

**DEPARTMENT OF COMMERCE**  
**HNB POSTGRADUATE COLLEGE KHATIMA**

**B.COM. 1<sup>ST</sup> YEAR**

	<b>ACCOUNTING GROUP</b>	
Group I	Paper I – Financial Accounting	Students will get conceptual knowledge of financial accounting and apply both theoretical and practical knowledge to their future careers in business.
	Paper II- Auditing	Students will be able to understand the process of auditing, classification of audit, Vouching and verification or valuation of assets. They also know about the company auditor qualification and appointment process with their power, duties and liabilities.
	<b>Management Group</b>	
Group II	Paper I – General & Office Management	The student will be able to understand the principles and functions of management and office, the process of decision making, and be modern trained in the management process.
	Paper II- Business Environment	This paper helps the students to understand the environment of enterprises, factors affecting business, and fundraising in business.
	<b>Economics and Law Group</b>	
Group III	Paper I – Business Economics	The students acquire the knowledge of Demand and supply. Price fixing, market competitors, and management business economically.
	Paper-II- Business Regulatory Framework	The student will be able to understand the important business legislation that dictates how to form and run the business along with relevant case law.

## B.COM. 2<sup>nd</sup> YEAR

<b>Accounting Group</b>		
Group I	Paper I – Advance Accounting	The student will get knowledge on the accounting practice prevailing in holding account, amalgamation and other Allied aspects.
	Paper II- Cost Accounting	The student will be able to understand various aspects of cost ascertainment and its determinants and advice the management to maximize its profits and used to streamline manufacturing operations.
<b>Management Group</b>		
Group II	Paper I – Basic Business Finance	Student will be understand the Functions and Scope of Financial Management. They will know about difference between over and under capitalization and the method of Capital Budgeting.
	Paper II- Personnel Management & Industrial Relations	The student will acquire the knowledge to know the Evolution, Scope, Function of Personnel Management and Functions, principles of Industrial Relations.
<b>Economics and Law Group</b>		
Group III	Paper I – Money & Banking Foreign Exchange	Through this paper Student will know about the Indian Money Market, Indian Capital Market and Fluctuation in the rate of exchange. They will also learn the Objects and Methods of Exchange Control.
	Paper II- Public Finance	Students will get the knowledge of Importance of Public Finance, Types of Taxation (Direct and Indirect), Distribution and level of economic activity.

## B.COM. 3<sup>rd</sup> YEAR

Group I	<b>Accounting Group</b>	
	Paper I – Income Tax Law & Accounts	Student will be able to understand the basic concept of Taxation, Income from Salaries, House Property, Business and Profession. They will also learn to computation of total Income and tax liability of individual.
	Paper II- Management Accounting	The student acquires the knowledge in the Management Accounting Techniques in business decision making.
Group II	<b>Management Group</b>	
	Paper I – Marketing Management	The Purpose of this paper to tell the students about Selling V/S Marketing, concept of product, Social Ethical and Legal aspects of marketing in India, develop the marketing skill in students.
	Paper II- Statistical Analysis	Student will develop the ability to analyze and interpret data to provide meaningful information to assist in making management decision.
Group III	<b>Economics and Law Group</b>	
	Paper I – Corporate Legal Framework	Students will get to knowledge about Promotion and Incorporation of Companies, Duties and Responsibilities of Director. They will also learn about the Board Meeting.
	Paper II- Insurance Law & Practice	Student will get the knowledge about various types of insurance its principles and usefulness in business.

### M.COM. 1<sup>ST</sup> SEMESTER

<b>MCOM 101</b>	Business Management	Student will learn about Nature and significance of Management, Concept of two-way communication, and the Process of Communication.
<b>MCOM 102</b>	Statistical Analysis	Student will develop the ability to analyze and interpret data to provide meaningful information to assist in making management decision.
<b>MCOM 103</b>	Economics of Growth	Student will be able to understand the Monetary policies for economic development, Rostows stages of economic growth.
<b>MCOM 104</b>	Business Environment	This paper helps the students to understand the environment of enterprises, factors affecting business and fund raising in business.
<b>MCOM 105</b>	Seminar (Write up and Presentation)	This paper helps in enhancing their presentation and communication skill they also learn to develop their personality, so that they can face the challenges of competitive world.

## M.COM. 2<sup>nd</sup> SEMESTER

<b>MCOM 201</b>	<b>Organizational Behavior</b>	Students will get the knowledge about the Relation between Management & Organizational Behavior, Group Dynamics and Organization Conflicts.
<b>MCOM 202</b>	<b>Accounting for Managerial Decisions</b>	Students will learn about Budgeting, Marginal and Break-Even-Analysis, Reporting to Management.
<b>MCOM 203</b>	<b>International Business</b>	Through this Paper Students will learn about the Management of International Trade, International Trade and Investment Theories.
<b>MCOM 204</b>	<b>Income Tax</b>	Students will be able to understand Provision of Income Tax relate to Depreciation, Computation of Tax liability of HUF.
<b>MCOM 205</b>	<b>Skill-Enhancement Elective-I/II</b>	Student will get the opportunity to make entrepreneurship as a career option. They will also understand the issues relating to the growth and development of the Uttarakhand Economy.

<b>MCOM 206</b>	<b>General/open Elective- I/II</b>	Students will get the knowledge of basic accounting system and various operations in banking.
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### **M.COM. 3<sup>rd</sup> SEMESTER**

<b>MCOM 301</b>	<b>Research Methodology</b>	Students will learn about Research and Sample Design, Basic Principles of ANOVA and Report writing.
<b>MCOM 302</b>	<b>Financial Management</b>	This paper helps the students to understand the functions of Finance, Capital Structure Theories and Dividend Policies.
<b>MCOM 303</b>	<b>Discipline-Specific Elective- Group: A/B/C/D</b>	The student will be able to understand the methods of Human Resource Accounting.  They will also learn about marketing research, the nature of the human resource, and its significance to the organization. They will also get the knowledge of International Financial Management.

<b>MCOM 304</b>	<b>Discipline Specific Elective- Group: A/B/C/D</b>	The Student will get knowledge on the accounting practice prevailing in holding account, Advertising and various behavior of consumer. They will also understand about the relations between industries, Financial institutions.
<b>MCOM 305</b>	<b>Skill-Enhancement Elective- III/IV</b>	Through Commerce Students will learn to take the overview on E-Commerce and Traditional Commerce. They will also learn to communicate in Business.
<b>MCOM 306</b>	<b>General/open Elective- III/IV</b>	Students will get the knowledge of basics of income tax, Indian Tax System. They will understand the Business ethics and corporate social responsibility.

### **M.COM. 4<sup>th</sup> SEMESTER**

<b>MCOM 401</b>	<b>Auditing and Corporate Governance</b>	Student will be able to understand about the process of auditing, classification of audit, Vouching and verification or valuation of assets. They also know about the Common Governance Problems Noticed in various Corporate Failures.
<b>MCOM 402</b>	<b>Corporate Tax Planning</b>	The Student will get the knowledge about tax planning in respect of own or lease, amalgamation or de-merger of companies.
<b>MCOM 403</b>	<b>Discipline Specific Elective- Group: A/B/C/D</b>	Student will develop the ability to analyze and interpret data to provide meaningful information to assist in making management decision.

		They can get the knowledge about International Marketing management, Strategy of Human Resource, various operations in Banking.
<b>MCOM 404</b>	<b>Discipline Specific Elective- Group: A/B/C/D</b>	The students will be able to understand various aspects of advanced cost ascertainment, Rural consumer behavior, Management of change and development. They will also learn portfolio management and security analysis.
<b>MCOM 405</b>	<b>Project/Comprehensive VIVA</b>	This paper helps in enhancing their presentation and communication skill they also learn to develop their personality, so that they can face the challenges of competitive world.



# **DEPARTMENT OF ECONOMICS**

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

### **VISION**

The vision of the department is to impart a quality-based theoretical and applied knowledge of economics striving for the overall development of the students as well as nurturing future researchers and specialists in Economics. The department also aims at conducting research on the national level with special focus on regional socio-economic problems for inclusive development.

### **MISSION**

The mission of the Department is:

- To prepare students for acquiring appropriate knowledge in the field of global, national, and local economic issues, so that they can enhance their employability and entrepreneurship.
- To undertake quality research for regional development in the field of Economics.
- To develop an environment for promoting research activities.
- To stimulate the academic environment by promoting quality teaching-learning and research.
- Engagement of faculty in research to create and disseminate new knowledge, develop quality teaching skills and actively serve the institution and community by maintaining high professional standards.

