

## Govt. College, Narnaul

### POs, PSOs, COs of Syllabus Offered for B.A. Pass course in session: 2022-23

#### Program Name: B.A. Pass course

The B.A. program in Govt. College, Narnaul college is follows the syllabus prescribed by the affiliating university. Our students are allowed to choose from any of the two optional subjects from the cluster of History, Economics, Political Science, Sociology, Geography, Defence Studies, Mathematics and Sanskrit. B.A. program in our college meets the standards prescribed by general humanities education. Some program outcomes given below:

**PO 1.** The students acquire knowledge in the field of social sciences, literature and humanities which make them sensitive and sensible enough.

**PO 2.** The B.A. graduates will be acquainted with the social, economical, historical, geographical, political, ideological and philosophical tradition and thinking.


**PO 3.** The program also empowers the graduates to appear for various competitive examinations or choose the post graduate program of their choice.

**PO 4.** The B. A. program enables the students to aquire the knowledge with human values framing the base to deal with various problems in life with courage, humanity and develop civic culture.

**PO 5.** The students will be ignited enough to think and act over for the solution of various issues prevailed in the human life to make this world better than ever.

**PO 6.** Program provides the base to be the responsible citizen.

Program Specific Outcomes & Course Outcomes are described subject-wise for all subjects of B.A. Program and are attached herewith.

  
Principal  
Principal  
Govt. College  
Narnaul

## Subject: English

Sr. No	Program Specific Outcomes
PSO-1	The 1 <sup>st</sup> 2 <sup>nd</sup> & 3 <sup>rd</sup> year of English compulsory at UG level enables the students to understand the scope and application of English. It aims to provide adequate basic knowledge about General English & Literature so that an interest of learner may develop and gives them the confidence to go to the next level of learning in the subject. i.e PG level
PSO-2	After the completion of all 6 semester course in English the learners will gain understanding about English language, which will make them skillful for jobs as translators as well as good speakers.
PSO-3	The learners will be able to crack the competitive examinations of UG level as well as entrance test for M.A. English in various Universities.
PSO-4	After learning the language and literature the students become eligible and confident in clearing competitive examinations as English language is indispensable in maximum of the examinations.

### Course Outcomes of English compulsory subject under B.A.

Under 3 year B.A. Program the courses are designed with the following outcomes:

Course Details	Course Outcomes
Literature Language-I & II	This course will enable the students to understand the General aspects of Literature & Language. It also emphasis on the various methods of understanding the English language through literature.
Literature Language	This course will enable the students to understand the General aspects of Literature & Language. It also emphasis on the various methods of understanding English language through literature.
Interpreting a play & Developing composition Skills	This course will enhance the skill of learners to understand the one specific branch of literature and composition skills as General learners of English.

### Subject: Political Science under B.A. Program

#### Program Specific Outcomes:-

Political Science is a branch of Social Sciences that teaches a student about the State, Global Politics and Government. Not only in India, but this course is one of the most opted course around the World as well. The Political Science deals with the working of the state government and various agencies. It helps the learner to know about the duties and responsibilities as well as their rights, the power and responsibilities of the government.

Greek philosopher Aristotle defined Political Science as "It is the course that deals with the study of the State".

Political Scientists have become so important today that they can be seen participating in every political debate.

A Graduate degree in Political Science prepares students for careers in research as well as managerial role in government or politics sectors. The various field/sectors are available to choose their careers:--

1. Understand the world, country, society and have awareness of ethical problems , social rights , values and responsibility to the self and to others.
2. Understand and follow changes in patterns of political behaviour, ideas and structures. Develop the ability to make logical inferences about social and political issues on the basis of comparative and historical knowledge.
3. Take individual and team responsibility, function effectively as an individual and a member or leader of a team ; and have the skills to work effectively in multi-disciplinary teams.
4. Know how to access and evaluate data from various sources of information.
5. Jobs :-- civil services, journalism, political scientists, bank manager, election campaign manager, Teacher , policy analyst, NGO, political content developer, legislative assistant, social media manager, political consultant, Human rights activists, legal advisor to political parties, political opinion analyst.

**Course Outcomes for Political Science subject in B.A. Program:**

Semester	Course Details	Course Outcomes
1	Indian Constitution	After completion of this course students will be able to understand about making and framing of Indian constitution along with various resources, constitutional values, rights and duties as well as centre and state constitutional structure.
2	Indian Politics	This course will enable the students to understand the Indian Politics Indian Politics federal structure, election procedure, Political parties, voting behaviour pattern and emerging trends in Indian politics.
3	Principles of political science-I	Students get acknowledged about the development of political science as discipline, concept of state, origin and functioning.
4	Principles of political science-II	This course will enable the students to understand the rights and duties at Universal level, liberty, equality, development and social changes, RTI & Consumer protection.
5	International Organizations-I	After completion of this course students will be able to understand about historical development of International organization, to maintain cooperation and making of peace toward nations.

6	International Organizations-II	Students get acknowledged about regional organizations i.e. SAARC, ASIAN, EEC etc. Decolonization, International agencies: UNESCO, WTO, Social and trust-ship Council, Role of India in security council & International organizations.
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**Program Specific Outcomes (POs): Sociology under B.A. Program**

समाजशास्त्र में कला स्नातक या BA सोशियोलॉजी तीन वर्षीय स्नातक कार्यक्रम है जहां छात्रों को समाजशास्त्र और समाजशास्त्र की सभी बेसिक कॉन्सेप्ट से परिचित कराया जाता है। अगर मोटे तौर पर कहा जाए तो बीए समाजशास्त्र संस्कृति, सामाजिक संपर्क, सामाजिक स्तरीकरण और सामाजिक संबंधों का अध्ययन है। यह समाज का अध्ययन है। समाजशास्त्र के स्नातक डिग्री कार्यक्रम में समुदाय और जनसांख्यिकी, अपराध और अपराध, सामूहिक व्यवहार, सांस्कृतिक समाजशास्त्र, तुलनात्मक समाजशास्त्र, अनुप्रयुक्त समाजशास्त्र आदि समाजशास्त्र स्नातक पढ़ाई पूरी करने के बाद निम्न पेशे किये जा सकते हैं –

प्रशिक्षण सलाहकार  
सोशियोलॉजिस्ट  
पुनर्वास सलाहकार  
सामाजिक आलोचक  
अनुसंधान सहायक  
सामुदायिक सेवा कार्यकर्ता  
बाजार सर्वेक्षण शोधकर्ता  
सोशल वर्कर  
पारिवारिक परामर्शदाता  
जनगणना कार्यकर्ता

\*Subject: Sociology\*

\*Program Specific Outcomes (PSOs)\*

- \*PSO-1\*: बी. ए. प्रथम सेमेस्टर समाजशास्त्र में मूलभूत अवधारणा जैसे समाजशास्त्र की प्रकृति, क्षेत्र, समाज, समुदाय, संरचना, प्रस्थिति, भूमिका, आदर्श, मूल्य, समूह, परिवार, विवाह, नातेदारी धर्म आदि के बारे में सिखा जाता है।
- \*PSO-2\*: दूसरे सेमेस्टर में जनजातीय, ग्रामीण, नगरीय, औद्योगिक, उत्तर औद्योगिक समाज, समजीकरण, सामाजिक नियंत्रण, संस्कृति, आधुनिकीकरण, सेकुलरिज़्म, वैश्वीकरण, जाति, वर्ग, शक्ति आदि।
- \*PSO-3\*: इस सेमेस्टर में सामाजिक शोध की विधियाँ, सर्वेक्षण, अनुसूची, साक्षात्कार, अवलोकन, निदर्शन, उपकल्पना, माध्य, बहुलक, मध्यांक आदि के बारे में सिखाया जाता है।
- \*PSO-4\*: भारत में सामाजिक समस्याएं जैसे विचलन, विघटन, पथभ्रष्टा, अपराध, कन्या भ्रूण हत्या, दहेज, एड्स, मद्यपान, भ्रष्टाचार, जाति, वर्ग, लैंगिक असमानता, तलाक़, आदि।
- \*PSO-5\*: इस सेमेस्टर में विभिन्न सामाजिक विचारको के बारे में है जैसे कामटे का प्रत्यक्षवाद, स्पेंसर का उद् विकासवाद, दुर्खीम का सामाजिक तथ्य, कार्ल का वर्ग संघर्ष, कोजर का सामाजिक संघर्ष, वेबर का सामाजिक क्रिया व कूले का प्रतीकात्मक सिद्धांत।
- \*PSO-6\*: इसमें ग्रामीण समाज के बारे में है ग्रामीण परिवार, समाज, जाति, वर्ग, लैंगिक भेदभाव, जजमानी प्रथा, भूमि सुधार, हरित क्रांति, प्रवासी मजदूर, बंधूआ मजदूर, पंचायती राज आदि सिखा जा रहा है।

**Subject: History under B.A. Pass Course Program**

**PSO for History at Graduation level**

History helps us understand how the world we live in today came into being. By studying the past, we can understand the Rounds of current events, Political systems, and social structures. History also Provides insights into the origins of cultural Practices, tradition and beliefs that have shaped our society.

These are important things about history

1. Learn about our culture
2. Learn about our identity
3. History builds citizenship
4. Understand Human Behavior
5. Warning signs of future events
6. Learn about the great leaders
7. Politicize history

History subject is more useful today's time be competition & master degree/ Archaeological degree.

The course is designed in the semester system comes each semester following course outcomes.

Course Outcomes:

#### **Paper Istsem**

History of ( from Earliest times 1200 A.D.)

In this paper students get information about social , Religions, economic, political, cultural history of India form Earliest time /initial call of human life till 1200 A.D.

#### **IIndsem Paper**

HISTORY OF INDIA (12:00 AD To 1707 AD.)

The syllables of this paper, we get information about the social, religious, economic, political, cultural History of sultanate period and Mughal's period in medieval India.

#### **IIIrdsem**

History of India (1707 to1947)

The syllables of this paper is about the decline of the Mughals Empire and rise of the Marathas and local kings, British rule, Freedom movement and British administrative system.

#### **Ivthsem**

History of Haryana (Earliest time to 1947 AD)

In this paper we get information about ancient, medieval, modern time of social economic, religious, Political arrangements has been done many historical wars happened in Haryana.

### **Vthsem**

Ancient & medieval world.

In this paper we are taught in the ancient & medieval world civilizations and origin of Islam and Christian Dharma and Feudalism & Trade of the world.

### **VIthsem**

Modern world

In this paper we are thought the mercantilism, capitalism, Imperialism, agricultural, Technological, French

passion Revaluation. Ist&IInd world wars and all worlds events.

### **Subject: Sanskrit under B.A. Program**

#### ***Programme Specific Outcomes (PSO):***

PSO1. Develop a strong concept of ancient Indian history, philosophy and

literature. PSO2. Enhance communications skills-

Listening, Speaking, Reading, Writing.

PSO3. Students will be able to write Devnagari scripts which provide them the paleographical knowledge to read out the script of modern languages like Hindi and Marathi.

PSO4. Students will demonstrate the skill needed to participate in conversation that builds knowledge with collaboration.

PSO5. Students will gain knowledge of the major traditions of literatures written in

Sanskrit. PSO6. To make them eligible for higher education.

PSO7. Prepare students for the profession of teacher, WBCS, UPSC etc.

#### ***Course Outcomes (CO):***

After becoming successful completion of all undergraduate general degree students should be able to achieve the following objectives.

CO1. Students will be able to know ancient Indian history of literature and literary criticism.

CO2. Grammar is a very important part of this language to make a sentence, to know appropriate meaning of texts, oral communication and perfection. Grammar is the only way to know this language well.

CO3. They will learn about the Indian Philosophy, Religion and Culture in Sanskrit tradition.

CO4. Through Gita they also develop their personality.

CO5. Ayurveda will help them to know the Indian medical tradition.

CO6. They will also know Nation and Nationalism through Sanskrit literature.

CO7. The students will be able to learn the yoga, its concept, features etc.

#### DEFENCE STUDIES- under B.A. Program

##### **Programme Specific Outcomes**

Defence Studies students should be able to:

1. Differentiate among multiple Defence Studies perspectives (Ideologies, Theories) from a range of written or spoken genres.
2. Evaluate contemporary issues in light of different research methods and theories of Comparative International geo-politics.
3. Demonstrate the ability to outline and defend a vision of policies in areas such as defence, nuclear, foreign, cyber, science & technology in security purposes.
4. Critically assess the actions of actors in the Indian Ocean region.
5. Demonstrate the ability to interpret, locate, evaluate, generate, and use sociologically relevant data to test hypotheses and draw evidence-based conclusions.
6. After the completion of the course, students will be able to demonstrate knowledge of a range of pedagogical approaches for teaching Defence Studies.
7. Implement lesson sequences, assessment activities, and other requirements during a period of supervised professional experience.
8. Student will be able to understand the links between defence sector and economic models of demand. It will also help in understanding the efficiency and equity implications of arms market interference, including government policy.
9. Student will be able to understand govt. policies and programs related military affairs.
10. It will help students in understanding the behaviour of individuals and small organizations in making decisions on the small arms trade.
11. It will help students in understanding war finance.
12. It will help students in understanding civil-military relations, civil defence and military aid to civil administration.

DEFENCE STUDIES- Course outcomes

<p>BA First Year Semester 1<sup>st</sup> Paper 1<sup>st</sup></p>	<p>World Military History (Earliest Time to 1789 A.D.)</p>	<p><b>1. Influence of Armament on the History of World.:</b> Inter-Relationship of weapons and tactics, Wintringham's Theory and Fuller's Classification, Constant Tactical Factor.</p> <p><b>2. The Age of Valour:</b> Comparative Study of Greek Phalanx and Roman Legion with special reference to the Battle of Pydna (168 B.C.), Detailed Study of the Battle of Arbella (331 B.C.), Battle of Cannae (216 B.C.), Reforms made by Alexander the Great in the Art of Warfare.</p> <p><b>3. The Age of Chivalry: (378 AD-1346 AD)</b> Decline of Infantry and Emergence of Cavalry with special reference to the battle of Adrianople (378 A.D.) , Study of Battle of Hastings (1068 A.D.) , Study of Battle of Crecy (1346 A.D.) Causes of the Decline of Cavalry, Influence of Feudalism, Church and Chivalry, Medieval Warfare.</p> <p><b>4. The Age of Gun-Powder:</b>Advent of Fire Arms and re-emergence of Infantry, Impact of Science and Technology on Warfare, Military reforms and contributions of GustavusAdolphus and Frederick the Great.</p> <p><b>5. The Age of Steam:</b> Revolution in Tactics, French Revolution 1789 A.D., Napolionic Art of War., Battle of Waterloo 1815 A.D.</p> <p><b>6. Contemporary Military Thinkers:</b> a) Suntsu. b) Kautilya. c) Machiavelli. d) Clausewitz. e) Jomini.</p>
<p>BA First Year Semester 2<sup>nd</sup> Paper 2<sup>nd</sup></p>	<p>Military Psychology</p>	<p><b>Military Psychology: Development; Functions and Problems, Significance.</b></p> <p><b>1. Human Factor in Fighting Forces:</b> i) Individual Differences, its importance for fighting forces. ii) Vocational Fitness, right soldier for a right job; Placement. iii) Methods of Selection: Job analysis, Interview: its merits and demerits.</p> <p><b>2. Fatigue: Causes and remedy.</b></p> <p><b>3. Motivation: Kinds, motivation during war.</b></p> <p><b>4. Aptitude and Morale :</b> Factors influencing Morale, Maintenance of Morale during War and Peace.</p> <p><b>5. Tools of Psychological Warfare:</b> Brain Washing, Rumour. Technique of Propaganda,Indoctrination and Coercive persuasion.</p> <p><b>6. Military Leadership:</b>Triats, Types and Qualities.</p> <p><b>7. Discipline and man-Management.</b></p>
<p>BA Second Year Semester 3<sup>rd</sup> Paper 3<sup>rd</sup></p>	<p>WORLD MILITARY HISTORY (MODERN)</p>	<p><b>1. Industrial Revolution and its Impact on Military Power.</b></p> <p><b>2. American Civil War (1862-65):</b> Introduction , Causes, Main Events (in brief), Effects on warfare</p> <p><b>3. Russo-Japanese War (1904-1905):</b> Introduction , Causes, Events (in Brief), Political Consequences</p>



		<p><b>4. World War 1st and its Origin:</b></p> <p>a) Causes of the World War-I</p> <p>b) Trench warfare and Armour with special reference to the battle of Somme.</p> <p>c) Naval Warfare; (i) Element of Sea Power, (ii) Naval Strategy and Tactics during world War-1.</p> <p>d) Air Warfare i) Birth and concept of Air Power and its development ii) Role of Air Craft during World War-1</p> <p><b>5. Second World War:</b></p> <p>a) Causes and Origin of World War-II.</p> <p>b) Armoured Warfare; Concepts of J.F.C.Fuller, Guderian and Liddell Hart.</p> <p>c) Air Warfare: Concepts of Douhet, Mitchell.</p> <p>d) Sea Power; Contribution of A.T.Mahan on Naval Warfare.</p> <p><b>6. Nuclear Warfare:</b></p> <p>i) Beginning of Nuclear Era.</p> <p>ii) Main destructive effects of nuclear energy. Flash, heat, thermal radiation, blast and nuclear radiation.</p> <p>iii) Theories of Nuclear Warfare: Deterrence and Massive Retaliation.</p>
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**Subject: Economics**

PROGRAMME SPECIFIC OUTCOMES (PSOs)

On successful completion of the B.A. Economics program, the students are able to

- PSO1 Have the Capability to demonstrate comprehensive knowledge and understanding on the basic concepts and theories that form a part of this programme.
- PSO2 Have the Capacity to analyse and evaluate the current events from an economic perspective.
- PSO3 Expand skills in practical application of economic theory.
- PSO4 Possess an ability to offer alternative solution on policy issues.
- PSO5 Demonstrate the ability to analyse, interpret and draw valid conclusions from quantitative and qualitative data.
- PSO6 Communicate effectively on specific economic issues and present complex information in a clear and concise manner.
- PSO7 Kindle the interest to use ICT in learning environment.
- PSO8 Nurture the spirit of leadership qualities and readiness to work and learn.
- PSO9 Boost the spirit of self confidence and inculcate the spirit of moral values.

PSO10 Build strong foundation for pursuing continuous learning

Course Outcomes:

***Course Name: Micro Economics –II***

<b>S. NO.</b>	<b>COURSE OUTCOME</b>
CO1	Explain how economists use economic models and able to Understand the Utility concepts.
CO2	Analyse the indifference curves and also understand its uses.
CO3	Explain the Elasticity of demand and supply.
CO4	Understand how factors of production can be used optimally to produce goods and services as they are the building blocks of the economy. Differentiate between short run and long run cost, interpret the relationship between short run and long run cost.

***Course Name: Micro Economics II***

<b>S. NO.</b>	<b>COURSE OUTCOME</b>
CO1	Gain analytical skills for understanding Market structure.
CO2	Analyse the characteristics and pricing methods under monopoly, Monopolistic competition, duopoly and duopoly.
CO3	Demonstrate the theory of interest and profits.
CO4	Analyse the marginal productivity theory of distribution.
CO5	Understand how factor market works, illustrate basic tools in welfare economics and understand the concept of social welfare functions.

***Course Name: MACRO ECONOMICS – 1***

<b>S. NO.</b>	<b>COURSE OUTCOME</b>
CO1	Understanding nature of macro economics and various sectors interrelationship.
CO2	Gaining knowledge on classical and Keynesian theory of employment their relevance.
CO3	Preparing to understand various factors of consumption function.
CO4	Accumulatate knowledge on saving and investment function in an economy.

***Course Name: Macro Economics – II***

<b>S. NO.</b>	<b>COURSE OUTCOME</b>
CO1	Gaining the concept of multiplier and its effects in an economy.
CO2	Accumulatate knowledge on operation of accelerator multiplier in an economy.
CO3	Demonstrate the general equilibrium model with various sectors.
CO4	Sketch the various theories of trade cycle and its relevance.
CO5	Framing the macro economic policies through various theories.

***Course Name: BUSINESS ECONOMICS 1***

<b>S. NO.</b>	<b>COURSE OUTCOME</b>
CO1	Gain knowledge of Basic concepts and Nature of Principles of Business Economics to apply in Business decision making.
CO2	Grasp the ideas on Demand and supply and influence on determination of Price in the market.

CO3	Illustrate the short run and Long run cost and their relationship with output and examine the Revenue concepts.
CO4	Demonstrate the Equilibrium price output determination under perfect and imperfect market conditions.
CO5	Understand the Economists arguments concerning profit policy and acquaint the Knowledge on features of factors of production inflation, deflation and business cycle and its impact on Economy.

***Course Name: BUSINESS ECONOMICS II***

S. NO.	COURSE OUTCOME
CO1	Gain knowledge of Basic concepts and Nature of Principles of Business Economics to apply in Business decision making.
CO2	Grasp the ideas on Demand and supply and influence on determination of Price in the market.
CO3	Illustrate the short run and Long run cost and their relationship with output and examine the Revenue concepts.
CO4	Demonstrate the Equilibrium price output determination under perfect and imperfect market conditions.

***Course Name – Development Economics***

S. NO.	COURSE OUTCOME
CO1	Understanding the basic requirement of economic development and growth.
CO2	Extract the knowledge on planning techniques for economic development.
CO3	Appraise the various planning models and achievements.
CO4	Diagrammatize the various growth models on balanced growth and unbalanced growth.
CO5	Identify the best models of growth can implemented in India.

**Course Name : INTERNATIONAL ECONOMICS**

S. NO.	COURSE OUTCOME
CO1	Distinguishing the internal trade and external trade with policy of free trade and production.
CO2	Accumulate knowledge on various theory of international trade and its effects.
CO3	Preparing the BOP with various transition in India.
CO4	Analysing need, importance and effects of tariff and dumping.
CO5	Understanding the basic rate of foreign exchange and their importance in economic development.

**Subject: Mathematics**

**Program Specific Outcomes (PSOs)**

After the completion of the B.A. with math Students will be able to

1. Appear for master program in various universities.
2. They will get the understanding of mathematical application to solve project specific problems.
3. The learners will efficient in the mathematical calculations in daily works.
4. They may identify and design problem statement for further research.

**Subject: Calculus**

**Class: B.A. 1st Sem.**

**Course Objective**

1. Use the fact that the derivative is the slope of the tangent line to the curve at a given point to help determine the derivatives of simple linear functions.

2. Determine whether the equation of a function given is differentiable or continuous at a particular value of  $x$ .
3. Determine the information from a graph that when the second derivative is positive the graph is concave upward, when the second derivative is negative the graph is concave downward, and when there is a switch in sign there is an inflection point.
4. Understand the curvature and asymptotes of curve.
5. Calculate definite integrals.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.
2. locate the  $x$  and  $y$  intercepts, any undefined points, and any asymptotes.
3. determine asymptotes for rational expressions (we will not go into these graphs in much detail)
4. apply the techniques from the previous section to graph a fourth-degree polynomial or higher.
5. determine if there is any symmetry to aid in the graphing process.
6. determine the point(s) of intersection of pairs of curves.

**Subject: Solid Geometry**

**Class: B.A. 1st Sem.**

### **Course Objective**

1. To get basic knowledge about Circle, Cone, Parabola, Hyperbola, Ellipse etc.
2. To understand the concepts & advance topics related to two- & three-dimensional geometry.
3. To study the applications of conics.
4. To study the application of Sphere, cone and cylinder.
5. To study null lines, reduction of degree of second degree equations and conicoid.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. Trace conic.
2. Solve problem of sphere through a given circle, Intersection of two spheres
3. find equation of tangent of central conicoid
4. Solve problem related generating line.
5. Understand polar equations of conic.

**Subject: Number Theory And Trigonometry**

**Class: B.A. 2nd Sem.**

### **Course Objective**

1. Define and interpret the concepts of divisibility, congruence, greatest common divisor, prime, and prime-factorization.
2. Formulate and prove conjectures about numeric patterns.

3. Produce rigorous arguments (proofs) centered on the material of number theory, most notably in the use of Mathematical Induction and/or the Well Ordering Principle in the proof of theorems.
4. Evaluate trigonometric and inverse trigonometric functions.
5. Solve trigonometric equations and applications.
6. Apply and prove trigonometric identities.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. Demonstrate knowledge and understanding of topics including, but not limited to divisibility, prime numbers, congruences, quadratic reciprocity, Diophantine equations.
2. Learn methods and techniques used in number theory.
3. Write programs/functions to compute number theoretic functions.
4. Use mathematical induction and other types of proof writing techniques.
5. Evaluate trigonometric and inverse trigonometric functions
6. Solve trigonometric equations and applications.
7. Apply and prove trigonometric identities.

**Subject: Ordinary Differential Equations**

**Class: B.A. 2<sup>nd</sup> Sem.**

### **Course Objective**

1. Evaluate first order differential equations including separable, homogeneous, exact, and linear.
2. Show existence and uniqueness of solutions.
3. Solve second order and higher order linear differential equations.



4. Create and analyze mathematical models using higher order differential equations to solve application problems such as harmonic oscillator and circuits.
5. Solve differential equations using variation of parameters
6. Solve linear systems of ordinary differential equations

### **Course Outcomes**

After the completion of the course, Students will be able to

1. Student will be able to solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.
2. Student will be able to find the complete solution of a nonhomogeneous differential equation as a linear combination of the complementary function and a particular solution.
3. Student will be introduced to the complete solution of a nonhomogeneous differential equation with constant coefficients by the method of undetermined coefficients.
4. Student will be able to find the complete solution of a differential equation with constant coefficients by variation of parameters.
5. Student will have a working knowledge of basic application problems described by second order linear differential equations with constant coefficients.

**Subject: Vector Calculus**

**Class: B.A. 2<sup>nd</sup> Sem.**

### **Course Objectives**

1. Define vector fields.
2. Calculate line integrals along piecewise smooth paths; interpret such quantities as work done by a force.
3. Use the fundamental theorem of line integrals.
4. Use Green's theorem to evaluate line integrals along simple closed contours on the plane.
5. Compute the curl and the divergence of vector fields.

6. Apply Stokes' theorem to compute line integrals along the boundary of a surface.
7. Use Stokes' theorem to give a physical interpretation of the curl of a vector field.
8. Use the divergence theorem to give a physical interpretation of the divergence of a vector field.

### **Course Outcomes**

1. Memorize definition of directional derivative and gradient and illustrate geometric meanings with the aid of sketches.
2. Memorize theorem relating directional derivative to gradient and reproduce proof.
3. Calculate directional derivatives and gradients.
4. Apply gradient to solve problems involving normal vectors to level surfaces.
5. Explain the concept of a vector integration a plane and in space.

**Subject : Advanced Calculus Class: B.A. 3<sup>rd</sup> Sem.**

### **Course Objectives**

1. To understand Different indeterminate forms of limit.
2. Calculate functional value in neighbourhood of some point using expansions.
3. To understand the behaviour of curve in space.
4. Continuity and Limits - Prove convergence and divergence of limits using the  $\epsilon$ - $\delta$  definition.
5. Differentiation - Identify and prove basic facts about derivatives and their properties.
6. To understand the maximum and minimum behaviour of a function of two variables.

### **Course Outcomes**

1. The student is expected to learn about the basic principles of multi-variable calculus with proofs.
2. To have full knowledge of calculus involving the fundamental tools such as continuity and differentiability.
3. Students are able to reason rigorously in mathematical arguments. They can follow abstract mathematical arguments and write their own proofs.
4. Students are able to effectively communicate mathematics: reading, writing, listening, and speaking. Students make effective use of the library, conduct research and make oral and written presentations of their findings.
5. To know Relationship between the increasing and decreasing behavior of  $f$  and the sign of  $f$

**Subject: Partial Differential Equation Class: B.A. 3<sup>rd</sup> Sem.**

### **Course Objective**

1. Introduce students to partial differential equations.
2. Introduce students to how to solve linear Partial Differential with different methods.
3. To derive heat and wave equations in 2D and 3D.
4. Find the solutions of PDEs are determined by conditions at the boundary of the spatial domain and initial conditions at time zero.
5. Technique of separation of variables to solve PDEs and analyze the behavior of solutions in terms of eigen function expansions.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. classify partial differential equations and transform into canonical form
2. solve linear partial differential equations of both first and second order
3. apply partial derivative equation techniques to predict the behaviour of certain phenomena.
4. apply specific methodologies, techniques and resources to conduct research and produce innovative results in the area of specialisation.

5. extract information from partial derivative models in order to interpret reality.
6. identify real phenomena as models of partial derivative equations.

**Subject: Statics Class: B.A. 3<sup>rd</sup> Sem.**

### **Course Objective**

1. Develop an understanding of the principles of statics
2. Develop an ability to analyze problems in a systematic and logical manner, including the ability to draw free-body diagrams.
3. Ability to analyze the statics of trusses, frames and machine.
4. Ability to apply laws of statics.
5. To know the knowledge of equilibrium conditions of a static body.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. An ability to construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium.
2. An understanding of the analysis of distributed loads.
3. A knowledge of internal forces and moments in members.
4. An ability to calculate centroids and moments of inertia.

**Subject : Sequences And Series Class: B.A. 4<sup>th</sup> Sem.**

### **Course Objective**

1. Learn to work with logarithmic, exponential, and inverse trigonometric functions.
2. Learn to work with infinite sequences and series.
3. Learn to work with infinite sequence is bounded.

4. Learn to work with an infinite sequence is monotonic.
5. Learn to work with an infinite sequence is convergent or divergent.
6. Find the sequence of partial sums of an infinite series.
7. Determine if a geometric series is convergent or divergent.
8. Find the sum of a convergent geometric series.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. Determine if an infinite sequence is bounded.
2. Determine if an infinite sequence is monotonic.
3. Determine if an infinite sequence is convergent or divergent.
4. Find the sequence of partial sums of an infinite series.
5. Determine if a geometric series is convergent or divergent.
6. Find the sum of a convergent geometric series.
7. Determine if an infinite series is convergent or divergent by selecting the appropriate test from the following: (a) test for divergence; (b) integral test; (c) p-series test; (d) the comparison tests; (e) alternating series test; (f) absolute convergence test; (g) ratio test; and (h) root test.
8. Determine if an infinite series converges absolutely or conditionally.

