily life. At the end of this program student have acquired the knowledge of chemistry of system, surrounding and their positive and negative impact in our daily life and environment.

Course outcome: The students will be able to know

Inorganic chemistry: This course includes the fundamental study of atomic structure, periodic properties, Nature of chemical bonding, related theories and chemistry of all the elements of periodic table. Metallurgical processes, chemistry of transition elements, oxidation and reduction, coordination chemistry, hard and soft acid-base theory, metal-ligand bonding in transition metal complexes, magnetic properties of transition metal complexes, electronic spectra of transition metal complexes, thermodynamic and kinetic aspects of coordination compounds, organometallic chemistry, bioinorganic chemistry, inorganicpolymers of silicon and phosphorus.

Organic chemistry:-this course gives the understanding of structure and bonding,mechanism of organic reactions, stereochemistry of organic compounds and the study of different functional groups in organic molecules. Study of electromagnetic spectrum; absorption spectroscopy, spectroscopy, organo-metallic compounds, organo-sulphur compounds, heterocyclic compounds. Also it involves the study of biomolecular like carbohydrates, amino acids, peptides, proteins and nucleic acids which constitutes of body and monitor the functioning of life. Study of fats, oils and detergents, synthetic polymers, synthetic dyes, natural products.

Physical Chemistry:-This course links physical state with the chemical changes occurs in our surroundings and nature. The chemistry of different states i.e. Solid, liquid and gaseous state and colloidal state and branch of science that deals with the quantitative relationship between heat and other forms of energy called thermodynamics and the chemistry related to electrolytes called electrochemistry. Study of Elementary Quantum Mechanics,

Spectroscopy, Photochemistry, Physical Properties and Molecular Structure, Solutions and Colligative Properties, Thermodynamics.

POST-GRADUATION

Program outcome: The P.G program offer the understanding of detail, advanced and fine

knowledge of chemistry. This program explores and covers the remaining concept of U.G program and links the text book chemistry to the daily life activities and their application. Importantly this program includes the course that deals with the study of interaction of light with matter called spectroscopy which helps in the real analysis.

COURSE OUTCOME:

INORGANIC CHEMISTRY

This Course encompasses the theories and bonding concepts in coordination compound and acids-bases in detail. The interesting chemistry of organometalliccompounds.

The students will be able to know

1. The chemistry of main group elements, synthesis and properties of few main group compounds.
2. General properties and separation of lanthanides and actinides.
3. Basics of nuclear chemistry and radio analytical techniques.
4. Stability of organometallic compounds and clusters, and their applications as industrial catalysts.
5. Explain the formation, reaction mechanism and stability of coordination complexes.
6. Interpret the electronic and magnetic properties of inorganic compounds.

ORGANIC CHEMISTRY

This advance organic chemistry course includes the mechanism, energy consideration, stereochemistry and different types of organic reactions in detail.

The students will be able to explain

1. Mechanistic aspects in nucleophilic and electrophilic substitution.
2. Reaction conditions, products formation and mechanisms of some named reactions.
3. Mechanisms of addition reactions of C=C and C=O bonds and elimination reactions.
4. Assess chromatographic separation and identification of organic compounds.
5. Distinguish purification, crystallization, and different distillation processes.
6. Recognize synthesis, purification and characterization of aspirin, Schiff's base, Diels-

Alder adduct.

PHYSICAL CHEMISTRY

This course includes the thermodynamic and kinetic behaviour ofreaction and various theories for reaction kinetics. The students will be able to:

1. Comprehend the redox processes in electrochemical systems.
2. Explain Debye-Huckel theory and determination of activity and activity coefficient.
3. Correlate and differentiate Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics, theories of specific heat for solids.
4. Interpret mechanism for chemical reactions for optimizing the experimentalconditions.
5. Familiar with application of homogeneous and heterogeneous catalysis in chemical synthesis.
6. Explain the importance of adsorption process and catalytic activity at the solidsurfaces.
7. Classify the colloidal material and their stability for many practical uses.

GROUP THEORY AND INSTRUMENTATION CHEMISTRY: Group Theory is the mathematical application to determine the symmetry of molecule and molecular operation and to obtain knowledge of its physical properties and binding nature. Instrumentation techniques involve the understanding about the instruments and techniques used in analysis.

The students will be able to explain

1. The concepts of symmetry and group theory in solving chemical structural problems.
2. Molecular structure by the use of character tables and projection operator techniques.
3. The importance of symmetry and group theory in spectroscopic applications.

Spectroscopic Techniques: This course deals with the study of interaction of light with matter. The light of different energy cause different type of changes like electronic, vibration,rotational, nuclear etc. interaction with different frequency light in molecule. Organic spectroscopy includes NMR, ESR, Mossbauer, IR, UV-visible spectroscopy.

The students will be able to

1. Identify functional groups using IR, λmax for polyenes and α, β-unsaturated carbonyl compounds.

2. Interpret Cotton effect curves for obtaining absolute configuration of chiral molecules with chromophores.
3. Determine chemical structure by UV-Vis, IR, 1HNMR, 13CNMR and mass spectral data.
4. Interpret microwave, vibration-rotation Raman and infra-red spectra for chemical analysis
5. Analyze electronic spectra of different elements and simple molecules.

4. Comprehend Nuclear Magnetic and Electron Spin Resonance spectroscopic techniques for organic compounds analysis and medical diagnostics.

Solid State Chemistry: The students will be able to

1. Correlate the physicochemical properties, defects in solid, diffraction techniques,electrical and magnetic properties of materials.

Chemistry for Biological System: The students will be able to

1. Assess molecular structure and interactions present in proteins, nucleic acids, carbohydrates and lipids.
2. Be familiar with organization and working principles of various components present in living cell.
3. Evaluate kinetics, thermodynamics, and mechanism of protein folding.

1. Assess the structure and biological functions of proteins and the role of metals inbiology.

Inter Disciplinary Topics in Chemistry: The students will be able to

1. Comprehend experimental techniques for different catalytic reactions.
2. Interpret physical and chemical characterization of catalysts and catalytic reaction.
3. Be familiar with various reagents and their applications in industry.
4. Various optical methods like AES, AAS, plasma and electric discharge spectroscopy, spectrofluorimetry, nephelometry and turbidimetry.
5. Potentiometric, coulometric, and voltametric methods of analysis.
6. Chromatographic techniques and applications.