### **PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)**

The Program Educational Objectives (PEOs) for the Economics program are:

- To develop the students with a thorough knowledge of economics. They will have in-depth understanding of economics by the means of theoretical and empirical constructs.
- Development in their chosen profession or making progress towards higher degree in the field of economics.
- To promote active members who are ready to serve the society locally and globally through sustainable development.

- To apply economics knowledge in identifying and addressing the societal problems.
- To develop capabilities in students to independently conduct theoretical and applied research in the relevant field.

### **PROGRAM OUTCOMES (PO)**

- Students will have a well-founded knowledge of economics.
- The students will be able to understand the functioning of a complicated modern economic system.
- The students will have an opportunity to focus on various issues in society in the field of economics.
- The students with a well-resourced learning environment in economics can serve society as a professional.
- The students will be able to interact with the theoretical and quantitative aspects of economics for better understanding and implementation.
- The structured curricula will support the academic development of students.
- The students will be able to decide the use of resources on an individual and collective basis.
- The study of economics will also provide valuable knowledge for making decisions in everyday life.

### **PROGRAM SPECIFIC OUTCOMES (PSOs)**

- The students will be able to explain the contribution of economics to the analysis of non-market social issues.
- The students will develop the ability to explain core economic terms, concepts, and theories.
- The students will be able to demonstrate the ability to employ the “economic way of thinking.”
- The students will be able to recognize the role of ethical values in economic decisions.
- The students will demonstrate computer proficiency within economics.

- The study of economics will create student's ability to suggest the various economic problems in society.
- The study of economics will develop ability to pinpoint and understand the past and present economic conditions of the country.
- The study of economics makes familiarity with the knowledge and application for the formulation of policies and planning.
- The study of economics develops a scholar that how societies allocate their scarce resources through developing conceptual models and rigorous statistical analysis to investigate the effects and changes.
- The study of economics also provides valuable and innovative knowledge to handle daily life problems and making effective decisions to resolve them.
- Studying economics as a subject enable the learners to build up their skills as a professional in the field of economics as an economist, policy & planning maker, financial analyst etc.
- Studying economics as a subject will help in understanding the efficiency and equity implications of market interference also including various government policies.

## **COURSE OUTCOME (CO)**

The department runs degree course at Graduate and Post-graduate level and in this section the program outcome for both levels is given separately.

## **POST GRADUATE LEVEL COURSE (MASTER OF ARTS IN ECONOMICS) CBCS PATTERN (SESSION 2020-21)**

The CBCS pattern is divided in four semesters. Semester I & II comprises of five Core papers. Semester III comprises two core paper's along with Dissertation, Two Elective paper & One Open Elective Paper. Semester IV comprises One Core paper along with viva-voce, three elective papers and one Open elective paper.

### **SEMESTER LEVEL – I & II**

#### **MICROECONOMICS (1<sup>st</sup> and 2<sup>nd</sup> SEMESTER)**

On success completion of the course the students will be able to understand

- Understand Concept of equilibrium and economic model in economics.
- Understand Theory of consumer behaviour.
- Understanding the production and theory of cost in long and short period.
- Understanding the firm and various theories of maximization.
- Understanding General equilibrium analysis.
- To understand the various type of markets and product pricing.
- Understanding the pricing of factors in market and concept of Welfare ineconomics through various theories.

### **PUBLIC FINANCE (1<sup>ST</sup> AND 2<sup>ND</sup> SEMESTER)**

On successful completion of the course, the students will be able to understand

- Understand the principle of Maximum Social Advantage, Major Fiscal Functions and Functional and activating finance.
- Attain the advantages and knowledge of public investments and other government expenditures.
- Understand the possible burden, benefits and distribution of various types of taxes among various classes of people and impact of taxes. Incidence of taxes under various markets and Indian tax system.
- Understanding the needs of Public debt from all various sources to meet the requirement of an economy and welfare schemes.
- Understanding the Fiscal policies and its objectives especially in a developing economy.
- Understanding the process of preparation, presentation and execution of budget of Union government.
- Understanding the Deficit financing and reports of the last finance commission.

### **INTERNATIONAL ECONOMICS (1<sup>st</sup> AND 2<sup>nd</sup> SEMESTER)**

On successful completion of the course the students will be able to understand –

- Identify the basic difference between inter-regional and international trade, various concepts of trade through international trade theories.
- Show the gains of international trade for an economy and terms of trade and how they are having importance in an economy.
- To understand the trade policy of Free Trade and Protection and to know the interventions in an economy.
- Understanding the functioning bodies and their objectives at international level for trade between the countries - GATT, WTO.

### **HISTORY OF ECONOMIC THOUGHT (1<sup>ST</sup> SEMESTER)**

On successful completion of the course, the students will be able to develop a chronological understanding of the development of economic thoughts (from classical to modern thoughts) which were developed in various schools of thought in different environments including with special sections to understand Indian Economic Thoughts.

### **QUANTITATIVE TECHNIQUES IN ECONOMICS (1<sup>ST</sup> SEMESTER)**

On successful completion of the course the students will be able to understand

- To understand the scope, importance and limitations of Quantitative methods.
- Demonstrate the rules of Measure of Central tendency, Dispersion, Concept of Normal Distribution, Measures of Kurtosis and Skewness.
- Explaining the rules for calculating derivatives and calculating inter-relationship among total, marginal and average cost and revenue analysis. Calculating Maxima and Minima and optimal level of production of a firm.
- To understand the Elementary concepts of Linear Programming.
- Illustrate matrix operation and using Cramer rule to solve system of equations.
- Demonstrate the rules for calculating integration and describing the importance and application of integration in economics.
- Explain the rules for calculating Correlation and Regression to solve and predict for data

analysis.

- Demonstrate the basic concept of probability with various laws and understanding use of Index Numbers for solving various economic problems.

## **INDIAN ECONOMIC DEVELOPMENT AND POLICY (2<sup>nd</sup> SEMESTER)**

On success completion of the course the students will be able to understand

- Develop ideas for the basic concept of Indian Economy and Demographic profile of Indian economy.
- Understand the importance of Human Resource in an economy and concept of Poverty and inequality in Indian environment.
- Understand the planning part of economy with centralised and decentralised institutions as well as magnitude of regional imbalances and regional planning in India.
- Demonstrating the role of agriculture in Indian economy and various food security schemes and Public Distribution System (PDS). Agriculture marketing and its structure.
- Understanding the Industrial structure of Indian economy in public and private system. Structure and functioning of Small and Cottage Industries in India.
- Understanding the globalization and its impact on Indian economy, effect of Foreign Direct Investment in economy and Information technology Industry in Indian environment.

## **RESEARCH METHODOLOGY (2<sup>nd</sup> SEMESTER)**

On success completion of the course the students will be able to understand

- To understand the methods for social investigation and social research selection, research methods and procedures, field study and field experiences to develop the skills for a good researcher.
- To understand the theory to research design and tools.

## **SEMESTER III**

### **MACROECONOMICS I**

On successful completion of the course the students will be able to understand

- Understanding and measuring the National income.
- Understanding the concept and type of macroeconomics and importance of Keynesian economic theory in market.
- Understanding the Saving and Investment functions with concept of Multiplier and accelerator.

### **ECONOMICS OF GROWTH AND DEVELOPMENT**

On successful completion of the course the students will be able to understand

- To understand the concept of economic growth and development as well as indices of development and quality of life indices.
- To understand the classical and partial theories of growth models of dual economy which are given at different time for growth and development of an economy.

### **DISSERTATION**

To develop research insights in the students

### **ELECTIVE PAPERS**

Two papers will be chosen by the students:

#### **LABOUR ECONOMICS (*Elective*)**

On success completion of the course the students will be able to understand

- Understanding of nature and characteristics of labor market with special reference to Indian Labor Market.
- They will understand the recruiting methods followed by industries to recruit the industrial labor.

- To know the wage payment techniques and concept of wages in the industry environment as well as the determination of wages on various sectors (Rural- Urban, Organised- Unorganised).