**Subject: Special Function & Integral Transforms Class: B.A. 4th Sem.**  
**Course Objective**

1. To analyze properties of special functions by their integral representations and symmetries.
2. To determine properties of Fourier Transform which may be solved by application of special functions.
3. To determine properties of Laplace Transform which may be solved by application of special functions.
4. To determine properties of Legendre Polynomial which may be solved by application of special functions.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. understand integral calculus and special functions of various engineering problem and to know the application of some basic mathematical methods via all these special functions.
2. explain the applications and the usefulness of these special functions.
3. classify and explain the functions of different types of differential equations.
4. understand purpose and functions of the gamma and beta functions, Fourier series and Transformation.
5. use the gamma function, beta function and special functions to: evaluate different types of integral calculus problems and Fourier series to solve differential equations.

**Subject: Programming in C & Numerical Methods Class: B.A. 4<sup>th</sup> Sem.**

### **Course Objective**

1. To develop programming skills using the fundamentals and basics of C language.
2. To study the advantages of user defined data type that provides flexibility for application development.
3. To enable effective usage of arrays, structures, functions and pointers.
4. Derive appropriate numerical methods to solve algebraic and transcendental equations.

5. Derive appropriate numerical methods to solve a linear system of equations.
6. Prove results for various numerical root finding methods.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. Read, understand, and trace the execution of programs written in C language.
2. Write the C code for a given algorithm.
3. Write programs that perform operations using derived data types.
4. Solve an algebraic or transcendental equation using an appropriate numerical method.
5. Solve a linear system of equations using an appropriate numerical method.
6. Perform an error analysis for a given numerical method.

**Subject: Real Analysis Class: B.A. 5<sup>th</sup> Sem.**

### **Course Objective**

The student will:

1. Define the real numbers, least upper bounds, and the triangle inequality.
2. Define functions between sets; equivalent sets; finite, countable and uncountable sets. Recognize convergent, divergent, bounded, Cauchy and monotone sequences.
3. Calculate the limit superior, limit inferior, and the limit of a sequence.
4. Recognize alternating, convergent, conditionally and absolutely convergent series.
5. Determine if subsets of a metric space are open, closed, connected, bounded, totally bounded and/or compact.
6. Determine if a function on a metric space is discontinuous, continuous, or uniformly continuous.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. describe fundamental properties of the real numbers that lead to the formal development of real analysis.
2. comprehend rigorous arguments developing the theory underpinning real analysis.
3. demonstrate an understanding of limits and how they are used in sequences, series, differentiation and integration.
4. construct rigorous mathematical proofs of basic results in real analysis.
5. appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.

**Subject: Groups & Rings Class: B.A. 5<sup>th</sup> Sem.**

### **Course Objective**

1. Present the relationships between abstract algebraic structures with familiar numbers systems such as the integers and real numbers.
2. Present concepts of and the relationships between operations satisfying various properties (e.g. commutative property).
3. Present concepts and properties of various algebraic structures.
4. Discuss the importance of algebraic properties relative to working within various number systems.
5. Develop the ability to form and evaluate conjectures.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. understand the importance of algebraic properties with regard to working within various number systems.
2. extend group structure to finite permutation groups (Cayley's Theorem).
3. understand Sylow's Theorems.
4. generate groups given specific conditions.
5. investigate symmetry using group theory.



6. understand the three major concrete models of Boolean algebra: the algebra of sets, the algebra of electrical circuits, and the algebra of logic.

**Subject: Dynamics Class: B.A. 5<sup>th</sup> Sem.**

### **Course Objective**

1. Develop an understanding of the principles of dynamics.
2. Develop an ability to analyze problems in a systematic and logical manner, including the ability to draw free-body diagrams of rigid body.
3. Ability to analyze the dynamics of rigid body.
4. Discuss the motion on smooth and rough planes.
5. Discuss general motion of rigid body, Keplers laws.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. An ability to construct free-body diagrams.
2. An understanding of the analysis of distributed loads.
3. A knowledge of internal forces and moments in members.
4. Apply Keplers laws to solve the problems.

**Subject: Real & Complex Analysis Class: B.A. 6<sup>th</sup> Sem.**

### **Course Objective**

1. Understand how complex numbers provide a satisfying extension of the real numbers;
2. Learn techniques of complex analysis that make practical problems easy (e.g. graphical rotation and scaling as an example of complex multiplication);
3. Appreciate how mathematics is used in design (e.g. conformal mapping);
4. Unlearn (if ever learned) the notion that mathematics is all about getting "the right answer";
5. To understand signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide.

6. Development of the mathematical skills to solve problems involving convolution, filtering, modulation and sampling.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. Students will be able to understand the concept of limit for real functions and be able to calculate limits of standard functions and construct simple proofs involving this concept;
2. Student will be introduced to the concept of continuity and be familiar with the statements and proofs of the standard results about continuous real functions;
3. Student will understand the concept of the differentiability of a real valued function and be familiar with the statements and proofs of the standard results about differentiable real functions.
4. Student will have a working knowledge of differentiability for complex functions and be familiar with the Cauchy-Riemann equations;
5. Student will evaluate integrals along a path in the complex plane and understand the statement of Cauchy's Theorem.

### **Subject: Geography**

#### **Program Specific Outcomes (PSOs):**

PSO-1 The 1st semester of Geography at UG level enables the students to understand the Geography of India. It enables the students to understand the resources available in India. The 2nd semester of Geography curriculum enables the students to understand the concept of physical geography and Geomorphology

PSO-2 The 3rd semester of geography at UG level enables the students to understand the concept of climatology. The 4th semester of B.A Geography provide the knowledge of human Geography like nature and scope of human geography, distribution and density of world population

PSO-3 The 5th semester of Geography inculcate the knowledge of economic condition and classification economic activities. The 6th semester of Geography provide the knowledge about latest technology of mapping, remote sensing and Geographical information system

PSO-4 After the completion of all 6 semester course in geography the learner will gain understanding about latest technology of survey

PSO-5 The learner will be able to qualify compitative examination of UG level as well as entrance test for M.Sc Geography in various universities.

PSO-6 Students will be prepared to apply the skills in professional carrier

PSO-7 after completion the course successful condidates will be eligible for position like Geographer, Surveyer,scientist in Remote sensing

### **Course Outcomes:**

Geography of India-Paper-101: Students will be able to understand the natural hazards,disasters and land resources

Physical Geography -Paper-102: After the completion of the course students will be able to gain the knowledge of interior structure of the earth,earthquakes and volcanoes

Climatology-Paper-201: After the completion of the course students will able to understand the concept of climatology.

Human Geography-Paper-202: Students will have a general understanding of distribution of race of india, distribution of density of world population, rural settlements.

Economic Geography-Paper-301After the completion of the course students will be able to understand economic activities and their impacts on environment, world natural resources

Remote Sensing and GIS Paper-303 After the completion of the course students will be able to use the tools and methods of GIS. Students will be familiar with modern techniquues in Geography

## HND-2122

1- ukVd ,ao jaxaeap ifj{kk isij ds }kjk fio?kkfFkZ;ksa dks laosnu" khy cuk;k tk ldrk gS D;iksa fd dkbZ Hkh fo/kkFkhZ tc fdlh ukVd i<+rk ,qao jaxeap ij ns[krk gSA mlesa lk/kjhdj.k dh `kfDr mRiUu gks tkrh gSA vkSj og lkfgR; esa vf/kd :fp tsrh gSA

2- jaxeap gekjss eu fn- fnekx ds vykok gekjs `kjhj ds fy, csgn vko';d gSA

3- vfHk:fp vkSj ukVd esa O;fDr Hkkoukvksa dks le>uk HkokRed leL;kvksa ls lh[krs gSA

4- ukVd ,ao jaxeap esa dksbZ Hkh fo/kkFkhZ tks ukVd ns[krk ,ao i<+rk gS mlesa Hkh vfHkusrk dk fodlk gksrk gSA bldk Toyar mnkgj.k gS%& bUV<sup>a</sup>kxzke ij jhy cukuk vkfnA

## HND 2123

1-tulaikj ls rkRi;Z mu lHkh lk/kuksa ds v/;;u ,ao fo'ys" k; ls gS tks ,d lkFk cgqr cM+h tual[;k ds lkFk lapkj lEcU/k LFkkfir djus esa lkg;d gksrs gS çlkj.k ij vk/kkfjr tulapkj ds ek/;e Vh-oh] jsfM+;ks] baVjusV L=ksr gSA

2- tulapkj ds ek/;e ls ge rhozxfR ls vf/kd yksxksa rd lans'k igq;pk ldrs GSA tulapkj esa ehfM;k bZ& dkelZ] bZ& i=dkfjrk vkfn Hkh vkrs gSA budk mi;ksx f'k{kk ds {ks= esa fd;k tkrk gsa rks bUgsa f'k{kk dk lk/ku dgk tkrk gS

3- f'k{kk ds ek/;e vf/kdkj dkuqu dks lghrjhds ls ykxq djuk [kqydj dk;Z ;k jsfM+;ks]nqj" kZu vkfn ds ek/;e ls lekftd ukVdks ds çlkj.k ls lekftd txk:drk fodkl o lLd`afr dk laj{k.k vkfnA

4- fnu&çfrfnu ns'k fons'k dh ?kVukvksa ls vke lekU; dks vLohdkj fd;k tkrk gSA ns" k ds fofHkUu Hkxksa dh LkaLd`fr ls tqM+s dk;Zdzeksa ds çn'kZu }kjk tu lekU; dks vius ns>k dh laLd`fr ls vkjksfir fd;k x;kA

## HND 2124

1yksd lkfgR; dk lkekftd egRo gSA lekftd O;oLFkk vkSj yksd lkfgR; dk xgjk laca/k gSA yksdthou lws tqM+s fofHkUu igyqvksa tSlS lkekftd jhfr%&çFkk,a ekU;rk, vkfn ls voxr djuk

2- çkphu laLd`fr ls fon~;kFkhZ;ksaa dks voxr djuk

3- yksd dFkkvks yksd xhrksa lkax] ukVd] vkfmn ds ek/;e ls

- fon~;kFkhZ;ksa dks çsfjr djuk rFkk Kku vtZu djukuk  
 4- yksd lkfgR; dks fo'o Lrj ij ukus dk ç;kl  
 5- viuh çkihu ijEijk ls fon~;kFkhZ;ksa tksM+ukA

**Course out come ,e-, -fgUnh**

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 ls v?krk½

- 1-vkikrdky ds nkSj dh dfork vkikrdky ds dkuys v;/k; ds mtxkj djrh gSA
- 2- uDlycknh vkUnkdyu dk fgUnh dfork ijn çHkok blh ç'u i= dh fo'ks"krk gSA
- 3- lkEçnkf;drk vkSj Hkqe.Muhdj.k dk fgUnh dfork ij çHko dk v/;;u t:jh gSA vr% ;g bl ç'u i= dh çklkafxr
- 4-ukxktqZu] lqnkek ik.Ms; fouksn dqekj `kqqDy vkssj vkyksd dh dfork vius le; thoar nLrkost gSA

**HND-3120**

- 1- bllsa fon~;kFkhZ;ksa dks fofHkUu xn`; fo/kkvksa dh tkudkjh feyrh gSA
- 2- x| fo/kk,a Kku dk Hk.M+kj gS ftlls i<+dj fon~;kFkhZ Kku xzg.k djrk gSA
- 3- fon~;kFkhZ;ksa ds lokZfx.k fodkl esa lgk;d gS
- 4- dgkuh] ukVd]fuca/k ] i=ys[ku] ;k=ko`rkar]Mk;jh vkRedFkk vkfn vusd x| fo/kk,a fon~;kFkhZ Lao; fy[kus yx tkrs gSA

**HND-3121**

- 1- dkO; jiuk ds u, dsoy çfrHkk ls dk;Z ughz gksrh cfYd `kkL=kksa ds i<+us lquus ls mRuu fueZy cqf) dh Hkh t:jr gksrh gSAA
- 2- vlls fon~;kFkhZ dkO; ipuk djus ds fy, çsfjr gksrs gS
- 3- bllsa jl]NUn vyadjk jhfr /ofu cØksfr] vkSfpR; vkfn fl)kUrksa dk Kku gksrk gS tks dkO; dh vkRek dgykrs gSA
- 4- Hkkjrh; dkO;'kk=ksa esa foFkUu vkpk;ksZ ds fl)kUR mudh fopkj/kkj mid ser vkfn ls Kku vtZu djuk
- 5- fon~;kFkhZ dkO;'kkL= dks ;fn vPNs ls vkRelkr dj ysrh gS rks vPNk dfo Hkh cu ldrk gSA

vk/kqfud Hkkjrh; lkfgR;

HND

3122

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,e-,-r`rh; l= ¼ f}rh; o"kZ½

- 1- bldk ys[ku gesa ml lekt dh lekftd fLFfr;ksa vkSj x`g esa lekt esa efgykvksa dh fLFkfr ds ckjs esa crkrk gS
- 2- lkdfR; dk mi;ksx djds u, `kCn] okD;& foU;kl vkSj çopu dk;Z lh[krs gSA os lgh okD; iSVus]ekud dgkuh lajiuk lh[krs gSA os vius ys[ku dkS'kydk fodkl djrs gsa
- 3- Nk=ksa dks lkfgfR;d vkSj lkaLd`ferd xzFkksa esa fn[kkbZ nsus ohys egRoiq.kZ fopkjksa] ewY;ksa vksj fo"k;ksa dh igpku fo'ys"k.k o o.kZu djus esa l{ke gksrs gSAbu foikjksa ewY;ksa vksj fo"k;ksa dks laLd`fr vksj lekt dks lqfpr djus o çHkkfor djus esa l{ke cukrk gS
- 4- Hkkjrh; lkfgR; ds xzUFkksa ls voxr djkrk gsa o Nk=ksa ds O;fDrxr fopkjksa dks fodflr djrk gSA

- 1- e/;dkyhu dk thou lkEçnkf;drk vkSj lkEçnkf;d jktuhfr  
ij pksV djrk gSA
- 2- vpusa le; ds ik[k.M vkSj vU/fo'okl ij djkh pksj lUr  
dfo us dh gS
- 3- dchj lekos'kh fodkl dk u;k ekWMy is'k djrs gsa  
vfgalk] eulk okpk deZ.kk ,d dh igpku jke esa djrs gSA
- 4- dchj vkt lokZf/kd çkalkfxd gS D;ksafd nqfu;k ckdn ds  
<sj ij cS<+h gsa vr% dchj dks ;kn djuk t:jh gSA

**HNd- 4119** ¼vkfndkyhu vkSj e/;dkfyu dfork ,e-,- prqFkZ  
lseSLVj 2019-2023½

- 1- fganh lkfgR; ds bfrgkl dks ij Hkkxksa esa ckaVk x;k  
gSA blesa vkfndky e/;dkfyu dfork ds ek/;e ls  
fo|kfFkZ;ksa esa rkIdkfyu lekftd O;oLFk ls voxr djok;k  
rk ldrk gSA
- 2- bl isij ds ek/;e ,e-, fgznh ds fo|kfFh;ks dks  
rkIrdkyhu jkts& egkjks ,ao lkearoknh O;oLFkk ls :c:  
djok;k tk ldrk gSA
- 3- vkfndkyhu vkSj e/;dkfyu dfork ds ek/;e ls rkIrdkyhu  
lekt eas dksbZ çFkk, & dqçFkk,a tks Hkh lekt esa O;kIr  
FkhA muds ek/;e ls dforkvksa ds }kjk lekt dks  
js[kkafdr fd;k tkuk ,ao ,ao lekt dks Hkzfer djus okys  
ik[kaM+ks dk fojks/k rks u ds cjkcj Fkk D;ksafd lekt  
esa ftldk ^^ [k.kk mlh dk xk.kk^^ çFkk O;kir FkhA
- 4- bl isij ds }kjk rkIrdkyhu thou dh :i js[kk dks  
js[kkafr djuk ,ao fo|kfFkZ;ksa dks clls :c: djokuk bl  
isij dk çeq[k mns'; vusd gks ldrs gSA

## HND 4120

1-bl ikBøe ls Nk] lkfgR; fopkjk/kkjk] dyk bfrgkl& ys[ku  
vkn :iks ls vfHko;DR gksrs gs ;g ,d ,sllk nk;jk gS  
ftlds rgr O;fdr vkSj leqnk; ;g crkrs gs d os [kqn dks  
D;k le>rs gSA

2-vfLerk foe'kZ ls mRiUu Nk=ksa esa lkfgfR;d vfHko;fDr  
dk cks/k fodlhr djuk gSA

3- nfyr fparu ls ysdj L=h vkSj vkfnoklh fparu rd lHkh  
lkfgR; vksj dyk ds lekt`kkL=h; v/;;u vuqal/kku ij cy  
fn;k gSA

4-Nk=ks dks lekt vkSj ns'k dh ukM+h dks ij[ks vkSj mldh  
/kM+du dks le>s Hkk"k ckyus dh igpku gksA

## 4<sup>th</sup> sem

r`rh; ç'u i= ¼ik'pkR; dkO; `kkL=½

### HND-4121

1- Ikk'pkR; dkO;'kkL=h;ksa ls fon~;kFkhZ ik'ikR;dkO;  
ys[ku dks le>rs gSa

2- Ikk'pkR; laLd`fr dks le>us dk volj feyrk gS

3- dkO;'kkL= esa Hkkjrh; vkSj ik'pkR; ds chp varj dks  
le>rs gS vksj tks mi;ksxh gS mls xzg.k djrs gSA

4- Ikk'ikR; fopkjk/kjk ls fon~;kFkhZ voxr gksrs gS



## HND- 4124

¼çseapn½

- 1.çsepUn ds thou eqY;ksa ls voxr djkuA
- 2- çsepUn sd vkn'kZokn o ;FkkZFkokn dks le> o vUrj dj ik,xsA
- 3- lekt esa çsepUn ds le; dk ik:i le> ik,sxs
- 4 nfyf foe'kZ] fdl;ku /ksfcu] ukbZu vkfn fuEu tkfr ds çfr i<+dj lerkewyd jk"V<sup>a</sup> ds fuek.kZ esa ;ksxnku gSA
- 5- eqa'kh çseapn dk lkfgR; vit Hkh gekjs lekt esa ifjorZu ds fy, çsj.kk dk v{k; L=ksr gsSA

Course out come , e-, -fgUnh

lesLVj &Iv paper code- HND-4122

¼fgUnh vkykspuk½

- 1- fgUnh vkykspuk dk mn~Hko dSls gqvk vkSj dfl çdkj ls bldh oSpkfjd fodlhr gqbZ bldk v/;;u t:jh gSA
- 2- HkkjrrsUnq fgUnh vkykspuk ds çorZd ds :i esa lkeus vkrs gSA
- 3- ekDlZoknh vkSj ¼vferkewyd vkykspuk dk fodkl vkt mls vkxs cM+k jgk gSSA
- 4- jpukHkkjksa jpuk ds vykok vkykspuk dk xq.k fdl çdkj ls fodflr gksrk gSA ;g Hkh çseapn çlkn] v'kksd o eqfDrcks/k dh vkykspuk esa ns[kus dks feyrk gSA

Course out come , e-, -fgUnh

lesLVj &Iv paper HND-4123

ledkyhu lkfgR; fparu ¼ekddZokn fo[k.Muokn  
rd½

- 1- Xk;k/khoknh dk fganh  
lkfgd ij çHkko ,d vafglk vkfn ds lanHkZ esa A
- 2- vEcsMjdkjh lfVd fparu dk  
lkfgd ij D;k çHkko iM+k vkSj fdl çdkj nfyr  
fodflr gksrh gSDA ;g mYysaduhZ; gSA
- 3- Ekuksfojys"koknh vkSj  
vkdrRoknh lkfgd fprsuh fganh lkfgd dks ubZ  
fn'kka, gsa nfgr] vkfnoknh] foe"kZ blh nkSj esa  
'kq: gqvka
- 4- Lajp;oknh vkSj  
mRrsjpkvksa lkfgd dk fgUnh ij çHkko ml iqoZ Hkh  
fo'ks"krk gSA

ch-,- f}rh; o"kZ ¼r`rh; lsesLVj½¼vk/kqfud fganh dfork ½  
1-vk/kqfud fganh dfork ds ek;/e ls fo|kFkh;ks dks gfjvkS/k  
eSfFkyh'kj.k xqIr fujkyk th vusd çeq[k jpkudkjksa dh  
jpkukvksa ls voxr dj;k;k x;k gSa

2-jhfrdki ,d Jaxkjh dkO; gSa fleas dyk o ckSf}drk ds ckjs  
esa fo|kFkhZ;ksa dks crk;k tkrk gSaA 'kq} dfork,a ml nkSj  
esa jph xbZ Fkh vkpk;Z jkepUn us e;/ dky dh u;k ukedj.k  
fn;k blh ds ckjs esa cPpkSa dh jhfrdki ls voxr dj;k;k x;k

3-bl dky esa D;k ifjorZu vk, fo|kFkhZ;ksa dks dkO; jpus dh  
vaydkj jl vkfn fo"k;ksa ls voxr dj;k;k tkrk gSa

4-Nk= vius }kjk vk, lekt esa u,s ifjorZu dks le>s bZesy  
baVjusV vkfn e'khuh dj.k dks viuk,s vkSj bls ykHk mBk,A

¼prqFkhZ lsesLVj½

1-fo|kFkhZ;ksa esa miU;kl dk v/;;u djus ls Kku çkIr djrs  
gSA thou dk lkj le>us esa lkg;d gSA

2- dgkuh ukVd]fuac/k vkfn vusd x/k fo/kka, fon~;kFkhZ Loa;  
fu[kus yx tkrk gSA

3] fo/kkFkhZ dk ckSf)d fodkl gksrk gSA ikfjHkkf"kd  
'kCnksa dk I;u dj ikrk gSA

4- vUrjjk"V<sup>a</sup>h;rkoknh]leUo;oknh] jk"V<sup>a</sup>h;rkoknh xq.kksa dk fodkl gksrk gSA

## **çFke lesLVsj e/;dkyhu dkO; dqat ,ao vkfndky dk egRo 2016-2023**

1- fo|kfFkZ;ksa esa e/;dkyhu dfo% dchj ]lqj ehjkckbZ] ?kukkuan fcgkjh ,ao jl[kku vkfn ds :i ls fo|kfFkZ;ksads gn; esa v/;kfRedrk dk lekos'k djuk A

2- fo|kfFkZ;ksadks jl fu"ifr vkfn HkoksA ls voxr djoukk A

3-fo|kfFkZ;ksa esa vkfndkyhu lekt dh :i& js[k dh >kadh dks çLrqr dj lekt dks iq.kZ:is.k çLrqr djukA

4 fo|kfFkZ;ksa esa `kCn & `kfDr;ksa dk fodkl djuk ,ao rhuksa `kCn `kfDr;ksa ¼vfHk/kk] y{k.kk] O;atuk½ ds ckjs esa crukA

5- fo|kfFkZ;ksa eas ekuorkoknh ,ao lektoknh n`f"Vdks.k dks fodflr djukA

## **Programme Specific outcome importance-**

### **B.Sc.**

1- fganH Hkk"kk ds ek/;e ls fo|kfFkZ;ksa esa ekuorkoknh n`f"Vdks.k dks fodflr fd;k tk ldrk gSA D;ksafd fganH Hkkj nr'k ds vaf/kdk'k yksxksa dh Hkk"kk gsa vksj ftl Hkk"kk esa ,d f'k'kq cksyuk lh[krk gSA ml vklkuh ls laLdkfjr fd;k tk ldrk gSA

- 2- fganh Hkk"kk ds }kjk  
 dksbZ Hkh fo/kkFkhZ vius fl)karksa dks vklkuh ls  
 lekt o jk"V<sup>a</sup>ds Hkoh d.kZ/kkj gksrh gSA
- 3- foKku fo"k; ds  
 fo|kFkZ;ksa esa uSfrdrk dk lekos'k djus ds fy,  
 ikB;deZ esa fganh Hkk"kk lqLaLd`r gksrs gq, fdlh fdHkh  
 O;fdr esa laosnuk mRiUu dj ldrh gSA
- 4- fganh Hkk"kk ij cxj vPnh  
 vf/kdkj `kfDr gS rks bl ds ifj.kkeLo:I fdlh Hkh çdkj  
 dh lsok Hkh nh tk ldrh gSApks çk'k'kfud {ks= gks ;k  
 dksbZ O;ol;fnd {ks=A
- 5- vkt fganh Hkk"kk dk xzWkQ  
 c<+rk gh tk jgk gSA blfy, bls çpkj&çlkj dks c<+kus ds  
 lkFk&2 gesa bls `kCn p;u çfØ;k ij Hkh fo|kFkZ;ksa  
 dk /;ku vkdf"kZr djuk gS tks fdlh Hkh jk"V<sup>a</sup> uhaogks  
 ldrs gSA

## programme specific outcome importance-

### B.S.C : (2016-2023)

- 1- fganh fo"k; ls oSKkfud n`f"Vdks.k okys  
 fo/kkFkZ;ksa esa fganh lkfgR; ds }kjk lqLaLd`r  
 cukukA
- 2- fganh Hkk"kk ds }kjk fo/kkFkZ;ksa dh eqyHqr  
 ço`fr;ksa esa vkewypqj ifjorZu djds ekuorkoknh  
 n`f"Vdks.k dks fodflr djukA
- 3- fganh Hkk"kk ds }kjk fo/kkFkZ;ksa esa lekftd  
 tkx:drk dks mRiUu djukA
- 4-fganh Hkk"kk ds }kjk fo/kkFkZ;ksa esa fo'o dh  
 Hkkouk dks fodflr djukA
- Ckh-,- f}rh; lsesLVj /kzoLokfeuh  
 ukVd ,ao HkfDrdky dk egRo 2016&2023  
 ¼iapae lsesLVj½ 2016&2023  
 Lkedkyhu fganh dfork

1-/kzoLokfeuh ukVd ds ek?;e ls ukjh leL;k dks  
fo|kfFkZ;ksa ds le> çLrqr dj muesa laosnu'khyrk dk  
çknqZHkko mRiUu djuk A

2- bl ukVd ds ek?;e ls ukjh eqfDr dks ckr dks lekt rd  
fo|kfFkZ;ksa }kjk igwapkuk rkfd lekt esa ukjh dh  
eqfDr dks losfifj LFkku fn;k tk lds tks fdlh Hkh :i  
esa gks ldrk gSa ;Fkk iquZfookg fo/kok fookg vkfnA

3-HkfDrdky ds ek?;e fo|kfFkZ;ksa dks lxq.k ,o fuxqZ.k  
dfo;ksa ,oa lekt lq/kkj dkSa dh jpukvksa ,oa  
dforkvksa ls voxr djokukA

4- HkfDrdkyhu lekt lq/kkj ds vkanksyukSa ls  
fo|kfFkZ;ksa dks :c: djokukA

Ckh-,- f}rh; lsesLVj 2016&2023 ¼iapae  
llesLVj½ 2016&2023

Lkedkyhu fganH dfork

1-fo|kfFkZ;ksa esa jlkuqHkwfr ,ao lkSUn;kZuqHkwfr djuk  
Nk=k igys dfork dk vFkZ le>s mlDs ckn dkO; }kjk  
ijekuUn dh çkfr djsa A

2- ç;kstuewyd fgUnh `kCn Nk=k esa O;kogkfjd :Ik dks  
lEidZ Lo:Ik ls gS tks tuekul ds vuqdwY vkSj tuO;ogkj  
ds fy, loZFkk l{keg SA

3- foKku dh Hkk"kk ,ao `kCnkoyh esa o`f} gksrh gSA  
`kCnks esa li"Vrk vkrh gSa

Ckh-,- f}rh; lsesLVj 2016&2023 ¼iapae  
llesLVj½ 2016&2023 gfj;kuk  
Hkk"kk vkSj lkfgR;

1-çFke bdkbZ esa vusd dfo;ks dh çfl} jpukvks ds ek;/e  
ls cPpks ds euksfodkl mudh Hkkoukvksa dks çse dks  
çksRlkfgr fd;k tkrk gSa

2-gfj;k.koh Hkk"kk ds bfrgkl ls voxr dj;k tkrk gSa  
gfj;k.koh Hkk"kk ls gfj;k.kk ds bfrgkl ls lkax vkfn

ls voxr djk;k tkrk gSa rkfd mles Hkh Hkk"kk ds çfr  
jkspdrk c<+s

3- gekjh laLdfr jhfr fjokt [kku& iku ls voxr djk;k tkrk  
gSa

4-ekuoh; detksfj;ksa] jktuhfrd Ny vkfn dks le>us dh  
{kerk vkrh gSA

1- /kzoLokfeuh ukVd ds ek?;e ls ukjh leL;k dks fo|kfFkZ;ksa ds le> çLrqr dj muesa laosnu'khyrk dk çknqZHkko mRiUu djuk A

2- bl ukVd ds ek?;e ls ukjh eqfDr dks ckr dks lekt rd fo|kfFkZ;ksa }kjk igwapkuk rkfd lekt esa ukjh dh eqfDr dks losfifj LFkku fn;k tk lds tks fdlh Hkh :i esa gks ldrk gSa ;Fkk iquZfookg fo/kok fookg vkfnA

3- HkfDrdky ds ek?;e fo|kfFkZ;ksa dks lxq.k ,o fuxqZ.k dfo;ksa ,oa lekt lq/kkj dksa dh jpukvksa ,oa dforkvksa ls voxr djokukA

4- HkfDrdkyhu lekt lq/kkj ds vkanksyuksa ls fo|kfFkZ;ksa dks :c: djokukA

Ckh-,- f}rh; lsesLVj 2016&2023 ¼iapae

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Lkedkyhu fganh dfork

1-fo|kfFkZ;ksa esa jlkuqHkwfr ,ao lkSUn;kZuqHkwfr djuk  
Nk=k igys dfork dk vFkZ le>s mlds ckn dkO; }kjk ijekuUn dh  
çkflr djsa A

2- ç;kstuewyd fgUnh 'kCn Nk=k esa O;kogkfjd :lk dks IEidZ  
Lo:lk ls gS tks tuekul ds vuqdwy vkSj tuO;ogkj ds fy, loZFkk  
l{keg SA

3- foKku dh Hkk"kk ,ao 'kCnkoyh esa o`f} gksrh gSA 'kCnks  
esa li"Vrk vkrh gSa

Ckh,-, f}rh; lsesLVj 2016&2023 ¼iapae  
llesLVj½ 2016&2023 gfj;kuk Hkk"kk  
vkSj lkfgR;

1-çFke bdkbZ esa vusd dfo;ks dh çfl} jpukvks ds ek;/e ls  
cPpks ds euksfodkl mudh Hkkoukvksa dks çse dks çksRlkfgr  
fd;k tkrk gSa

2-gfj;k.koh Hkk"kk ds bfrgkl ls voxr dj;k tkrk gSa gfj;k.koh  
Hkk"kk ls gfj;k.kk ds bfrgkl ls lkax vkfn ls voxr dj;k tkrk gSa  
rkfd mles Hkh Hkk"kk ds çfr jkspdrk c<+s

3- gekjh laLdfr jhfr fjokt [kku& iku ls voxr dj;k tkrk gSa

4-ekuoh; detksfj;ksa] jktuhfrd Ny vkfn dks le>us dh {kerk vkrh  
gSA





## Govt. College, Narnaul

POs, PSOs, COs of Syllabus offered in Session: 2022-23

Name of the program: Bachelor of Commerce

### Program Outcomes (POs)

PO-1: Understand the role of business and its implications on society

PO-2: Understand the conceptual knowledge of accounting and acquire skills of maintaining  
Accounts

PO-3: Acquire entrepreneurial, legal and managerial skills


PO-4: Identify the avenues of marketing and banking both traditional and modern

PO-5: Develop the skills and techniques of communication to be successful in business and personal  
life

PO-6: Improve competency to make eligible and employable in the job market

PO-7: Recognize different value systems and ethics, understand the moral dimensions and accept  
responsibility

Program Specific Outcomes & Course Outcomes are described subject-wise for all subjects of Commerce stream and are attached herewith.