Photo Chemistry and Allied Chemistry: Various reactions takes place by the effect of

temperature change called thermal reaction. The reactions which takes place by the effect of light of different frequency and wavelength is called photochemical reaction and mechanism of such reactions studied under photochemistry.

The student will be able to

1. Conformational analysis of cycloalkanes, reactivity, chirality, interconversion, resolution and asymmetric synthesis.
2. Aromaticity, nonaromaticity and antiaromaticity in carbocyclic and heterocyclic compounds.
3. Molecular orbital symmetry and possibility of thermally and photochemically pericyclic reactions.
4. Basics of photochemical reactions of alkenes, carbonyl and aromatic compounds.
5. Assess photochemistry and photophysical principles.
6. Identify and characterize of transient intermediates by ultrafast modern techniques.
7. know the theory and application of photochemistry and photophysical principles of macromolecules.

organic Synthesis: The synthesis of organic molecules involve various approached and mechanism, new molecules synthesized by mimicking the existing route amd concept. Retrosynthetic or disconnection approach also used to design various drug molecule and biologically active molecule.

The students will be able to interpret

1. Mechanistic pathway of organic reactions.
2. Retro-synthetic approach to planning organic syntheses.
3. Conversion of different functional group *via* rearrangement reaction.

Medicinal Chemistry: The students will be able to

1. Comprehend drug designing and development, their SAR and QSAR.
2. Explain the mode of action of different drugs.
3. Describe the role of drugs to inhibit the particular enzymes and treatment of disease.

Program Specific Outcomes:

Chemistry is a broad area, its important branch of science as everything we do is chemistry! All matter is made up of chemical, even our body is made of chemicals and chemical reactionoccur when we eat, breath etc, so it's the study of everything. From starting (like extractionof elements, compounds) to their final state (like polymers, cosmetics, drugs and medicine etc.) Ready for application involve various chemical processes and purification techniques which were studied under the program. The advantage of leaning chemistry and acquiring knowledge about the process and techniques involves have great career opportunities in academic as well as industries. As this subject covers broad area, one can pursue a job as a pharmacologist, biochemist, lab technicians, analytical chemist, environmentalist, synthetic chemist, material scientist, geochemist, chemical engineer in industry.

DEPARTMENT OF PHYSICS
HNB PG COLLEGE KHATIMA

PROGRAM OUTCOMES (POS): The Physics department offers two programs:

1. Physics for B.Sc. students of PCM.
2. M.Sc. Physics.

Both these programs are primarily geared towards cultivating the idea – "***Physics is the study of nature and its laws (till the most fundamental level)***", amongst the students. The Program Specific Outcomes (PSOs) and the Course Outcomes (COs) of the individual programs/courses/papers are more or less spun around this theme and are listed below.

Program Specific Outcomes (PSOs): For the Under-Graduate Physics program (B.Sc. Physics forPCM)

PSO1: Understanding the fundamental concepts of Physics and its basic laws.

PSO2: Acquire the necessary mathematical tools and concepts required for understanding the underlyingphysics.

PSO3: Acquire theoretical and experimental knowledge/skill related to the physical phenomenon, as well as theability to connect both (theory & practical).

PS04: Acquire problem solving skills and ability to apply them to real world physical phenomenon.

PSO05: Motivation to pursue higher studies (Postgraduate, Research etc.) in Physics.

Course Outcomes (COs): For the Under-Graduate Physics program (B.Sc. Physics for PCM).

Mechanics and Theory of Waves and Oscillations	Understanding vector analysis (applying concepts for problem solving), the nabla operator (Gradient, Divergence & Curl), Differentiation and Integration of Vectors (fields), IntegralTheorems (Gauss, Stokes, Green and corollaries). Understanding - Frame(s) of Reference, Newton's Laws (along with application for point particles as well as system of particle), (conservative) force and potential energy, Work-Energy Theorem, Rocket motion.

	Understanding quantities and ideas related to rotational motion- Angular Velocity, Angular momentum, Torque, Moment of Inertia (calculations and related theorems), Conservation of Angular Momentum. Understanding Newton's law of gravitation, Gravitational Field, Potential & Potential Energy, Central force, Kepler's Laws of Planetary motion, Satellite and Planetary orbits and motions. Understanding material properties such as elasticity, stress, strain, various elastic constants and their relationships, Experimental methods to determine the various elastic properties. Understanding fluids at rest (surface tension, excess pressure) as well as in motion (viscosity, flow through capillary tube, Bernoulli's theorem, Poiseuille's formula), Experimental methods to determine surface tension and viscosity. Understanding Simple Harmonic Motion, the Harmonic Oscillator Equation and solutions, Linearity and Superposition principle, Superposition of Harmonic Oscillations- Collinear(Interference & Beats) and Perpendicular (Lissajous Figures). Understanding waves and wave motion, Waves on a string (travelling and standing), Normal-modes, Group and Phase velocities. Understanding the Fourier Theorem and its applications. Understanding Damped Harmonic Oscillations, Over/Under/Critical damping, Relaxation time,LCR circuit. Understanding Forced Harmonic Oscillations, Transient and Steady state behavior, Resonance andSharpness, Bandwidth, Quality Factor. Understanding intensity and loudness of sound waves, Decibels, Ultrasonic waves (generation, detection and uses), Building acoustics, Reverberation time and Sabine's formula, (Acoustic) design of buildings.