### **ADVANCED STATISTICS (ELECTIVE)**

On success completion of the course the students will be able to understand –

- They will enable to describe and discuss the key terminology, concepts tools and techniques used in statistical analysis of economic variables and attributes.
- Understand and critically discuss the process from statistical data collection to interpretation of data using analytical tools.
- Able to solve a range of problems using the techniques covered.

### **AGRICULTURAL ECONOMICS (ELECTIVE)**

On successful completion of the course the students will be able to

- Sensitize the overall development and engine of growth in agriculture.
- Learn and identify the opportunities in those flourishing sectors such as horticulture, fishing and agro based industries.
- To understand the concept of organic farming, sustainable farming, livestock energy as well as the technological change in agriculture sector.
- Make them aware of the land distribution, tenure and farming system and the policies which were developed for land reforms in Indian agriculture environment.
- Gain knowledge of the rural unemployment, rural labour supply and agriculture wage along with various poverty eradication programmes in country.

### **OPEN ELECTIVE PAPER (FOR STUDENTS OF OTHER STREAMS) INDIAN ECONOMY (OPEN ELECTIVE)**

On successful completion of the course the students will be able to

- Develop ideas for the basic concept of the Indian Economy



- Understand the importance of Human Resource in an economy and concept of Poverty and inequality in Indian environment.
- Understand the planning part of economy with centralised and decentralised institutions as well as magnitude of regional imbalances and regional planning in India
- Understand the Industrial structure of Indian economy in public and private system.

## **SEMESTER IV**

### **MACROECONOMICS - II**

On successful completion of the course the students will be able to understand

- Understand the various concepts of money and role of banks.
- Understanding the concept of general equilibrium and types of market.
- Understanding the theories of trade cycle of various economists.

### **VIVA-VOCE EXAMINATION**

## **ELECTIVE PAPERS**

### **INDUSTRIAL ECONOMICS**

On successful completion of the course the students will be able to understand –

- This will help students to study the firms, industries and markets.
- The paper will provide knowledge to understand theory, models, methods and concepts which explain the behavior and functioning of industries.
- This also gives insight into how the firms organize their activities, as well as considering their motivation.
- This will develop that how industrial firms organise their activities as well as considering their motivation.

### **FINANCIAL INSTITUTIONS AND MARKETS**

On successful completion of the course the students will be able to understand –

- Functions of financial markets and intermediary institutions
- The structure and objectives of the financial market
- The structure of financial market and the contents of financial assets
- Basic concepts, functions and tools of the financial market: securities, currency, loans, precious metals and precious stones
- Understand the challenges of uncertain environment of financial markets, assess them and take appropriate financial and investment decisions.

## **DEMOGRAPHY**

On successful completion of the course the students will be able to understand –

- The students will understand and aware to know the importance of population in economic development.
- To understand various theories explaining the population growth in an economy.
- The various demographic techniques also enable student to their analytic approach towards qualitative and quantitative aspects and characteristics of population.

## **ECONOMIC SYSTEMS**

On successful completion of the course the students will be able to understand

- Students will be able to understand the links between household behavior and the economic models of demand.
- It will also help in understanding the efficiency and equity implications of market interference, including government policy.

## **OPEN ELECTIVE PAPER (FOR STUDENTS OF OTHER STREAMS) ECONOMY OF UTTARAKHAND**

On successful completion of the course, the students will be able to understand

- Develop ideas for the basic concept of the Economy of Uttarakhand
- Understand the importance of Human resources in the economy of Uttarakhand and the concept of migration and inequality in rural areas.
- Understand the planning part of the economy as well as the magnitude of regional imbalances and regional planning in India
- Understand the Industrial structure of Uttarakhand economy.

## **GRADUATE LEVEL COURSE**

### **(BACHELOR OF ARTS IN ECONOMICS)**

#### **SEMESTER LEVEL – I & II**

#### **MICROECONOMICS I & II**

Upon successful completion of the course, the students will be able to understand –

- The behavior of individuals and small organizations with the help of various theories developed in their respective field.
- It will result in equipping the students with the various aspects of consumer behavior and demand analysis, production theory, cost theory, various markets as well as the equilibrium of a firm in modern market framework.

#### **BASIC QUANTITATIVE TECHNIQUE FOR ECONOMICS I & II**

On success completion of the course the students will be able to understand –

- To understand the economic problems and theories clearly quantitative technique (Mathematical, Statistical and Programming Techniques) is an essential part and this paper is designed to understand the student in this direction.

## **SEMESTER LEVEL – III & IV**

### **MACROECONOMICS & PUBLIC FINANCE I & II**

On successful completion of the course the students will be able to understand

- To make students familiar with the basic theoretical framework underlying in the field of macroeconomics and also aware students to study the aggregates and to provide overall idea about national income, economic policies and its implications.
- This will help them to understand and analyze the impact of public finance on the allocation of resources and the distribution of income and analysis of public expenditure, taxation, budgetary procedures & debt issues in economy.

### **MONEY, BANKING AND INTERNATIONAL TRADE I & II**

On successful completion of the course the students will be able to understand –

- This will help to understand various concepts of money and money substitutes in economy.
- Able to understand various theories of money, inflation and banking system in an economy (Central & Commercial Banks).
- The course is helpful to understand the composition, direction and consequences of international trade.

## **SEMESTER LEVEL – V & VI**

### **PROBLEMS AND PROSPECTS OF INDIAN ECONOMY I & II**

On successful completion of the course the students will be able to understand

- It will help in developing the structure of Indian economy through various pillars of economy and policies framed to run the economy.
- As a part also help in understanding the structure and policies of Uttarakhand's economy as a part of regional economy.
- It acquaints students with latest data and enhancing their analytical skills.

- They will be able to understand the landscape of Indian Economy and Uttarakhand's Economy.

## **HISTORY OF ECONOMIC THOUGHT I & II**

On successful completion of the course the students will be able to understand –

- This will develop a chronological understanding of the development of economic thoughts (from classical to modern) which were developed in various schools of thought in different environment.

**DEPARTMENT OF HISTORY**  
**HNB PG COLLEGE KHATIMA**  
**BA FIRST YEAR**

**Paper 1- Ancient History**

Studying ancient history allows Students to understand where they have come from and why they are here, and by doing so, shows us how the ancients' attempts to shape their futures relate to our own actions in the present day.

**Paper 2-World History**

Through world history, students can learn how past societies, systems, ideologies, governments, cultures and technologies were built, how they operated, and how they have changed. The rich history of the world helps us to paint a detailed picture of where we stand today.

**BA SECOND YEAR**

**paper 1- Medieval History**

The medieval Indian period is an important period for students of history because of the developments in the field of art and languages, culture, and religion. Also, the period has witnessed the impact of other religions on the Indian culture and various political dimensions.

**Paper 2 -World History**

Students can learn about the pillars upon which different civilizations were built, including cultures and people different from their own.

**BA THIRD YEAR**

**Paper 1- Modern History**

Students will be able to understand India in 1707, British Expansion. Changes were introduced by the British. Popular Uprising and Revolts against the British. Socio-Religious Movements. The emergence of Indian Nationalism and India's struggle for independence

## **PAPER 2- INDIAN SOCIETY AND CULTURE**

Education is an important part of a student's life, and it calls for a system designed to support the student's overall development and growth. With the passage of time, conceptualization has improved, resulting in a positive shift in the delivery of knowledge to students. People are looking for more holistic and effective development of their children rather than just focusing on academic excellence. Also, since its inception, modern education has had a significant impact on Indian society and culture. On the one hand, it provided the key to the treasures of modern scientific and democratic thought to the Indian intelligentsia, and on the other hand, it might also disassociate people from their cultural roots, and fade Indian values.

## **MA 1<sup>st</sup> SEMESTER**

### **PAPER 1- WORLD HISTORY (1453- 1648 AD)**

World history is full of stories and facts. Some are inspiring and uplifting; others are chaotic and immoral. Tap into the vivid realm of history, and there are many vital lessons students need to learn. They will study times of suffering and times of joy, and the lessons they learn here can then be applied to their own life experience.

### **PAPER 2 HISTORIOGRAPHY: SOURCE AND EARLY TRENDS**

Historiography is important for a wide range of reasons. First, it helps us understand why historical events have been interpreted so differently over time. In other words, historiography helps students examine not only history itself, but also the broader overlying characteristics that shape the recording of history itself.