  
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## Subject: Core Groups of Commerce

### Program Specific Outcomes (PSOs) & Course Outcomes (COs):

<b>Accounting Group</b> Financial Accounting, Corporate Accounting, Cost Accounting and Accounting for Financial Management	<ul style="list-style-type: none"><li>• Impart conceptual knowledge of various accounting concepts, convention and policies</li><li>• Helps in ascertaining the cost of material and labour.</li><li>• Provides knowledge of long term investment decisions, planning and risk of investment projected with it.</li></ul>
Statistics and Mathematics	Introduce mathematics and statistics to undergraduate students of commerce so that they can use them in the field of commerce and industries to solve the real life problems
Banking and Insurance	Provide knowledge of e-banking services and e-banking techniques in the competitive IT Environment
Taxation Law and GST	Provide practical knowledge which will be beneficial to the students in their lifetime
Management and others Economics , BRF ,Corporate law, Computer	<ul style="list-style-type: none"><li>• Enhances the use of IT Services at all aspects</li><li>• Identifies</li></ul>

## Subject: Mathematics

### Program Specific Outcomes (PSOs)

After the completion of the B.Com. With math Students will be able to

1. Appear for master program in various universities.
2. They will get the understanding of mathematical application to solve project specific problems.
3. The learners will efficient in the mathematical calculations in daily works.

4. They may identify and design problem statement for further research.

**Subject: Business Mathematics I Class: B.Com. 1st Sem.**

### **Course Objectives**

1. To understand basics of integration and its uses in the areas of mathematics.
2. Independently solving of business problems.
3. Use percentages, ratios, and proportions for business applications such as discounts, markups, and markdowns, and be able to differentiate which math methods should be used for different problems.
4. Use simple and compound interest to do business calculations such as value of money, maturity value, promissory notes, present value, and future value and be able to differentiate which math method should be used for different problems.
5. Use business statistics for central measurements, frequency distributions, graphs, and measure of dispersion and be able to select which math method should be used for different problems.

### **Course Outcomes**

1. To apply basic terms of integration in solving practical problems field of as of business.
2. To explain basic methods of business calculus, types and methods of interest account and their basic applications in practice.
3. To solve problems in the areas of business calculus, simple and compound interest account, use of compound interest account, loan and consumer credit.
4. To discuss effects of various types and methods of interest account.
5. connect acquired knowledge and skills with practical problems in economic practice.

**Subject: Business Mathematics Class: B.Com. 2nd Sem.**

### **Course Objectives**

1. Understanding basic terms in the areas of business calculus and financial mathematics.

2. Independently solving of business problems.
3. Use percentages, ratios, and proportions for business applications such as discounts, markups, and markdowns, and be able to differentiate which math methods should be used for different problems.
4. Use simple and compound interest to do business calculations such as value of money, maturity value, promissory notes, present value, and future value and be able to differentiate which math method should be used for different problems.
5. Use business statistics for central measurements, frequency distributions, graphs, and measure of dispersion and be able to select which math method should be used for different problems.

### **Course Outcomes**

After the successful completion of the syllabus, students will be able to

1. define basic terms in the areas of business calculus and financial mathematics.
2. explain basic methods of business calculus, types and methods of interest account and their basic applications in practice.
3. solve problems in the areas of business calculus, simple and compound interest account, use of compound interest account, loan and consumer credit.
4. discern effects of various types and methods of interest account.
5. connect acquired knowledge and skills with practical problems in economic practice

### **Subject: Economics**

#### PROGRAMME SPECIFIC OUTCOMES (PSOs)

On successful completion of the B.Com. Economics program, the students are able to

PSO1 Have the Capability to demonstrate comprehensive knowledge and understanding on the basic concepts and theories that form a part of this programme.

PSO2 Have the Capacity to analyse and evaluate the current events from an economic perspective.

PSO3 Expand skills in practical application of economic theory.

PSO4 Possess an ability to offer alternative solution on policy issues.

PSO5 Demonstrate the ability to analyse, interpret and draw valid conclusions from quantitative and qualitative data.

PSO6 Communicate effectively on specific economic issues and present complex information in a clear and concise manner.

PSO7 Kindle the interest to use ICT in learning environment.

PSO8 Nurture the spirit of leadership qualities and readiness to work and learn.

PSO9 Boost the spirit of self confidence and inculcate the spirit of moral values.

PSO10 Build strong foundation for pursuing continuous learning

Course Outcomes:

***Course Name: Micro Economics –II***

<b>S. NO.</b>	<b>COURSE OUTCOME</b>
CO1	Explain how economists use economic models and able to Understand the Utility concepts.
CO2	Analyse the indifference curves and also understand its uses.
CO3	Explain the Elasticity of demand and supply.
CO4	Understand how factors of production can be used optimally to produce goods and services as they are the building blocks of the economy. Differentiate between short run and long run cost, interpret the relationship between short run and long run cost.

***Course Name: Micro Economics II***

<b>S. NO.</b>	<b>COURSE OUTCOME</b>
CO1	Gain analytical skills for understanding Market structure.
CO2	Analyse the characteristics and pricing methods under monopoly, Monopolistic competition, duopoly and duopoly.
CO3	Demonstrate the theory of interest and profits.
CO4	Analyse the marginal productivity theory of distribution.

CO5	Understand how factor market works, illustrate basic tools in welfare economics and understand the concept of social welfare functions.
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***Course Name: MACRO ECONOMICS – 1***

S. NO.	COURSE OUTCOME
CO1	Understanding nature of macro economics and various sectors interrelationship.
CO2	Gaining knowledge on classical and Keynesian theory of employment their relevance.
CO3	Preparing to understand various factors of consumption function.
CO4	Accumulalte knowledge on saving and investment function in an economy.

***Course Name: Macro Economics – II***

S. NO.	COURSE OUTCOME
CO1	Gaining the concept of multiplier and its effects in an economy.
CO2	Accumulalte knowledge on operation of accelerator multiplier in an economy.
CO3	Demonstrate the general equilibrium model with various sectors.
CO4	Sketch the various theories of trade cycle and its relevance.
CO5	Framing the macro economic policies through various theories.

***Course Name: BUSINESS ECONOMICS 1***

S. NO.	COURSE OUTCOME
CO1	Gain knowledge of Basic concepts and Nature of Principles of Business Economics to apply in Business decision making.

CO2	Grasp the ideas on Demand and supply and influence on determination of Price in the market.
CO3	Illustrate the short run and Long run cost and their relationship with output and examine the Revenue concepts.
CO4	Demonstrate the Equilibrium price output determination under perfect and imperfect market conditions.
CO5	Understand the Economists arguments concerning profit policy and acquaint the Knowledge on features of factors of production inflation, deflation and business cycle and its impact on Economy.

***Course Name: BUSINESS ECONOMICS II***

S. NO.	COURSE OUTCOME
CO1	Gain knowledge of Basic concepts and Nature of Principles of Business Economics to apply in Business decision making.
CO2	Grasp the ideas on Demand and supply and influence on determination of Price in the market.
CO3	Illustrate the short run and Long run cost and their relationship with output and examine the Revenue concepts.
CO4	Demonstrate the Equilibrium price output determination under perfect and imperfect market conditions.

***Course Name – Development Economics***

S. NO.	COURSE OUTCOME
CO1	Understanding the basic requirement of economic development and growth.
CO2	Extract the knowledge on planning techniques for economic development.
CO3	Appraise the various planning models and achievements.
CO4	Diagrammatize the various growth models on balanced growth and unbalanced growth.
CO5	Identify the best models of growth can implemented in India.



***Course Name : INTERNATIONAL ECONOMICS***

S. NO.	COURSE OUTCOME
CO1	Distinguishing the internal trade and external trade with policy of free trade and production.
CO2	Accumulate knowledge on various theory of international trade and its effects.
CO3	Preparing the BOP with various transition in India.
CO4	Analysing need, importance and effects of tariff and dumping.
CO5	Understanding the basic rate of foreign exchange and their importance in economic development.

## Govt. College, Narnaul

### POs, PSOs, COs of Syllabus offered in Session: 2022-23

**Name of the program: BBA**


**Program outcomes:-**

- Upon completion of the BBA program, the individual must demonstrate maturity, professionalism and team working skills.
- Upon completion of the BBA program the student will have general idea of operations in business.
- Upon completion of the BBA program, the individual will have specialized issues of concern.
- Upon completion of the BBA program, the individual will be able to apply technological know-how for business advancements.
- After BBA, the individual will be capable of analysing, investigating and solving critical business issues.

**Program specific outcomes:-**

- Acquire practical learning through summer training, industrial visit and business plan etc.
- Demonstrate analytical and problem solving skills through core elective of finance /account , human resource , marketing IT etc. solve the business issues
- Understand and develop the new dimensions of knowledge through open electives to cater the need of the industry.

Course Outcomes for each course in the program are described and attached herewith.

  
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Narnaul

Program Name: BBA

**Program outcomes:-**

1. Upon completion of the BBA program, the individual must demonstrate maturity, professionalism and team working skills.
2. Upon completion of the BBA program the student will have general idea of operations in business.
3. Upon completion of the BBA program, the individual will have specialized issues of concern.
4. Upon completion of the BBA program, the individual will be able to apply technological know-how for business advancements.
5. After BBA, the individual will be capable of analysing, investigating and solving critical business issues.

**Program specific outcomes:-**

1. Acquire practical learning through summer training, industrial visit and business plan etc.
2. Demonstrate analytical and problem solving skills through core elective of finance /account , human resource , marketing IT etc solve the business issues
3. Understand and develop the new dimensions of knowledge through open electives to cater the need of the industry.

**Course outcomes:-**

(a) General management group :-

It comprise organisational behaviour, business environment , human resource management , business law, capital market , production material management , consumer protection , environment science , disaster management, business organisation , business communication, principles of management research business subject ,

After completions of these course the individual will be capable of :-

1. Applying the concepts related to ecology for sustainable life on earth
2. Determine the managerial roles and skill with special attention to managerial roles and skills, with special attention to managerial responsibility for affective and efficient achievement of goals .

3. Understand group behaviour in organizations, including communication, leadership, power and policies, RBI role process of economic reforms.
4. Develop insights of economics policies, RBI role, process of economic reforms.
5. Understand the concept, process design tools and techniques of RM .
6. Develop an understand of the concept of HRM and its importance in the organization

(B) Account & mathematics group:-

This group comprise statistics for business decisions financial accounting, company law , cost accounting, financial management m accounts income tax etc.

Course outcomes

1. Analyses statistical statistics for using measures of central tendency dispersion and skewness, construct index number and its use.
2. Apply critical thenking and problem solving skill for preparation of trading and profit& loss account , balance sheet of sole trader .
3. Student s will understand of the concepts company law.
4. Familiarize the concept of cost accounting and analysis material cost by various methods of pricing material issues.
5. Determine optimum capital structure and cost of capital of various source like equity, debt, preference and retained earnings.
6. Will become aware of Law related to sales of goods, the unpaid seller and understand Consumer protection measures available in India.
7. Will become aware of taxation process, rebates, provision etc.
8. Analyse the Network Design and logistics Management of a firm.

(b) IT & other group

This group Consists Personality Development & Communication skills, Macro & Micro Economics Analysis, Fundamental of Computers, Marketing Management, E-commerce System Analysis& Networking etc. subjects.

Outcomes of course:-

1. Demonstrate an in depth knowledge of the roots, concepts and evolution of E-Business and E-commerce along with its benefits & limitations.
2. Enhancing confidence articulation skills (to listen, speak and write in English at workplace).
3. The students will understand the Basic working of computers and about hardware & software.
4. Understanding of different school of thought of Micro and Macro Economies
5. Understand the basics concepts, importance of marketing and marketing environment.
6. Understand the Concept of Networking.

## Govt. College, Narnaul

### POs, PSOs, COs of Syllabus offered in Session: 2022-23

Program Name: B.Sc. (Pass Course) Medical, Non-Medical & Computer Science

**Program Outcomes (PO):** Common for B.Sc. (Pass Course) Medical, Non-Medical & Computer Science

The Three-year B.Sc. Program at Government College, Narnaul offers courses in the subjects of Physics, Chemistry, Mathematics, Zoology, Geology, Botany, Computer Science. All of these subjects are designed with a specific aim of introducing students to various learning methods thereby exposing them to several laboratory techniques in handling equipment, critical thinking and being independent as well as team learner. Under this program the students learn several approaches of data analysis and become confident in using computational methods to analyze and solve various problems. Although, the long term objectives of the program are quite varied as the courses taught here will be helpful in drawing many to careers that demand scientific and technical knowledge and strong logical reasoning abilities. The following are the key Program Outcomes that highlight important areas in which the students are expected to gain proficiency at the end of the tenure of their undergraduate program.

**PO-1:** The program enables the learners to demonstrate, solve and understanding of major concepts in different disciplines of Non-Medical Medical, Computer Science.

**PO-2:** The learners can think scientifically and draw a logical conclusion and solve problems independently.

**PO-3:** It will employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of the experiments.

**PO-4:** By the use of modern techniques & lab equipment they will have practical knowledge about courses opted.

**PO-5:** Students become eligible to join various positions like managers, scientific officers, medical representatives etc. in private sector as well as government sector.

**PO-6:** Students can join Post Graduate programs in Physics, Chemistry, Mathematics, Geology, Botany, Zoology, Computer Science etc.

**PO-7:** Program will develop empathy and love towards the biota.

Program Specific Outcomes & Course Outcomes are described subject-wise for all subjects offered in the B.Sc. Program are attached herewith.

  
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## **Subject: Botany**

### **Program Specific Outcomes (PSO's)**

**PSO1.** Critical evaluation of ideas and arguments by collecting relevant information about the plants, so as to recognize their position in the classification systems and at phylogenetic level.

**PSO2.** Students will be able to access the primary literature, identify relevant works for a particular topic, and evaluate the scientific content of these works.

**PSO3.** Students will be able to compare and contrast the characteristics of the different groups of plants such as algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms.

**PSO4.** Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth.

**PSO5.** Students will be able to explain how Plants function at gene, genome, cellular and tissue level,

**PSO6.** Students will be able to relate the physical features of the environment to the structure of populations, communities, and ecosystems.

**PSO7.** Students will be able to conceive the idea of artificial propagation of plants via vegetative methods and to find a livelihood via establishing miniature plant nurseries.

### **Course Outcome (CO's)**

#### **Core course 1 Code: BOT1.1**

#### **METHODOLOGY OF SCIENCE AND AN INTRODUCTION TO BOTANY**

**(Theory 36 hrs; Practical 36 hrs; Credits 2 + 1)**

**CO 1–** To understand the universal nature of science

**CO 2–** To demonstrate the use of scientific method

**CO 3–** To lay a strong foundation to the study in Botany

**CO 4 –** Impart an insight into the different types of classifications in the living kingdom.

**CO 5–** Appreciate the world of organisms and its course of evolution and diversity.

**CO 6–** Develop basic skills to study Botany in detail

#### **Core course 2 Code: BOT1.2**

#### **MICROBIOLOGY, MYCOLOGY AND PLANT PATHOLOGY**

**(Theory 36 hrs; Practical 36 hrs; Credits 2 + 1)**

**CO 1–** Understand the world of microbes, fungi and lichens

**CO 2–** Appreciate the adaptive strategies of the microbes, fungi and lichens

**CO 3–** To study the economic and pathological importance of microorganisms

#### **Core course 3 Code: BOT2.1**

#### **PHYCOLOGY AND BRYOLOGY**

**(Theory 54 hrs; Practical 36 hrs; Credits 3 + 1)**

**CO1–** To study the evolutionary importance of Algae as progenitors of land plants

**CO2–** Understand the unique and general features Algae and Bryophytes and familiarize it

**CO3–** To study the external morphology, internal structure and reproduction of different types of

**CO4-** Realize the application of Phycology in different fields

**Core course 4 Code: BOT2.2**  
**PTERIDOLOGY, GYMNOSPERMS AND PALEOBOTANY**  
(Theory 54 hrs; Practical 36 hrs; Credits 3 + 1)

**CO1-** Understand the diversity in habits, habitats and organization of various groups of plants.

**CO2-** To impart an insight into the modern classifications in lower forms of plants.

**CO3-** Understand the evolutionary trends in Pteridophytes and Gymnosperms.

**CO4-** Study the anatomical variations in vascular plants.

**CO5-** Understand the significance of Paleobotany and its applications.

**Core course 5 Code: BOT3.1**  
**ANATOMY, REPRODUCTIVE BOTANY AND MICROTÉCHNIQUE**  
(Theory 54 hrs; Practical 36 hrs; Credits 3 + 1)

**CO1-** Imparting an insight into the internal structure and reproduction of the most evolved group of plants, the Angiosperm.

**CO2-** Understand the individual cells and also tissues simultaneously

**CO3-** Understand the structural adaptations in plants growing in different environment.

**CO4-** Understand the morphology and development of reproductive parts.

**CO5-** Get an insight in to the fruit and seed development.

**CO6-** Understand the techniques used to preserve and study plant materials.

**Core course 6 Code: BOT3.2**  
**RESEARCH METHODOLOGY, BIOPHYSICS AND BIOSTATISTICS**  
Theory: 54 hrs; Practical: 45 hrs; Credits: 3 + 1)

**CO1-** To equip the students to conduct independent research and prepare research reports.

**CO2-** To make the students acquaint with different tools and techniques used in research work.

**CO3-** To equip the students with basic computer skills necessary for conducting research.

**CO4-** To enable the students to have enough numerical skills necessary to carry out research.

**Core course 7 Code: BOT4.1**  
**PLANT PHYSIOLOGY AND BIOCHEMISTRY**  
(Theory 54 hrs; Practical 45 hrs; Credits 3 + 1)

**CO1-** Acquire basic knowledge needed for proper understanding of plant functioning.

**CO2-** Familiarize with the basic skills and techniques related to plant physiology.

**CO3-** Understand the role, structure and importance of the bio molecules associated with plant life.

**Core course 8 Code: BOT4.2**  
**ENVIRONMENTAL SCIENCE AND HUMAN RIGHTS**  
(Theory 54 hrs; Practical 36 hrs; Credits 3 + 1)

**CO1-** Acquaint the student with the significance of Environmental Science.

**CO2-** Make the students aware about the extent of the total biodiversity and the importance of their conservation.

**CO3-** Help the student to design novel mechanisms for the sustainable utilization of natural resources.



- CO4** -Enable the students to understand the structure and function of the ecosystems.
- CO5**- Enable the students to understand various kinds of pollution in the environment, their impacts on the ecosystem and their control measures
- CO6**- Make the students aware about various environmental laws in India and the role of various movements in the protection of nature and natural resources.

**Core course 9 Code: BOT5.1**  
**GENETICS, PLANT BREEDING AND HORTICULTURE**  
**(Theory 54 hrs; Practical 45 hrs; Credits 3 + 1)**

- CO1**- Imparting an insight into the principles of heredity
- CO2**- Understand the patterns of inheritance in different organisms
- CO3**- Understand the inheritance pattern of nuclear and extra nuclear genes
- CO4**- Understand the methods of crop improvement
- CO5**- Understand the importance of horticulture in human welfare
- CO6**- Develop skill in gardening technique among students

**Core course 10 Code: BOT5.2**  
**CELL AND MOLECULAR BIOLOGY**  
**(Theory 54 hrs; Practical 36 hrs; Credits 3 + 1)**

- CO1**- Understand the ultra structure and functioning of cell in the sub-microscopic and molecular level.
- CO2**- Get an idea of origin, concept of continuity and complexity of life activities.
- CO3**- Familiarization of life processes.
- CO4**- Understand the basic and scientific aspect of diversity.
- CO5**- Understand the cytological aspects of growth and development.
- CO6**- Understand DNA as the basis of heredity and variation.

**Core course 11 Code: BOT6.1**  
**ANGIOSPERM MORPHOLOGY, TAXONOMY AND ECONOMIC BOTANY**  
**(Theory 72 hrs; Practical 45 hrs; Credits 3 + 1)**

- CO1**- Acquaint with the aims, objectives and significance of taxonomy.
- CO2**- Identify the common species of plants growing in Kerala and their systematic position.
- CO3**- Develop inductive and deductive reasoning ability.
- CO4**- Acquaint with the basic technique in the preparation of herbarium.
- CO5**- Familiarizing with the plants having immense economic importance.

**Core course 12 Code: BOT6.2 BIOTECHNOLOGY AND BIOINFORMATICS**  
**(Theory 54 hrs; Practical 36 hrs; Credits 3 + 1)**

- CO1**- Understand the current developments in the field of Biotechnology and Bioinformatics.
- CO2**- Equip the students to carry out plant tissue culture.
- CO3**-Introduce the vast repositories of biological data knowledge.
- CO4**- Equip to access and analyze the data available in the databases.

**PLANT GENETIC RESOURCES MANAGEMENT**  
(Theory 54 hours; Credit 3)

- CO1-** Acquaint the student with the history and evolution of crop plants, and their diversity.  
**CO2-** Familiarize the student with the available plant genetic wealth and the measures adopted for the conservation of these resources.  
**CO3-** Help the student to identify the crop plants and their wild relatives.  
**CO4-** Help the student to explore the potentialities of various underutilized plants to project as the future food prospects.  
**CO5-** Understand the significance of modern technology to locate the distribution of endangered species.

**Complementary course 1 Code: BOT01**  
**CRYPTOGAMS, GYMNOSPERMS AND PLANT PATHOLOGY**  
(Theory 36 hrs; Practical 36 hrs; Credits 2 + 1)

- CO1-** Acquire fundamental knowledge in plant science and to make the student to understand that Botany is an integral part of the human life and developments.  
**CO2-** Foster and encourage an attitude of curiosity, appreciation and enquiry of various life forms of plants.  
**CO3-** Understand the identifying characters of the different types included in the syllabus.  
**CO4-** Understand the diversity of plants with respect to Algae, Fungi, Lichens, Bryophytes, Pteridophytes and Gymnosperms.

**Complementary course 2 Code: BOT02**  
**PLANT PHYSIOLOGY**  
(Theory 36 hrs; Practical 36 hrs; Credits 2 + 1)

- CO1-** Make the students realize the importance of all physiological processes which take place in plants.  
**CO2-** Understand the mechanism of various physiological processes related to plant life.

**Complementary course 3 Code: BOT03**  
**ANGIOSPERM TAXONOMY AND ECONOMIC BOTANY**  
(Theory 54 hrs; Practical 36 hrs; Credits 3 + 1)

- CO1-** Acquaint the student with the objectives and components of Taxonomy.  
**CO2-** Help the student to understand the systems of classification of angiosperms.  
**CO3-** Help the student to identify the common angiosperm species of Kerala.  
**CO4-** Familiarize the student with plants of immense economic importance.

**Complementary course 4 Code: BOT04**  
**ANATOMY AND APPLIED BOTANY**  
(Theory 54 hrs; Practical 36 hrs; Credits 3 + 1)

- CO1-** Understand different types of plant tissues.  
**CO2-** Understand the internal structure of different plant organs with reference to their functions.  
**CO3-** Understand the process of normal and anomalous secondary thickening in plants.  
**CO4-** Know the morphological and anatomical adaptations of plants growing in different habitats.  
**CO5-** Understand how botanical knowledge could be applied for crop improvement.

**Subject: Zoology under B.Sc. Pass Course**

## **Program Specific Outcomes:**

PSO1. Understand the nature and basic concepts of cell biology, genetics, taxonomy, physiology, biochemistry, ecology, evolutionary biology, developmental biology and applied and economic zoology.

PSO2. Analyse the relationships among animals, plants and microbes.

PSO3. Perform procedures as per laboratory standards in the areas of Taxonomy, Physiology, Ecology, Cell biology, Genetics, Applied Zoology, Clinical science, tools and techniques of Zoology, Toxicology, Entomology, Nematology, Sericulture, Biochemistry, Fish biology, Animal biotechnology.

PSO4. Understand the applications of biological sciences in Apiculture, Aquaculture, Sericulture, Animal Husbandry, Poultry Farm.

PSO5. Gains knowledge about effective communication and skills of problem solving methods.

PSO6. Contributes the knowledge for Nation building.

## **Course Outcomes:**

### **Animal Diversity – Invertebrates & Vertebrates**

CO1. Describe general taxonomic rules on animal classification.

CO2. Classify Phylum Protozoa to Echinodermata with taxonomic keys.

CO3. Imparts conceptual knowledge of vertebrates, their adaptations and associations in relation to their environment.

CO4. Classify phylum Protochordates to Mammalia.

CO5. Complex Vertebrate interactions.

### **Comparative Anatomy and Developmental Biology of Vertebrates:**

CO1. Comparative knowledge of Integumentary, Digestive, Circulatory, Urinogenital, Nervous and Skeletal system of various classes of vertebrates.

CO2. Basic concepts of developmental biology.

CO3. Concept of hormonal regulation of reproduction.

### **Physiology and Biochemistry:**

CO1. Students gain fundamental knowledge of animal physiology

CO2. Seeks to understand the mechanisms that work to keep the animal body alive and functioning.

CO3. Interactions and interdependence of physiological and biochemical processes.

CO4. Students are taught the detailed concepts of digestion, respiration, excretion, the functioning of nerves and muscles, cardiovascular system, endocrine system and reproductive system.

CO5. Physiological and biochemical understanding through scientific enquiry into the nature of mechanical, physical, and biochemical functions of animals, their organs, and the cells of which they are composed.

CO6. Students learn the concepts of endocrine systems and homeostasis.

### **Genetics and Evolutionary Biology:**

CO1. Division aspects of basic unit of life i.e. cell.

CO2. Mendelian and non-Mendelian inheritance.

CO3. Understanding of basic concepts of genetics and laws of inheritance.

CO3. Concept behind genetic disorder, gene mutations- various causes associated with inborn errors of metabolism.

CO4. Theories of evolution and knowledge of evolution of species CO5. Knowledge about eras and population genetics.

CO6. Understanding of genetic basis of evolution, human karyotyping and speciation **Applied Zoology**

CO1. Understands concepts of fisheries, fishing tools and site selection.

CO2. Understands about parasites and epidemiology of parasites in human and animals.

CO3. Use of recombinant DNA technology in genetic manipulations and in a variety of industrial processes.

CO4. Understanding of in vitro culturing of organisms and production of transgenic animals.

CO5. Types of breeds in animal farming and poultry farming along with their management.

CO6. Aqua culture systems, induced breeding techniques and post harvesting techniques.

### **Insect Vectors and Diseases**

CO1. Imparts knowledge of non-beneficial insects.

CO2 Interaction of insect vectors with humans and spread of diseases.

CO3. Managements and control of vector and vector born diseases.

### **Apiculture:**

CO1. Knowledge about honey bee and bee rearing.

CO2. Knowing beehives, bee keeping equipment, methods of extraction of honey and processing of honey.

CO3. Bee enemies and diseases.

CO4. Bee economy and entrepreneurship in apiculture

### **Sericulture:**

CO1. Gives knowledge of silk worm rearing.

CO2. Mulberry cultivation.

CO3. Pests and diseases associated with silk worm and mulberry.

CO4. Various process involved in silk production **Aquarium Fish Keeping:**

CO1. Provides knowledge of ornamental fish breeding which is highly professional and attractive avenue for youth.

CO2. Aquarium fish keeping, aquarium setup and accessories.

CO3. Aquarium fishes, their food and feeding.

CO4. Fish transportation and management.

CO5. Maintenance of aquarium.

### **Public Health and Hygiene**

CO1. Knowledge about medical care, nutrition, health and major nutritional deficiency diseases.

CO2. National Health Policy, National Rural Health Mission (NRHM) and National Urban Health Mission (NUHM).

CO3. Concept of environment degradation, issues and health hazards like personal and mental hygiene, addiction etc.

CO4. General concept of communicable diseases, mechanism of pathogenesis and their control measures.

CO5. Life Style Related Non-Communicable Diseases, their causes and prevention through dietary and lifestyle modifications.

CO6. Concept of Mental Health diseases and their management.

CO7. Social health problems like smoking, alcoholism, drug dependence and their deaddiction.