Electricity and Magnetism	Understand the basic concepts of Electrostatics-Field, Flux, Gauss's Theorem with applications, Potential and relation with Field, Potential Energy. Also concept of conductors, dielectrics and capacitance, The Electric-Vector. Understand the basic concepts of Magnetostatics- Biot-Savart's Law and applicatons, The Lorentz Force law, Div and Curl of magnetic field and the magnetic vector potential, Ampere's circuital law, Magnetism in matter (Magnetization, Permeability, Susceptibility) and Types of Magnetic materials (Dia, Para & Ferro). Understanding inductance (self and mutual and induction), Faraday's Law, Lenz' Law & energy conservation, AC circuits- RC, LC and LCR, Resonance. Realizing that EM is contained in the 4 Maxwell's Equations, Understanding equation of continuity, displacement current, Maxwell's correction to Ampere's circuital law. Gain knowledge on EM waves, propagation and their properties using Maxwell's equations, Polarization of EM Waves.
Practical (B.Sc. !st Year)	The various practicals included in the Physics syllabus of B.Sc. 1 are aimed at understanding (and measuring) the phenomenon/ quantities studied in the theory papers (e.g. ideas about Momentof Inertia, Elastic constants, Simple & Compound pendulums, Current, Voltage, Resistances, Solenoid, LCR circuit, SHM, Normal modes of a string etc.). The student should use and develop "hand-skills", observation-skills, mathematical tools (analytical, numerical, graphical etc.) to connect theory with experiments.
Heat Thermo dynamics & Statistical Physics	Understanding the basic thermodynamic concepts- State variable, Equilibrium, Heat, Work, Zeroth and First Laws and the concepts of Temperature and Internal Energy, Applications of First Law to various processes (Adiabatc, Isothermal etc.), Mayer's relation. Understanding the need of second law of thermodynamics, Reversible & Irreversible processes, Heat Engine and Refrigerator, Second Law of Thermodynamics (in term of Engines and refrigerators), concept of entropy, the Carnot cycle, second law in terms of entropy change, the Nernst theorem.

	Understanding the four thermodynamic potentials, The Maxwell's relations and applications (response functions, Joule-Thompson cooling, Calusius-Clapeyron equation etc.) Understanding the Kinetic Theory of Gases (towards a microscopic description), Maxwell's velocity distribution law, transport phenomenon, the classical equipartition theorem and its use to determine specific heats of mono-atomic and diatomic gases. Understanding Blackbody radiation (the first step towards quantum mechanics), Spectral emissive power, Energy Density of Cavity Radiation, The Rayleigh-Jeans Law, Planck's law and deducing Wien's displacement law, Wien's distribution laws (1^{st} and 2^{nd}), Stefan-Boltzmann law and Rayleigh-Jeans from it. Understanding Basic postulates of Statistical Physics, Macro and Micro States, Phase Space, Density distribution in phase space, μ space representation and its division, Statistical average values, Condition of equilibrium, Stirling's Approximation, Entropy and Thermodynamic probability, Boltzmann entropy relation. Ensembles, Micro -canonical, Canonical and Grand Canonical ensembles, Statistical definition of temperature and interpretation of second law of thermodynamic, Pressure, Entropy and Chemical potential. Entropy of mixing and Gibb's paradox, Partition function and Physical significances of various statistical quantities. Understanding Maxwell-Boltzmann statistics and Distribution law, Energy distribution function, MaxwellBoltzmann law of velocity distribution (most probable velocity, average velocity, RMS velocity), Limitations of M-B statistics, Elementary idea of quantum statistics.

optics	Understanding Geometrical Optics- Fermat's principle of extremum path and applications, Cardinal points, Combination of Lenses, Lagrange equation of magnification. Understanding optical instruments- Eye pieces (Ramsden's, Huygen's and Gaussian), Aberrations (and types) and their corrections. Understanding the Interference of Light- The superposition principle, Coherence and conditions for interference, Double slit interference, Division of amplitude and division of wavefront, Fresnel's Biprism, Phase change upon reflection, Thin-film interference (Haidenger and Fizeau fringes), Newton's rings (theory and experimental setup), The Michelson Interferometer and its (experimental) use, Fabry-Perot interferometer. Understanding diffraction of light- Fresnel diffraction, Half-period zones and zone-plate, Diffraction pattern of edge, slit and wire, Fraunhofer diffraction (single, double and multiple slits), The diffraction grating as a measurement tool. Understanding polarization of light- Transverse EM Wave, Plane polarized light (production and analysis), Malus Law, Brewster's Law, The Nicol Prism, Circularly and Elliptically polarized light, Optical rotation, The polarimeter (experimental setup also).
Practical (B.Sc. 2nd Year)	The various practicals included in the Physics syllabus of B.Sc. 2 are aimed at understanding (and measuring) the phenomenon/ quantities studied in the theory papers (e.g. ideas about thermal conductivity, blackbody radiation, calorimetry, statistical probabilities, dispersion, interference, gratings, lens combinations, polarization etc). The student should use and develop "hand-skills", observation-skills, mathematical tools (analytical, numerical, graphical etc.) to connect theory with experiments.

Modern Physics	Understanding the origins of quantum theory- Blackbody radiation and early radiation laws, Planck's (revolutionary) idea (the quantum hypothesis & birth of quantum mechanics), Photoelectric and Compton effects. waves and their wavelength, Davisson-Germer Experiment, Wave-particle duality, The uncertainty principle (position-momentum and Energy-time), Interference experiments with particles. Understanding the Schrodinger's equation (quantum mechanical equation of motion), Time dependent and time-independent versions, Framework of QM (postulates, wavefunction- properties and physical significance), Probability and Conservation, Operators, Eigenfunctions and Eigenvalues, Expectation values, The free particle wavefunction. Learning to solve the Schrodinger's equation, Stationary states, Boundary conditions lead to quantization, Potential Step & Barrier and transmission, Potential well (infinite and finite depths), The one dimensional harmonic oscillator in QM, Zero point energy. Learning to solve the Schrodinger's equation in three dimensions (for spherically symmetric systems), The Schrodinger's equation for the Hydrogen atom and solving it using separation of variables, Angular momentum eigenfunctions (spherical harmonics), Solving the radial equation using Frobenius's method, Emergence of the various quantum numbers (n, l and m). Understanding the various atomic models- Thomson, Rutherford and Bohr, the Bohr model and the hydrogen spectra, Other quantum ideas/experiments- Bohr-Sommerfeld model and quantization condition, the Stern-Gerlach experiment and electron spin, Electron magnetic moment, Bohr magneton, Larmor's precession, The vector atom model, Space quantization. Understanding optical spectra (on the basis of the vector atom model), LS and JJ couplings, Selection and Intensity Rules, The fine structure of sodium D lines, Magnetic interactions and Zeeman effect, X-ray spectra and