### **PAPER 3 - HISTORY OF UTTARAKHAND (FROM THE BEGINNING TO CHAND PERIOD)**

Students need to know about the history of Uttarakhand and its importance. In the Puranas, Uttarakhand was the ancient term for the central Indian Himalayas. Its peaks and valleys were known as *Svargaloka*: a temporary abode of the righteous, and the source of the Ganges. At that time, present-day Uttarakhand was also reportedly inhabited by rishis and sadhus. Uttarakhand is known as "the land of the gods" (Devbhumi) because of its number of Hindu pilgrimage sites.

During the Vedic period, several small republics known as Janapada existed in this region. The Pauravas, Kushanas, Kunindas, Guptas, Katyuris, Palas, Chands, Parmars (or Panwars), and the British have ruled the state by turns.

#### **PAPER 4- POLITICAL AND ECONOMIC HISTORY OF DELHI SULTANATE (AD 1206-1526)**

The Delhi Sultanate is very important for students because it started the Muslim Rule in India. Before that, it was the Rajputs under Prithiviraj Chauhan who ruled over Delhi and the surrounding areas. The start of Muslim rule brought in great cultural diversity which became an important and invaluable feature of our country.

#### **PAPER 5 - SOCIETY AND CULTURE OF INDIA**

The medieval period is an important era in Indian History for the development in the field of art, languages, culture, and religion, so students need to know about this period

Studying history opens up amazing avenues for a career. History is an academic discipline dealing with the study of societies and cultures of a certain time period or long periods of time, to enhance our understanding of the past.

A degree in history provides you with a set of transferable skills that are applicable to a wide range of careers such as law, publishing, journalism and the media, museums, librarianship and archive work, teaching, advertising, work in the development sector, global charity work, Civil Services, and other competitive examinations and Academic Research fields, etc. Having a degree in history, you can specialize in various fields. At the graduate and postgraduate levels, most of these courses are offered nationwide.

A history degree, backed by specialization at the Master's level, can pave the way to a number of careers. Here are eight career options you can go for after a degree in History:

##### **1. ARCHAEOLOGY**

The work of an archaeologist can be research-based or field-related. It includes excavation, but that is only one aspect of archaeology. You are free to specialize in particular objects of study. For instance, you can be an expert on coins called a numismatist, or an epigraphist who decipher



inscriptions. The Archaeological Survey of India (ASI) employs archaeologists and is entrusted with the maintenance of 3,600 monuments, state departments of the archaeology of different state governments, heritage bodies, museums, and other research institutions.

## **2. MUSEOLOGY**

Museologists or specialists in museology are the ones who deal with the design, organization, and management of museums. Their work is filled with research, administration, and public relations. For instance, The National Museum Institute (New Delhi) offers master's in Museology.

## **3. MUSEUM CURATORS**

Museum curators specialize in natural history, metals, terracotta, textiles, paintings, and other related things. The field requires an artistic and aesthetic bent of mind along with administrative skills. It also includes maintenance of records of each item, for instance, from where it has been discovered or acquired, its estimated age, conservation treatment, and such details.

## **4. ARCHIVISTS**

Archivists are experts in preservation, repairing parchment and paper manuscripts, and microfilming documents. They get work in museums, libraries, the National Archives of India, and different state archives.

## **5. HISTORIANS**

A historian's job is to study and research history, and communicate it through written or published works. The prerequisite to becoming a historian is a bachelor's degree in history followed by a Masters in specific areas such as political history, military history, etc.

## **6. HISTORY EXPERTS**

There is a tremendous demand for History experts in movie houses as well who could undertake research work for costumes, jewelry, and movie sets. These experts work closely with both the director and the cinematographer. A history expert can go for a production house as a research analyst as well.

## **7. TEACHERS**

Those who have an interest in teaching can share their knowledge by becoming a teacher either for primary schools or universities. To be a teacher you need to have pursued history in your graduation and should have pursued B.Ed. If you wish to teach at the university level, you will have to complete your Master's degree and then clear the NET examination.

In addition, you can also be employed as a researcher in historical research organizations such as the Indian Council of Historical Research (ICHR) and the Indian Council of Social Sciences Research (ICSSR).

## **8. CIVIL SERVICES**

History has always been a favorite subject for the Civil Services exam, particularly the main exam. Although vast, the syllabus offers many advantages like ease to understand and absorption, no dearth of study material, and the fact that it covers a key segment of the General Studies paper.

## **9. WORK IN THE FILM INDUSTRY**

There is a lot of demand in production houses for people who have a background in History and can-do research for costumes, jewelry, background set, etc. One can join the production house as a research analyst after completing your graduation in history honors.

# **DEPARTMENT OF GEOGRAPHY**

## **VISION OF THE DEPARTMENT**

Geography as a subject is offered at the undergraduate and postgraduate level to Arts, Science, and students so as to enhance and apply their knowledge and skills in multidisciplinary areas. Upon graduation, the students will be able to understand the impact of information and Knowledge change in society. Also, they will be to appreciate the current usage of in various fields of importance in agriculture, business, and industry. Further, the students will be exposed to the current trends in understanding basic physical and Human systems that affect everyday life (e.g. earth-sun relationships, water cycles, wind and ocean currents Population, settlement and transport).

## **MISSION OF THE DEPARTMENT**

- Prepare students to present themselves effectively in a dynamic knowledge and technological, era.
- Promote the understanding and application of the spatial organization of society and see Order in what often appears to be a random scattering of people and places.
- Enable to have sound knowledge of the theory and practical for understanding core subjects
- Facilitate the development and application of problem-solving skills in students.
- After all students are socially responsible citizens.

The programme consists of Six Semesters, each with Two Theory Papers and One Practical Course. In Semester-III the Students have to participate in a compulsory Survey Camp organized normally outside the University Campus. The theory and practical programmes have been designed in such a way that they help students in attaining the holistic knowledge of the subject and in the overall development of the personality that includes physical, intellectual, moral, professional and aesthetic dimensions of human development.

The main objectives of the programme are:

- To acquaint students with the various dimensions of geographical and interdisciplinary knowledge and field realities.
- To develop students' comprehensive understanding of the major concepts, thoughts, and ideas of both conventional and modern streams and branches of Geography and its field applications.
- To expose students to emerging areas of science and technology, such as applications of Remote Sensing [RS], Geographical Information System [GIS], and Global Positioning System [GPS], and help them in building professional competence with in-depth knowledge.
- To sharpen students' critical, creative, liberal, innovative, and scientific thinking in the subject.
- Motivate students involved in self-reflexivity and lifelong learning.
- To inspire students in integrating different aspects of physical, practical, aesthetic, moral and intellectual dimensions of education to develop a holistic personality of each student.
- To help the student in becoming a responsible citizen for the nation and a sensitive and creative human resource for the society's strong value base and ethics.
- To familiarize students with environmental contexts, inclusivity and sustainable development, technology, discussion, professional studies and research.

#### **PROGRAMME OUTCOMES [POs]:**

**PO1: Enrichment of Intellectual Ability:** The programme develops students' comprehensive understanding of the various dimensions of geographical and interdisciplinary knowledge and field realities. It acquaints students with the major concepts, thoughts, and ideas of both conventional and modern branches of Geography and interdisciplinary streams of knowledge, and their field applications. It also enriches their analytical, and critical, creative faculties.

**PO2: Inculcation of Planning Abilities:** The programme develops effective planning abilities including time management, resource management, delegation skills and organizational skills of students which may develop their leadership qualities.

**PO3: Appropriate Application of Knowledge Methodological Tools:** The programme makes a sincere attempt of familiarizing students with critical knowledge and methodological tools which help them in making applications of new ideas, thoughts, and concepts in the real world.

**PO4: Formation of Professional Identity:** The programme intends to develop professional skills among students that would help them in building their professional identity as well becoming professional leaders from local to global levels.

**PO5: Developing Communicative Competence:** The programme intends to develop grammatical and communicative competence among students and make them aware of the nature, form and function of Hindi and English languages. The programme therefore nurtures listening, writing, speaking and reading skills of students which allow them to communicate effectively and improves their access to new knowledge.

**PO6: The knowledge, Knower and Society:** The programme disseminates the fact the conception and distribution of knowledge in any form seems meaningless unless it is seen functioning in a society which is defined by the existence of human beings. Thus, the programme intends to integrate knowledge with the human society and nature. This will help in Creating a Sustainable, Flexible, Enduring and Peaceful Global Society.