**Subject: Geology under B.Sc. (Medical & Non Medical) Pass Course**

Sr. No	Program Specific Outcomes
PSO-1	The 1 <sup>st</sup> year of Geology at UG level enables the students to understand the scope and application of Geology. It aims to provide adequate basic knowledge about General Geology, Crystallography & Mineralogy as well as Physical Geology so that an interest of learner may develop and gives them the confidence to go to the next level of learning in the subject.
PSO-2	The 2 <sup>nd</sup> year curriculum enables the students to understand Geo-science through basic domains like Petrology, Optical Mineralogy and Paleontology so that learners will have the overview of all basic branches of Geology.
PSO-3	The 3rd Year of B.Sc. Geology inculcate the knowledge of applied aspects like economic Geology, Mineral Exploration and Environment Geology so that learners will be able to apply the basic geo-scientific knowledge for the better management of Earth resources.
PSO-4	After the completion of all 6 semester course in Geology the learners will gain understanding about Earth system and various processes responsible for Geomorphological changes on the earth.
PSO-5	The learners will be able to crack the competitive examinations of UG level as well as entrance test for M.Sc. Geology in various Universities.
PSO-6	The successful candidates will be eligible for positions like mining Inspector, Scientific Officer and Sectional Officer in the related professional fields.

**Course Outcomes for Geology subject under B.Sc. Geology (Medical & Non Medical) Pass Course**

The courses are designed in the semester system and each semester consists 2 courses of Geology subject with the following course outcomes:

**1<sup>st</sup> Semester**

Course Details	Course Outcomes
Paper-101- General Geology	This course enable the students to understand the General aspects of Earth like size, shape, mass, density etc. it also emphasis on the various branches of Geology and their relationships. It will also help the students to understand the weathering of earth material and elementary idea about the basic geological structures like fold faults and unconformities.
Paper-102 Crystallography	This course provide the basic understanding about Crystallography so the learners can understand the earth material in a better manner as most of it is in crystalline form.
Paper-103 Practical	Course covers demonstration of various equipments like Brunton Compass, Clinometer and models to understand the Geological processes and structure of the Earth along with Geological Field Work.

## 2<sup>nd</sup> Semester

Course Details	Course Outcomes
Paper-201- Physical Geology	This course is designed to make learners well equipped with adequate knowledge of various processes and features developed by the geological action of Wind, Water, Glacier, lakes etc.
Paper-202 Mineralogy	After learning this course students will come to know the processes of formation of minerals, physical & chemical properties of minerals and uses of various minerals.
Paper- 203 Practical	Demonstration of various processes through Models and identification of Minerals in hand-specimen. The learners will be able to differentiate and identify the various minerals.

## 3<sup>rd</sup> Semester

Course Details	Course Outcomes
Paper-301 Petrology & Optical Mineralogy	After reading this course learners will be able to understand the processes of formation of various rock types. They will be able to identify the igneous rocks in the hand specimen and field. They will know "How to interpret the texture and structures of Igneous Rocks?".
Paper-302 Paleontology	The Paleontology course will help the student to understand the mode of preservation of fossils and Geological history of earth based on paleontological record. The course also emphasizes on the morphology and geological history of particular species like trilobites, Gastropods, Lamellibranchia etc.
Paper-303 Practical and Field Work	The students of this course will be able to identify the common Igneous, Sedimentary and Metamorphic rocks in the hand specimen. They will also be familiar with petrological microscope and basic optical properties of Minerals.

## 4<sup>th</sup> Semester

Course Details	Course Outcomes
Paper-401 Petrology & Optical Mineralogy	This course is designed in the continuity of previous semester to complete the remaining portion of petrology and mineralogy so after the completion of this course students will be able to understand the transformation of one type of rock into another through rock cycle and processes of formation of sedimentary and metamorphic rocks.
Paper-402 Palaeontology	In the continuity of course titled same in the previous semester this course will enhance the understanding of learner's about classification, evolution and distribution of various invertebrate, vertebrate and plant fossils.
Paper-403 Practical and Field Work	Students will be able to learn about identification of various rocks in the lab and field on the basis of their physical properties. They also get idea about optical observations of earth material in thin section under petro-logical microscope. They will also learn about the identification of fossil in handspecimen.

## 5<sup>th</sup> Semester

Course Details	Course Outcomes
Paper-501 Structural Geology	This course emphasis on the deeper concepts of structural Geology and hence enable the students to understand the behaviors of earth material under different tectonic environment and mechanism of rock deformation.
Paper-502 Economic Geology	Course deals with origin, occurrence, formation process and distribution in the Indian Subcontinent of various economic minerals. So learners will be able to explore the economic prospects in an area. They will also got skill for the identification of Ores of important metals like Iron, copper, Lead, Zinc, Gold etc.
Paper-503 Practical and Field Work	The practical study of this course will help the learners to visualize the important Geological structures and deformation indicators. At the same time, they will be able to identify the hand-specimen for the Ores of important metals like Iron, copper, Lead, Zinc, Gold etc.

## 6<sup>th</sup> Semester

Course Details	Course Outcomes
Paper-601 Stratigraphy	This course will enable the students to appreciate the stratigraphic principles, distribution of rocks in geological time scale in the Indian Subcontinent and their correlation in global geology.
Paper-602 Indian minerals & Environmental Geology	In this particular course try to touch the applied aspects of domains like mineral exploration, mining and environment. It will make candidates prepare for interpretation of Geological maps for mineral prospecting and Exploration. The learners will be able to understand the environmental effects of Geo-science related activities such as mining.
Practical and Field Work	This practical course will enable the learners to apply the Geo-scientific knowledge into applied fields such as Mineral Exploration & Mining. It will also enhance their understanding about actual work culture and conditions in mining.

## **Subject: Chemistry under B.Sc. Geology (Pass Course)**

### **Program Specific Outcomes**

#### **1: Scientific Problem solving skill**

Sound knowledge of fundamentals can develop the problem solving skills using chemical principles.

#### **2: Analytical skills:**

Develop analytical skills such as synthesizing, separating, characterizing chemical compounds and chemical reaction with the help of sophisticated instruments.

#### **3: Skills related to employability:**

Develop deep knowledge in some applied areas of chemistry such as pesticides chemistry, pharmaceutical chemistry etc. which helps in employability.

#### **4: Learning on life processes:**

Develop basic understanding the role of chemistry in natural products as well as biological system.

### **COURSE OUTCOMES**

#### **Semester-I**

##### **Paper: Inorganic Chemistry Theory**

Inorganic Chemistry is the branch of chemistry that deals with the synthesis and behavior of inorganic and organ metallic compounds. This diverse field covers all the extensive chemical compounds except the myriad organic i.e. carbon based compounds, usually containing C-H bonds. The branch has amplified applications in every aspect of the chemical industry, including catalysis, materials science, pigments, surfactants, coatings, medications, fuels, and agriculture. It helps in laying the foundations of fundamental chemistry. From this course the students will

1: Have a deep understanding of the structure of atom and the particles constituting it.

2: Will be familiar with the periodic table in which how different elements are placed according to their unique properties.

3. Understand the concept of bonding and how the theories of bonding govern the structures of different compounds. Further on the basis of basic information will develop skills to analyse compounds in unknown compounds.

4: Draw structure of ionic solids and understand its properties.

##### **Paper: Physical Chemistry Theory**

Physical Chemistry deals with the study of macroscopic, atomic, subatomic and particulate phenomena in chemical systems in relation of the principles, practices, and concepts of physics



like motion, energy, force, time, thermodynamics, quantum chemistry, statistical mechanics, analytical dynamics and chemical equilibrium. Upon the successful completion of this course, the students will be able to:

- 1: Differentiate between the states of matter based on the interactions existing amongst their particulates.
- 2: Understand the simultaneous relationship between pressure, temperature and volume persuading amongst different states of matter.
- 3: Inculcate the numerical ability.
- 4: Amalgamate the theoretical knowledge into the practical world by understanding the basic concepts of matter.
- 5: Learn why different substances display a characteristic melting or boiling points.

#### **Paper: Organic Chemistry Theory**

Organic chemistry is the scientific study of structure, properties, and reactions of organic compounds and organic materials (materials that contain carbon atoms). By the end of this course, students will:

- 1: Understand the different kinds of bonds existing in organic compounds.
- 2: Learn how to name different compounds according to IUPAC nomenclature.
- 3: Be able to visualize the 3D-structures of organic compounds.
- 4: Recognize and draw constitutional isomers, stereoisomers, including enantiomers and diastereomers, racemic mixture and meso compounds.
- 5: Perceive different kind of reactions occurring amongst the organic compounds.
- 6: Be able to differentiate between reactant and reagents.
- 7: Be able to differentiate between cyclic and acyclic compounds and study their specific reactions.

#### **Paper: Practical**

This course deals with the practical aspects of physical and inorganic chemistry. From this course, students will be benefitted in the following ways:

- 1: Will be able to apply the theoretical concepts while performing experiments.
- 2: Will be able to design, carry out, record and analyze the results of chemical experiments.
- 3: Will be able to titrate different mixtures.
- 4: Will acquire the habit of working safely with the chemicals and handling of equipments.

5: Will learn, how to make solutions of different concentrations generalizing the concept of normality, molarity and molality.

6: Design experiments that can be applied in everyday life based on the parameters of viscosity, surface tension and specific refractivity.

7: Learn the basics of precipitation.

8: Acknowledge experimental errors and their possible sources.

9: Learn statistical approach for evaluating data.

## **Semester-II**

### **Paper: Inorganic Chemistry-Theory**

This course deals with the advance knowledge of inorganic chemistry, in which the applications of fundamental inorganic chemistry will be seen. The course will benefit the students in the following ways:

1: Knowledge enhancement to understand the geometry of molecules.

2: Understanding of the classification of periodic table.

3: Recognition of various factors on which the elements are categorized in the periodic table.

4: Analysis of the formation and structure of various compounds by varying the chemical composition thereby enhancing their skillfull growth.

### **Paper: Physical Chemistry Theory**

This course of physical chemistry is inclined towards kinetics and electrochemistry, in which the topics are gradually divided on the basis of complexity. With this course students will be able to:

1: Understand that every reaction has a unique time of occurrence due to the involvement of different chemical species and with effect of various parameters under observation.

2: Apply the kinetic concept in the interdisciplinary field of science and also in the real world.

3: Relate to the concept about half-life.

4: Enhance their numerical ability by solving numerical from different parameters of these two branches.

5: Differentiate between conductance and resistance and how both the terms are related to each other.

6: Correlate the factors of acidity and basicity with pH and pKa and apply this knowledge

with daily edible products.

7: Realize the importance of buffer solutions and which all buffer solutions are used by them on daily basis.

### **Paper: Organic Chemistry Theory**

This course of organic chemistry nurtures more than the introduction of organic compounds.

Following outcomes are expected from this course:

- 1: Students will be able to analyse the route of formation of certain products.
- 2: Students will be able to differentiate between the aromatic, antiaromatic and non aromatic compounds and how Huckel rules govern the phenomenon of aromaticity amongst different organic compounds.
- 3: Students will be able to clearly access the basic difference between alkyl and aryl compounds.
- 4: Students will be able to relate the concept of stability of compounds with the phenomenon of conjugation and conditions necessary for a system to be a conjugating system.
- 5: Students will be able to clearly identify the role of hybridization and how the physical and chemical reactivity of these compounds are affected because of different hybridization.

### **Paper: Practical**

Students will be able to:

- 1: Design, carry out, record and analyze the results of chemical experiments.
- 2: Understand the principle and applications of chromatography.
- 3: Skillfully perform synthesis of organic compounds.
- 4: Perform different methods and learn the importance of purification.

### **Semester-III**

#### **Paper: Inorganic Chemistry Theory**

1: Students will have the ability to demonstrate knowledge and understanding of essential facts, concepts and principles of inorganic chemistry.

1: Students will be able to relate the basic difference amongst transition metals. Metal complexes itself covers a broad aspect of chemistry and has a wide applicability in quantification of analysis and metal extraction.

2: Students will have an insight idea of spectral properties of different inorganic compounds based on their electronic properties.

3: Students will be able to understand the urge of development of co-ordination chemistry and its integration with d- block elements.

4: Students will be able to relate with the basic nature of solvents and how different solvents act differently.

#### **Paper: Physical Chemistry Theory**

1: Students will be able to relate the basic concept of thermodynamics with their every day world and will understand that how the stability of whole universe is effected with different laws of thermodynamics.

2: Students will cater the basic difference between path and state functions.

3: Students will understand the concept of entropy and how the whole universe is related to it.

4: Students will inculcate the importance of equilibria and how different forms of equilibrium are different from each other and are affected by various external parameters

5: Students will be able to calculate thermal efficiency of heat energies and solve problems based on laws of thermodynamics.

6: Students will be able to determine the Nernst distribution law and can relate to various factors causing its deviation.

#### **Paper: Organic Chemistry Theory**

1: Students will understand the need for introducing IUPAC nomenclature for organic compounds and will also be able to write IUPAC nomenclature for different functional groups.

2: Students will be able to differentiate between different chemical and physical reactivity amongst organic compounds based on presence of different functional groups.

3: Students will be able to learn how alcohols and phenols are two different classes.

4: Student will get a thorough learning of the basic concept of UV spectroscopy and how it can be used in organic chemistry to identify the type of electronic transitions, cause for the colour of compounds and their stability.

#### **Paper: Practical**

1: Experimentation enhances the skills of managing the resources, time and team work.

2: Students will be able to function as a member of an interdisciplinary problem solving team.

3: Students will be skilled enough to perform gravimetric analysis.

4: Students will be forced to think in an inclined manner via performing chemistry experiments.

5: Students will be able to detect the presence of extra elements in any given unknown sample, thereby inculcating the concept of logical thinking.

#### **Semester-IV**

##### **Paper: Inorganic Chemistry Theory**

1: Enables to describe the chemical and physical properties of f-block elements including lanthanides and actinides specifically reasoning for anomalous electronic configuration.

2: Enables to differentiate between acidic and basic radicals and how they can be further useful in research as well as day to day life.

3: Enables to individuate qualitative analysis from quantitative analysis.

4: Enables to understand different theories of precipitation and how they are unique from each other.

##### **Paper: Physical Chemistry Theory**

1: Enables to understand the advance domain of thermodynamics.

2: Enables to conceptualize the second law of thermodynamics and how it is related to entropy.

3: Enables to clearly distinct entropy and enthalpy

4: Students will acquire knowledge of how to apply third law in calculating entropy associated with various phases of matter and pure crystalline solid.

5: Students have advance knowledge of work function, Gibb's energy and their significance for criteria of spontaneous reactions.

6: Students understand the essential conditions for a system to be spontaneous or nonspontaneous.

##### **Paper: Organic Chemistry Theory**

1: Enables to familiarize with the concept of IR spectroscopy and how it can be applied in day to day life.

2: Enables to differentiate between compounds containing oxygen and nitrogen functional groups.

3: Enables to understand the effect of different reagents like  $\text{LiAlH}_4$ ,  $\text{NaBH}_4$  etc. in presence of different functional groups.

4: Inculcate the understanding of mechanisms prevailing in organic synthesis.

#### **Paper: Practical**

1: Enables to determine the methods for calibration to quantitative analysis.

2: Enables to perform graphical analysis for determining experimental results in the laboratory.

3: Enables to analyse that how the colour of solution varies its absorption properties.

4: Enables to expertly handle the apparatus used in calorimetric experiments.

#### **Semester-V**

##### **Paper: Inorganic Chemistry Theory**

1: Students will understand the limitations of Valence bond theory (VBT) and how the structures of different compounds were not satisfied with the help of VBT.

2: Students will have an idea why crystal field theory (CFT) was introduced.

3: Students will know the difference in CFT of octahedral and tetrahedral complexes.

4: Students will have a detailed knowledge on magnetic and electronic properties of transition metal complexes.

5: Students will have a thorough understanding of stability in metal complexes governed by kinetic and thermodynamic parameter.

##### **Paper: Physical Chemistry Theory**

1: Students understand the need of quantum mechanics and shortcomings of classical mechanics.

2: Students acquire quantitative knowledge of operators in quantum mechanics corresponding to classical observables.

3: Students acquire adhere descriptive attitude for probabilities, postulates, wave functions and expectation values.

4: Students acquire extensive knowledge about spectral information.

5: Students acquire skills of understanding molecular spectroscopy, qualitative and quantitative description of vibrational, rotational and Raman spectra that plays key role in research.

##### **Paper: Organic Chemistry Theory**

- 1: Students will have the knowledge of principles of spectroscopy.
- 2: Will have hands on training on structure determination of organic compounds using spectroscopic techniques.
- 3: Will be able to understand that how NMR spectroscopy can be used to identify unknown compounds
- 4: Will be able to classify different carbohydrates based on their structural and positional composition.
- 5: Will understand the nature of metal-carbon bond present in organic compounds.
- 6: Will understand the mode of action of different organic reagents because of the presence of different metals in them.
- 7: Will understand the nature of action of reagents depend on the nature of metal-carbon bond.
- 8: Will be able to acknowledge the use of organometallic compounds in biological systems and chemical reactions.

**Paper: Practical**

- 1: Students will have a comparative knowledge of different types of chromatography.
- 2: Students can relate that how  $R_f$  values determine separation.
- 3: Students will have a vast idea of different types of salts and the factors on which they are categorized into different groups.
- 4: Students will be able to categorize and maintain a detailed record differentiating different radicals on the basis of different factors.
- 5: Students will be able to apply the theory of common ion effect in the precipitation of compounds.

**Semester-VI**

**Paper: CH-601 (Inorganic Chemistry Theory)**

- 1: Students will be able to relate the basic difference between acids and bases.
- 2: Students will be able to cater this theoretical knowledge of acid-bases into practical world.
- 3: Students will have an insight idea of the composition of biomolecules.
- 4: Students will learn about the roles of metal ions in different physiological processes.
- 5: Students will be able to relate to the compounds of silicon and phosphorous and

applications of these compounds specially in greases.

### **Paper: Physical Chemistry Theory**

1: Students will be familiarized with the electronic spectral properties of different compounds and how these properties affect the nature of compounds.

2: Students will have a detailed idea of interaction of electromagnetic radiations with matter.

3: Students will have a thorough knowledge of different types of solutions, on what factors the miscibility of different solutions depend, how colligative properties are related to different solutions, difference between ideal and non-ideal solutions.

4: Will learn about the concept of phase equilibria and how phase equilibria of two components are related.

5: Will possess the skills to solve problems within broader context related to field of photochemistry.

6: Will be capable of analyzing the impact of photochemistry in sustainable development to help society.

### **Paper: Organic Chemistry Theory**

1: Students will be introduced about heterocyclic compounds in organic chemistry.

2: Will be explained that how introduction of heteroatom amongst cyclic hydrocarbons change the properties of entire compounds.

3: Will be given an idea of the application part of organic chemistry i.e. how they can use their theoretical knowledge into the real world.

4: Will be taught about proteins, how they are formed from their smallest monomers amino acids and how arrangement of different amino acids changes the basic composition of proteins and peptides.

5: Will be able to differentiate between primary and secondary structure of proteins.

6: Will be able to describe the advantages of heterocyclic compounds in materials and pharmaceutical chemistry.

7: Will be able to explain the synthesis and applications of industrially important polymers that find use in everyday life.

### **Paper: Practical**

1: Students will be skilled to perform conductometry experiments.



- 2: Students will be having hands on experience on pH meter and potentiometer.
- 3: Students will be able to perform different synthetic reactions.
- 4: Students will be able to analyse that how different processes are used for a single synthesis.
- 5: Students will be able to carry out and record these experiments in a skilful manner.
- 6: Students will be able to show competence in obtaining and interpreting data.

## **Subject: Mathematics under B.Sc. Pass Course**

### **Program Specific Outcomes (PSOs)**

After study the mathematics in B.Sc. Program Students will be able to

1. Appear for master program in various universities.
2. They will get the understanding of mathematical application to solve project specific problems.
3. The learners will efficient in the mathematical calculations in daily works.
4. They may identify and design problem statement for further research.

### **Course Objective & Outcomes**

**Subject: Algebra**

**Class: B.Sc. 1st Sem.**

#### **Course Objective**

1. learn to find inverse and rank of matrices using elementary operation.
2. Learn to solve systems of linear equations and application problems.
3. Learn to compute determinants and know their properties.
4. Learn to find and use eigenvalues and eigenvectors of a matrix.
5. Learn to find roots of polynomial equations up to fourth-degree .

#### **Course Outcomes**

After the completion of the course, Students will be able to

1. Find the inverse of a square matrix.
2. Solve the matrix equation  $Ax = b$  using row operations and matrix operations.
3. Find the determinant of a product of square matrices, the transpose of a square matrix, and the inverse of an invertible matrix
4. Find the characteristic equation, eigenvalues and corresponding eigenvectors of a given matrix.
5. find roots of polynomial equations up to fourth-degree.

### **Course Objective & Outcomes**

**Subject: Calculus**

**Class: B.Sc. 1st Sem.**

#### **Course Outcomes**

After the completion of the course, Students will be able to

1. understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.
2. locate the x and y intercepts, any undefined points, and any asymptotes.
3. determine asymptotes for rational expressions (we will not go into these graphs in much detail)
4. apply the techniques from the previous section to graph a fourth-degree polynomial or higher.
5. determine if there is any symmetry to aid in the graphing process.
6. determine the point(s) of intersection of pairs of curves.

**Subject: Solid Geometry**

**Class: B.Sc. 1st Sem.**

#### **Course Outcomes**

**After** completion of the course, Students will be able to

1. Trace conic.
2. Solve problem of sphere through a given circle, Intersection of two spheres
3. find equation of tangent of central conicoid
4. Solve problem related generating line.
5. Understand polar equations of conic.

**Subject: Number Theory And Trigonometry**

**Class: B.Sc. 2nd Sem.**

### **Course Outcomes**

After the completion of the course, Students will be able to

1. Demonstrate knowledge and understanding of topics including, but not limited to divisibility, prime numbers, congruences, quadratic reciprocity, Diophantine equations.
2. Learn methods and techniques used in number theory.
3. Write programs/functions to compute number theoretic functions.
4. Use mathematical induction and other types of proof writing techniques.
5. Evaluate trigonometric and inverse trigonometric functions
6. Solve trigonometric equations and applications.
7. Apply and prove trigonometric identities.

**Subject: Ordinary Differential Equations**

**Class: B.Sc. 2nd Sem.**

### **Course Outcomes**

After the completion of the course, Students will be able to

1. Student will be able to solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.
2. Student will be able to find the complete solution of a nonhomogeneous differential equation as a linear combination of the complementary function and a particular solution.
3. Student will be introduced to the complete solution of a nonhomogeneous differential equation with constant coefficients by the method of undetermined coefficients.
4. Student will be able to find the complete solution of a differential equation with constant coefficients by variation of parameters.
5. Student will have a working knowledge of basic application problems described by second order linear differential equations with constant coefficients.

**Subject: Vector Calculus**

**Class: B.Sc. 2nd Sem.**

### **Course Outcomes**

1. Memorize definition of directional derivative and gradient and illustrate geometric meanings with the aid of sketches.
2. Memorize theorem relating directional derivative to gradient and reproduce proof.
3. Calculate directional derivatives and gradients.
4. Apply gradient to solve problems involving normal vectors to level surfaces.
5. Explain the concept of a vector integration a plane and in space.

**Subject: Advanced Calculus**

**Class: B.Sc. 3rd Sem.**

### **Course Outcomes**

1. The student is expected to learn about the basic principles of multi-variable calculus with proofs.
2. To have full knowledge of calculus involving the fundamental tools such as continuity and differentiability.
3. Students are able to reason rigorously in mathematical arguments. They can follow abstract mathematical arguments and write their own proofs.
4. Students are able to effectively communicate mathematics: reading, writing, listening, and speaking. Students make effective use of the library, conduct research and make oral and written presentations of their findings.
5. To know Relationship between the increasing and decreasing behavior of  $f$  and the sign of  $f$

**Subject: Partial Differential Equation**

**Class: B.Sc. 3rd Sem.**

### **Course Outcomes**

After the completion of the course, Students will be able to

1. classify partial differential equations and transform into canonical form
2. solve linear partial differential equations of both first and second order
3. apply partial derivative equation techniques to predict the behaviour of certain phenomena.

4. apply specific methodologies, techniques and resources to conduct research and produce innovative results in the area of specialisation.
5. extract information from partial derivative models in order to interpret reality.
6. identify real phenomena as models of partial derivative equations.

**Subject: Statics**

**Class: B.Sc. 3rd Sem.**

### **Course Outcomes**

After the completion of the course, Students will be able to

1. An ability to construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium.
2. An understanding of the analysis of distributed loads.
3. A knowledge of internal forces and moments in members.
4. An ability to calculate centroids and moments of inertia.

**Subject : Sequences And Series**

**Class: B.Sc. 4th Sem.**

### **Course Outcomes**

After the completion of the course, Students will be able to

1. Determine if an infinite sequence is bounded.
2. Determine if an infinite sequence is monotonic.
3. Determine if an infinite sequence is convergent or divergent.
4. Find the sequence of partial sums of an infinite series.
5. Determine if a geometric series is convergent or divergent.
6. Find the sum of a convergent geometric series.
7. Determine if an infinite series is convergent or divergent by selecting the appropriate test from the following: (a) test for divergence; (b) integral test; (c) p-series test; (d) the comparison tests; (e) alternating series test; (f) absolute convergence test; (g) ratio test; and (h) root test.
8. Determine if an infinite series converges absolutely or conditionally.

**Course Outcomes**

After the completion of the course, Students will be able to

1. understand integral calculus and special functions of various engineering problem and to know the application of some basic mathematical methods via all these special functions.
2. explain the applications and the usefulness of these special functions.
3. classify and explain the functions of different types of differential equations.
4. understand purpose and functions of the gamma and beta functions, Fourier series and Transformation.
5. use the gamma function, beta function and special functions to: evaluate different types of integral calculus problems and Fourier series to solve differential equations.

**Subject: Programming in C & Numerical Methods**

**Class: B.Sc. 4th Sem.**

**Course Outcomes**

After the completion of the course, Students will be able to

1. Read, understand, and trace the execution of programs written in C language.
2. Write the C code for a given algorithm.
3. Write programs that perform operations using derived data types.
4. Solve an algebraic or transcendental equation using an appropriate numerical method.
5. Solve a linear system of equations using an appropriate numerical method.
6. Perform an error analysis for a given numerical method.

**Subject: Real Analysis**

**Class: B.Sc. 5th Sem.**

**Course Outcomes**

After the completion of the course, Students will be able to

1. describe fundamental properties of the real numbers that lead to the formal development of real analysis.
2. comprehend rigorous arguments developing the theory underpinning real analysis.
3. demonstrate an understanding of limits and how they are used in sequences, series, differentiation and integration.
4. construct rigorous mathematical proofs of basic results in real analysis.
5. appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.

**Subject: Groups & Rings**

**Class: B.Sc. 5th Sem.**

**Course Outcomes**

After the completion of the course, Students will be able to

1. understand the importance of algebraic properties with regard to working within various number systems.
2. extend group structure to finite permutation groups (Cayley's Theorem).
3. understand Sylow's Theorems.
4. generate groups given specific conditions.
5. investigate symmetry using group theory.
6. understand the three major concrete models of Boolean algebra: the algebra of sets, the algebra of electrical circuits, and the algebra of logic.

**Subject: Dynamics**

**Class: B.Sc. 5th Sem.**

**Course Outcomes**

After the completion of the course, Students will be able to

1. An ability to construct free-body diagrams.
2. An understanding of the analysis of distributed loads.
3. A knowledge of internal forces and moments in members.
4. Apply Keplers laws to solve the problems.

**Subject: Real & Complex Analysis**

**Class: B.Sc. 6th Sem.**

**Course Outcomes**

After the completion of the course, Students will be able to

1. Students will be able to understand the concept of limit for real functions and be able to calculate limits of standard functions and construct simple proofs involving this concept;
2. Student will be introduced to the concept of continuity and be familiar with the statements and proofs of the standard results about continuous real functions;

3. Student will understand the concept of the differentiability of a real valued function and be familiar with the statements and proofs of the standard results about differentiable real functions.

4. Student will have a working knowledge of differentiability for complex functions and be familiar with the Cauchy-Riemann equations;

**Subject: Linear Algebra**

**Class: B.Sc. 6th Sem.**

### **Course Outcomes**

After the completion of the course, Students will be able to

1. Identify and construct linear transformations of a matrix.
2. Characterize linear transformations as onto, one-to-one.
3. Solve linear systems represented as linear transforms.
4. Express linear transforms in other forms, such as as matrix equations, and vector equations.
5. Characterize a set of vectors and linear systems using the concept of linear independence.

**Subject: Numerical Analysis**

**Class: B.Sc. 6th Sem.**

### **Course Outcomes**

After the completion of the course, Students will be able to

1. understand the theoretical and practical aspects of the use of numerical analysis.
2. proficient in implementing numerical methods for a variety of multidisciplinary applications.
3. establish the limitations, advantages, and disadvantages of numerical analysis.
4. derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
5. understand of common numerical analysis and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.



# Subject: Physics in B.Sc. Pass Course Program

## Program Specific Outcomes

- ☐ Students get acquainted with techniques which are useful in industry.
- ☐ Students get conceptual knowledge of entrepreneurship through the co-curricular activities
- ☐ learn the organizational skills and working in group.
- ☐ Students will be well versed with use of computers

## Course Outcomes

### Semester-I

#### Paper: Mechanics (Phy-101)

- This course helps student to understand the basic and fundamental concepts of classical mechanics.
- This course helps students to have a deep understanding of Newton's laws and get the knowledge about forces which help them in their daily life. The velocity and acceleration parameters give the knowledge about how the vehicles move.
- This course helps students to understand the rolling concept and concept of inertia which helps them in their daily life.
- This course helps students to understand the concept of Lagrangian which further helps them to solve problems related to simple physical systems.

#### Paper: Electricity and Magnetism (Phy 102)

- Study the electric field using coulombs inverse square law in electrostatics of current
- Analyse the relations between  $b$ ,  $h$  and  $m$
- Understand the faradays laws of electromagnetic induction by rayleigh's method
- Analyse the value of maxwell equation- boundary conditions.