	Moseley's Law. Understanding basics of radiation, Absorption and Emission (spontaneous and stimulated), The Einstein's A and B coefficients, Metastable states (long living), Population inversion, Pumping, Lasing action and Laser/Maser. Understanding Franck-Condon Principle, Molecular spectra, Rotational, Vibration and Electronic spectra of diatomic molecules, General features of electronic spectra, Luminescence, Basics of Raman effect. Understanding the atomic nucleus, Constituents of the nucleus, properties, Nature of nuclear force, Binding Energy and BE curve, Stable nuclei, The semi-empirical mass formula, Models of thenucleus (Liquid drop and Shell model), elementary particles and their classification schemes.
Electronics	Understanding Kirchhoff's Laws, Superposition Theorem, Constant voltage source and constant current source, Conversion of voltage source into current source, Thevenin's Theorem and procedure for finding thevenin equivalent circuit, Norton's Theorem and procedure for finding Norton equivalent circuit, Maximum power transfer theorem, Applications of Network Theorems, Four terminal Network and h-parameters. Understanding elementary semiconductors and devices (intrinsic, extrinsic-P & N), the PN diode and its characteristics in forward and reverse bias, Zener diode, Optoelectric devices- LEDs, Photodiode and Solar cell. Understanding diode circuits- The rectifier- Half-wave, Full-wave (Centre tapped and Bridge versions), Ripple factor and Efficiency, Filters (C, L, Pi etc.), Clipping and Clamping circuits using diodes, Voltage multipliers, Zener diode and voltage regulation. Understanding transistors and amplifiers- Bipolar Junction transistors (NPN, PNP), Characteristics (input and output) in various configurations (CE, CB & CC), Current gains alpha and beta and their relation, Load line analysis, Q-point, Active, Cutoff and Saturation regions, Transistor biasings; Transistor Amplifiers- Voltage, Current and Power, Class A, B and C amplifiers; The Field Effect Transistor (FET) and the Uni-Junction

	Transistor (UJT) Understanding Oscillator circuits- Feedback (negative and positive), Birkhausen's criterion, RC (Wein bridge and Phase-Shift) & LC (Collector tuned and Colpitt) oscillators and frequency of oscillation, Crystal oscillators, The Multivibrator and various operation modes (Monostable, Astable and Bistable). Understanding Digital Electronics and Circuits- Number systems (Binary etc.) and conversions, Basic Logic Gates (AND, OR & NOT) and realizations using diodes and transistors, Universal Gates (NAND & NOR), Other gates, Boolean Algebra- De Morgan's Theorem, Simplifying logic circuits, Minterm, Maxterm, SOP and POS, Karnaugh Map, Binary arithmetic (addition, subtraction) using circuits- Half/Full adders, Word (4-bit) binary adder-subtractor
Practical (B.Sc. 3rd Year)	The various practicals included in the Physics syllabus of B.Sc. 3 are aimed at understanding (and measuring) the phenomenon/ quantities studied in the theory papers (e.g. ideas about Energy quanta, quantization, diodes, LEDs, rectifiers, power supplies, transistors, amplifiers, oscillators, logic gates, Boolean algebra, logic circuits etc). The student should use and develop "hand-skills", observation-skills, mathematical tools (analytical, numerical, graphical etc.) to connect theory with experiments.

PROGRAM SPECIFIC OUTCOMES (PSOs): FOR M.SC. PHYSICS

PSO 01: Strengthening and further understanding of the fundamental concepts of Physics and its basic laws (as acquired during the Under-graduate studies) by augmenting mathematical rigor (at the Physicists level) along with Physical interpretations (and clear physical picture(s)) of any theory/process/situation.

PSO 02: Acquire the necessary mathematical-tools (analytic, approximate, numerical, graphical etc.) and concepts required for understanding the underlying physics and use them to solve complex and advanced problems (including those with real world

applications).

PSO 03: Gain substantial knowledge in the various (core) branches of Physics- viz. Classical Mechanics, Electrodynamics, Mathematical Methods, Quantum Mechanics, Statistical Mechanics, Condensed Matter Physics, Astrophysics, Electronics, Nuclear Physics, Particle Physics etc.

PSO 04: Acquire theoretical and experimental knowledge/skill related to the physical phenomenon, as well as theability to connect both (theory & practical). Also gradually develop the scientific method by designing and conducting experiments.

PSO 05: To get an exposure to research and research methodology during the dissertation work (theoretical and/or experimental) to be performed during the last semester.

PSO 06: Motivation to pursue a research/academic career in Physics. Aim towards writing and qualifying in various competitive exams- (e.g. CSIR-UGC-NET, GATE, JEST, BARC, DRDO, Entrance exams of premier research institutes (National & International)).

PSO 07: Gain knowledge of the subject along with general competence and analytical skill for employment in other sectors viz. industry, R&D, consultancy, public administration etc.

COURSE OUTCOMES (COS): FOR M.SC. PHYSICS

Mathematical Physics	To learn series solution of differential equations, Legendre, Bessel, Hermite, and Laguerre differential equation and related polynomial, physical integral form of polynomials and their orthogonality relations. Generating Function and recurrence relation. Understanding curvilinear Coordinates and various operators in circular, cylindrical and spherical coordinate systems, classification of Tensors, Rank of a Tensor, covariant and contra-variant tensors, symmetric and anti-symmetric Tensors, Kronecker delta symbol. Contraction of