**PO7: Environment and Sustainability:** The unprecedented growth and development have disrupted the nature as well as natural resources. In view of this, the programme intends to prepare students to respond to some major issues of environmental conservation and sustainable development.

**PO8: Lifelong Learning:** The programme would motivate and inspire the students to strive on the path of lifelong learning as creation and acquaintance of emerging knowledge and ideas.

#### **PROGRAMME SPECIFIC OUTCOMES [PSOs]**

PSO1. Understand the complexities of man and nature relationships.

PSO2. Integration of Geography with various social and natural sciences.

PSO3. Developing geography as an important professional discipline

PSO4. Identifying new areas for the application of Space and Geo-spatial Sciences.

PSO5. Develop capacity to find solutions to new and emerging risks and challenges that the global society is facing currently.

## **SEMESTER COURSE FRAMEWORK**

### **SEMESTER-I**

#### **Geography (B.A/B. Sc)**

#### **PAPER I -PHYSICAL GEOGRAPHY (GUGP-101)**

**Outcomes: On completion of the course, the student will be able to:**

- This course will familiarize students with the basic understanding of the constituents of Information Technology.
- The intention is to lay the foundation for the core subjects.
- To polish their practical knowledge in office automation tool.
- Describe, Meaning, Scope and Branches of Physical Geography, Explain the Origin of the earth, Interior of the earth, Rocks: origin and classification.
- Interpret the Origin of continents and ocean basins and related theories, and describe Mountains, Plateaus and Plains, Gradational processes, Weathering and Erosion.
- Analyze Composition and structure of the atmosphere, Insulation, Vertical and Horizontal Distribution of atmospheric temperature Pressure and pressure belts, and Wind: Planetary, Periodic and Local.
- Describe Ocean bottom topography, Ocean deposits, Salinity, Temperature, Ocean currents, Tides and Coral reefs.

#### **PAPER II- GEOGRAPHY OF ASIA (Excluding India) (GUGP-102) Max. Marks: 50**

**Learning Outcomes: On completion of the course, the student will be able to:**

- Describe Structure and relief, Drainage, Climate, Natural vegetation, Soils, Natural regions of Asia
- Analyze Population distribution, Agriculture and agriculture regions, Principal minerals.

- Classify Industries and industrial regions, Transport, Major cities, Sources of power.
- Describe Regions and countries: Japan, China, Pakistan, Indonesia, Iran and Israel.

### **PAPER III- PRACTICAL (Basic Cartographic Techniques) (GUGP-P-103)**

**Learning Outcomes: On completion of the course, the student will be able to:**

- Draw different types of Scales
- Enlarge, reduce and combine different types of maps
- Describe concept, nature and scope of cartography, Globe and maps, Essentials of maps, History of map making, Types and uses of maps, Elements of map reading
- Learn and practice Cartographic representation of relief: Hachures, Contours, Form-line, Spot height, Bench mark, Trig point, Layer tint; Interpolation of contours

## **SEMESTER-II**

### **PAPER I- GEOMORPHOLOGY (GUGP-201)**

**Learning Outcomes: On completion of the course, the student will be able to:**

- Describe Nature and scope of Geomorphology, Dominant contemporary methodologies, The role and nature of time in Geomorphology, Space in Geomorphology
- Describe Models of Landscape Evolution: Davis, Penck, King and A time-independent model of Heck, Deterministic modelling of process-response.
- Analyze Isostasy, Seismicity, Vulcanicity, Tectonic and neo-tectonic landforms
- Describe Mass wasting and associated landforms, Landforms associated with geomorphic agents: surface water, underground water, glaciers, sea waves and winds

## **PAPER II- GEOGRAPHY OF INDIA (GUGP-202)**

**Learning Outcomes: On completion of the course, the student will be able to:**

- Describe Physical features, Geologic structure, Drainage system, Climate, Natural vegetation, Soils, Natural regions
- Describe Agriculture, Crops, Agriculture production, Agriculture regions, Irrigation, Livestock raising and Fishery
- Describe Industries Industrial regions, Minerals and Power resources
- Analyze Population density, distribution and urbanization, Transport, Multipurpose projects, foreign trade, Regional development and planning

## **PAPER III- PRACTICAL (MAP READING)**

**Learning Outcomes: On completion of the course, the student will be able to:**

- Reading and classifying Indian topographical maps
- Interpretation of topographical maps and preparation of base map, index map, drainage map, orographic map
- Interpretation of topographical maps and preparation of land use map, settlement map and transport network map.
- Reading Indian weather maps: Their interpretation and preparation of weather report

## **SEMESTER-III**

### **PAPER I- CLIMATOLOGY AND BIOGEOGRAPHY (GUGP-301)**

**Learning Outcomes: On completion of the course, the student will be able to:**

- Describe Nature and scope of climatology, General circulation of the atmosphere, monsoon, Local winds, Humidity, Fog and clouds, Precipitation, Air Masses, Cyclones and anticyclones.



- Classify Climate type and describe their distribution, understand Climate change
- Analyze Biosphere and bio-geography-concept, scope and components, Ecosystem concept, component and functioning, Ecology- some conceptual aspects
- Describe Distribution of plants in different ecosystem and ecological conditions, Distribution of animals in different ecosystem and ecological conditions, Environmental degradation.

## **PAPER II- HUMAN GEOGRAPHY**

**Learning Outcomes:** On completion of the course, the student will be able to:

- Define concept of Human Geography and describe Nature and scope of Human Geography, Branches of Human Geography, Concept of man-environment relationship: Determinism, Possibilism and Neo-determinism
- Describe Evolution of man: Classification of races, Characteristics of races and their broad distribution, Human adaptation to the environment: Eskimo, Bushman, Masai, Naga and Tharus
- Describe Growth and distribution of population, World pattern: Physical, economic and social factors, Major human agglomerations, Migration: Internal and international
- Describe and Classify Rural settlements: Types and pattern, Urban settlement: Evolution and classification, Rural houses in India, Cultural regions of the world

### **PAPER III- PRACTICAL – THEMATIC CARTOGRAPHY (GUGP-P-303)**

Learning Outcomes: On completion of the course, the student will be able to:

- Represent geographical data by (a) dot method (b) proportional sphere method and circle method.
- Represent climatic data: Climatograph, Climograph and Hythergraph
- Represent economic data: Agriculture land use and production and industrial data, Representation of population data: Growth, distribution and employment
- Describe Drainage ordering, Slope analysis: Wentworth's and Smith's methods

### **SEMESTER-IV**

#### **PAPER I- URBUN GEOGRAPHY (GUGP-P-401)**

Learning Outcomes: On completion of the course, the student will be able to:

- Discuss concept of Urban Geography, Urbanism and urbanization, Trends of urbanization in the world
- Describe Towns and culture, Origin and growth of ancient towns, Modern towns and their problems,
  - Site and situation of towns, Urban morphology: Meaning and principles
- Describe Urban areas and the conurbation, Rural-urban fringe, Umland
- Describe Functional classification of towns, Hierarchy of urban settlement, Town planning: Meaning and principles

## **PAPER II- ENVIRONMENTAL GEOGRAPHY (GUGP-P-402- (a))**

Learning Outcomes: On completion of the course, the student will be able to:

- Define Concept, Scope and evolution of Environmental Geography, Environment, Man and environmental processes
- Describe Ecosystem: Food chains, Trophic levels and Productivity, Energy flow, Circulation of element and Geo-biochemical cycle
- Describe Ecosystem services, Biomes, Bio-diversity, Soil system, Man and climate
- Interpret Environmental degradation, Environmental events and hazards, Environmental pollution, Environmental conservation and planning

## **PAPER II- WORLD REGIONAL GEOGRAPHY (EXCEPT ASIA)**

Learning Outcomes: On completion of the course, the student will be able to:

- Explain Meaning and scope of Regional Geography, Regions and regionalism, Globalization and WTO, Population-environment and sustainable development
- Describe Europe: A geographical introduction, Physical structure, Economic and demographic pattern, regional study of United Kingdom
- Describe North America: A geographical introduction, Physical structure, Economic and demographic pattern, regional study of United States of America
- Describe Latin America: A geographical introduction, Physical structure, Economic and demographic pattern, regional study of Brazil