#### Paper: Physics Practical (PHY – 103)

- ☐ The set of experiments is framed so as to understand the meaning of minute observations and measurements. These experiments are first lesson to the learners that how imperative is the role of measurement in the practical world.
- ☐ Experiments based on moment of inertia provide a technical hand to the students and opens a pathway to the industrial world related to machinery and vehicles.
- ☐ Experiments related to the measurement of acceleration due to gravity and elastic constants would put up a clear picture of universal constants to the mind of students.
- Therefore besides increasing the conceptual clarity, these experiments would further raise the imagination power of the learner.

### Semester-II

#### Paper: Properties of Matters, Kinetic Theory and Relativity (PHY - 201)

- The Students are able to understand the fundamental concepts related to Hook's law and elastic properties of materials that have many useful applications in daily life.
- Proper understanding of bending of beam phenomena, cantilever as well as the concept of twisting couple could open up industrial doors to the students.
- The concepts of energy distribution, specific heats and Maxwell laws of distribution have interesting statistical and experimental verifications. It helps students to closely realize the theoretical part of the curriculum.

#### Paper: Electromagnetic Induction and Electronic Devices (Phy-202)

- ☐ Would be able to understand the role of a semiconductor elements in controlling the applied source of voltage and current and how these elements have brought up a big change after the discovery of transistor as a semiconductor device.
- ☐ would be able to meet the course objectives in all respects by orienting teaching and other academic processes adopted by the faculty to facilitate the students to do what they are expected to do.

#### Paper: Physics Practical (PHY–203)

- The experiments of this course are framed so as to understand comprehensively the meaning of minute observations and measurements. These experiments are primary lesson to the learners that how essential is the role of measurement in the practical world.
- These experiments have foundation in the theory course of the students in the same year.
- Therefore, these laboratory experiments are elemental part of the curriculum and helps in improving the widespread knowledge to the students.
- Experiments based on special type of diode provide scientific temperament and an industrial hand to the students and opens a pathway to the manufacturing world related to machinery and vehicles.
- The students by performing the experiments based on current and electricity, learner could realize the many theoretical concepts solenoid, magnetism, frequency of A.C. mains. These experiments provide answer to many queries of the students which is the part of their thoughts so far.

### Semester-III

#### ➤ Paper: Computer Programming and Thermodynamics (Phy-301)

- This course will help to understand the concept of heat and its conversion from one form to another. Thermodynamics can be used in our daily life Laws of thermodynamics are used in refrigerators, air-conditioners, heat pumps etc.
- The laws of thermodynamics dictate energy behavior, for example, how and why heat, which is a form of energy, transfers between different objects.
- The Maxwell relations allow us to relate changes in one set of thermodynamic variable to other variables.

#### Paper: Optics – I (Phy-302)

- The Students are able to understand and correlate various optical phenomena related to light with practical problems/applications in day-to-day life.
- Analytical treatment of Fourier analysis would establish a bridge that link mathematical equations with their physical aspects and comprehensive recognition with conceptual clarity.
- A different dimension of laws of reflection, refraction and other equations based on them is shown in Matrix methods. These methods results in simplification/alternate of complicated and lengthy equations studied in twelfth class.
- Wave nature of light is described by interference of light and it answers many observations in our daily life. For e.g. : coloration in the soap bubble, fringe patterns observed somewhere and laser phenomena based on coherence of light. Thus, students are able to observe and analyze various naturally occurring phenomena.

#### Paper: Physics Practical (PHY–303)

- The experiments of the Optics branch would assist students to understand and verify the various laws related to the light and optical event which is just a part of theory for them till now.
- By performing the experiments based on current and electricity, learner could realize the many theoretical concepts solenoid, magnetism, frequency of A.C. mains. These experiments provide answer to many queries of the students which is the part of their thoughts so far.
- Use and handling of the sophisticated instruments of the optical phenomena such as telescope and microscope would provide make learner an expert in the field on measurements.

### Semester-IV

#### Paper: Statistical Mechanics (Phy-401)

- This course helps the students to understand the methods of statistical mechanics used to develop the statistics for Bose-Einstein, Fermi-Dirac and photon gases.
- This course helps the students to understand the concept of microstates and macrostates and how the particles are distributed in the system in different states.
- This course helps the students to understand the macroscopic and microscopic description of temperature, entropy and free energy and their descriptions in terms of probabilities.
- This course helps the students to understand the concept of canonical and microcanonical ensemble.

**Paper: Optics - II (Phy- 402)**

- The description of wave nature of light by interference of light answers many observations in our daily life.
- The concept of polarization would comprehensively describe the bifurcation between longitudinal and transverse waves. Along with it, students can learn the practical aspect to distinguish between polarized and unpolarized light.
- The Students are able to understand and correlate various optical phenomena related to light with practical problems/applications in day-to-day life.

**Paper: Physics Practical (Phy-403)**

- To make use of and handling of the sophisticated optical instruments such as Bi -prism arrangement, telescope and microscope would provide learner an expertise in the field of measurements.
- In addition to realize the fundamental concepts of theory, the laboratory experiments could make available learner a potential candidate to be absorbed in the industrial world.
- CO 4: The computer programming would help students to get familiar with software skills. It not only develops a skill in the students but also opens up another way to the students after completing their graduation course.

**Semester-V****Paper: Solid State Physics (Phy-501)**

- This course (solid state physics) gives an extended knowledge of the principles and techniques of solid state physics.
- It helps us in determining the structures by diffraction (X-rays method)
- Graduates may pursue careers in applied research or education and work in a variety of industries such as aerospace, engineering and in government laboratories.

**Paper: Quantum Mechanics (Phy-502)**

- This course helps student to understand the basic and fundamental concepts of quantum mechanics in terms of its evolution and its applications
- It also throws light on the co-existence of particle and wave nature of matter particles and their applications in photoelectric effect and Compton effect (particle nature) and interference, diffraction, polarisation (wave nature)
- It also explains the meaning of uncertainty in Physics and how it can be applied to explain various phenomenon of nuclear physics i.e. existence of protons and neutrons and non-existence of electrons in nucleus, how to find the radius of Hydrogen atom
- This course also explains the behaviour of a free and bound particle in terms of Schrodinger equation and explains the role of potential by way of its applications such as potential barrier, particle in a box. It makes student to understand the concept of tunnelling, reflection and transmission probabilities at different energies of the particle.

**Paper: Physics Practical Paper (Phy-503)**

- This course helps students in gaining practical knowledge of CB, CE amplifiers & in determining their various parameters. It also helps in gaining knowledge of Hartley Oscillator.
- This course helps students to gain practical knowledge of FORTRAN programming.
- This course helps students in gaining practical knowledge of resolving power of prism & plane transmission grating & in determining their various parameters.

**Semester-VI****Paper: Atomic, Molecular & Laser Physics (601)**

- After studying this course students are able to analysis different spectrums of alkali atoms.
- The effect of electric and magnetic fields on alkali atoms spectrums is also analyzed and studied.
- Students are also able to analyze the Raman Effect which gives insight into irrational and rotational energies.
- The students get in-depth knowledge of He-Ne and RUBY laser, different type of coherence. They can design simple lasers after studying this course.

**Paper: Nuclear Physics (PHY-602)**

- Nuclear Physics is a wonderful course having a great relevance to current scenario in terms of research, be it the material science or nuclear science or polymer or nuclear energy etc. all around the world, because this course helps students to have a deep understanding of basic and fundamental concepts of nucleus in terms of its composition (i.e. mass, charge and size), its stability (i.e. binding energy) and various properties (nuclear spin, parity, magnetic and electric dipole moment etc.) and various nuclear reactions.
- This course enables the students to study the various experimental methods for the acceleration of charged particles (LINAC, Cyclotron, Betatron, etc.), interaction of charged particles (such as Alpha and Beta particles) and Gamma radiations with matter and their detection (G.M. Counter, semi-conductor detector, etc.) and understand the energy loss mechanism of various particles which is most useful when the student goes for higher studies and opt for research.

**Paper: Physics Practical (PHY-603)**

- The computer programming would help students to get familiar with software skills. It not only develops a skill in the students but also opens up another way to the students after completing their graduation course.
- The experiments of electricity such as Transistor, Amplifier, Oscillator would assist students to recognize and verify the various laws related to the electricity which is just a part of their imagination till now.
- In addition to realize the fundamental concepts of theory, the laboratory experiments could make available learner a potential candidate to be absorbed in the industrial world.

# **B.Sc. (Computer Science)**

## **Program Specific Outcomes**

- PSO1: Students get knowledge and training of technical subjects so that they will be technical professional by learning C/C++, Visual Basic programming, Database Management, Data Structure, Software Engineering, Computer Architecture, Theoretical Computer Science, Web Technology using HTML.
- PSO2: Students understand the concepts of software application and projects.
- PSO3: Students understand the computer subjects with demonstration of all programming and theoretical concepts with the use of ICT.
- PSO4: Development of in-house applications in terms of projects
- PSO5: Students will build up programming, analytical and logical thinking abilities.
- PSO6: Aware them to publish their work in reputed journals
- PSO7: To make them employable according to current demand of IT Industry and responsible citizen.

## **Course Outcomes**

### **Computer Science Paper-1.1 Computer Fundamentals & MS-Office**

- Give students an in-depth understanding of why computers are essential components in business, education and society.
- Introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing.
- Provide hands-on use of Microsoft Office applications Word, Excel and PowerPoint. Completion of the assignments will result in MS Office applications knowledge and skills.
- Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components
- Understand the difference between an operating system and an application program, and what each is used for in a computer
- Describe some examples of computers and state the effect that the use of computer technology has had on some common products
- Identify the applications of computer in daily life

### **Computer Science Paper-1.2 Computer Architecture**

- To understand the organization and design of basic digital computer.
- To understand the procedure for implementing the arithmetic algorithm in digital hardware.
- To discuss the techniques that computers use to communicate with I/O devices and Memory
- Outline the structure of a basic computer system and explain the role of functional units
- Design the control logic circuit for various digital circuits such as registers, memory and adder - logic circuit of a basic computer system
- To understand the working of different Sequential logic circuits
- To understand working operations of different types of Flip flops as a basic building block.
- To know the operations of shift registers and BinaryCounters
- To understand the basic Computer System and general organization of different blocks

### **Computer Science Paper-2.1 Programming in C**

- Identify the basic concepts needed for program development
- Apply the basic concepts and develop program to find solutions for simple problems
- Design programs to solve complex problems by using suitable control statements
- Analyze the problem and design efficient program using functions
- Use array and structure to handle volume of data

### **Computer Science Paper-2.2 Structured Systems Analysis and Design**

- To provide adequate understanding of systems concept, system analysis, and systems design which would help them in having efficient and workable information system for management.

- To provide an understanding the role of Hardware and Software for realizing organizational Objectives and automation.
- To provide an understanding of the role of systems analyst and software development firms for their role in distributing meaningful ERP modules and other business intelligent system.
- To provide an understanding of the role of system analysis and design within various systems development stages.
- To develop an awareness of the different approaches that might be taken to systems design.
- To understand the activities of the management and systems analyst, and in the overall development of system.
- To develop an understanding of Testing software and complying the various software quality parameters.
- To develop an understanding of how to migrate old data within newly developed system with the help of various techniques.

### **Computer Science Paper-1.3&2.3 Practical Lab on MS –Office and Programming in C**

- Able to perform documentation and presenting skills.
- Proficient in using Windows, Word Processing Applications, Spreadsheet Applications, Database Applications and Presentation Graphics Applications.
- Develop algorithms to find solutions for simple problems
- Analyze the source code and rectify errors if any and bring out necessary solution
- Utilize proper control statements to find solution for a given problem
- Able to devise pseudo code and flowchart for computational problems.
- Understand how to write, debug and execute simple programs in C.

### **Computer Science Paper-3.1 Data Communication and Networking**

- To understand the basics of data communicating systems.
- To provide knowledge about the concepts of internet.
- To learn the various protocols used in the internet
- Explain the local, metropolitan and wide area networks using the Standard OSI reference model.
- Explain the concepts of protocols, network interfaces and design of performance issues in local area networks and wide area networks.
- Describe about wireless networking concepts, contemporary issues in networking technologies, network tools and network programming.
- Explain the analysis of different types of protocol and the comparison of number of data link, network and transport layer protocols.

### **Computer Science Paper-3.2 Object-Oriented Design and C++**

- Knowledge about the top-down and bottom-up programming approach and apply bottom up approach to solve real world problems.
- Knowledge about the difference between static and dynamic binding. Apply both techniques to solve problems.
- Describe the concept of inheritance and apply real world problems.
- Discuss the generic data type for the data type independent programming which relates it to reusability.
- Explain to design of handling large data set using File I/O.

### **Computer Science Paper-4.1 Data Structure with C/C++**

- Identify data structures needed to solve specific problems
- Analyze the data structures for effective use in problem solving
- Design and develop efficient algorithms in terms of Space and Time
- Troubleshoot algorithms, analyze time complexity of algorithms
- To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
- To imbibe quality software development practices. To create awareness about process and product standards.

### **Computer Science Paper-4.2 Operating System**

- To develop critical thinking, inquiring, technology skills to describe and to paraphrase what operating systems are, what they do and how they are designed & construct.
- To identify, infer and summarize the resource management utility.
- To develop collaborative and soft skills to compare the structure & basic organization of different operating system.
- Describe the basic components of an operating system and their role in implementations for general purpose, real-time and embedded applications.
- Discuss mutual exclusion principles and their use in concurrent programming including semaphore construction and resource allocation.

### **Computer Science Paper-3.3& 4.3 Practical based on paper 3.2 & 4.1**

- Programs using Object oriented programming paradigm – Encapsulation (Classes and objects), Polymorphism and Inheritance.
- Apply various features like constructors and destructors, overloading- function and operators.
- Able to acquire in depth knowledge and develop software in C/C++
- Utilize different types of inheritance to suit different applications.
- Write efficient programs consuming less memory.
- Compile and Execute programs using required data structures.
- Implement the algorithms using C/C++.
- Debug programs.

### **Computer Science Paper-5.1 Database Management System**

- The key goal is to prepare students for a professional career in the field of data administration and database design.
- To get acquaint students with good knowledge of DBMS. During the course, students will learn about database design and database handling activities.
- To get acquaint students with basics of database security and administration.
- Knowledge & Understanding : Databases and their design & development
- Intellectual Cognitive/ analytical skills: Normalization of Databases.
- Transferable skills: Usage of DBMS design and administration.

### **Computer Science Paper-5.2 Introduction to Internet & Web Technologies**

- Knowledge about the concepts of markup languages, unordered list, table, formatting, linking and frames.
- Understanding about the creation of cascading style sheets, backgrounds, media types and building a dropdown menu.
- To explain the JavaScript, control structure, if structure, switch, do-while and logical operators.
- To describe the javascript functions, javascript arrays and javascript objects.

### **Computer Science Paper-6.1 Visual Basic Programming**

- Basic Concepts of Program building block control statements and the basic concepts of function and procedure.
- Knowledge of the functionality and properties of GUI based ActiveX Control with example programs.
- About graphics handling related control and properties.
- About the fundamental functions and properties of Advanced ActiveX Control.

### **Computer Science Paper-6.2 Software Engineering**

- Fundamental knowledge in science, mathematics, fundamentals of computer science, software engineering and multidisciplinary engineering to begin in practice as a software engineer.
- To understand several SDLC models for software development that can be consistent to produce high quality software at low cost.
- To obtain knowledge about the improvement in design specification and software testing.
- To design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, manufacturability, sustainability, ethical, health and safety.

- Describe the techniques, skills, and modern engineering tools necessary for engineering practice.
- Analyze, design and manage the development of a computingbased system, component or process to meet desired needs within realistic constraints in one or more application domains.

### **Computer Science Paper-5.3& 6.3Practical based on paper 5.1, 5.2 & 6.1**

- Students will get to know how to apply DML/DDDL commands on database.
- To apply knowledge of Programming in PL/SQL including stored function, cursor, trigger, designing the normalized database.
- Understanding the practical knowledge of exception handling.
- Understanding the fundamental tags used in HTML.
- Develop the web page in various applications and web page using various ordered and unordered listing commands.
- Understanding the simple programs using basic control statement, GUI based program using Basic ActiveX Control.
- Knowledge about different advanced ActiveX control with example application programs.
- Knowledge about various types of data base handling with MS-Access and Oracle
- Describe the concepts of data report for an organization.




## Office of the Principal, Govt. College, Narnaul

The following Post Graduate Programs are running in this college in the academic session-2022-23

1. M.A. Geography
2. M.A. English
3. M.Sc. Geology
4. M.Sc. Chemistry
5. M.Sc. Botany
6. M.Sc. Zoology
7. M.Sc. Mathematics
8. M.Com
9. M.A. Hindi
10. M.Sc. Computer Science
11. PGDCA

The Program outcomes (POs), Program Specific Outcomes & Course Outcomes are described program-wise for academic session: 2022-23 are attached herewith.

  
**Principal**  
Principal  
Govt. College  
Narnaul

## **Program Name: M.A. English**

### **POs, PSOs, COs of Syllabus Offered for the program**

#### **PROGRAMME OUTCOMES (POs):**

**PO1:** Critical Thinking: Apply theoretical knowledge to make a critical analysis, intervene using innovative frameworks and evaluate and follow up.

**PO2:** Effective Communication: Engage in inter and intra personal communications, behavioural change communication and proficiency in information Communication Technology.

**PO3:** Scientific Temper: To build essential skills of life including questioning, observing, testing, hypothesizing, analysing and communicating.

**PO4:** Effective Citizenship: Demonstrate empathetic social concern and engage in service learning and community engagement programmes for contributing towards achieving of local, regional and national goals.

**PO5:** Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions and accept responsibility for them.

**PO6:** Environment and Sustainability: Participate and promote sustainable development goals.

**PO7:** Gender Sensitization and Social Commitment: To imbibe Gender sensitivity and the sense of social responsibility for self and community for the benefit of the society at large. **PO8:** Self-directed and Life-long learning: Engage in continuous learning for professional growth and development.

#### **Programme Specific Outcomes (PSO's):**

**PSO1:** To familiarise with the writers of English literature across different ages and continents, their theories, perspectives, models and methods.

**PSO2:** To be able to demonstrate competence in analysis and critically analyse scholarly work in the areas of English language teaching, literary research and translation.

**PSO3:** To enhance literary and critical thinking.

**PSO4:** Application of the knowledge of Literature, theories, research and skills in different fields of literary practice.

**PSO5:** To develop the technical skills and ethical decisions appropriate for the holistic professional development in the field.

#### **Outcomes of the courses:**

##### **1<sup>st</sup> Semester**

<b>Course Details</b>	<b>Course Outcomes</b>
Reading, Writing and Documentation	☑ Students will be able to learn the basic documentation skills required for effective communication and research.

Skills	<ul style="list-style-type: none"> <li>☑ They will develop critical ability to appreciate complexity and ambiguity of prose</li> <li>☑ They will enhance their grammar skills</li> </ul>
British Poetry	<ul style="list-style-type: none"> <li>☑ The students will learn a historical overview of the developments in poetry</li> <li>☑ The students will be able to engage themselves in critical reception of poetry</li> <li>☑ They will enhance their critical ability to interpret poetry</li> </ul>
British Drama	<ul style="list-style-type: none"> <li>☑ The students will understand plays both as literary and performative texts</li> <li>☑ They will learn the relation between literary texts and social environment.</li> <li>☑ They will be able to think critically and rationally.</li> </ul>
British Novel	<ul style="list-style-type: none"> <li>☑ students will learn the historical development of the novel</li> <li>☑ They develop a better understanding of the relationship between history, culture and literature through novels</li> <li>☑ They will have an enhanced critical understanding of the novels and their technical aspects</li> </ul>
British Prose	<ul style="list-style-type: none"> <li>The Students will be able to differentiate various types and techniques of prose writing.</li> <li>☑ They will be able to examine the socio-historical issues discussed in the essays.</li> <li>☑ They will be able to develop critical thinking by analyzing the cultural contexts of these texts.</li> </ul>
Self Study	<ol style="list-style-type: none"> <li>1. The students will be able to develop a flair for reading</li> <li>2. They will also gain confidence for giving free expression to their ideas in speaking as well as writing</li> <li>3. They will learn to organize their ideas and thoughts in a rational, logical and spontaneous manner while writing</li> <li>4. On the whole, it will help students build tremendous confidence</li> </ol>
Computer Application	<ol style="list-style-type: none"> <li>1. Students will emerge more confident after learning computer applications</li> <li>2. Knowledge of computer application will make them fit for variety of career options.</li> </ol>

## 2<sup>nd</sup>Semester

Course Details	Course Outcomes
American Literature-I	<ul style="list-style-type: none"> <li>Students will be able to read critically and appreciate the genres of American Literature.</li> <li>☑ Students will be able to understand the nature of problems in American society.</li> <li>☑ Students will be able to understand and compare the literary movements of American with other movement in same time period across world.</li> <li>☑ Students will be able to understand American culture and people etc.</li> </ul>
Modern British Literature	<ul style="list-style-type: none"> <li>☑ Students will be able to know the nature and genres of Modern British Literature.</li> <li>☑ Students will be able to understand and appreciate the difference of pre-modern and modern period British literature.</li> <li>☑ Students will be able to know the current social, economical, psychological and other problems.</li> </ul>
Indian Writings in English	<ul style="list-style-type: none"> <li>Students will be able to know the growth and development of Indian literature in English.</li> <li>Students will have an insight to locate Indian Writings in English in literature of different countries.</li> </ul>

Diasporic Literature	Students will be able to understand the notion of diaspora. Students will be able to understand the problems of diaspora and the country they live in.
Self Study	The students will be able to develop a flair for reading 6. They will also gain confidence for giving free expression to their ideas in speaking as well as writing
Seminar	The students will be inclined towards a habit of reading and widen their horizons of knowledge 2. Their presentation skills,(Vocabulary, tonepatterns etc) will be improved

### 3<sup>rd</sup>Semester

Course Details	Course Outcomes
Literary Criticism & Theory - II	Comprehend a range of theoretical aspects and their progress in literary studies. 2. Recognize and understand literary premises and the philosophical background of a particular theoretical approach.
American Literature - II	1. Get a good grasp of the historical, political, and cultural contexts of American literature. 2. Recognize and explain distinct characteristics of American literature of a particular era and tradition.
Study of Language-I	1. Get an understanding of the contemporary approaches to the study of language. 2. Understand the nuances of English speech sounds, word stress, intonation, and rhythm.
Literature and Gender	1. Theorize about gender in literary texts 2. Build upon their knowledge of Gender theory and its evolution.
South Asian Literature	1. Demonstrate a deep understanding of the cultural, historical geopolitical contexts of South Asian literature. 2. Gain an understanding of the principal thematic concerns of South Asian literature.

### 4<sup>th</sup>Semester

Course Details	Course Outcomes
Criticism & Literary Theory - III	Students will be able to apply theoretical approaches to the literary texts. ☑ It will enhance their knowledge on the major concepts given by different literary and cultural theorists
Non-Fictional Narratives	☑ Familiarizing the students about major Non-fiction narratives ☑ Enabling critical thinking in students to appreciate these narratives in their cultural as well as personal contexts
Study of Language-II	To introduce the students to various types of communication and its regional variation. ☑ To Make the students familiar to historicity of language, socio-linguistics and psycho-

	linguistics
Self Study	1. Improve their existing skills through independent reading, guided research, and analytical writing on specific texts. 2. Read critically literary works not discussed in class.
Seminar	1. The students will be inclined towards a habit of reading and widen their horizons of knowledge 2. Their presentation skills,(Vocabulary, tone patterns etc) will be improved
Dalit Literature	1. The students will get acquainted with a neglected social the history of the oppressed. 2. The students will get knowledge of the caste system and untouchability and social ramifications
Literature of Protest	Students will get familiar with the history and political analysis of protest and dissent in literary tests ☑ It will make them reflect upon constraints and challenges culture or social structure poses. ☑ It will improve their critical thinking skills

## **Program Name: M.Sc. in Geology**

### **POs, PSOs, COs of Syllabus for the program**

#### **PROGRAMME OUTCOMES(POs):**

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study
PO2	Research Aptitude	Capability to ask relevant/appropriate questions for identifying, formulating and analyzing the research problems and to draw conclusion from the analysis
PO3	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large
PO4	Problem Solving	Capability of applying knowledge to solve scientific and other problems
PO5	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member Or leader in diverse teams, in multidisciplinary settings.
PO6	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions
PO7	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices
PO8	Science and Society	Ability to apply reasoning to assess the different issues related to Society and the consequent responsibilities relevant to the professional scientific practices
PO9	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout life
PO10	Ethics	Capability to identify and apply ethical issues related to one's work, avoid unethical behavior such as fabrication of data, committing plagiarism and

		unbiased truthful actions in all aspects of work
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects

### **Programme Specific Outcomes (PSO's):**

- PSO1:** Basic understanding of fundamental concepts of Geology and applying it on the various natural processes occurring on and inside the Earth as a complete system.
- PSO2:** Clearly formulate and solve real life challenges with respect to human environment interactions.
- PSO3:** Applications of fundamental principles of Geology in finding out various minerals and other natural resources for the betterment of the human society.
- PSO4:** Acquisition of skills to effectively communicate the knowledge of Geology.
- PSO5:** Enable the learners to be responsible and Aware citizen who will think about society for safeguarding the physical environment.

### **Outcomes of the courses designed for M.Sc. in Geology**

The courses are designed in the semester system and options are given to opt the course of interest of the learners. The following Courses, in syllabus for the above said program, with the given course outcomes statements:

#### **1<sup>st</sup> Semester**

<b>Course Details</b>	<b>Course Outcomes</b>
Geosciences- I	Students will learn about origin and evolution of Planets in Solar System. This course will help the learner in the understanding the nature and behavior of Earth material. They can develop an understanding about the geomorphic and sedimentological processes related to fluvial, coastal, aeolian, and glacial regimes. Ocean floor morphology can be understood by explaining depth wise division of it.
Geosciences- II	Students will get the knowledge about the basics of Palaeontology, Stratigraphy, Structural Geology, Engineering Geology, Mining and Remote Sensing.
Mineralogy and Crystallography	The students will get to know about fundamentals of crystallography and mineralogy so that they can understand Geosciences.
Igneous Petrology	Study of igneous rocks is a key component of geology curriculum (because these rocks not only abundant throughout the crust of the Earth, but, dominate some crustal and upper mantle environments) that provides understanding of melt generation and crystallization mechanisms, diverse rock types and their link to tectonic settings.
Structural Geology	Successful students in this course be able to demonstrate proficiency in common skills in Structural Geology, including structural features of a region from this interpret geological history of area. Successful students be able to apply this study in various other branch of Geology e.g. Groundwater geology, petroleum geology, engineering geology etc.
Practical based on GEOL-101 & GEOL-102 &	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.

GEOL-103	
Practical based on GEOL-104 & 105	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.
Geological Field Training- I	Students get knowledge about Brunton compass, topographic sheet , geological maps and mapping and their uses in field.

## 2<sup>nd</sup>Semester

Course Details	Course Outcomes
Geomorphology and Geotectonics	The course will provide an understanding of the conceptual and dynamic aspects of landform development. Students will also learn the relevance of applied aspects of Geomorphology in various fields. Successful students in this course be able to understand evolution of the Great Himalaya and other mountains of the world.
Paleontology and Stratigraphy	In tandem with Stratigraphic studies, the course will give students the understanding of the geological history of the planet.
Metamorphic Petrology	Identifying equilibrium mineral assemblages through textural and mineralogical observations. Plotting the quantitative as well as qualitative mineral and mineral assemblage data to interpret the discontinuous reactions and to infer the nature of continuous reactions.
Engineering Geology	This will help students to develop an understanding of the geological factors responsible to create a sound structure whether it is a dam, tunnel or bridge. It may ensure that students understand the factors responsible for instability of slope and how to improve slope stability.
Climatology and Oceanography	On successful completion of this course, students should be able to understand the mean global atmospheric circulations and disturbances, world climate systems, climatic variability and change.
Practical based on GEOL-201 & GEOL-202	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.
Practical based on GEOL-203 & GEOL-204/GEOL-205	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.
Foundation Elective	The students will be able to choose the basic course of their choice.
Open Elective	The students can study the course of their interest out of Geoscience domain.

### 3<sup>rd</sup>Semester

Course Details	Course Outcomes
Sedimentology and Fuel Geology	Sedimentology is the study of sediments, particularly focusing on how it is produced, transported, and deposited.
Advanced Paleontology	In this course we will understand in depth about different life forms that evolved over the years on earth.
Ore Geology and Indian Mineral Resources	The students will gain knowledge regarding ore deposits, their genesis and mineral economics.
Mineral Exploration and Mining Geology SUMMER INTERNSHIP (ACADEMIC OR INDUSTRIAL)	The students will get knowledge regarding the fundamentals of Mineral Exploration and various mining methods along with mine safety measures and legislations. The understanding of subject increases by visiting research institutes or industries. The students may learn some of the leading software useful in industries and in research. They shall understand the challenges and required skills to be a researcher or to work in an industry. They shall be motivated to embody those skills and understand the kind of challenges they are going to face after they graduate with a master's degree.
Practical based on GEOL-301 & GEOL-302	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.
Practical based on GEOL-303 & GEOL-304/GEOL-305	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.
Geological Field Training- II	Students get knowledge about large scale mapping methods and techniques, sampling in field using different tools and instruments.
Open Elective	The students will be able to choose the basic course of their choice.

### 4<sup>th</sup>Semester

Course Details	Course Outcomes
Geochemistry	The students will get to know the vast applications of geochemistry in the field of geosciences.
Geohydrology	The students will learn about the water bearing formations, water wells and how to acquire various aquifer parameters by carrying out pumping tests, slug tests etc. The students will learn about the methods of groundwater exploration and quality



	parameters.
Stratigraphy and Paleogeography	The students will get to know the basic concepts of geohydrology, groundwater prospecting and management.
Geophysical Prospecting and Instrumentation	Students will be able to operate various instruments for analytical techniques and understand the Geo-scientific data.
Environmental Geology Or Remote Sensing & GIS	The students will acquire knowledge regarding our environment and its significance in the field of geology and our society. Acquisition of knowledge regarding basics of remote sensing, GIS and their application in geo-science.
Practical based on GEOL-401 and GEOL-402	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.
Practical based on GEOL-403 & GEOL-405/GEOL-406	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.