	Tensor, metric Tensor and Tensor densities, covariant differentiation and Geodesic equation. Understanding function of complex variable, Cauchy's Riemann differential equation, Cauchy's integral theorem, residues and Cauchy's residues theorem, singularities, evolution of residues and definite integral. Understanding Fourier integral and Fourier Transform, Fourier integral theorem, finite and infinite integral, Laplace transform of elementary function (Dirac delta & Green's function), Solution of simple differential equations.
Classical Mechanics	Understanding mechanics of a system of particles (Constraints and generalized coordinates, D Alembert's principle, Lagrange equations for holonomic and non holonomic systems and their applications, conservation laws of linear momentum, energy and angular momentum. Understanding Lagrangian and Hamiltonian Formulations with their applications to various conservative systems, Hamilton Jacobi theory. Understanding Dynamics of rigid bodies including Motion of a rigid body, body and space Reference system, angular momentum and Inertia tensor, Principle axes- Principle moments of Inertia, spinning tops, Euler angles, Infinitesimal rotations. Understanding Central force problem including Action and angle variables, phase integral, small oscillations, Kepler's laws of Planetary motion and their deduction, scattering in a Central field, Rutherford scattering cross section.
Quantum mechanics	Understanding that our world in inherently quantum and so the proper framework to understand it is Quantum Mechanics. "Establishing"/Understanding the basic framework of QM

	(Schrodinger's equation, wavefunctionand probabilistic interpretation, uncertainty relations etc.). Learning to solve the Schrodinger's (time-independent) equation (various one and three dimensional problems). Understanding the various formulations of QM and their equivalence-Schrodinger, Heisnberg (Matrix) and Dirac formulations. Understanding symmetry in QM- Space and Time translation symmetries as well as Rotational symmetry (Angular momentum, Spin, Addition etc.) Understanding the various approximation methods to solve the Schrodinger's equation (Perturbation, Variational method, WKB approximation) and application to different (stationary) state problems. Applying approximation methods to time dependent problems and treatment of radiation (emission and absorption) via such methods (Time dependent perturbation theory, Fermi's Golden Rule, the Semiclassical theory of radiation etc.).
Statistical Mechanics	Understanding the (average) microscopic description vs. the macroscopic description (as done in Thermodynamics) for a system with large no. of degrees of freedom. Understanding (and calculating within the framework) the various statistical ensembles and the corresponding (thermodynamic) formulations. Application of the statistical ideas to derive/understand the behavior of gases (ideal as well as real). Understanding the basics of Quantum SM (FD & BE stat) and some simple applications. Understanding blackbody radiation as a gas of photons (i.e statistical treatment- BE statistics).
Atomic & MolecularPhysics	Understanding that optical properties of materials and realizing the fact that it are just an application of Quantum Mechanics to

	atomic/molecular systems. Understanding the atomic and molecular spectra along with their finer features (Fine structure, Vibrational-Rotational spectra). Understanding the effect of electric and magnetic fields on the various spectra via interactions (or charge and/or spin). Understanding the various theories/formulations/models to understand spectra (Vector atom model, LS, JJ coupling schemes, Raman spectroscopy, Heitler-London and Born-Oppen hiemer treatments etc.) Understanding the quantum theory of radiation (Einstein's coefficients) and basic working principle of Lasers.
Practical (Sem1)	The various practicals included in the Physics syllabus of M.Sc. 1st Semester are aimed at understanding (and measuring) the phenomenon/ quantities studied in the theory papers of various other semesters (e.g. CRO, SCR, Transistors, Diodes, FET, Amplifiers, Oscillators, Antennas, Amplitude modulation/demodulation etc.). The student should use and develop "hand-skills", observation-skills, mathematical tools (analytical, numerical, graphical etc.) to gradually connect theory with experiments.
General relativity and cosmology	Understanding the foundations of general relativity including Elements of Special relativity, Tensors as geometrical objects, Mach's Principle, non-inertial frames of reference, Gravity and space-time, Principle of equivalence and principle of general covariance, Metric tensor and gravity, Geodesics and Affine parameters (Christoffel symbols), covariant derivative and its geometrical interpretation, parallel transport, spacetime curvature and curvature tensor, Riemann curvature tensor, Bianchi identity, Ricci tensor, classification of space-time curvature (in different dimensions).

	Understanding Christoffels connection as Einstein's connection, Gravitational action, field equations and their general properties, Newtonian limit of Einstein's field equations, Metric in spherically symmetric space-time (Schwarzchild metric), Orbits in the Schwarzschild metric, gravitational collapse of a dust sphere, Schwarzschild black holes. Introduction of Gravitational radiation, Wave equation in linearized theory and plane waves, propagating modes of gravity, gravitational waves in a flat space-time background, propagation of gravitational waves in the curved space-time, Energy and momentum of the gravitational waves, Detection of gravitational waves. Basic Concepts and elementary idea of big-bang and steady state cosmologies, Seagull static models, Cosmological principle, Friedmann space-time, Robertson-Walker line element, Weyl's postulate, expansion of the universe, Hubble's law, dynamical equation of cosmology and their consequences, the primordial fire and the remnant radiation, Big-bang and steady state models of the universe.
Advanced Quantum Mechanics	Understanding, applying and formulating QM at an even deeper level than done earlier (in the QM Course). Applying quantum ideas to understand the scattering of particles. Employing various(approximate) methods- Partial Wave Analysis and the Born approximation. Understanding notion of identical and indistinguishable. Realizing origin of the Pauli's exclusion principle and related notions (Spin-Statistics connection, Permutation symmetry etc.) Formulation (along with the need) of the relativistic version of (NR) quantum mechanics. Working out in detail the two basic relativistic wave equations (Klein-Gordon and Dirac equations) and the various associated

	phenomenon/notions (Plane wave solutions, NegativeEnergies and Probabilities, Spin of electron and its magnetic moment, The Hole Concept,Particles and Antiparticles etc.) Understanding the need of relativistic quantum fields (towards Quantum Field Theory), Field formulations for the various wave equations via 2nd quantization.
Nuclear Physics	Understanding the atomic nucleus and its various properties along with the experimental tools and techniques of nuclear investigations. Understanding basic properties of the nucleus and the various nuclear models. Understanding the nature of the nuclear force along with experimental setup(s) to study them. Understanding radioactive decay and its various feature. Understanding nuclear reactions by applying (mainly) quantum ideas to them.
Elementary Particle Physics	Get a basic understanding of the fundamental constituents of our Universe (the "elementary" particles and the four fundamental interactions). Understanding the gauge principle and role of symmetry (along with ideas of unification). Understanding the common (mathematical) origin of (the various) conservation laws as a manifestation of (some) symmetry. A very basic understanding of the unification of the fundamental interactions- Electroweak andGrand Unifications. Understanding (hadronic) matter as composed of quarks and the "construction" schemes (i.e. various direct-product representation of SU(3)). An overview of the various properties of quarks (and also of the composite mesons and baryons).