### **PAPER III- PRACTICAL- SURVEYING**

**Learning Outcomes: On completion of the course, the student will be able to:**

- Describe Fundamentals of Surveying: Objects, Primary divisions of survey, Classification
- Perform Surveying by Prismatic Compass: Radiation, Intersection, Close Traverse, Open Traverse, and Correction of bearing
- Perform Plane Table Surveying: Radiation, Intersection, Close Traverse, Open Traverse, Resection by two point and three-point problems
- Measure height/depth by Indian Pattern Clinometer

### **SEMESTER-V**

#### **PAPER I- EVOLUTION OF GEOGRAPHICAL THOUGHTS (GUGP-501)**

Learning Outcomes: On completion of the course, the student will be able to:

- Define and analyze concept and purpose of Geography, Science and philosophy of Geography, The basic concepts of Geography, Techniques and tools in Geography, Different branches of Geography, Aspects of study and Relationship with other Sciences
- Describe Geography in classical times: Greek and Roman Geographers, Contribution by Arab Geographers, Renaissance, Eighteenth century Geography, Classical period of Geography
- Discuss Formulation of scientific Geography, Schools of thought; German, French, Environmental determinism, possibilism, Neo-determinism and probabilism, British, American and former Soviet Union
- Describe Dualism in Geography, Dichotomism of scientific and regional Geography; Unity in Geography, Recent Trends in Geography

## **PAPER II- OCEANOGRAPHY (GUGP-502(a))**

Learning Outcomes: On completion of the course, the student will be able to

- Define concept, scope and development of Oceanography, describe Distribution of water over the globe
- Map Relief of the ocean floor, Continental drift and ocean floor spreading, Composition of sea water
- Discuss Temperature in oceans, Salinity, density and water masses in oceans, Marine deposits
- Map and analyze Coral landforms, Waves and tides, Ocean currents, Marine life

## **PAPER II- AGRICULTURAL GEOGRAPHY**

Learning Outcomes: On completion of the course, the student will be able to

- Define Nature, scope, significance and development of Agriculture Geography, describe Approaches to the study of Agricultural Geography: Commodity, systematic, regional, behavioural and recent approaches etc., Origin and dispersal of agriculture
- Describe Determinants of agricultural land use: Physical, economic, social, and technological, Land holding and land tenure systems, Agricultural efficiency Concepts, Techniques and Methods of measurements; Methods of delimiting crop combination, cropping pattern, crop concentration, intensity of cropping, degree of commercialization, diversification and specialization
- Explain Theories of Agriculture Geography, von Thunen's theory (model) of agricultural location and its recent modifications, Demarcation of Agricultural regions, Whittlesey's classification of agricultural regions; Land use and land capability

- Describe Regional pattern of productivity in India, Green Revolution, White Revolution, Food deficit and food surplus regions; World pattern of Agriculture: Subsistence agriculture, Commercial farming, Plantation agriculture, Mixed agriculture, State, collective and cooperative farming

## **PAPER II- POPULATION GEOGRAPHY**

Learning Outcomes: On completion of the course, the student will be able to

- Describe Nature, Scope and Development of Population Geography; Source and Types of Population Data: Census, Sample Survey and Vital Registration System; Theories of Population: Classical and Modern
- Analyze World Population: Growth, Causes and Consequences; Factors Affecting Population Distribution; Demographic Transition Theory; Migration Types and Determinants
- Discuss Population Characteristics: fertility and Mortality; Age and Sex Structure; Occupational Structure; Human Resource Development and Human Development Index; Urbanization
- Map Population Resource Region of India; Population Growth and Distribution in India; Density Types; Population Problems and Population Policy in India

## **PAPER III- PRACTICAL- PROJECTIONS**

Learning Outcomes: On completion of the course, the student will be able to:

- Define and understand of map projection, Necessity of map projections, Mathematical method of drawing projection, Classification of map-projections
- Construct map projections: Simple conical projection with one and two standard parallels, Bonne's projection, Polyconic projection

- Construct Cylindrical projections: Equidistant and Equal area cylindrical projections, Mercator's, Gall's stereographic projection
- Construct Zenithal Projections: Polar zenithal equidistant, Equatorial zenithal equidistant, Polar zenithal equal-area, Equatorial zenithal equal area

## **SEMESTER-VI**

### **PAPER I- ECONOMIC GEOGRAPHY**

Learning Outcomes: On completion of the course, the student will be able to

- Define concept, aim and scope of economic geography, Resources, classify resources, describe conservation and concepts, Economic landscapes
- Analyze Primary production, Vegetation & forest economy, Soil resources, Mineral resources, Power resources, describe Resource conservation
- Define and map Agricultural regions, describe Principle crops, Theory of agriculture location, Theory of industrial location and industrial regions, Major industries
- Describe World transportation, International trade, patterns and trends, Major trade blocks, Globalization and developing countries

### **PAPER II- REGIONAL PLANNING AND DEVELOPMENT (GUGP-602(a))**

Learning Outcomes: On completion of the course, the student will be able to

- Define Regional concept in geography; Concept, Scope and purpose of Regional planning, classify regions
- Describe Regional Planning: Planning process - sectoral, temporal and spatial dimensions; short term and long-term perspective planning, Indicators of development and their data

sources, measuring levels of regional development and disparities, Planning for a region's development and multi-regional planning in a national context

- Describe Regional development strategies: Concentration vs. dispersal, Case studies for plans of developed and developing countries, Regional planning in India, Regional development in India: problems and prospects, Regional disparities: causes and consequences
- Analyze Concept of Multi-level planning: Decentralized planning; people's participation in the planning process, Concept and approaches of urban development, Landscape ecology and sustainable urban development, Application of remote sensing and Geographic Information systems in Development Planning

## **PAPER-II- POLITICAL GEOGRAPHY**

Learning Outcomes: On completion of the course, the student will be able to

- Define basic concepts and scope of Political Geography; Describe Politics, Geopolitics; History and Development, Approaches of Political Geography.
- Discuss Concept of Nation, State and Nation-State; Geographic Characteristics of States: Size, Shape, Location, Cores and Capitals; Nation Building/Nationalism; Define Frontier and Boundaries; Differentiate Between Frontier and Boundaries; classify Boundaries and describe their Role and Importance in States Functioning.
- Describe Global Geo-politics; Interpret Mahan, Mackinder, Spykman and Seversky with Other Views Related to Heartland and Rimland.
- Describe Political Geography of India; Resource Development and Power Politics; Geopolitical Study of Indian Ocean; Political Geography of SAARC Region; Electoral Geography.



## **PAPER II- GEOGRAPHY OF TOURISM (GUGP-602(c))**

**Learning Outcomes: On completion of the course, the student will be able to**

- Define fundamental Concepts, classify Tourism; Describe Resources and Infrastructure for Tourism
- Assess Physical, Economical, Social and Cultural Impacts of Tourism; Describe Concept of Ecotourism, and New Emerging Trends in Tourism
- Discuss Tourism Marketing; Describe the Tourist Product, Tourism Circuits, Tour Agencies Describe Globalization and Tourism; Tourism in India; Resource and Growth; National Tourism Policy in India; Tourism Organizations. Tourism in Uttarakhand: Policies and Planning.

## **PAPER III- PRACTICAL- STATISTICAL TECHNIQUES AND GEOINFORMATICS**

**Learning Outcomes: On completion of the course, the student will be able to:**

- Elucidate Types of data, Collection of data, Methods of sampling, Measures of central tendency
- Analyze Measures of dispersion, Correlation Coefficient
- Explain Components of remote sensing, Platform and sensors Ground truth, Elements of image interpretation; Image processing techniques: Visual and digital, Geometric and Radiometric corrections, Restoration; Enhancement and Classification: supervised and unsupervised
- Perform Geo-referencing, explain Spatial and Non-spatial data; Raster and Vector models for geographic data representation, Linkages and Matching, Principal Functions of GIS; Data Capture; Geographic Analysis; Scanning System; Data Conversion, Data Base

Management System (DBMS); Geo-Relational Data Model; Topological Data Structure; Attribute Data Management; Relational Database - Concepts and Model, Digital Elevation Model (DEM)

**DEPARTMENT OF POLITICAL SCIENCE**  
**H.N.B. G.P.G. COLLEGE KHATIMA**

<b>B.A. I Year</b>		
	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>B. A. II Year</b>	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>B. A. III Year</b>	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.