**Program Name: M.Sc. & M.A (Pass Course) Geography**

**Program Outcomes (PO):** Common for M.Sc. & M.A (Pass Course) Geography

<b>PO1</b>	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study
<b>PO2</b>	Research Aptitude	Capability to ask relevant/appropriate questions for identifying, formulating and analyzing the research problems and to draw conclusion from the analysis
<b>PO3</b>	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large
<b>PO4</b>	Problem Solving	Capability of applying knowledge to solve scientific and other problems
<b>PO5</b>	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary settings.

<b>PO6</b>	Investigation of Problems	Ability of critical thinking, analytical reasoning and research-based knowledge including design of experiments, analysis and interpretation of data to provide conclusions
<b>PO7</b>	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices
<b>PO8</b>	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices
<b>PO9</b>	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout life
<b>PO10</b>	Ethics	Capability to identify and apply ethical issues related to one's work, avoid unethical behaviour such as fabrication of data, committing plagiarism and unbiased truthful actions in all aspects of work
<b>PO11</b>	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects

### Program Specific Outcomes (PSO's):

- **PSO1:** Understanding the human and physical environmental phenomena using specialized knowledge pertaining to various sub-fields of geography. □
- **PSO2:** Ability to use the state of art geospatial knowledge for resolving the social, economic, cultural and physical problems of the society. □
- **PSO3:** Learning the techniques of data acquisition, data processing and interpretation of locational and spatial data. □
- **PSO4:** Ability to demonstrate and communicate the geographical knowledge and inculcate analytical ability, research aptitude and relevant skills. □

#### Core Course(cc)

Sr. No.	Course Code	Nomenclature of the course
1	GEOG101	Climatology
2	GEOG102	Geomorphology
3	GEOG103	Advance Geography of India
4	GEOG104	Computer Applications
5	GEOG105	Seminar/Journal Club
6	GEOG106	Self-Study Paper

7	GEOG107	Lab Course-I: Study and Interpretation of Topographical sheets
8	GEOG108	Lab Course-2: Climatology and Geomorphology

9	GEOG109	Urban Geography
10	GEOG110	Rural Geography
11	GEOG111	Resource Geography
12	GEOG112	Cultural Geography

**M. Sc. Geography**  
**Semester – II Core**

Sr. No.	Course Code	Nomenclature of the course
1	GEOG201	Geographical Thought
2	GEOG202	Economic Geography
3	GEOG203	Population Geography
4	GEOG204	Statistical Methods in Geography
5	GEOG205	Seminar/Journal Club
6	GEOG206	Self-Study Paper
7	GEOG207	Lab Course-I: (Economic Geography & Population Geography)
8	GEOG208	Lab Course-2: Computer based data management and Cartography.
9	GEOG209	Oceanography
10	GEOG210	Soil Geography

**Foundation Course ( Compulsory)**

11	GEOG211	Communication Skills & Personality Development
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**Semester – III Core Courses (CC)**

Sr. No.	Course Code	Nomenclature of the course
1	GEOG301	Regional development and Planning with special reference to India
2	GEOG302	Environmental Geography
3	GEOG303	Remote Sensing (RS)
4	GEOG304	Geographical Information System (GIS)
5	GEOG305	Seminar/Journal Club
6	GEOG306	Self-Study Paper
7	GEOG307	Lab Course-I : Visual Interpretation of Aerial Photographs
8	GEOG308	Lab Course -2 (Field- Work): Socio- Economic Survey & Report Writing)
9	GEOG309	Agricultural Geography
10	GEOG310	Biogeography
11	GEOG311	Political Geography
12	GEOG312	Fundamentals of Geography

**M. Sc. Geography**  
**Semester – IV Core Courses (CC)**

Sr.No.	Course Code	Nomenclature of the course
1	GEOG401	Research Methodology
2	GEOG402	Geography and Disaster Management
3	GEOG403	Application of Remote Sensing and Geographical Information system
4	GEOG404	Hydrology
5	GEOG405	Seminar/Journal Club
6	GEOG406	Self-Study Paper
7	GEOG407	Lab Course-I: Digital Image Processing Techniques
8	GEOG408	LabCourse-2: GIS Exercises

## **M. Sc. Botany Program and Courses Outcome**

**On completion of program students will be able to**

1. Think Critically - Get ability to apply the process of science by formulating hypotheses and design experiments based on the scientific method.
2. Analyze and interpret results generated through studies in botany, taxonomical treatments, field studies, excursion tours and laboratory techniques used in the subject.
3. Use quantitative reasoning by using mathematical calculations and graphing skills to solve problems in plant science (Botany)
4. Effective Communication and collaborate with other disciplines by effectively communicating the fundamental concepts of Botany in written and oral format.
5. Identify credible scientific sources to interpret and evaluate the evidences
6. Understand the relationship between science and society by recognizing and discussing logical, scientific and ethical issues in Botany subject.
7. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development with respect to assessment, conservation and utilization of floral diversity

## Program specific outcomes

On completion of program students will be specifically able to

1. Identify classify the plants by using the key characters.
2. Prepare and view specimens for examination using light microscopy
3. Use pure culture and selective techniques to isolate fungi, plant pathogens, algae and identify them growing on media.
4. Qualitative and quantitative estimate the number of floral components by using enumeration and suitable sampling and techniques.
5. Use appropriate plant molecular techniques and use of instrumentation related to it.
6. Practice safe laboratory procedures, using appropriate protective, biosafety and emergency procedures.
7. Documentation and report writing on experimental protocols, results and conclusions, study tours and field visits etc.

## BOT 101 CELL BIOLOGY

### COURSE OBJECTIVES

The main objective of the course is to make students aware of -

- **Prokaryotic and eukaryotic Cell:** The ultra-structural details and comparative assessment.
- **Plasma membrane:** Molecular organization, current models and functions. Cell wall architecture, biosynthesis, assembly, growth and cell expansion.
- **Plasmodesmata:** Structure and role in movement of molecules and macromolecules.
- **Cytoskeleton:** Organization and role of microtubules and microfilaments. Implications in flagellate and other movements.
- **Plant vacuole:** Tonoplast membrane, ATPases, transporters, as storage organelle.
- **Chloroplast and Mitochondria:** Ultrastructure, function and biogenesis. The organization of genome and patterns of gene expression.
- **Nucleus:** Microscopic and submicroscopic organization. Structure and function of nuclear envelope. The ultrastructure of nucleolus and its role in rRNA biosynthesis.
- **Ribosomes:** Structure and site of protein synthesis. Mechanism of translation, details of initiation, elongation and termination. The structure and role of RNA.

### COURSE OUTCOMES

After successful completion of this course, students will be able to understand :

- The cell structures in relation to function of cells the fundamental unit of life, are concerned in this course along with molecules present in cells.
- Apply the principles of cell biology in designing experiment, statistical analysis, and interpretation of results
- Operate and solve exercise using computation statistics software.
- Get acquainted with basic approach in the research methodology.

## BOT 102 MOLECULAR BIOLOGY

### COURSE OBJECTIVES

- To understand the concepts in prokaryotic, eukaryotic Plant system with respect to-
- To study the central dogma of molecular biology (replication, transcription, and translation)
- **Cell signaling**
- **Protein sorting**
- **Cell Cycle and its molecular aspects**
- **Molecular Cytogenetics**
- **Restriction mapping**
- **Laboratory Techniques:**

## COURSE OUTCOMES

- After successful completion of this course, students will be able to:
- Acquaint with concepts in prokaryotic, eukaryotic, and viral genetics
- Explain central dogma of molecular biology (replication, transcription, and translation)
- Enlist and explain types of mutation, gene regulation and transposable element
- **Conversant with Laboratory Techniques** viz. Microscopy, SEM & TEM, Ultracentrifugation, fractionation, Electrophoresis, PCR, GISH, FISH and Immunochemical techniques. The flow cytometry and confocal microscopy in karyotype analysis.
- Isolation of plant DNA and its quantification.
- Isolation of RNA and its quantitation
- Estimation of seed proteins

## BOT 103 BIOLOGY AND DIVERSITY OF VIRUS, PHYTOPLASMA, BACTERIA, ALGAE AND FUNGI

### COURSE OBJECTIVES

- To understand the phycoecology with special reference to Indian work.
- Algae in diversified habitats (Terrestrial, fresh water, marine) Criteria used in classification of algae, Role of algae in human welfare
- General account of thallus organization, reproduction and life history of algae.
- Study of important groups of algae **Cyanophyta** , **Chlorophyta**, **Xanthophyta** , **Bacillariophyta**, **Phaeophyta & Rhodophyta**
- **Fungi:** General Characters, Classification., Economic importance of fungi in medicine, Agriculture ( Biopesticide and biofertilizer ), food (SCP Mushrooms)
- Fungi as plant pathogen – General account of different groups and type study of fungi as pathogen. **Mastigomycotina** , **Zygomycotina**, **Ascomycotina**, **Basidiomycotina** & **Deuteromycotina**
- **Bacteria:** General characters, ultrastructure, classification, Role of bacterium in crop improvement and bacterial disease of plants.
- **Phytoplasma:** General characters, economic uses, classification, role and disease of plants.
- **Viruses:** General account, ultrastructure and economic importance of viruses.



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**COURSE OUTCOMES**

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- Comprehend the diversity of lower cryptogams (Algae, Fungi, Bacteria, Phytoplasma and viruses. Collection and study of algae, fungi, bacteria from different localities, Identification up to generic level.
- Recognize the morphology, anatomy , physiology, reproduction and lifecycle pattern.
- Their diversification and familiarize with various ecological niche.
- Positive and negative values.

## **BOT 104 TAXONOMY OF ANGIOSPERMS**

**COURSE OBJECTIVES**

- Deals with naming and classification of plants their interrelationships and evolution.
- Deals with recent developments in plant systematic and phylogenetics
- Criteria used for classification; phases of plant classification and brief history on account
- Botanical Nomenclature: Concept of nomenclature, Binomial nomenclature and its advantages.
- Taxonomic literatures and Use of computers in angiosperms taxonomy.
- Taxonomic evidences: Morphology, anatomy, embryology, palynology, cytology, phytochemistry and numerical taxonomy
- Angiosperm Families: Nymphaeaceae, Hydatellaceae, Magnoliaceae, Papaveraceae, Malvaceae, Sapotaceae, Apiaceae, Asteraceae, Arecaceae and Poaceae

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**COURSE OUTCOMES**

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After successful completion of this course, students will be able to:

- Study plant morphology
- Description of a plant specimen.
- Study of at least 20 locally available families of flowering plants.
- Identification of genus and species of locally available wild plants.
- Preparation of botanical keys at generic level by locating key characters.
- Knowledge of at least 10 medicinal plant species.
- Knowledge of secondary metabolites and its use in taxonomy.

## **BOT 105 CYTOLOGY AND GENETICS**

### **COURSE OBJECTIVES**

To understand the concepts and details of heredity and variation at molecular and cellular levels.

Deals with more recent development which have taken place in the field of genetics besides providing introduction to methods of plant breeding of improvement of crop plants with respect to --

- Genetics of prokaryotic and eukaryotic organelles
- Chromatin organization
- Structural and Numerical alterations in chromosomes
- Mutation
- DNA Damage and repair mechanism
- Cytogenetics of aneuploids and structural heterozygotes:

### **COURSE OUTCOMES**

After successful completion of this course, students will be able to:

- Know about the induction of polyploidy in plants using colchicines, methods of application of colchicine.
- Isolation of biochemical mutants following physical and chemical mutagenic
- Isolation of chlorophyll mutants following physical and chemical mutagenic treatments.
- Isolation of morphological mutants following physical and chemical mutagenic treatments.
- Karyotype analysis , Meiosis of complex translocation heterozygotes.
- Meiotic behaviour of monosomy, trisomy in plants and its effect.
- Chromosomal behaviour in mutagen treated plants.
- Chromatin organization, Structural and Numerical alterations in chromosomes

# BOT 201 PLANT DEVELOPMENT AND REPRODUCTION

## COURSE OBJECTIVES

Deals with regulation of growth and development of plant as affected by various growth regulations, thus cross talk and extrinsic biotic and abiotic factors.

To know the various structural and anatomical components of plant tissue and reproductive parts *viz.*

- **Meristems:** Organization of shoot and root apical meristem its structure and function,
- **Tissue systems:** Differentiation and functions of epidermis, parenchyma, chlorenchyma, sclerenchyma, laticifers and glands.
- **Vascular tissues:** Origin, structure and functions its taxonomic significance, development of wood in relation to environment.
- **Leaf:** Growth and differentiation, differentiation of epidermis (with special reference to stomata and trichomes) and mesophyll.
- **Root:** Initiation and development
- **Structure and development of** Flower, Male gametophyte, Female gametophyte , Seed development and fruit growth
- Mechanism of pollination

## COURSE OUTCOMES

After successful completion of this course, students will be able to:

- Know about plants anatomical structure, their developmental patterns.
- Plant reproductive parts development of male, female gametophytes and fruits.
- Vascular tissues and its constituents by sections and maceration, wood anatomy, TS, TLS and RLS
- Mechanical tissues (Collenchyma, Sclerenchyma, Stone cells and Xylem) , Secretary tissues (Mucilage Canals, Resin canals, Nectaries, and oil glands), laticifers (Latex cells and Vessels).
- Normal and abnormal secondary growth etc.

## BOT 202 BIOTECHNOLOGY

### COURSE OBJECTIVES

Provides a detailed view of the visualizing concepts and technique for genetic engineering and biotechnology.

Deals mainly with science, methodology and applications of plant tissue culture methods in

- Cell and organ culture
- Practical approaches of single cell culture
- Applications of tissue culture
- Somatic embryogenesis, protoplast isolation, regeneration of protoplasts and protoplasts fusion, Synthetic seeds, generation of cybrid and hybrids.
- Cryopreservation technique.
- Recombinant DNA technology Gene cloning, Vectors, Role of *Agrobacterium*, Gene cloning techniques.

### COURSE OUTCOMES

After successful completion of this course, students will be able to:

- Know about Equipment's required in Tissue culture Lab
- Media preparation techniques for different plants
- Sterilization techniques for media as well as for explants
- Explant Culture.- Anther culture Pollen culture, Micropropagation. Embryo rescue technique.
- Somaclonal variation. *In vitro* mutation. Isolation of plant protoplasts and viability testing.
- Protoplast fusion techniques.
- Tissue culture of important Horticultural, medicinal plants

## **BOT 203 PLANT PHYSIOLOGY AND METABOLISM**

### **COURSE OBJECTIVES**

Deals with selected topics of high important plant Physiology and Biochemistry.

- Plant water relations
- Enzyme
- Photosynthesis
- Respiration
- Nitrogen Metabolism
- Lipid Metabolism
- Plant Growth
- Plant Development

### **COURSE OUTCOMES**

- After completion of the course the students are familiar with various physiological aspects involved in the plant development.
- Also the role of enzymes in it and mechanism of photosynthesis, respiration, nitrogen and lipid metabolism.
- The students are able to isolate starch, pectine and various nutritive products from the plants.
- Qualitative and quantification of the plant contents and its biochemistry and mode /mechanism of synthesis etc.

## **BOT 301 BIOLOGY AND DIVERSITY OF BRYOPHYTES, PTERIDOPHYTES AND GYMNASPERMS**

### **COURSE OBJECTIVES**

- Highlights advances made in diversity analysis, developmental biology, reproductive biology and phylogenetics of the lower plants with female organ being archegonium present in bryophytes, pteridophytes and some most gymnosperms.
- Adaptive mechanism of the lower plant.
- Economic importance of the bryophytes, pteridophytes and gymnosperms

### **COURSE OUTCOMES**

After successful completion of this course, students will be able to:

- To know about morphological, anatomical and developmental patterns in the bryophytes, pteridophytes and gymnosperms.
- To know about the reproductive parts their development and mechanism of reproduction and life cycle pattern.
- Thallus and wood anatomy, Mechanical tissues (Collenchyma, Sclerenchyma, Stone cells and Xylem) , Secretary tissues (Mucilage Canals, Resin canals, Nectaries, and oil glands), laticifers (Latex cells and Vessels).
- Economic values of the lower plants.

## BOT 302 ECOLOGY AND CONSERVATION

### COURSE OBJECTIVES

Strategies adopted by the organisms under changing environment in relation to their biogeographic distribution. The students are made conversant with the following topics-

- **Structure of ecosystem:**
- **Functions of ecosystem:**
- **Community ecology:**
- **Biogeography:**
- Environmental pollution in relation to air, water and soil. Use of fertilizer, pesticides and other chemicals in agriculture and hygiene and their disposal.
- **Climate change:** Greenhouse gases, their sources, trends and role, Ozone layer and its depletion (Global warming, Sea level rise, UV radiation) acid rain, Bioindicator and biomarkers of environmental health.
- **Biodiversity:** Concept, types and situation in India. IUCN categories. Strategies of conservation: *In situ* conservation & *Ex situ* conservation measures.
- Various act related to Bio Diversity conservation and protection and international conventions.

Knowledge on ecology, and ecological dynamics CO2 Ability to correlate ecological dynamics and regulation of vital processes on earth as biogeochemical cycles CO3 Ability to interpret ecosystem services, ecological resilience, ecological economics, and landscape ecology CO4 Set up experiments to appreciate concepts of Ecology CO5 Critically examine the forces impacting ecosystems viz., climate change, stress, population, consumerism, globalization, land use change

### COURSE OUTCOMES

- On completion of this course the students are able to analyze various types of ecosystems, correlate different ecosystems.
- To analyze the threat and suggest conservative measures.
- The students are also trained in the environmental impact analysis
- Students are able to analyze, monitor various physical, chemical and biological properties of soil water and air.

## **BOT 303 APPLIED MYCOLOGY –I**

### **COURSE OBJECTIVES**

- Understanding the concept of fermentation and various fermentation techniques.
- Use of fungi in food feed and various industrial products.
- Various types of Mushroom cultivation practices and its importance and economics.
- Screening techniques of the fungi for various industrial application.

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### **COURSE OUTCOMES**

- Describe the microorganisms that participate in fermentation – production & processes.
- Evaluate the impact of different types of microorganisms on the final characteristics of the product.
- Identify the origin of the principal microorganisms of importance in the industrial environment.
- Know procedures and strategies for mushroom cultivation.
- Know the role of microorganisms in different production processes in order to improve these processes and ensure their success.

## **BOT 304 APPLIED MYCOLOGY –II**

### **COURSE OBJECTIVES**

- Detection and assay of fermentation products
- Principal and working process of instruments used in fermentation industry.
- Role of fungi in cheese production, its types and process

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### **COURSE OUTCOMES:**

After completion of the course the students are able to –

- Handle instruments related to fermentation
- Conversant with Spectroscopic, Chromatographic, techniques, HPLC, HPTLC, and various techniques,
- Screening of fungi for acid, alcohol, cellulose, amylase and various organic acid production

## BOT 401 BIODIVERSITY –I

### COURSE OBJECTIVES

- Biodiversity concept, Origin and evolution of diversity, Types of biodiversity, Estimation of known floras and faunas, Importance of Biodiversity, Revision of ecosystem: organization, structure, function and energetics.
- **Genetic Diversity:** Definition, Concept and importance, Nuclear centre and regional centres of origin, Germ-plasm,
- **Species diversity:** Species concept and definition, estimation and plant global status and with India, taxonomic procedure, taxa delimitation.
- **Ecological Diversity:** Types ecosystem diversity (Terrestrial and aquatic), Forest ecosystem types (Tropical, Subtropical, temperate and alpine).
- **Agricultural and cropland diversity:** Agricultural and cropland diversity concept, Crop domestication, India's status for primary and secondary agricultural crops.

### COURSE OUTCOMES

- Systematically understand biodiversity and its vital role in ecosystem function
- Identify the importance of biodiversity in natural environments Critically examine biodiversity and human linkages, and help policy formulating for conservation Application of knowledge in general communication for public extension

## BOT 401 BIODIVERSITY –II

### COURSE OBJECTIVES

- **Diversity Distribution:** Mega diversity regions, Endemism concept and its types, World Hots spots, Western Ghats and Eastern Himalayas.
- **Modern methods in taxonomy:** Comparative morphology, Cytological methods, dermal studies, root and stem anatomy, vessel study, Chemotaxonomy, Embryology And Palynology.
- **Numerical Taxonomy:** Numerical treatment data generation: Similarity concept, matrix building, assessment, correlation, distance calculation duster method, dendrograms, computer programs.
- **Cladistics and Phenetics:** Introduction, definition of Cladistics and phenetics, methodology of genetics, diversity concept and importance of gene mapping, DNA finger printing and its applications.

### COURSE OUTCOMES

- Appreciate the need of biodiversity conservation in the context of various developmental pathways and policy framework that the mankind has been undergoing
- Concepts of Hotspots, megadiversity regions of the world.
- Use of modern methods in plant taxonomy viz. Cytological, chemical, embryological pollen characters along with micromorphological features.
- Concept of numerical taxonomy
- Concept and use of cladistics, phenetics, and molecular tool in biodiversity studies.



# BOT 402 BIOPROSPECTING AND PLANT RESOURCE UTILIZATION

## COURSE OBJECTIVES

: Is to apprise students of conventional and non-conventional plant resources being used by human, their effective and sustainable utilization and improvement by biotechnological tools.

- **Medicinal Plants:** Bioprospecting/ Pharmaceutical Bioprospecting: for new drugs, assays in Bioprospecting, Antioxidant assay – NO free radical scavenging assay, Antigenotoxicity assay – MTT assay, Antiviral activities of plants – SRB assay.
- **Marine Bioprospecting:** Sources of marine planktons and their bioprospecting, Isolation and cultivation of marine bioresources, Isolation of Marine Yeast and its industrial applications, bioactive chemicals from seaweeds and their applications. Understand the common cultivation methods of microalgae including photobioreactors and open ponds.
- Analyze the major cultivation methods of seaweeds, along with detailed life history of selected high-value seaweed species from India
- **Microbial Bioprospecting:** Isolation of microbial metabolites and their bio-activity, endophytic microbial products as antibiotics.
- **Origin, evolution, cultivation and uses** - food, fodder, fibers, oil yielding crops, wood and timber (at least 5 examples each), Non-wood forest products (NWFPS): Bamboos, Gums, Dyes, Resins, Fruits etc.
- **Medicinal and Aromatic plants:** Morphological peculiarities, chemical properties and uses (at least 5 examples each)
- **Phytochemistry:** Separation techniques – column chromatography and HPLC technique, secondary metabolites, pharmacognostic procedures, authentication of specimens, Preservation of plants and plants products.

## COURSE OUTCOMES

On completion of this course, the students will be able to:

- Understand core concepts of Economic Botany and relate with environment, populations, communities, and ecosystems
- Develop critical understanding on the evolution of concept of organization of apex new crops/varieties, importance of germplasm diversity, issues related to access and ownership.
- Develop a basic knowledge of taxonomic diversity and important families of useful plants.
- Understand the common cultivation methods of microalgae including photobioreactors and open ponds, Seaweed bioresources etc.
- Appreciate the diversity of plants and the plant products in human use.
- Understand the concept of IPR, various legal issues related to IPR.
- Exploring the potential of Marine bioresources, Microbial, medicinal plants etc.
- Various phytochemical techniques, industrial process, pharmacognostic procedures, authentication of specimens, Preservation of plants and plants products

## **BOT 403 GENETIC ENGINEERING AND BIOINFORMATICS**

### **COURSE OBJECTIVES**

Deals with fundamentals of bioinformatics tools, computational biology and statistical methods utmost necessary for contemporary research in plant science.

- To get introduced to the basic concepts of genetic engineering
- To get introduced to Bioinformatics and its significance in Biological data analysis.
- Describe the history, scope and importance of Genetic Engineering, Bioinformatics and role of internet in Bioinformatics.
- Explain about the methods to characterize and manage the different types of Biological data.
- Classify different types of Biological Databases. Introduction to the basics of sequence alignment and analysis.
- Explain about different types of protein and other organism specific databases.

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### **COURSE OUTCOMES**

On completion of this course, the students will be able to:

- To use genetic engineering tools in crop improvement
- Use the Bioinformatics tools in Biological data analysis.
- Able to explain the methods used for characterizing and managing Biological data.
- Classify different types of Biological Databases.

## **Programme Name: M.Sc. Zoology**

### **Program Outcomes, Program Specific Outcomes and Course Outcomes**

#### **Program Outcomes:**

The primary objective of the program is to impart quality education in the subject of Zoology as a basic science and its applied branches to the students. The programme also works across related majors within the Bio Sciences. The programme is designed with following outcomes:

- Distinguish between the Structure, Function, Behaviour and evolution of different animals.
- For instance if you major in zoology, you can also still take courses from across the other complementary.
- Master of Science majors of conservation biology and ecology, giving you an in-depth knowledge of those most closely related programmes.
- Apply the wide range of subject based skills to various fields that provide a base for future career in disciplines such as Health Sciences, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.
- Perform, Assess and implement practical techniques and procedure to solve biological problems and analyse and quantify data collected during any project.
- Understand the applications of Biological techniques to various fields of biology.
- When you graduate with a Master of Science (Zoology) you will have learned how to work at a high level of academic achievement.

#### **Program Specific Outcomes (PSOs):**

- Used the evidences of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth.
- They are able to use specific examples to explicate how descent with modification has shaped animal morphology, physiology, life history, and behavior.
- Explicated the ecological interconnectedness of life on earth by tracing energy and nutrient flows through the environment. They are able to relate the physical features of the environment to the structure of populations, communities, and ecosystems.
- Subjects such as invasive or endangered species, embryonic development in mammals and ageing in social insects. Lead to advances in medicine to prevent disease amongst both animals and human beings.
- Developed knowledge and understood of living organisms at several levels of Zoological and Biological organization from the molecular, through to cells and whole organisms and ecosystems all organs of evolutionary perspectives.
- Understood how the chemistry and structure of the major biological macromolecules, including proteins and nucleic acids, determines their biological properties.

## **COURSE OUTCOMES (COs):**

### **COURSE Title - ANIMAL DIVERSITY**

- Understood the Classification and Phylogeny of Animals
- Described General characteristics, classification of invertebrates and vertebrates.
- Described General characteristics, classification and systematic portion of Minor phyla Described the general biology of few selected non-chordates and chordates which are useful to mankind?
- Enriched knowledge on ecology of some important fishes, amphibians, reptiles, birds and mammals

### **COURSE Title - BIOCHEMISTRY**

- Identified the five classes of polymeric biomolecules and their monomeric building blocks.
- Explained the specificity of enzymes (biochemical catalysts), and the chemistry involved in enzyme action.

- Understood types, Structure, biochemical properties and functions of vitamins.
- Explained how the metabolism of organic compounds leads ultimately to the generation of large quantities of ATP.
- Described the structure and classification of hormones.

#### **COURSE Title - CELL AND MOLECULAR BIOLOGY**

- Described the ultra-structure and functions of cell organelles.
- Understood DNA replication, RNA and protein synthesis and came to know protein synthesis can be controlled at the level of transcription and translation.
- Understood cell signaling and cellular communication.
- Described the oncogenes
- Understood the types and applications of stem cells.

#### **COURSE Title - BIOSTATISTICS**

- Came to know the data collection, tabulation and presentation.
- Described the mean, median, mode and SD.
- Understood the Analysis of Variance.
- Described Student 't' test and probability
- Understood the Correlation and Regression.

#### **COURSE Title - LAB – ANIMAL DIVERSITY, BIOCHEMISTRY AND CELL AND MOLECULAR BIOLOGY**

- Performed and understood the anatomy and physiology of animals by dissection.
- Performed by experiments to analyze the macromolecules in animals
- Understood the principles and types of PCR demonstration.
- Described the fine structure and functions of cell organelles.
- Performed a variety of molecular and cellular biology techniques.

#### **COURSE OUTCOMES – ANIMAL PHYSIOLOGY**

- An integrated Understanding of physiological mechanisms

- Described the physiology of digestive and respiratory system of human beings.
- Understood the blood composition, types, groups and circulatory system.
- Described the physiology of excretory system and nervous system of human beings.
- Came to know the physiology of sense organs, muscles and reproductive system.

### **COURSE OUTCOMES – GENETICS**

- Described the fundamental molecular principles of genetics
- Understood the structure and function of DNA & RNA
- Understood about the transmission, distribution, arrangement, and alteration of genetic information and how it functions and is maintained in populations
- Described the basics of genetic mapping.

### **COURSE OUTCOMES – IMMUNOLOGY AND MICROBIOLOGY**

- Outline the key components of the innate and adaptive immune responses.
- Described about cell types and organs which are involved in an immune response
- Described the Infectious diseases, hypersensitivity, autoimmune disorders, immunodeficiency diseases
- Understood the microbial diversity, ultra structure, culture techniques of microbes.
- Came to know about the various pathogenic fungi and viruses and beneficial microbes.

### **COURSE OUTCOMES – LAB – ANIMAL PHYSIOLOGY, GENETICS, IMMUNOLOGY AND MICROBIOLOGY**

- Biological chemistry and its importance in physiology by testing
- Performed an experiment to culture Drosophila, Identifications of sex & mutants.
- Observed ABO blood grouping and studied the lymphoid organs
- Performed an experiment about the immunodiffusion  
Immunoelectrophoresis and Immunoelectrophoresis

- Learnt about the microbial culture methods.

### **COURSE OUTCOMES – SERICULTURE**

- Described the Taxonomy, Morphological sex differences in larva and adult of beneficial and harmful insects.
- Understood the culture of mulberry plants, mulberry silk and silk gland.
- Came to know the culture methods of *B.mori* and *Apis*
- Described the diseases and pests of *B.mori* and plants.
- Studied the quality of silk and marketing strategies of silk.

### **COURSE OUTCOMES – DEVELOPMENTAL BIOLOGY**

- Understood and mastered on the basic concepts of developmental biology.
- Understood how fertilisation, cleavage and gastrulation occur.
- Understood the basic concepts of organogenesis.
- Understood about the basic concepts of growth, regeneration and ageing
- Described the test tube baby and placentation in mammals.