Condensed Matter Physics	Understanding of the basic (theoretical) ideas involved in the study of Condensed Matter Physics. Understanding the origin of elasticity (and elastic constants) from the properties of the underlying crystal structure. Understanding the interaction of crystals with radiation (X-rays) and the related theoretical framework as well as experimental setup(s) (Diffraction experiments). Understanding the quantum treatment of elastic/sound waves (i.e. the idea of phonons and phonon gas etc.) Understanding the thermal properties of solids on the basis of the phonon picture. Understanding crystal defects, superconductivity, and magnetism.
Practical (Sem2)	The various practicals included in the Physics syllabus of M.Sc. 2nd Semester are aimed at understanding (and measuring) the phenomenon/ quantities studied in the theory papers of various other semesters (e.g. oscillators, electronically regulated power supply, negative feedback amplifiers, FET characteristics, Michelson Interferometer, Fabry Parot Interferometer, four probe method, Fresnel's Law, Magnetic susceptibility, Radiation laws, etc.). The student should use and develop "hand-skills", observation-skills, mathematical tools (analytical, numerical, graphical etc.) to gradually connect theory with experiments.
Advanced Electronics I	Understanding Integrated Circuit technology, Classification of IC's, Fabrication of IC's & components, Basic monolithic integrated circuit technology, processes used in monolithic technology, active & passive components, metal semiconductor contact, thick & thin film IC's, hybrid IC's, charge coupled devices (CCD), advantages & limitations of integrated circuits.

	Understanding Operational amplifiers (Linear and Non-linear Analog systems),
Advanced Electronics II	Understanding Digital communication, Digital signal processing, Image processing (Basic ideas only), Pulse Modulation systems, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse position modulation, Pulse code modulation, Delta modulation Frequency division multiplexing (FDM), Basic idea of digital telemetry. Learning Optical communication, Principle of optical communication, Different modes of propagation of E. M. Wave through optical fibre, Brief concept, classification of fibres and ray path, Advantages of multimode fibres and cladding , Optical Fibre connectors, Optical Fibre communication Receiver, Brief Introduction , Signal path through optical data link, Block diagram of optical Receiver, Advantages of optical communication, Light propagation in cylindrical wave guide. Gaining knowledge of Memory and optoelectronic devices, Bulk and thin films. Photoconductive devices (LDR), Memory devices, static and dynamic random access memories SRAM and DRAM, CMOS and NMOS, nonvolatile-NMOS, magnetic, optical and ferromagnetic memories, charge coupled devices (CCD), LCDS.
Electrodynamics	Realizing the unification of Electricity and Magnetism as a single physical concept- Electromagnetism (or Electrodynamics) and that Maxwell's equations express this fact. Understanding various electromagnetic phenomenon (EM Wave in vacuum, conductors, non-conductors, plasma, bounded media, wave guides). Understanding the potential formulation of ED (and its advantages). Understanding generation and nature of radiation (fields) from moving (accelerated) charges. Formulating ED (and writing and performing calculations) within the relativistic framework i.e. four-vector & Tensor notations. Understanding the role of this relativistic formulation

	and ability to apply it elsewhere.
Practical (Sem 3)	The various practicals included in the Physics syllabus of M.Sc. 3rd Semester are aimed at understanding (and measuring) the phenomenon/ quantities studied in the theory papers of this semester (Richardson's Law, ESR spectra, Hall effect, multivibrators, transistor amplifiers cum feedback amplifiers, FET and MOSFET, VTVM etc.). The student should use and develop "hand-skills", observation-skills, mathematical tools (analytical, numerical, graphical etc.) to gradually connect theory with experiments.
Advanced Electronics 3	Understanding power supply regulation including Servomechanism, regulation using OA, Zener reference source, The 723 regulator current regulator, short circuit and over load protection, Precision rectifier, IC regulated power supply. Three terminal voltage regulations, dual Polarity regulated power supplies using 78 XX and 79 XX series regulators, Switched mode power supply (SMPS), Active filter , PLL understanding microwave production with basic ideas of Microwave frequencies, Principle of velocity modulation. Reflex klystron. Theory and uses an of cavity magnetron PIN & GUNN Diode, Detection of microwave measurement of power. Understanding Advantages and Disadvantages of Microwave transmission, loss in free space, propagation of microwaves, atmospheric effects on prorogation , Fresnel zone problem, ground reflection, fading sowlles, detectors, components, antennas used in microwave communication system.
Advanced Electronics 4	Understanding Ananlog computation with Solution of ordinary linear differential equations with constant coefficients, Operation modes of analog computers, repetitive operation of computers, Time scaling,

	amplitude scaling, Generation of functions, Simulation of time varying systems. Understanding Boolean algebra, Canonical forms of Boolean, functions, Simplification of Boolean functions (K-map, Tabulation method), don't care conditions. Digital logic families; Adders & Subtractors, Magnitude comparator, Code converters; Parallel adders, Encoders, Decoders, Multiplexers, Demultiplexers, Parity bit generator and checker, Read only memory (PROM, EPROM), P.L. Digital to Analog and Analog to Digital converters. Understanding Sequential logic- Memory element, RS, JK, JKMS, T type and Edge triggered Flip flop; Registers; Shift register; Counters—synchronous and Synchronous; The memory unit; Semiconductor Random Access Memory; Inter-register transfer; Arithmetic; Logic and Shift Micro-operation; Fixed point and floatation point data.
Practical (Sem 4)	Study of regulated power supply (723), operational amplifier (741), Timer (555), A to D and D to A converter, Logic gates (Different types), amplitude and frequency modulations and demodulations, different flip-flop circuits (RS, JK, Dk type, T-type, Master slave), Digital combinational and sequential circuits, Microprocessor (8085), SCR etc.
Dissertation/ Project	The student has to complete a dissertation/project (theoretical and/or experimental) and submit a written report during this last semester. This gives the students some exposure to research and research methodology. Moreover the written report enables the students to write scientific communication. All this is aimed at nurturing them into (possible) future researchers who are capable of- (a) thinking and analyzing critically and clearly (b) adopting the scientific method and (c) working independently.
Elective Courses	