### **BACHOLER OF ARTS**

**MA. 1<sup>ST</sup> SEM.**

<b>PAPER I</b>	Western Political thought (from Plato to Bodin)	Students will able to get knowledge about the ideology of famous ancient and medieval western political thinkers.
<b>PAPER II</b>	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.
<b>PAPER III</b>	Public Administration	Student will get basic knowledge and difference of public and private administration.
<b>PAPER IV</b>	Indian Political system	Basic knowledge of Indian political system and basics of Indian constitution.
<b>PAPER V</b>	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. 2<sup>nd</sup> SEM.**

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

### M.A. 3<sup>rd</sup> SEM.

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

### MA. 4<sup>th</sup> SEM.

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

<b>PAPER VI</b>	<b>Viva- Voce</b>	To improve the personality development for future prospective.
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## **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 a diverse 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 to the 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 regional languages as a means of understanding and countering marginalization on the basis of region, class, caste, creed and gender.
- Students shall be educated in both the artistry and utility of the English language through the study of literature and other contemporary forms 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 getting placement 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, inorganic polymers 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 organometallic compounds.

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 of reaction 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 experimental conditions.
5. Familiar with application of homogeneous and heterogeneous catalysis in chemical synthesis.
6. Explain the importance of adsorption process and catalytic activity at the solid surfaces.
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,  $\lambda_{\max}$  for polyenes and  $\alpha$ ,  $\beta$ -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, <sup>1</sup>HNMR, <sup>13</sup>CNMR 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 in biology.

**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 reaction occur when we eat, breath etc, so it's the study of everything. From starting (like extraction of 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 for PCM)

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

**PSO2:** Acquire the necessary mathematical tools and concepts required for understanding the underlying physics.

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

**PSO4:** Acquire problem solving skills and ability to apply them to real world physical phenomenon.

**PSO5:** Motivation to pursue higher studies (Postgraduate, Research etc.) in Physics.

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

<b>Mechanics and Theory of Waves and Oscillations</b>	Understanding vector analysis (applying concepts for problem solving), the nabla operator (Gradient, Divergence & Curl), Differentiation and Integration of Vectors (fields), Integral Theorems (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.
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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 and Sharpness, 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.

<p><b>Electricity and Magnetism</b></p>	<p>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.</p> <p>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 &amp; Ferro). Understanding inductance (self and mutual and induction), Faraday's Law, Lenz' Law &amp; energy conservation, AC circuits- RC, LC and LCR, Resonance.</p> <p>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.</p>
<p><b>Practical (B.Sc. 1<sup>st</sup> Year)</b></p>	<p>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 Moment of Inertia, Elastic constants, Simple &amp; 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.</p>
<p><b>Heat Thermodynamics &amp; Statistical Physics</b></p>	<p>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 (Adiabatic, Isothermal etc.), Mayer's relation.</p> <p>Understanding the need of second law of thermodynamics, Reversible &amp; 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.</p>



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<sup>st</sup> and 2<sup>nd</sup>), 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,  $\mu$  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.

<p style="text-align: center;"><b>optics</b></p>	<p>Understanding Geometrical Optics- Fermat's principle of extremum path and applications, Cardinal points, Combination of Lenses, Lagrange equation of magnification.</p> <p>Understanding optical instruments- Eye pieces (Ramsden's, Huygen's and Gaussian), Aberrations (and types) and their corrections.</p> <p>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.</p> <p>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.</p> <p>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).</p>
<p style="text-align: center;"><b>Practical (B.Sc. 2<sup>nd</sup> Year)</b></p>	<p>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.</p>

**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

	<p>Moseley's Law.</p> <p>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.</p> <p>Understanding Franck-Condon Principle, Molecular spectra, Rotational, Vibration and Electronic spectra of diatomic molecules, General features of electronic spectra, Luminescence, Basics of Raman effect.</p> <p>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 the nucleus (Liquid drop and Shell model), elementary particles and their classification schemes.</p>
<p><b>Electronics</b></p>	<p>Understanding Kirchoff'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.</p> <p>Understanding elementary semiconductors and devices (intrinsic, extrinsic-P &amp; N), the PN diode and its characteristics in forward and reverse bias, Zener diode, Optoelectric devices- LEDs, Photodiode and Solar cell.</p> <p>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.</p> <p>Understanding transistors and amplifiers- Bipolar Junction transistors (NPN, PNP), Characteristics (input and output) in various configurations (CE, CB &amp; 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</p>

	<p>Transistor (UJT)</p> <p>Understanding Oscillator circuits- Feedback (negative and positive), Birkhausen's criterion, RC (Wein bridge and Phase-Shift) &amp; LC (Collector tuned and Colpitt) oscillators and frequency of oscillation, Crystal oscillators, The Multivibrator and various operation modes (Monostable, Astable and Bistable).</p> <p>Understanding Digital Electronics and Circuits- Number systems (Binary etc.) and conversions, Basic Logic Gates (AND, OR &amp; NOT) and realizations using diodes and transistors, Universal Gates (NAND &amp; 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</p>
<p><b>Practical (B.Sc. 3<sup>rd</sup> Year)</b></p>	<p>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.</p>

### **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 the ability 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**

<b>Mathematical Physics</b>	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
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	<p>Tensor, metric Tensor and Tensor densities, covariant differentiation and Geodesic equation.</p> <p>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.</p> <p>Understanding Fourier integral and Fourier Transform, Fourier integral theorem, finite and infinite integral, Laplace transform of elementary function (Dirac delta &amp; Green's function), Solution of simple differential equations.</p>
<p><b>Classical Mechanics</b></p>	<p>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.</p> <p>Understanding Lagrangian and Hamiltonian Formulations with their applications to various conservative systems, Hamilton Jacobi theory.</p> <p>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.</p> <p>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.</p>
<p><b>Quantum mechanics</b></p>	<p>Understanding that our world is inherently quantum and so the proper framework to understand it is Quantum Mechanics.</p> <p>"Establishing"/Understanding the basic framework of QM</p>

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



	<p>atomic/molecular systems.</p> <p>Understanding the atomic and molecular spectra along with their finer features (Fine structure, Vibrational-Rotational spectra).</p> <p>Understanding the effect of electric and magnetic fields on the various spectra via interactions (or charge and/or spin).</p> <p>Understanding the various theories/formulations/models to understand spectra (Vector atom model, LS, JJ coupling schemes, Raman spectroscopy, Heitler-London and Born-Oppenheimer treatments etc.)</p> <p>Understanding the quantum theory of radiation (Einstein's coefficients) and basic working principle of Lasers.</p>
<p><b>Practical (Sem1)</b></p>	<p>The various practicals included in the Physics syllabus of M.Sc. 1<sup>st</sup> 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.</p>
<p><b>General relativity and cosmology</b></p>	<p>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).</p>

	<p>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 (Schwarzschild metric), Orbits in the Schwarzschild metric, gravitational collapse of a dust sphere, Schwarzschild black holes.</p> <p>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.</p> <p>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</p> <p>and their consequences, the primordial fire and the remnant radiation, Big-bang and steady state models of the universe.</p>
<p><b>Advanced Quantum Mechanics</b></p>	<p>Understanding, applying and formulating QM at an even deeper level than done earlier (in the QM Course).</p> <p>Applying quantum ideas to understand the scattering of particles. Employing various (approximate) methods- Partial Wave Analysis and the Born approximation.</p> <p>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.</p> <p>Working out in detail the two basic relativistic wave equations (Klein-Gordon and Dirac equations) and the various associated</p>

	<p>phenomenon/notions (Plane wave solutions, Negative Energies and Probabilities, Spin of electron and its magnetic moment, The Hole Concept, Particles and Antiparticles etc.)</p> <p>Understanding the need of relativistic quantum fields (towards Quantum Field Theory), Field formulations for the various wave equations via 2nd quantization.</p>
<p><b>Nuclear Physics</b></p>	<p>Understanding the atomic nucleus and its various properties along with the experimental tools and techniques of nuclear investigations.</p> <p>Understanding basic properties of the nucleus and the various nuclear models.</p> <p>Understanding the nature of the nuclear force along with experimental setup(s) to study them. Understanding radioactive decay and its various feature.</p> <p>Understanding nuclear reactions by applying (mainly) quantum ideas to them.</p>
<p><b>Elementary Particle Physics</b></p>	<p>Get a basic understanding of the fundamental constituents of our Universe (the “elementary” particles and the four fundamental interactions).</p> <p>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.</p> <p>A very basic understanding of the unification of the fundamental interactions- Electroweak and Grand Unifications.</p> <p>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).</p>