### **COURSE OUTCOMES – ECOLOGY**

- Demonstrated an Understood of ecological relationships between organisms and their environment.
- Presented an overview of diversity of life forms in an ecosystem.
- Explained and identified the role of the organism in energy transfers
- Described the Habitat ecology and Resource ecology
- Understood the Environmental Pollution and their management

### **COURSE OUTCOMES – EVOLUTION**

- By biological evolution we could understand that many of the organisms that inhabit the Earth today are different from those that inhabited it in the past
- Understood that the four propositions underlying Darwin's theory of evolution through natural selection are:
  - more individuals are produced than can survive;
  - There is therefore, a struggle for existence
  - Individuals within a species show variation
  - Offspring tend to inherit their parental characters
- Explained adaptation, providing examples from several different fields of biology
- Explained how the molecular record provides evidence for evolution
- Understood the Human origin and evolution.

### **COURSE OUTCOMES – LAB – DEVELOPMENTAL BIOLOGY, ECOLOGY AND EVOLUTION**

- Performed to know the various embryonic stages of animals.
- Learnt that the mounting of chick blastoderm and observation of sperm motility
- Confirmed the role of iodine and thyroxin in Amphibian metamorphosis.
- Analysed various physicochemical parameters in environmental matrices.



- Came to knowing the Animals of evolutionary importance, fossils, analogous and homologous organs, Mimicry and Colouration.

### **COURSE OUTCOMES – ANIMAL CELL CULTURE TECHNOLOGY**

- Described the structure and Organisation of animal cell.
- Understood the preparation of the culture medium.
- came to knowing the basic techniques of mammalian cell culture *in vitro*.
- Understood about Cell cloning and micro manipulation
- Applications of cultured animal cells are known.

### **COURSE OUTCOMES – TRANSGENIC TECHNOLOGY**

- Described the history and scope of transgenic animals.
- Understood Recombinant DNA technology.
- Described the Systems and strategies for improvement of livestock for milk, meat, wool production and drought and poultry for eggs and meat.
- Described the production of transgenic Cattle, pigs, sheep etc.
- Understood the History, definition, importance and application of cell technology

### **COURSE OUTCOMES – ANIMAL BIOTECHNOLOGY**

- Understood animal cell structure, scope of biotechnology.
- Described the Gene cloning and gene transfer methods.
- Came to know the concept of PCR, Screening of recombinant clones – nucleic acid hybridisation, DNA sequencing, DNA fingerprinting.
- Described the Animal tissue culture techniques.
- Understood Embryo transfer & transgenic animal technology.

### **COURSE OUTCOMES – FISHERY BIOLOGY AND AQUACULTURE**

- Learnt the general classification of fishes, economically important marine and freshwater fishes, migration and fishery products.
- Described recent concepts in fisheries management, endangered species management.
- Came to know the various aquaculture systems.

- Understood the type of hatchery, brood stock, larval production, feed management water quality and disease management in cultivable species, live feed production.
- Described the feed and disease management.

Program Name: M.Sc. Mathematics

## **Course Objective & Outcomes**

**Subject: Abstract Algebra-I**

**Class: M.Sc. Maths 1st Sem.**

### **Course Objective**

1. Present the relationships between abstract algebraic structures with familiar numbers systems such as the integers and real numbers.
2. Present concepts of and the relationships between operations satisfying various properties (e.g. commutative property).
3. Present concepts and properties of various algebraic structures.
4. Discuss the importance of algebraic properties relative to working within various number systems.
5. Develop the ability to form and evaluate conjectures.

### **Outcomes**

After the completion of the course, Students will be able to

1. Generate groups given specific conditions.
2. Investigate symmetry using group theory.
3. Identify plane periodic patterns (lattices).
4. Understand the base of the coding theory as an application of finite fields.
5. Demonstrate knowledge that the rational numbers and real numbers can be ordered and that the complex numbers cannot be ordered, but that any polynomial equation with real coefficients can be solved in the complex field.

6. Discuss the three major concrete models of Boolean algebra: the algebra of sets, the algebra of electrical circuits, and the algebra of logic.
7. Describe other applications of abstract algebra such as in avoiding problems of round off in computations

## **DEPARTMENT OF MATHEMATICS**

### **Course Objective & Outcomes**

**Subject: Ordinary Differential Equation**

**Class: M.Sc. Maths 1st Sem.**

#### **Course Objective**

1. To aware the students about initial value and boundary value problems and their corresponding equivalent integral equations.
2. To aware the students about concepts of approximate solution and existence theorem.
3. To familiarize the students about Adjoint system in detail.
4. Detailed study of Fundamental Set and matrix.
5. To demonstrate knowledge and understanding of Critical points in Autonomous system and their stability.

#### **Course Outcomes**

After the completion of the course, Students will be able to

1. Solve problems in ordinary differential equations, dynamical systems, stability theory, and a number of applications to scientific and engineering problems.
2. Demonstrate their ability to write coherent mathematical proofs and scientific arguments needed to communicate the results obtained from differential equation models.
3. Demonstrate their understanding of how physical phenomena are modelled by differential equations and dynamical systems.
4. Implement solution methods using appropriate technology, and
5. Investigate the qualitative behavior of solutions of systems of differential equations

## **DEPARTMENT OF MATHEMATICS**

### **Course Objective & Outcomes**

**Subject: Mathematical Statistics**

**Class: M.Sc. Maths 2<sup>nd</sup> Sem.**

### **Course Objective**

The objectives of this course are to:

1. Understand the theory of statistics and their applications.
2. Understand the concepts of Probability.
3. To analyse different distributions along with their properties.
4. Aware the students about mathematical expectation, variance, moment generating function and moment about mean & about origin.
5. To understand the concepts of testing hypothesis.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. Differentiate between discrete and continuous random variables.
2. Solve the problems related to Bay's theorem.
3. Calculate mean, variance, Standard deviation of different types of theoretical distribution.
4. Apply different types of tests of significance.
5. Differentiate between types of error.
6. Understand Null & alternative hypothesis for testing.

## **DEPARTMENT OF MATHEMATICS**

### **Course Objective & Outcomes**

**Subject: Complex Analysis**

**Class: M.Sc. Maths 1<sup>st</sup> Sem.**

### **Course Objective**

1. To provide an introduction to the theories for functions of a complex variable.
2. To explore algebraic, geometric and topological structures of the complex number field.
3. To introduce the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
4. To present Complex integration and complex power series.

5. To discuss the classification of isolated singularities and examine the theory and illustrate the applications of the calculus of residues in the evaluation of integrals.

### **Course Outcomes**

After the completion of the course,

1. Student will have introduced to the fundamental concepts of complex analysis and their role in modern mathematics and applied contexts.
2. Student will demonstrate to accurate and efficient use of complex analysis techniques.
3. Student will be able to understand capacity for mathematical reasoning through analyzing, proving and explaining concepts from complex analysis
4. Student will be able to apply problem-solving using complex analysis techniques applied to diverse situations in physics, engineering and other mathematical contexts.
5. Student will be able to apply problem-solving using evaluation of improper integral by Cauchy Residue Theorem.

## **DEPARTMENT OF MATHEMATICS**

### **Course Objective & Outcomes**

**Subject: Measure & Integration**

**Class: M.Sc. Maths 2<sup>nd</sup> Sem.**

#### **Course Objective**

1. Revision of basic tools, including in particular the concept of countable/uncountable sets.
2. Be able to describe at least one approach to the construction of Lebesgue measure, the Lebesgue integral of a function and measure spaces.
3. Know the principal theorems as treated and their proofs and be able to use them in the investigation of examples.
4. Be able to prove simple unseen propositions concerning measure spaces, Lebesgue measure and integration.
5. To gain understanding of the abstract measure theory and definition and main properties of the integral.
6. To construct Lebesgue's measure on the real line and in n-dimensional Euclidean space.
7. To explain the basic advanced directions of the theory.

### **Course Outcomes**

After the completion of the course, Student will be able to

1. understand  $\sigma$ -algebras, measurable sets, measures, outer measures, Lebesgue measure and its properties, completion of measures.
2. understand measurable functions, approximation by simple functions.
3. understand Lebesgue integral, Monotone Convergence Theorem, Dominated Convergence Theorem, coincidence of Lebesgue and Riemann integral for Riemann integrable functions.
4. develop an appreciation of the basic concepts of measure theory. These methods will be useful for further study in a range of other fields, e.g. Stochastic calculus, Quantum Theory and Harmonic analysis.
5. establish relation to graduate attributes: The above outcomes are related to the development of the Science Faculty Graduate Attributes, in particular: Research, inquiry and analytical thinking abilities, Communication, and Information literacy

## **DEPARTMENT OF MATHEMATICS**

### **Course Objective & Outcomes**

**Subject: Abstract Algebra-II**

**Class: M.Sc. Maths 2<sup>nd</sup> Sem.**

#### **Course Objective**

1. Present the relationships between abstract algebraic structures with familiar numbers systems such as the integers and real numbers.
2. Present concepts of and the relationships between operations satisfying various properties (e.g. commutative property).
3. Present concepts and properties of various algebraic structures.
4. Discuss the importance of algebraic properties relative to working within various number systems.
5. Develop the ability to form and evaluate conjectures.

#### **Course Outcomes**

After the completion of the course,

1. Student will be able to understand the relationships between abstract algebraic structures with familiar numbers systems such as the integers and real numbers.
2. Student will be able to verify relationships between operations satisfying various properties (e.g. commutative property).

3. Student will be able to work within various algebraic structures.
4. Students will have a working knowledge of important mathematical concepts in abstract algebra such as definition of a module, properties of module and application of module.
5. Students will be knowledgeable of different types of modules such as noetherian module, artinian module and understand the structure and characteristics of these modules.
6. Students will be introduced to and have knowledge of many mathematical concepts studied in abstract mathematics such as Nil ideal and Nilpotent ideal.

## **DEPARTMENT OF MATHEMATICS**

### **Course Objective & Outcomes**

**Subject: Elementary Topology**

**Class: M.Sc. Maths 2<sup>nd</sup> Sem.**

#### **Course Objective**

1. Students will learn the fundamentals of point-set topology
2. Students will learn the fundamentals of algebraic topology
3. Students will be prepared to begin thesis research.
4. Have the knowledge of basic properties of the field of real numbers.
5. Studying Bolzano –Weirstrass theorem and Cauchy criteria.
6. Studying the basic topological properties of the real numbers
7. Studying the notion of continuous functions and their properties

#### **Course Outcomes**

After the completion of the course, Students will be able to

1. Define and recognize the basic topological properties of  $\mathbb{R}$
2. Students will know the definitions of standard terms in topology.
3. Students will know how to read and write proofs in topology.
4. Students will know a variety of examples and counter examples in topology.
5. Students will know about the fundamental group and covering spaces.

6. Define and recognize the continuity of real functions.

## **DEPARTMENT OF MATHEMATICS**

### **Course Objective & Outcomes**

**Subject: Functional Analysis**

**Class: M.Sc. Maths 3<sup>rd</sup> Sem.**

#### **Course Objective**

1. To know and be able to use the elementary properties of normed and inner product spaces.
2. To be able to check whether a linear operator is bounded, to find its adjoint and determine whether operators are normal, self adjoint, unitary or positive.
3. To determine whether a bounded operator is invertible and understand the importance of the spectrum of a bounded linear operator.
4. To study normed linear spaces and some of the linear operators between them and give some applications of their use.
5. To introduce the theory of Lebesgue integration with the aim of providing examples of complete normed linear spaces of integrable functions.

#### **Course Outcomes**

After the completion of the course, Students will be able to

1. improve abilities in mathematical reasoning and in expressing themselves accurately in writing by producing correct mathematical proofs.
2. use logical reasoning to prove theorems.
3. introduced to the concept of continuity and be familiar with the statements and proofs of the standard results about continuous real functions;
4. understand the concept of the differentiability of a real valued function and be familiar with the statements and proofs of the standard results about differentiable real functions.
5. understand the concept of Signed measure, Baire measure and continuous function with compact support.

## **DEPARTMENT OF MATHEMATICS**

### **Course Objective & Outcomes**



**Subject: Fluid Dynamics**

**Class: M.Sc. Maths 3rd Sem.**

### **Course Objectives**

1. The student will learn analytical solution techniques for diverse fluid problems, including lubrication flows, boundary layers, and Stokes flow, in steady and unsteady conditions.
2. learn analytical techniques required to solve fluid flow equations for different geometries and flow conditions.
3. learn the fundamentals physics involved in modelling fluids and hydrodynamic phenomena .
4. Through learned analytical methods and basic numerical techniques presented in this course the students will be able to determine volumetric flow rates, shear and pressure drag, and lift forces for different geometric configurations.
5. The course provides fundamental tools for professional engineers working in fluid mechanics.

### **Course Outcomes**

1. Identify the relevant parameters that govern a fluid system and use dimensional analysis to identify the fundamental variables that define flow [SO1].
2. Analyze microscopic continuum fluid mechanics where flow is governed by the continuity equation and Navier-Stokes equation (differential forms of conservation equations). Evaluate a problem and arrive at reasonable approximations to put the equations in a more soluble form [SO1].
3. Analyze systems using macroscopic fluid mechanics, using the integral form of the conservation equations (Bernoulli's equation) [SO1,SO3].
5. Evaluate pressure distributions in a static fluid, taking account of hydrostatic pressure, buoyancy force, and interfacial tension (Laplace pressure and capillary action).

## **DEPARTMENT OF MATHEMATICS**

### **Course Objective & Outcomes**

**Subject: Inner Product Space & Measure Theory**

**Class: M.Sc. Maths 4th Sem.**

### **Course Objective**

1. To know and be able to use the elementary properties of normed and inner product spaces.
2. To be able to check whether a linear operator is bounded, to find its adjoint and determine whether operators are normal, self adjoint, unitary or positive.
3. To determine whether a bounded operator is invertible and understand the importance of the spectrum of a bounded linear operator.
4. To study normed linear spaces and some of the linear operators between them and give some applications of their use.
5. To introduce the theory of Lebesgue integration with the aim of providing examples of complete normed linear spaces of integrable functions.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. improve abilities in mathematical reasoning and in expressing themselves accurately in writing by producing correct mathematical proofs.
2. use logical reasoning to prove theorems.
3. introduced to the concept of continuity and be familiar with the statements and proofs of the standard results about continuous real functions;
4. understand the concept of the differentiability of a real valued function and be familiar with the statements and proofs of the standard results about differentiable real functions.
5. understand the concept of Signed measure, Baire measure and continuous function with compact support.

## **DEPARTMENT OF MATHEMATICS**

### **Course Objective & Outcomes**

**Subject : Classical Mechanics**

**Class: M.Sc. Maths 4<sup>th</sup> Sem.**

### **Course Objective**

1. To demonstrate knowledge and understanding of the following fundamental concepts in the dynamics of system of particles,

2. To demonstrate knowledge and understanding of the following fundamental concepts in motion of rigid body,
3. To demonstrate knowledge and understanding of the following fundamental concepts in Lagrangian and Hamiltonian formulation of mechanics
4. To represent the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulation of classical mechanics.
5. To develop math skills.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. define and understand basic mechanical concepts related to discrete and continuous mechanical systems,
2. describe and understand the vibrations of discrete and continuous mechanical systems,
3. describe and understand planar and spatial motion of a rigid body,
4. describe and understand the motion of a mechanical system using Lagrange-Hamilton formalism.

## **DEPARTMENT OF MATHEMATICS**

### **Course Objective & Outcomes**

**Subject: Viscous Fluid Dynamics**

**Class: M.Sc. Maths 4<sup>th</sup> Sem.**

#### **Course Objectives:**

1. Learn the fundamentals physics involved in modelling fluids and hydrodynamic phenomena.
2. Learn analytical techniques required to solve fluid flow equations for different geometries and flow conditions.
3. The student will learn analytical solution techniques for diverse fluid problems, including lubrication flows, boundary layers, and Stokes flow, in steady and unsteady conditions.
4. Through learned analytical methods and basic numerical techniques presented in this course the students will be able to determine volumetric flow rates, shear and pressure drag, and lift forces for different geometric configurations.
5. The course provides fundamental tools for professional engineers working in fluid mechanics.

## **Course Outcomes**

1. Explain the fundamental properties of fluids, including viscosity, Newtonian and non-Newtonian rheology, and viscoelasticity [SO1].
2. Analyze microscopic continuum fluid mechanics where flow is governed by the continuity equation and Navier-Stokes equation (differential forms of conservation equations). Evaluate a problem and arrive at reasonable approximations to put the equations in a more soluble form [SO1].
3. Analyze systems using macroscopic fluid mechanics, using the integral form of the conservation equations (Bernoulli's equation) [SO1,SO3].
4. Identify the relevant parameters that govern a fluid system and use dimensional analysis to identify the fundamental variables that define flow [SO1].
5. Evaluate pressure distributions in a static fluid, taking account of hydrostatic pressure, buoyancy force, and interfacial tension (Laplace pressure and capillary action) [SO1].
6. Identify conditions under which flows are turbulent and derive equations that approximate its properties (time averages and fluctuations). Compare turbulent flow with those of laminar flow [SO1].

## **DEPARTMENT OF MATHEMATICS**

### **Course Objective & Outcomes**

**Subject: Graph Theory**

**Class: M.Sc. Maths 4th Sem.**

#### **Course Objective**

The objectives of this course are to

1. Introduce the concepts of Graph and their different types as well as the isomorphism between them.
2. Introduce the classes of Eulerian and Hamiltonian graphs, trees and weighted graphs.
3. Illustrate how to find minimal walks in graphs.
4. Introduce vertex and edge colourings of graphs.
5. Find out the different methods of searching tree.

## **Course Outcomes**

After the completion of the course, Students will be able to

1. Understand the theoretical base of the subject.
2. Identify different types of the graphs and be able to apply different operations on them.
3. Identify Eulerian and Hamiltonian graphs.
4. Apply special algorithms to find minimal walks in weighted graphs.
5. Apply special algorithms to find spanning trees in graphs.
6. Find chromatic numbers and be able to find out planer graphs.

## **DEPARTMENT OF MATHEMATICS**

### **Course Objective & Outcomes**

**Subject: Information and Communication Technology**

**Class: M.Sc. Maths 4th Sem.**

### **Course Objective**

This paper's scope is to propose one possible set of objectives that could realize above defined aim. For each objective a set of applications, change drivers, requirements and possible leaders will be identified.

Education processes differ among themselves because of the subject of Course, required Course outcomes, previous knowledge, Course styles, culture, industry and many other factors. On the other hand, ICT can be used in a variety of ways in any traditional or new activity.

These two factors combined derive numerous activities in educational process in which ICT is or can be implemented. In order to streamline them and to try to identify some common points and shared resources, it is proposed to group them in three sets of objectives:

1. Support functions: administrative, technical, and supportive functions.
2. Course assistance: assistance and support for Course and teaching,

3. New Course: new teaching and Course methods, techniques, and tools.

### **Course Outcomes**

After the completion of the course, Students will be able to

1. understand the meaning of all the terms highlighted in the text
2. demonstrate an awareness of the main processes in an ICT system (sending, receiving, storing, retrieving, manipulating, conveying)
3. demonstrate an awareness of some of the hardware, software and communication components used in ICT systems
4. use a system map or a block diagram to identify the components of an ICT system

## **Name of the program: Master of Commerce (M.Com.)**

### **Programme Outcomes**

#### **PURPOSE OF THE COURSE:**

The commerce stream has witnessed a sea change over the past decades, with a range of specialisations and career options emerging in recent years. Commerce education is specialisation to develop the required knowledge, skills and attitudes for the successful handling of trade, commerce and industry. M.Com is the most exalted two year full time postgraduate programme in commerce. The 2-year course delves deeper into the functioning of the economy, capital, revenue, trade, taxes, etc. taught in B.Com. The course aims at providing specialization to the students in the field of Finance and Marketing. The course provides an extreme and rigorous base for teaching, research and allied business administration. The programme is well received in the industry and for years had been serving the needs of managerial cadre. The course serves the needs of academics and prepares students for research and teaching.

#### **PROGRAMME OBJECTIVES:**

The aim of this Programme is to develop Commerce professionals with specialised skills and applied competencies in theoretical and practical knowledge of Finance and Marketing that will cater the contemporary needs of industry and academia by providing student-centric learning ambience backed with critical thinking and problem solving capabilities. The main objective of this Programme is to train the student to develop conceptual, applied and research skills as well as competencies required for effective problem solving and right decision making in routine and special activities relevant to financial management, security market transactions, corporate governance practices, and marketing management of a business. The Programme will enable students:

- To acquaint with conventional as well as contemporary areas in the discipline of Commerce.
- To well versed in national as well as international trends.
- For conducting business, accounting and research practices.
- To understand role of regulatory bodies in corporate and financial sectors.

#### **SKILLS:**

The students after completing the program should inculcate the following skills:

- The techniques of managing the business with special focus on marketing and finance.

- Application oriented research through research for business decisions.
- Effective use of Statistical methods for analysis of business data.
- Adopt a suitable corporate tax planning and management for the growth of business within the legal framework.
- Investment and portfolio management skill to examine different investment schemes with respect to risk and return and to construct optimum portfolio.
- Adopt a reflective approach to personal development and embrace the philosophy of continual professional development.
- Plan and undertake independent research in a chosen discipline.

### COURSE OUTCOME

Course name	Course Objectives and Outcomes
<b>Accounting and Finance:</b> Financial Management, Accounting theory, Corporate Tax Planning, Management of Financial Services, Advanced Cost Accounting, Accounting for Managerial Decisions and Cost Management	<ul style="list-style-type: none"> <li>• Know the developments in accounting theory, financial reporting and disclosure practices at the national and international level.</li> <li>• Explain terms such as incomes, revenues, expense, losses, and gains.</li> <li>• Compute tax liability of a company.</li> <li>• Consider tax implications while taking business decisions.</li> <li>• Assess impact of taxation on trade off of financial decisions.</li> <li>• Compute tax liability of a company.</li> <li>• Consider tax implications while taking business decisions.</li> <li>• Assess impact of taxation on trade off of financial decisions.</li> </ul>
<b>Management Group</b> MC&OB, Portfolio Management, Investment Management and Strategic Management	<ul style="list-style-type: none"> <li>• It provides the understanding about organisational culture and develop a technique to create a sound culture for the organisation</li> <li>• They understand the role of the Power and politics in the organisation and develop the rational political behaviours</li> <li>• To describe the role of strategic management and the strategic management process.</li> <li>• To understand the importance of strategy</li> </ul>



	<p>formulation and strategy implementation.</p> <ul style="list-style-type: none"> <li>• The student will also be able to appreciate the principles, theories and models of corporate governance.</li> </ul>
<b>Business Research Methods and Statistical Technique</b>	<ul style="list-style-type: none"> <li>• To develop logical reasoning ability in decision making.</li> <li>• To apply various parametric and non-parametric tests in the real life case situation.</li> <li>• To make decisions under uncertain business situations.</li> <li>• To bring out clearly the importance of statistics in solving different research problems.</li> <li>• This course enables the student to know the scientific approach to decision making when solving business problems.</li> <li>• Determining the most profitable distribution pattern.</li> </ul>
<b>Human Resource Management</b>	<ul style="list-style-type: none"> <li>• Build an understanding, perspective and appreciation for HRD as discipline, process, and activity and come to know the competitive environment.</li> <li>• Students come to know after completing this about the various aspects of the personal as well as professional life and try to balance between these both.</li> <li>• Develop the decision making skills in different situations and enhances the skills regarding specific work.</li> <li>• Develop the competency mapping skills, self, peers, superiors and subordinate appraisal skills.</li> </ul>

DEPARTMENT OF CHEMISTRY  
PROGRAM NAME-M.Sc (PASS COURSE) CHEMISTRY

**Program Outcomes**

**1: Creative Thinking:** Students will be able to think creatively (divergently and convergent) to propose novel ideas in explaining facts and figures or providing new solution to the problems in chemistry. The skills of observations and drawing logical inferences from the scientific experiments will also be developed.

**2: Interdisciplinary Approach:** Students will realize how developments in any science subject helps in the development of other science subjects and vice-versa and how interdisciplinary approach helps in providing better solutions and new ideas for the sustainable developments. Also the knowledge of subjects in other faculties such as humanities, performing arts, social sciences etc. can have greatly and effectively influence which inspires in evolving new scientific theories and inventions.

**3: Personality Development:** Students will imbibe ethical, moral and social values in personal and social life leading to highly cultured and civilized personality. They will also 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.

**4 Skills in research and industrial field:** Students will build a scientific temper and will be able to learn the necessary skills to succeed in research or industrial field. In addition they will acquire the skills in handling scientific instruments, planning and performing in laboratory experiments.

**5 Communication Skills:** Students will develop various communication skills such as reading, listening, speaking, etc., which we will help in expressing ideas and views clearly and effectively.

**6 Environmental monitoring:** Students will be able to understand the environmental issues Global warming, Climate change, Acid rain, Ozone depletion and will create awareness in society .

**COURSE OUTCOMES**

**COURSE NAME: LIGAND FIELD THEORY**

**CLASS - M.Sc. Chemistry SEMESTER – I**

**Objectives:** This course aims at acquainting students to concept of Crystal field and Ligand field theory. The symmetry, magnetic properties and spatial arrangements of molecules are studied in good detail.

**Programme Learning Outcomes:**

**A. Knowledge and Understanding:**

Students will be able to analyse the point group of chemical molecules. They will learn the relation of structure to magnetic properties.

**B. Intellectual (Cognitive and Analytical) Skills:**

Students will be able to understand the structure and arrangement of ligands around different oxidation state of metals.

**C. Practical Skills**

Students will learn the theoretical basis of stability of different electronic states.

**D. Transferable Skills**

Students will be able to make a correlation between structure and stability of different metal compounds.

**COURSE NAME: ORGANIC REACTION MECHANISM-I**

**CLASS - M.Sc CHEMISTRY SEMESTER – I**

**Objectives of the Course ;**

This course aims at acquainting students with the knowledge of organic reaction mechanisms of aromatic electrophilic substitution and aromatic nucleophilic substitution reactions. It provides an introduction to the synthesis of complex organic molecules. Transformations for C-X and C-C bond-formation, functional group reactivity, chemoselectivity, regioselectivity, and the strategy of multistep synthesis will be the core topics that are covered.

**Program Learning Outcomes:**

The aim is to help the students to study in detail the basics of very important substitution reactions in organic chemistry. Along with the revision of basic concepts of electrophilic and nucleophilic reactions, further applications in advanced fields of organic chemistry are aimed to be discussed. Concepts include strategy/retrosynthesis, advanced aromatic chemistry, protecting groups, stereochemistry, enolates and other carbonyl chemistry, alkene synthesis, reduction/oxidation (introductory), heterocycles, cross-coupling reactions and other modern methods of synthesis.

**COURSE NAME: PHYSICAL CHEMISTRY – THERMODYNAMICS**

**CLASS - M.Sc CHEMISTRY SEMESTER – I**

**Objectives of the Course :**

1. This course aims at to accustom the students the basic concepts of thermodynamics along with the Non-ideal systems including the basic Debye Huckel theory.

2. Students will be guided to apply phase rule to various systems (2 and 3 component systems) and introduction to the basic concepts of non equilibrium thermodynamics along with the applications is another purpose.

**Program Learning Outcomes:**

**Knowledge and Understanding:**

Students will explain statistical chemistry and thermodynamics as logical consequences of the postulates of statistical mechanics;

**Intellectual (Cognitive and Analytical) Skills:**

Apply the principles of statistical mechanics to selected problems;

**Practical Skills**

Apply techniques from statistical mechanics to a range of situations;

**Transferable Skills**

Use the tools, methodologies, language and conventions of chemistry to test and communicate ideas and explanations.

**COURSE NAME: SPECTROSCOPY A: TECHNIQUES FOR STRUCTURE ELUCIDATION OF ORGANIC COMPOUNDS**

**CLASS - M.SC CHEMISTRY SEMESTER – I**

**Objectives of the Course:**

Modern theoretical and experimental methods used to study problems of molecular structure and bonding; emphasis on spectroscopic techniques.

**Program Learning Outcomes:**

The student will learn :

1. To perform rigorous characterization of their compound using 1- and 2-dimensional NMR techniques ( $^1\text{H}$  and  $^{13}\text{C}$ ),

2. Mass spectrometry, infrared spectroscopy and UV-Vis spectroscopy.

**COURSE NAME: COMPUTER FOR CHEMISTS – THEORY**

**CLASS - M.SC CHEMISTRY SEMESTER – I**

**Objective of the Course:**

This course aims at acquainting students with learn various concepts and basic techniques essential for conduct of practical in computers

**Course Outcomes:**

A. Knowledge and understanding:

Basic understanding about Computer

Understanding the basic concept associated with C- Language and program designing

Students will develop different programs, Run and Retrieve results.

B. Intellectual ( Cognitive/Analytical) skills:

Design program in C-language on the basis of given query.

Use of data structures in C

C. Practical skills:

Use of standard input (scanf) and standard output (printf) functions

Use of variables, keywords, arithmetic operators, relational operators, logical operators, unary operators, assignment operator, arithmetic assignment operators and conditional operator.

Use of library functions and user defined functions.

Use of Looping Statement (like while, do-while, for loops) and branching statements (like if, if-then, if-then-else).

Create functions and to show different calls: Call by reference, Call by value.

In future student may be able to develop a big program(s)(Software) which may simulate the behavior of the chemical reaction/processes/events

**COURSE NAME: ORGANOMETALLICS CHEMISTRY**

**CLASS - M.Sc CHEMISTRY SEMESTER – II**

**Objectives of the Course:**

This course aims at acquainting students to complete knowledge of catalytic and industrial uses of organometallic compounds.

**Course Outcomes:**

**A. Knowledge and Understanding:**

Students will be able to understand the role of coordination number, coordination geometry and oxidation state of metal in catalytic cycles.

**B. Intellectual (Cognitive and Analytical) Skills:**

Students will be able to study the wide variety of organometallic compounds and the choice of hapticity in different conditions.

**C. Practical Skills**

Students will learn to go through some important emerging compounds especially multi-decker sandwich compounds.

**D. Transferable Skills**

Students will be able to study the reactions at coordinated ligands.