Communication Electronics	Understanding AM and FM (Transmission and reception): Modulation, AM generation, Power consideration, Balanced modulator, SSB transmission, AM detection, AGC, Radio receiver characteristics, signal to noise ratio, FM analysis, noise considerations, generation, direct method and reactance tube method, FM transmitter, AFC, FM Propagation, phase discriminator. To know the propagation of radio waves, Antenna and TV. Study of transmission lines, Voltage and current relations on transmission line, propagation constant, characteristic impedance, impedance matching, quarter wave T/L as impedance transformer, attenuation along coaxial cable, cables of low attenuation, propagation of radio waves between two parallel lines, wave guide modes, TE10 mode and cut off wavelength, cavity resonator, light propagation in cylindrical wave guide, step index and graded index fibers, attenuation and dispersion in fibers.
Plasma Physics	Introduction to Plasma, Elementary concept: Derivation of moment Equation from Boltzmann Equation, Plasma Oscillation, Debye Shielding, Plasma parameter, Magneto plasma, Plasma confinement. Understanding MagnetoHydrodynamics and magneto Plasma To study plasma propagation and fluid plasma, Propagation at finite angle and CMA diagram, Propagation through ionosphere and magnetosphere, Helicon, Faraday rotation, Fluid equations for a plasma, Continuity equation, Momentum balance equation, Equations of state, Two-fluid equations, Plasma resistivity.

Digital Electronics and Computer Architecture	Learning elementary idea of combinational and sequential circuits, Overview of Microcomputer organization and operation, Microprocessor evolution and types, Fundamental knowledge of Microprocessor (8085/8086), Architecture and its operation, Basic idea of logic devices for interfacing 8085/8086. Understanding Computer Organization and Architecture Understanding data communication, Computer and Communications, Need for communication networks, Internet and World Wide Web, communication protocols, Local Area Networks, Interconnecting networks, Future of Network Technology. To study Characteristics of communication channels, Allocation of Channels, Physical Communication media, Public Switched Telephone Network, Cellular Communication Path, ATM networks.
Atmospheric Physics	To gain knowledge about Earth atmosphere, Elementary concept of atmospheric sciences, atmosphere and it composition, Thermal and pressure variation in earth atmosphere, Thermal structure of the troposphere, stratosphere, mesosphere and ionosphere, Hydrostatic equation, spectral distribution of the solar radiation, Green house effect and effective temperature of earth. Meteorological process and different system, local winds, monsoons, fogs, clouds, precipitation, Cyclones and anti-cyclones, thunderstorms, Mountain Meteorology. Understanding Atmospheric Dynamics and Thermodynamics, Environmental pollution and climate change Study of Convectional measurements of pressure, temperature, humidity, wind speed and direction, sunshine duration, radiation clouds, upper air pressure, temperature, humidity and wind measurements, Polit balloons, radiosonde, dropsonde, ozonesonde, GPS sonde. Application

	of radars to study the atmospheric phenomenon, LIDAR, SONAR, RASS (Radio- acoustic sounding system), Observational technique for aerosol.
Introduction to Nanoscience and Nanotechnology	Understanding Emergence of Nanotechnology – Challenges in Nanotechnology, Carbon age–New form of carbon (From Graphene sheet to CNT), Introduction to nanomaterials, evolution of nanoscience, general properties of nanomaterials, role of size in nanomaterials, semiconducting nanoparticles, nanoclusters, quantum wells, conductivity and enhanced catalytic activity compared to the same materials in the macroscopic state. Synthesis of nano structured materials, sol-gel processing, Mechanical alloying and mechanical milling, Inert gas condensation technique, Nanopolymers, Bulk and nano composite materials, top down and bottom up approaches. Study of properties of nanomaterials and characterization techniques. Learning about the applications of nanomaterial to Molecular electronics and nanoelectronics, Quantum electronic devices, Carbon Nano Tube based transistor and Field Emission Display, Biological applications, Biochemical sensor, medical applications and Membrane based water purification. Biological systems- DNA and RNA - Lipids.
Self study Courses	
Advances in High Energy Physics	Understanding Gauge Theory and Unification of Fundamentals Forces, Quantum Chromodynamics, Thermal Field Theory and Beyond Standard Model

Advances in Laser Physics	Understanding Laser Raman Spectroscopy and Laser Spectroscopy in Molecular Beams. To gain knowledge of Modern Laser Spectroscopy.
Advances in Solar Physics	Learning about Solar Flares: Magnetohydrodynamic Processes, Solar Cycle: Observations and theory, Sun-Earth Connection.
Bio-Physics	To Know the Basic Concepts of Bio-Physics Understanding Technique For The Study of Biological Structure and Function To study the Radiation Effects on Biological Systems
Computer Application in Physics	Understanding the role of Computers in Physics, Formulation of a problem for solution on a computer, paradigm for solving physics problems for solution . Algorithms and Flowcharts Learning Scientific Programming (FORTRAN and C language), Scientific Word Processing and Modern Software's For Mathematical Computing (LaTeX and MatLab). Study of Computer Applications to Physical Problems(Numerical Methods and Monte Carlo methods).
Medical Physics	To know about the mechanics of human body, Physics of Respiratory and Cardiovascular System. Understanding Electricity in the Body and Sound/Light In Medicine and Diagnostic X-Rays and Nuclear Medicine. To gain knowledge about Medical Precision Equipments and Modern Medicines (MRI, PET, CT scan, ventilators, description, working, analysis and clinical applications of Ultrasonic imaging, ECG, EMG, EEG and ERG. Nanotechnology-based drugs e.g. Abraxane, Doxil, C-

	dots (Cornell dots) and goldnano particle as a diagnostic tool, Anti-cancer polymeric nanomedicines, Use of nano-technology in Photodynamic therapy.
Optical Communication	Understanding Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics, Optical Fiber Modes and Configurations -Mode theoryof Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes -Single Mode Fibers- Graded Index fiber structure. Study of Signal Degradation Optical Fibers and Fiber Optical Sources And Coupling, Fiber Optical Receivers and Digital Transmission System.