<p><b>Condensed Matter Physics</b></p>	<p>Understanding of the basic (theoretical) ideas involved in the study of Condensed Matter Physics.</p> <p>Understanding the origin of elasticity (and elastic constants) from the properties of the underlying crystal structure.</p> <p>Understanding the interaction of crystals with radiation (X-rays) and the related theoretical framework as well as experimental setup(s) (Diffraction experiments).</p> <p>Understanding the quantum treatment of elastic/sound waves (i.e. the idea of phonons and phonon gas etc.)</p> <p>Understanding the thermal properties of solids on the basis of the phonon picture.</p> <p>Understanding crystal defects, superconductivity, and magnetism.</p>
<p><b>Practical (Sem2)</b></p>	<p>The various practicals included in the Physics syllabus of M.Sc. 2<sup>nd</sup> 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.</p>
<p><b>Advanced Electronics I</b></p>	<p>Understanding Integrated Circuit technology, Classification of IC's, Fabrication of IC's &amp; components, Basic monolithic integrated circuit technology, processes used in monolithic technology, active &amp; passive components, metal semiconductor contact, thick &amp; thin film IC's, hybrid IC's, charge coupled devices (CCD), advantages &amp; limitations of integrated circuits.</p>

	<p>Understanding Operational amplifiers (Linear and Non-linear Analog systems),</p>
<p><b>Advanced Electronics II</b></p>	<p>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.</p> <p>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.</p> <p>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.</p>
<p><b>Electrodynamics</b></p>	<p>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).</p> <p>Understanding the potential formulation of ED (and its advantages).</p> <p>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 &amp; Tensor notations. Understanding the role of this relativistic formulation</p>

	and ability to apply it elsewhere.
<b>Practical (Sem 3)</b>	The various practicals included in the Physics syllabus of M.Sc. 3 <sup>rd</sup> 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.
<b>Advanced Electronics 3</b>	<p>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 &amp; GUNN Diode, Detection of microwave measurement of power.</p> <p>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.</p>
<b>Advanced Electronics 4</b>	Understanding Ananlog computation with Solution of ordinary linear differential equations with constant coefficients, Operation modes of analog computers, repetitive operation of computers, Time scaling,

	<p>amplitude scaling, Generation of functions, Simulation of time varying systems.</p> <p>Understanding Boolean algebra, Canonical forms of Boolean, functions, Simplification of Boolean functions (K-map, Tabulation method), don't care conditions. Digital logic families;</p> <p>Adders &amp; 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.</p> <p>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.</p>
<p><b>Practical (Sem 4)</b></p>	<p>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.</p>
<p><b>Dissertation/ Project</b></p>	<p>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.</p>
<p><b>Elective Courses</b></p>	

<p><b>Communication Electronics</b></p>	<p>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.</p> <p>To know the propagation of radio waves, Antenna and TV.</p> <p>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</p> <p>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.</p>
<p><b>Plasma Physics</b></p>	<p>Introduction to Plasma, Elementary concept: Derivation of moment Equation from Boltzmann Equation, Plasma Oscillation, Debye Shielding, Plasma parameter, Magneto plasma, Plasma confinement.</p> <p>Understanding MagnetoHydrodynamics and magneto Plasma</p> <p>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.</p>



<p><b>Digital Electronics and Computer Architecture</b></p>	<p>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.</p> <p>Understanding Computer Organization and Architecture</p> <p>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.</p> <p>To study Characteristics of communication channels, Allocation of Channels, Physical Communication media, Public Switched Telephone Network, Cellular Communication Path, ATM networks.</p>
<p><b>Atmospheric Physics</b></p>	<p>To gain knowledge about Earth atmosphere, Elementary concept of atmospheric sciences, atmosphere and its 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.</p> <p>Understanding Atmospheric Dynamics and Thermodynamics, Environmental pollution and climate change</p> <p>Study of Convective measurements of pressure, temperature, humidity, wind speed and direction, sunshine duration, radiation clouds, upper air pressure, temperature, humidity and wind measurements, Pilot balloons, radiosonde, dropsonde, ozonesonde, GPS sonde. Application</p>

	<p>of radars to study the atmospheric phenomenon, LIDAR, SONAR, RASS</p> <p>(Radio- acoustic sounding system), Observational technique for aerosol.</p>
<p><b>Introduction to Nanoscience and Nanotechnology</b></p>	<p>Understanding Emergence of Nanotechnology – Challenges in Nanotechnology, Carbon age–New form</p> <p>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.</p> <p>Study of properties of nanomaterials and characterization techniques.</p> <p>Learning about the applications of nanomaterial to Molecular electronics and nanoelectronics, Quantum electronic devices, Carbon Nano Tube</p> <p>based transistor and Field Emission Display, Biological applications, Biochemical sensor, medical applications and Membrane based water purification. Biological systems- DNA and RNA - Lipids.</p>
<p><b>Self study Courses</b></p>	
<p><b>Advances in High Energy Physics</b></p>	<p>Understanding Gauge Theory and Unification of Fundamentals Forces, Quantum Chromodynamics, Thermal Field Theory and Beyond Standard Model</p>

<p><b>Advances in Laser Physics</b></p>	<p>Understanding Laser Raman Spectroscopy and Laser Spectroscopy in Molecular Beams.</p> <p>To gain knowledge of Modern Laser Spectroscopy.</p>
<p><b>Advances in Solar Physics</b></p>	<p>Learning about Solar Flares: Magnetohydrodynamic Processes, Solar Cycle: Observations and theory, Sun-Earth Connection.</p>
<p><b>Bio-Physics</b></p>	<p>To Know the Basic Concepts of Bio-Physics</p> <p>Understanding Technique For The Study of Biological Structure and Function</p> <p>To study the Radiation Effects on Biological Systems</p>
<p><b>Computer Application in Physics</b></p>	<p>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</p> <p>Learning Scientific Programming (FORTRAN and C language), Scientific Word Processing and Modern Software's For Mathematical Computing (LaTeX and MatLab).</p> <p>Study of Computer Applications to Physical Problems(Numerical Methods and Monte Carlo methods).</p>
<p><b>Medical Physics</b></p>	<p>To know about the mechanics of human body, Physics of Respiratory and Cardiovascular System.</p> <p>Understanding Electricity in the Body and Sound/Light In Medicine and Diagnostic X-Rays and Nuclear Medicine.</p> <p>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-</p>

	<p>dots (Cornell dots) and goldnano particle as a diagnostic tool, Anti-cancer polymeric nanomedicines, Use of nano-technology in Photodynamic therapy.</p>
<p><b>Optical Communication</b></p>	<p>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.</p> <p>Study of Signal Degradation Optical Fibers and Fiber Optical Sources And Coupling, Fiber Optical Receivers and Digital Transmission System.</p>

**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 vice 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**



Students understood the importance of hand washing, sanitation and hygiene, safe drinking water; household cleaning and food safety constitute the main focus for hygiene interventions in the college, home and community level.

#### **OUTCOME OF SPECIAL PAPERS (PG LEVEL)**

1. Fishery Science: Students describe the knowledge necessary for professional or academic work in the field of aquaculture and fisheries.
2. Evaluate the importance of diversity as well as the role of social factors (e.g. culture, economics, policy) on aquaculture and fisheries from local to global scales.
3. Demonstrate the basic technical skill necessary for work in aquaculture and fisheries (e.g. data collection and analysis, scientific methods etc.)
4. Create local and global solution to complex challenges in aquaculture and fisheries.
5. Students become familiar with Earth system and the manner in which they have been modified by human activity over time, especially with regards to coastal ecosystems. Recognize and appreciate the diversity of human culture and their relationship to local and global ecosystems. Develop a personal environmental ethic.

#### **OUTCOMES OF IMMUNOLOGY (PG LEVEL)**

1. Trace the history and development of immunology.
2. Understood the organization of immune system.
3. Learn how cell culture is used for research in cancer.
4. Understand the vaccines and their importance.
5. Learn how cancer defeats the immune system.

#### **OUTCOMES OF IMMUNOLOGY (PG LEVEL)**

1. Learn how microorganisms are used as model system to study basic biology, genetics, metabolism and ecology.
2. Learn laboratory skills i.e. preparation of and viewing samples for microscopy, culture techniques, viewing samples in microscopy to identify microorganisms etc.
3. Overall students develops hypothesis generation and testing, including the development of theoretical and practical skills in the design and execution of experiments.