**COURSE NAME: ORGANIC REACTION MECHANISM -II**

**CLASS - M.Sc CHEMISTRY SEMESTER – II**

**Objectives of the Course:**

• The aim of the course is to provide the vast knowledge to the Students regarding various topics related to Organic Chemistry such as Free Radical reactions, Elimination Reactions and their Mechanisms, Addition to C-C and C- Hetero Multiple bonds etc.

**Course Outcomes:**

• The aim is to provide vast knowledge of Organic Reactions and their mechanisms along with their Stereo-chemical aspects.

**COURSE NAME: PHYSICAL CHEMISTRY – QUANTUM CHEMISTRY**

**CLASS - M.Sc CHEMISTRY SEMESTER – II**

**Objectives of the Course ;**

This course aims at to accustom the students the principles and applications of quantum mechanics in detail with further introduction of different types of operators later on used in the solution of conjugated systems.

**Course Outcomes:**

The aim is to help the students to revise the basic principles of quantum mechanics. Introduction to new operators such as Hermitian and Hamiltonian and their use in the solution of Hydrogen and Hydrogen like atoms.

Students will also be able to apply quantum postulates in solution of particles in one, two and three dimensional boxes.

**COURSE NAME: REACTION MECHANISMS AND METAL CLUSTERS**

**CLASS - M.Sc CHEMISTRY SEMESTER – II**

**Objectives of the Course:**

This course aims at acquainting students to reaction mechanisms of Inorganic complex ions.

Inorganic reaction mechanisms are point of study due to variable coordination number and oxidation states of metal ions.

**Programme Learning Outcomes:**

**A. Knowledge and Understanding:**

Students will be able to interpret the different mechanisms of reactions based on rate constant data available.

**B. Intellectual (Cognitive and Analytical) Skills:**

Students will be able to predict whether reaction follows outer sphere path or inner sphere path in the reaction mechanisms under study.

**C. Practical Skills**

Students will learn to understand the preference of a metal ion to undergoing a particular pathway of reaction mechanism.

**D. Transferable Skills**

Students will be able to judge the relative stability of products in variety of reactions.

**COURSE NAME: SPECTROSCOPY B: TECHNIQUES FOR STRUCTURE ELUCIDATION OF INORGANIC COMPOUNDS**

**CLASS - M.Sc CHEMISTRY SEMESTER – II**

**Objectives of the Course:**

This course aims at acquainting students with techniques that measure the elemental composition at microscopic level, electronic state, chemical state of matter, binding energy, empirical formula and more of surface region of solids

**Course Outcomes:****(Knowledge and Understanding of the fundamental concepts, Learning Outcomes:**

Students will know how to define the various electronic energy levels in atoms and molecules ,excitations & ejection of electrons, understand and explain the basic concepts associated with Symmetry & molecular orbitals, Dissociation, Predissociation, change of shape on excitation.

**COURSE NAME: MATHEMATICS FOR CHEMISTS****CLASS - M.Sc. CHEMISTRY SEMESTER – II****Course Objectives:**

This course introduces the math content to chemistry students. It has been designed to compliment lecture material with particular focus on the application of math's in chemistry.

**Course Outcomes:****A. Knowledge and Understanding:**

Students will be able to know

1. Matrix and its types, Determinant and its properties.
2. Define the derivative and integral of the trigonometric, logarithmic and inverse trigonometric and rational functions
3. Recognize the different techniques of integration (by parts, trigonometric integrals, partial fractions).
4. definite integrals

**B. Intellectual(cognitive/Analytical) skills:**

1. Calculate the rank of matrix
2. Determine derivatives of function using different techniques.
3. Evaluate integrals by different methods of integration.
4. Calculate the areas of plane regions.

**C. Practical skills:**

1. Have the ability to carry out complex calculations orally and mentally.
2. Present mathematics to others in oral and written form clearly and in a well organized manner.

**COURSE NAME: BIOLOGY FOR CHEMISTS****CLASS - M.Sc CHEMISTRY SEMESTER – II**

Course Name: **Course–XIII BIOLOGY FOR CHEMISTS**

**Class: M Sc. (Chemistry)**

**Semester - II**

**Objectives of the course:**

1. To study the structure and organization of cell membrane and cell wall, process of membrane transport and membrane models.
2. To understand the DNA structural organization and biochemical composition of genetic material.
3. To understand the vascular tissues, structure of woods and anomalous secondary growth, anatomical variations and tissue systems in plant shoot system.
4. To know various tissue systems and understand the normal and anomalous secondary growth in plants

**Course Outcomes:**

**(a) Knowledge and Understanding:** Student will know about whittaker system of classification, plant and animal tissue systems, genetic principles, structure and functional aspects of biomolecules.

**(b) Intellectual Cognitive /Analytical skills:** Students will be able to understand the basic principles of biology and biomolecules.

**(c) Transferable skills:** communicate and interact about the biological principles applied to chemistry.

**COURSE NAME: INORGANIC CHEMISTRY-II**

**CLASS - M.Sc CHEMISTRY SEMESTER – III**

**Objectives of the Course:**

This course aims at acquainting students to concept of bio-inorganic chemistry. Due to ever increasing role of metals in medicine, these topics are of good concern in chemistry.

**Course Outcomes:**

**A. Knowledge and Understanding:**

Students will be able to analyse the relation between oxidation state of metals and their biological behaviour.

**B. Intellectual (Cognitive and Analytical) Skills:**

Students will be able to understand the role of metals and chemicals in biological systems.

**C. Practical Skills**

Students will learn the use of porphyrins of different metal ions in biological systems.

**D. Transferable Skills**

Students will be able to make a correlation between enzymatic functions and metals.

**COURSE NAME: ORGANIC SYNTHESIS**

**CLASS - M.Sc CHEMISTRY SEMESTER – III**

**Objectives of the Course:**

This course aims at acquainting students to concept of synthesis in organic chemistry. This will cover a wide area of synthesis including polynuclear compounds, heterocyclic compounds, reagents in organic synthesis, and basic concepts of supramolecular chemistry.

**Course Outcomes:**

**A. Knowledge and Understanding:**

Students will be able to analyse the difference in the basic types of synthetic approaches.

**Intellectual (Cognitive and Analytical) Skills:**

Students will be able to understand the role of reagents and catalysts in organic synthesis.

**Transferable Skills**

Students will be able to make a correlation between supramolecular and normal organic synthesis.

**COURSE NAME: SURFACE AND POLYMER CHEMISTRY**

**CLASS - M.Sc CHEMISTRY SEMESTER – III**

**Objectives of the Course ;**

This course aims at acquainting the students the knowledge of the basic concepts of polymers. A complete packet of knowledge of the kinetics, thermodynamics of polymerization, various techniques

of determination of molecular mass and applications of polymers in various fields of life will be provided to the students.

Various factors affecting the structure and properties of polymers will be discussed in detail which makes students aware of the things to be considered while preparing polymers commercially.

**Program Learning Outcomes:**

This course will equip the students with the necessary detailed chemical knowledge concerning the chemistry of macromolecules.

This will also help to develop skills to interpret and explain various factors affecting structure and property of macromolecules. The students will be able to pursue their career objectives in higher education, scientific research and teaching.

**COURSE NAME: ELECTROCHEMISTRY AND CHEMICAL DYNAMICS**

**CLASS - M.Sc CHEMISTRY SEMESTER – III**

**Objectives of the Course ;**

1. This course aims at acquainting students with the knowledge of various concepts and theories related to physical chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject.

2. To equip students with necessary chemical knowledge concerning the concept of reaction rates and electro analytical techniques and to bring forth the importance of academic and laboratory skill for the students.

**Program Learning Outcomes:**

**Learning Outcomes(Knowledge and Understanding):**

Students will understand the fundamentals of Chemical dynamics and Voltammetry and their applications.

**B. Intellectual( Cognitive/ Analytical) Skills:**

Students will be able to develop the academic and laboratory skills.

**C. Practical Skills**

Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.

**D. Transferable Skills :**

Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

**COURSE NAME: PHOTOCHEMISTRY AND PERICYCLIC REACTIONS**

**CLASS - M.Sc CHEMISTRY SEMESTER – III**

**Objectives of the Course ;**

This course aims at acquainting students with the detailed knowledge of pericyclic as well as photochemical reactions. Starting from the very basic ideas, and moving towards the classification using different approaches, electrocyclic and sigmatropic rearrangements will be discussed.

**Program learning outcomes:**

Students will learn the basic difference between photochemical and thermal reactions. Based on the different principles of photochemistry, they will be able to solve different practical problems. Further some well known named reactions in this field will add on to the knowledge of the students.

**COURSE NAME: ADVANCED INORGANIC CHEMISTRY**

**CLASS - M.Sc CHEMISTRY SEMESTER – IV**

**Objectives of the Course:**

This course aims at acquainting students to the knowledge of transition metal compounds with bonds to hydrogen. Such compounds have wide synthetic applications from study point of view.

**Course Outcomes:**



### **A. Knowledge and Understanding:**

Students will be able to characterise theoretically the type of bond of hydrogen with the transition metal.

### **B. Intellectual (Cognitive and Analytical) Skills:**

Students will be able to understand the reducing properties of compounds and the chemical reactions.

### **C. Practical Skills**

Students will learn to make difference of terminal and bridging hydrogen bonds.

### **D. Transferable Skills**

Students will be able to think and devise new synthetic applications of such compounds.

#### **COURSE NAME: NATURAL PRODUCTS**

#### **CLASS - M.Sc CHEMISTRY SEMESTER – IV**

#### **Objectives of the Course:**

1. Recognize and draw particular carbohydrate structures
2. Know general structural elements of cyclic monosaccharides and disaccharides, and their implications for structure/function
3. Predict the products of condensation reactions and hydrolysis.
4. Knowledge of Sequence determination of amino acids
5. Familiarity with Enzymes, Kinetics, inhibition mechanism.
6. Know general structure of Nucleosides, nucleotides, DNA, RNA structure etc.

#### **Course Outcomes:**

- Students will be able to Recognize and draw particular carbohydrate structures, general of cyclic monosaccharides and disaccharides, and their implications for structure/function.
- Students will be able to predict the products of condensation reactions and hydrolysis.
- Students will be capable of determining the Sequence of amino acids

Students will be Familiar with Enzymes, Kinetics, inhibition mechanism and structure of Nucleosides, nucleotides, DNA, RNA structure etc.

#### **COURSE NAME: CHEMISTRY OF MATERIALS**

#### **CLASS - M.Sc CHEMISTRY SEMESTER – IV**

#### **Objectives of the Course ;**

- This course aims at acquainting the students the knowledge of the factors affecting glass formation various thermodynamic, kinetic factors controlling the designing of glass materials, important compositions and different properties.
- A complete packet of knowledge of the preparation of smart materials and their applications as nano drug delivery agents and energy storage materials.

#### **Program Learning Outcomes:**

- The aim is to help the students to understand the basics of glass formation from different materials along with different kinetic and thermodynamic aspects discussing the applications also. Smart materials will be introduced while discussing different electrical and magnetic properties.

## **Program Specific Outcomes**

1. Students will understand the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life. They will also be able to acquire knowledge about the fundamentals and applications of chemical and scientific theories.
2. Students will find that every branch of science and technology is related to Chemistry. They will develop scientific outlook not only with respect to science subjects but also in all aspects related to life.
3. Students will become familiar with the different branches of chemistry like analytical, organic, inorganic, physical, environmental, polymer and biochemistry. They will also learn to apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.
4. The student will acquire knowledge of Chemical Thermodynamics, Kinetics, Electrochemistry, Atomic Structure, Organic Chemistry, Spectroscopy and Skill in Industrial Chemistry.
5. Viewing chemistry as a tool the developing mind and critical attitude and the faculty of logical reasoning that is prepared to serve in diverse fields.
6. Students will gain a thorough Knowledge in the subject to be able to work in projects at different research as well as academic institutions.

## **M.Sc. (Computer Science)**

### **Programme Outcomes**

After successfully completing M. Sc. (Computer Science) Programme students will be able to:

PO1: Use creativity, critical thinking, and analysis and research skills to solve theoretical and real-world problems in computer science

PO2: Work effectively both individually and as member of team to design and implement solution to computational problems.

PO3: Discuss various algorithms and analysis of algorithms with its complexity

PO4: Illustrate the concepts of networking, computation, and security.

PO5: Gain the knowledge about programming languages like PROLOG, LISP, Dot Net.

PO6: Communicate effectively for different purposes and in different situations.

PO7: Gain self-discipline in everyday aspects of life and work.

PO8: Make use of Application fundamentals, including information management and intelligent applications.

PO9: Apply current technical concepts and practices in the core information Technologies

PO10: Apply the knowledge about software engineering fundamentals, including software analysis and design, evaluation and testing, and software engineering processes.

### **Program Specific Outcomes**

PSO1: Students get knowledge and training of technical subjects so that they will be technical professional by learning C/C++, JAVA, C#.net, Visual Basic programming, Database Management, Data Structure, Software Engineering, Computer Architecture, Theoretical Computer Science, Web Technology using HTML.

PSO2: Students understand the concepts of software application and projects.

PSO3: Students understand the computer subjects with demonstration of all programming and theoretical concepts with the use of ICT.

PSO4: Development of in-house applications in terms of projects

PSO5: Students will build up programming, analytical and logical thinking abilities.

PSO6: Aware them to publish their work in reputed journals

PSO7: To make them employable according to current demand of IT Industry and responsible citizen.

### **MSC COMPUTER SCIENCE Course Outcomes**

**Paper name: DISCRETE MATHEMATICS**

**Code: MCS101**

Course Outcomes:

- Verify the validity of an argument using propositional and predicate logic.
- Understand allocations of set theory by applying operations on set.
- Apply operations of relations and functions in discrete structures.
- Understand applications of Lattices and Boolean algebra in computer science domain.
- Identify Group, Ring and Field in Group Theory

- Understand applications of Graph Theory and Tree
- Apply the concepts of graph theory and trees to formulate problem solving

**Paper name: Computer Fundamentals and Programming in C**

**Code: MCS102**

Course Outcomes:

- Understand computer basics and role of operating system.
- Learn about concept of computer network, Internet and social impacts of IT.
- Gain understanding of PC Software Tools – Word, Excel and Power-Point.
- Design an algorithm and draw flowchart for simple problems.
- Develop C programs implementing all features of C.

**Paper name: Data Base Management Systems**

**Code: MCS103**

Course Outcomes:

- The key goal is to prepare students for a professional career in the field of data administration and database design.
- To get acquainted students with good knowledge of DBMS. During the course, students will learn about database design and database handling activities.
- For a given query write relational algebra expressions for that query and optimize the developed expressions
- For a given specification of the requirement design the databases using ER method and normalization
- For a given specification create the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2.
- For a given evaluation of transaction processing system, determine the transaction atomicity, consistency, isolation, and durability
- Through polyglot persistence They will understand how different database technologies can work together
- Students will be able to select database according to their needs

**Paper name: COMPUTER ORGANIZATION & ARCHITECTURE**

**Code: MCS104**

Course Outcomes:

- Identify, understand and apply different number systems and codes.
- Understand the digital representation of data in a computer system.
- Understand the general concepts in digital logic design and their use in sequential and combinational circuit design.

- Describe fundamental organization of a computer system.
- Explain addressing modes, instruction formats and program control statements.
- Understand computer arithmetic formulae and solve problems.
- Distinguish the organization of various parts of a system memory hierarchy.
- Identify and compare different methods for computer I/O

**Paper name: Seminar**

**Code: MCS105**

Course Outcomes:

- To analyze a current topic of professional interest and present it before the audience.
- To familiar with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.
- Acquired the basic skills to for performing literature survey and paper presentation
- To improve skills to read, understand, and interpret material on technology.
- To improve communication and writing skills.
- Prepare the report.

**Paper name: SELF-STUDY PAPER**

**Code: MCS106**

Course Outcomes:

- To create habits of reading books and to develop writing skills.
- Develop skills of creativity and originality.
- Select a topic of their own interest with consultation with their teachers/In charge/mentors.
- Encourage students to go beyond what is available to them in their text book and what is taught to them by their instructors.
- Inspires curiosity and motivates further discovery.

**Paper name: Practical-I (Based on MCS102 & MCS103)**

**Code: MCS107**

Course Outcomes:

- Students will get to know how to apply DML/DDDL commands on database.
- To apply knowledge of Programming in PL/SQL including stored function, cursor, trigger, designing the normalized database.
- Understanding the practical knowledge of exception handling.
- Understanding the fundamental tags used in HTML.
- Develop the web page in various applications and web page using various ordered and unordered listing commands.
- Understanding the simple programs using basic control statement, GUI based program using Basic ActiveX Control.
- Knowledge about different advanced ActiveX control with example application programs.
- Knowledge about various types of data base handling with MS-Access and Oracle
- Describe the concepts of data report for an organization.
- Able to devise pseudo code and flowchart for computational problems.
- Understand how to write, debug and execute simple programs in C.

**Paper name: Data Structures and Algorithms**

**Code: MCS201**

Course Outcomes:

- Knowledge of basic data structures and algorithms.
- Understand concepts of searching and sorting techniques
- Understand concepts of stacks, queues, lists, trees and graphs.
- Able to write algorithms for solving problems with the help of fundamental datastructures

**Paper name: Object Oriented Programming Using C++**

**Code: MCS202**

- Understanding of Object-oriented programming and advanced C++ concepts.
- Use C++ Concepts for solving real life problems.
- Develop problem solving skills using object-oriented techniques.

**Paper name: Software Engineering**

**Code: MCS203**

Course Outcomes:

- Able to apply the concepts of software engineering which is essentially important while working on big modules and or projects.
- Understand the concept of system and able to analyse its feasibility study.
- Understand software process framework, requirement modelling approaches, software design, software quality.
- Able to apply software metrics and software testing.

**Paper name: COMPUTER NETWORKS**

**Code: MCS204**

Course Outcomes:

- Understand the basics concepts of computer network organization and implementation.
- Describe theoretical understanding of layered network models - OSI and TCP/IP Models.
- Illustrate the functionalities of different network layers.
- Analyze the network application such as data transmission between client and server, file transfer, real-time and multimedia transmission.
- Explain the security aspects in networks and principles of cryptography.

**Paper name: Practical-II (Based on MCS201 & 4 MCS202)**

**Code: MCS207**

Course Outcomes:

- Programs using Object oriented programming paradigm – Encapsulation (Classes and objects), Polymorphism and Inheritance.
- Apply various features like constructors and destructors, overloading- function and operators.
- Able to acquire in depth knowledge and develop software in C/C++
- Utilize different types of inheritance to suit different applications.
- Write efficient programs consuming less memory.
- Compile and Execute programs using required data structures.
- Implement the algorithms using C/C++.
- Debug programs

**Paper name: COMPUTER GRAPHICS**

**Code: MCS301**

Course Outcomes:

- Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
- Extract scene with different clipping methods and its transformation to graphics display device. CO3: Explore projections and visible surface detection techniques for display.
- Explore object representations and surface detection methods.
- Understand techniques and OpenGL programming concepts

**Paper name: Management Information System**

**Code: MCS302**

Course Outcomes:

- Understand the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making.
- Analyze and synthesize business information and systems to facilitate evaluation of strategic alternatives.
- Effectively communicate strategic alternatives to facilitate decision making.
- Evaluate the role of information systems in today's competitive business environment
- Assess the relationship between the digital firm, electronic commerce, electronic business and internet technology.

**Paper name: Operating System and UNIX**

**COURSE Code: MCS303**

Course Outcomes:

- Understand the basic components of a computer operating system.
- Compare and interpret the applications of Process and threads.
- Describe the policies for scheduling, deadlocks, synchronization, system calls, and file systems. CO4: Illustrate the functioning of process management, memory management and file management Modules present in an OS.
- Differentiate various types of scheduling algorithms.
- Understand the concepts of Three-Tier Client/Server Architecture, Middleware and the characteristics of mobile operating systems.

**Paper name: Visual Programming**

**Code: MCS04**

Course Outcomes:



- Basic Concepts of Program building block control statements and the basic concepts of function and procedure.
- Knowledge of the functionality and properties of GUI based ActiveX Control with example programs.
- About graphics handling related control and properties.
- About the fundamental functions and properties of Advanced ActiveX Control.

**Paper name: Practical-II (Based on MCS303, MCS304, MCS301C )**

**Code: MCS307**

Course Outcomes:

- Discuss the knowledge of programming terminology and how it is applied using Visual Basic.
- Demonstrate an Event Planning Chart based on problem description so as to define the processing that is to occur based on specific.
- Implement UNIX/Linux Commands.
- Demonstrate the use of various system calls.
- Apply various graphics drawing algorithms and 2D -3D transformations using C
- Apply optimization techniques for intermediate code and generate machine code for high level language program.

**Paper name: Java Programming**

**Code: MCS401**

Course Outcomes:

- Learn Java programming language which can be utilized to develop windows and internet-based software solutions.
- Able to understand and apply the knowledge of object-oriented principles, applets, graphical user-interface for scientific and business-oriented applications.

**Paper name: DATA WAREHOUSE AND DATA MINING**

**Code: MCS402**

Course Outcomes:

- Understand the basic concepts of Data mining and warehousing.
- Identify the different techniques of data preprocessing.

- Analyze patterns that can be discovered by classification and clustering.
- Understand data mining techniques of clustering.
- Identify complex data types based on spatial and web mining

**Paper name: Internet & Web Designing**  
**Code: MCS403**

Course Outcomes:

- Knowledge about the concepts of markup languages, unordered list, table, formatting, linking and frames.
- Understanding about the creation of cascading style sheets, backgrounds, media types and building a dropdown menu.
- To explain the JavaScript, control structure, if structure, switch, do-while and logical operators.
- To describe the javascript functions, javascript arrays and javascript objects.

**Paper name: Practical-II (Based on MCS401, MCS403A)**

**Code: MCS406**

Course Outcomes:

- Skill of writing core Java application using OOP concept.
- Skill of writing applet for internet applications.
- Skill of writing GUI based windows applications
- Understanding the fundamental tags used in HTML.
- Develop the web page in various applications and web page using various ordered and unordered listing commands.
- Understanding the simple programs using basic control statement, GUI based program using Basic ActiveX Control.

**Paper name: PROJECT REPORT**

**Code: MCS407**

Course Outcomes:

- Demonstrate a depth of knowledge of modern technology. Practice to communicate effectively and to present ideas clearly and coherently to specific audiences in both the written and oral forms.
- Practice different phases of software/system development life cycle.
- To introduce the student to a professional environment and/or style typical of a global IT industry,
- Understand the project requirements, reflect on their learning and take appropriate actions to implement it.

- Estimate, plan, calculate, and adjust project variables.
- Understand the importance of iteration, evaluation and prototyping in design of a software system.

## Program Name-&,e0,0 fgUnh

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## **Post Graduate Diploma in Computer Applications**

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### **(PGDCA)**

#### **Program Outcomes (POs)**

**After the completion of the program the learner will be able to**

1. Students are eligible to pursue MCA (Lateral Entry) and apply for jobs in various multinational companies, industries, banks.
2. They can start their own business in web development and software development.
3. Students are able to use their knowledge to develop different web and windows based applications.
4. Students can create database, websites and applications for their clients.
5. Students can also pursue the career of computer operators.
6. Students can also become network administrators.

#### **Program Specific Outcomes (POs)**

1. Students become eligible to pursue MCA and M.Sc. in Information Technology.
2. They can also join MBA.

## **Post Graduate Diploma in Computer Applications (PGDCA)**

### **Course Outcomes (COs)**

#### **Semester - I**

<b>Paper No</b>	<b>Nomenclature of Paper</b>
PGDCA101	Introduction to Information Technology
PGDCA102	Computer Programming Using C
PGDCA103	Operating Systems
PGDCA104	Database Management Systems
PGDCA105	Web Technologies
PGDCA106	Software Laboratory –I Programming using C
PGDCA107	Software Laboratory –II HTML and MS-Office
PGDCA108	Seminar

## Semester –II

Paper No	Nomenclature of Paper
PGDCA201	Data Structure and Algorithms
PGDCA202	Computer Networks
PGDCA203	Object Oriented Systems and C++
PGDCA204	Computer Organization
PGDCA205	Software Engineering
PGDCA206	Software Laboratory –III Data structure implemented in C/C++
PGDCA207	Software Laboratory –IV Programming in C++
PGDCA208	Seminar

## Course Outcomes (COs)

### PGDCA-101 Fundamentals of Information Technology & Software Lab – I (Office Automation and Productivity Tools)

Upon the completion of the course the learner will be able to

**PO-1:** Familiarization with the types of computer, peripheral devices, memory management, multimedia and number system.

**PO-2:** Learn about working of various input and output devices.

**PO-3:** Learnt about binary number representation along with its operations.

**PO-4:** Understand theoretical framework of internet and associated application of the internet.

**PO-5:** Acquire the knowledge about the binary number representation along with its operations.

**PO-6:** Understand of the role of computers in business, education and society.

## **PGDCA-102 & 106 Problem Solving using C & Software Lab – II (Programming Fundamentals through C Language)**

**Upon the completion of the course the learner will be able**

**to** CO-1: Understand of various concepts of programming language. CO-2: Develop logics and analytical ability solve problem.

CO-3: Learn about procedural programming using

functions.CO-4: Acquired various flow control statements.

CO-5: Learn about various storage classes along with user defined data types.CO-6: Acquire knowledge of file handling

CO-7: Work with arrays of complex structure data types.

CO-8: Understanding a concept of functional hierarchical code organization.

## **PGDCA-103 Operating Systems**

**After the completion of the course the learner will be able to**

**CO-1:** Understand various terminologies related to Operating system.

**CO-2:** Learn the basic structure and organization of the file system.

**CO-3:** Acquire knowledge about various process management and CPU scheduling.

**CO-4:** Understand various features and application of windows operating system.

**CO-5:** Learn about fundamentals of Linux operating system.

**CO-6:** Acquire knowledge about various Linux commands.

## **PGDCA-104 Database Management System**

**Upon the completion of the course the learner will be able to**

**CO-1:** Familiarization with various features and applications of Database Management system.

**CO-2:** Acquire knowledge about database languages (DDL, DML, DCL)

**CO-3:** Learn how to design a database by using different data models.

**CO-4:** Understand the database handling during execution of the transactions along



with concurrent access.

**CO-5:** Ability to perform various types of SQL queries.

**CO-6:** Able to design a good database using normalization, decomposition and functional dependency

### **PGDCA-105 & Software Lab – III (Web Designing, HTML )**

**After completion of this course, students will be able to:**

**CO-1:** Write and debug webpage using HTML and DHTML languages.

**CO-2:** Knowledge and Use of web publishing and phases related with the website development.

**CO-3:** Make use of knowledge related to links, addresses, images, and tables.

**CO-4:** Knowledge of various formatting options on HTML page and website.

**CO-5:** Knowledge of Server Side programming.

### **PGDCA-106 Seminar**

**After completion of this course, students will be able to:**

**CO-1:** Students are required to prepare a presentation on any topic, not from syllabus, assigned by the teacher

**CO-2:** Every candidate will have to deliver a seminar of 15-20 minutes duration on the assigned topic.

**CO-3:** The seminar will be delivered in the presence of students and teachers of the department on any fixed week day of the semester.

**CO-4:** The evaluation (internal evaluation only) will be based on the presentation of the student, depth of subject matter of the topic and answer to questions.

### **PGDCA-201 & 206 : Data Structure and Algorithms and Software Laboratory –III**

**After completion of this course, students will be able to:**

**CO-1:** Have a comprehensive knowledge of the data structures and algorithms on which file structures and data bases are based.

- CO-2:** Understand the importance of data and be able to identify the data requirements for an application.
- CO-3:** Design linear data structures stacks, queues and linked lists
- CO-4:** Design nonlinear data structures like trees, searching and sorting, and implement their operations
- CO-5:** Understand various traversing techniques – Inorder , Preorder , Postorder

### **PGDCA-202 : Computer Network**

**After completion of this course, students will be able to:**

- CO-1:** Understand the functions of different layers of TCP/IP and OSI referencemodels.
- CO-2:** Classify of networks-LAN, MAN and WAN.
- CO-3:** Identify and understand various techniques and modes of transmission mediawith real time applications.
- CO-4:** Understand the fundamentals of Network security.

### **PGDCA-203 & 207 : Object Oriented System and C++ and Software Laboratory –IV**

**After completion of this course, students will be able to:**

- CO-1:** Understand the benefits of Object-Oriented Programming (OOP) as compare to Traditional Programming approach and resolve problem in domain of object- oriented programming.
- CO-2:** Familiarization with a widely range of features of object-oriented programming using C++
- CO-3:** Understand Object oriented approach for finding solutions to various problems with the help of C++ language.
- CO-4:** Understand the concept of polymorphism with the help function overloadingand virtual functions.
- CO-5:** Acquire various types of various types and forms of inheritance.
- CO-6:** Understand basic of generic functions and classes.

## **PGDCA-204 : Computer Organization**

**After completion of this course, students will be able to:**

**CO-1:** the basic understanding of addressing modes

**CO-2:** computer organization and design

**CO-3:** multiprocessors and memory organizations

**CO-4:** understand the overall basic computer hardware structure, including the peripheral devices.

## **PGDCA-205 : Software Engineering**

**After completion of this course, students will be able to:**

**CO-1:** Understand Software Engineering Fundamentals

**CO-2:** Understand Software Process Models

**CO-3:** Explain Software Project Management

**CO-4:** Explain Software Project Estimation and Risk Management

**CO-5:** Explain Software Design

**CO-6:** Explain Structured Analysis Design Tools

**CO-7:** Understand Software Testing

**CO-8:** Understand Software Quality and Maintenance

## **PGDCA-108 Seminar**

**After completion of this course, students will be able to:**

**CO-1:** Students are required to prepare a presentation on any topic, not from syllabus, assigned by the teacher

**CO-2:** Every candidate will have to deliver a seminar of 15-20 minutes duration on the assigned topic.

**CO-3:** The seminar will be delivered in the presence of students and teachers of the department on any fixed week day of the semester.

**CO-4:** The evaluation (internal evaluation only) will be based on the presentation of the student, depth of subject matter of the topic and answer to questions.