DEPARTMENT OF BOTANY

H.N.B. PG COLLEGE KHATIMA

(VISION, MISSION, PEO, PO, PSO & CO)

VISION:

To promote the culture of learning by educating students in the basics of plant science, its related components, and evolving advancements that will serve science and the nation in the twenty-first century.

MISSION:

1. To make a significant contribution to the national goals of promoting knowledge society through high-quality education, innovative research, and services to the society in the field of plant sciences.
2. To produce highly qualified postgraduate and Ph.D. students in the field of plant sciences that serve in academic and research institutions.
3. To serve society's needs and contribute to transforming society into a knowledge society.

PROGRAM EDUCATIONAL OBJECTIVES (PEOS):

PEO-1: Enable graduates to pursue post-graduate studies in botany and succeed in academic and research careers.

PEO-2: Possess essential professional plant science skills that make them confident to synthesize and apply knowledge in various application domains.

PEO-3: Demonstrate an understanding of the importance of life-long learning through practical training.

PEO-4: Assume leading and influential roles in their organizations and societies.

PROGRAM OUTCOME:

After the successful completion of the M.Sc. degree in Botany, the students will be able to:

PO-1: Understand the structure, function and life-cycle patterns of different plant life forms.

PO-2: Achieve an up-to-date level of understanding of plant physiology, ecology, and biochemistry.

PO-3: Identify plant diseases, causing organisms, and their control measures.

PO-4: Identify plants in their natural habitats, and their economic and ethnobotanical importance.

PO-5: Differentiate between different types of ecosystems and their structural components. PO-6: Evaluate services provided by different ecosystems in the Himalayan region.

PO-7: Understand and solve problems related to climate change and global warming.

PO-8: Isolate and identify phytochemicals in different plant species and their antimicrobial potential.

PO-9: Analyze the regeneration status of different tree species in their natural habitat. PO-10. Develop strategies for the conservation of rare and threatened plant species.

PO-11: Develop a protocol for propagation of economically and medicinally important plant species through plant tissue culture.

PROGRAM SPECIFIC OUTCOME (PSOS):

After the successful completion of the M.Sc. degree in Botany the students will be able to:

PSO 1: Apply knowledge of botany in many applied fields like Agriculture, Horticulture, Sericulture, Forestry, Pharmacology, and Medicine.

PSO 2: Able to qualify for competitive exams like UPSC, NET, SET, GATE, etc.

PSO 3: Understand the multi-functionality of plants in the production of secondary metabolites and their widespread industrial applications.

PSO 4: Correlate biodiversity to habitat, climate change, land and forest degradation and develop conservation measures.

COURSE OUTCOME (COs):

AT U.G. LEVEL:

1. Students will be able to explain how organisms function at the level of the biomolecules, genes, genome, cells, tissue, and various plant systems.
2. They will be able to explain various physiological and biochemical processes, development, reproduction, and behavior of different forms of plant life.

AT P.G. LEVEL:

1. Students will be able to understand the range of plant diversity in terms of structure, function, and conservation.
2. Students will strengthen the experimental techniques and methods of analysis appropriate for their area of specialization within botany.

DEPARTMENT OF ZOOLOGY
HNB PG COLLEGE KHATIMA

SYLLABUS/PROGRAM OUTCOMES

1. Acquired the knowledge with facts and figures related to various papers in zoology such as Animal Diversity, Taxonomy, Evolution, Genetics, Biochemistry, Endocrinology, Toxicology and Ecology and animal behavior.

2. Understood the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevance in the day-to-day life.

3. Acquired the skills in handling scientific instruments, planning and performing in laboratory equipments.

4. The skill of observation and drawing logical inference from the scientific experiments.

5. Analyze the given scientific data critically and systematically and the ability to draw the objective conclusions.

6. Been able to think creatively (divergent and convergent) to propose novel ideas in explaining facts and figures or providing new solution to the problems.

7. Realize how developments in any science subject help in the development of other science subject and via versa and how interdisciplinary approach helps in providing better solution and new ideas for the sustainable development.

8. Develop various communication skills such as reading, listening, speaking, etc.

9. Realize that pursuit of knowledge is a lifelong activity and in combination with untiring efforts and positive attitude and other necessary qualities leads towards a successful life.

SEC (UG LEVEL) PUBLIC HEALTH AND HYGIENE- OUTCOMES

M.A. 3rd SEM.

PAPER I	**Indian Political thought**	Students can get the ideology of Indian political thinkers.
PAPER II	**Political Ideology**	This paper helps the students to understand the knowledge of the world's famous ideologies.
PAPER III	**Political thought (from Lenin to Rawls)**	The Student will be able to get the knowledge of the ideology of famous communist thinkers.
PAPER IV	**Gandhian Discourse in Politics**	The Student will get knowledge of the main elements of Gandhian ideologies.
PAPER V	**Human Rights / Local self Government/ India in World Affairs**	The Students will learn to take an overview on Human Rights, Local self Government and India in World Affairs

M.A. 4th SEM.

PAPER I	**Contemporary Political Philosophy**	The students will be able to understand contemporary political ideologies.
PAPER-II	**Environmentalism**	The Student will get the knowledge of environmentalism from political angle.
PAPER III	**Post-Cold War International Relations**	Students can get the knowledge of the new world order and issues after the post-cold war international relations.
PAPER IV	**International Organization**	Students can get the knowledge of emerging history and objectives of international military and non-military organization.
PAPER V	**Research Methodology/Ethics and Politics**	Students can get the basic knowledge of keen factors related with research methods.
PAPER VI	**Viva- Voce**	To improve the personality development for future prospective.

विभागाध्यक्ष
राजनीति शास्त्र विभाग
हे०न०ब०रा०स्नातकोत्तर महाविद्यालय
खटीमा (ऊधम सिंह नगर)