DEPARTMENT OF ECONOMICS
SARBATI DEVI WOMEN'S COLLEGE,RAJGANGPUR
PO,CO,PSO- NEP-2020

SEMESTER I

Core I **Basic Economics I**

Course Description

This course is designed to expose the students to the basic principles of how the economy works at the microeconomic level with some basic concepts like markets, and consumer choice in macroeconomics. The emphasis will be on thinking like an economist and the course will illustrate how microeconomic concepts can be applied to analyse real-life situations. This course also discusses the preliminary macroeconomic concepts associated with the determination and measurement of aggregate macroeconomic variables like savings, investment, and GDP.

Course Outcomes (COs)

- To expose the students to the introductory micro and macro-economic concepts.
- To explain how to think like an economist and illustrate how microeconomic concepts can be applied to analyses of real-life situations.
- To introduce preliminary macroeconomic concepts associated with the determination and measurement of aggregate macroeconomic variables like savings, investment, and GDP.
- To examine the circular flow of income and expenditure in a 2, 3, and 4-sector economy.

Unit I: Exploring the Subject Matter of Economics, Markets and Welfare

The Ten Principles of Economics: How people make decisions; Working of the economy as a whole; Thinking Like an Economist: The Economist as Scientist – The scientific method: Observation, Theory and more observation; Role of Assumptions; Economic Models; Why economists disagree; Graphs in Economics; The Market Forces; Markets and Competition; The Demand and Supply curves – Market vs Individual curves, Shifts in Demand and Supply Curves; Market Equilibrium and changes therein; Price Elasticity of Demand – determinants and computation; Income and Cross Elasticity of Demand; The Price Elasticity of Supply – determinants and computation; Consumer and Producer Surplus.

LO: Upon completion of this module, students will get a basic idea about the basic underlying principles followed in economics and get a formative perspective to concepts of elasticity of demand and supply.

Unit II: Theory of Consumer Choice

The Budget Constraint; Preferences – representing preferences with indifference curves; Properties of Indifference Curves; Two extreme examples of indifference curves;

Optimization – Equilibrium; Change in equilibrium due to changes in income, changes in price; Income and Substitution Effect; Derivation of Demand Curve; Three applications – Demand for Giffen goods, Wages and Labour Supply, Interest rate and Household saving.

LO: Upon completion of this module, the students can understand the problem of choice and decision-making by consumers and have a vivid understanding of optimization and equilibrium.

Unit III: Basic Concepts in Macroeconomics

Macro vs. Micro Economics; Limitations of Macroeconomics; Stock and Flow variables, Equilibrium and Disequilibrium, Partial, and General Equilibrium Statics – Comparative Statics and Dynamics; National Income Concepts – GDP, GNP, NDP, and NNP at market price, factor cost, real and nominal; Disposable Personal Income.

LO: Upon completion of this module, the students will be introduced to concepts of macroeconomic variables and the basic concept of National Income Accounting.

Unit IV: Measurement of Macroeconomic Variables

Output, Income and Expenditure Approaches; Difficulties of Estimating National Income; National Income Identities in a simple 2-sector economy and with government and foreign trade sectors; Circular Flows of Income in 2, 3 and 4-sector economies; National Income and Economic Welfare; Green Accounting.

LO: Upon completion of this module, the students will be familiarized with the estimation of National Income and understand the circular flow of income and expenditures in a closed and open economy.

2. Indian Economy I

Core 1

Course Description

Using appropriate analytical frameworks, this course reviews major trends in economic indicators and policy debates in India in the post-independence period, with particular emphasis on paradigm shifts and turning points. Given the rapid changes taking place in India, the reading list should be updated annually.

Course Outcomes

- *To have a clear idea about the principles that govern the economy's running at the micro and macro levels.*
- *To understand about the working of the input market.*
- *To gain clarity about dynamic concepts of Inflation, Employment, money, and income.*

- *To understand of the theories of determination of income and employment in the aggregate economy.*

Unit I: The Firm and Market Structures

Cost concepts; Production and Costs; The various measures of cost – Fixed and Variable cost, Average and Marginal cost; Cost curves and their shapes; Costs in the short run and the long run; Economies and diseconomies of scale. Firms in Competitive Markets – What is a competitive market; Profit maximization and the competitive firm‘s supply curve; The marginal cost curve and the firm‘s supply decision; Firm‘s short-run decision to shut down; Firm‘s long-run decision to exit or enter a market; The supply curve in a competitive market – short run and long run

LO: Upon completion of this module, the students will have a clear understanding of the traditional theory of cost and different cost concepts, and be able to distinguish between short-run and long-run costs, and relate them to a firm's decision-making under competitive markets.

Unit II: The Input Markets

The Demand for Labour – The production function and the marginal product of labour; Value of the marginal product of labour and demand for labour; Shifts in labour demand curve; The supply of labour – the trade-off between work and leisure; Shifts in the labour supply curve; Equilibrium in the Labour Market; Other factors of production: Land and Capital; Linkages among factors of production

LO: Upon completion of this module, the students will get an insight into the analysis of demand and supply of inputs and the linkages among the factors of production.

Unit III: Money and Changes in its Value

Evolution and Functions of Money, Quantity Theory of Money – Cash Transactions, Cash Balances and Keynesian Approaches, Value of Money and Index Number of Prices

Inflation – Meaning, Causes, and Anti-Inflationary Measures; Classical, Keynesian, Monetarist and Modern Theories of Inflation, Inflationary Gap, Deflation- Meaning, Causes, and Anti- Deflationary Measurers, Depression and Stagflation; Inflation vs. Deflation

LO: Upon completion of this module, the students shall understand the evolution of money and the classical theories of money supply and be able to explain the causes of inflation and deflation in an economy and the impact and solution thereto.

Unit IV: Determination of National Income

The Classical Approach - Say‘s Law, Theory of Determination of Income and Employment with and without saving and Investment; Basics of Aggregate Demand and Aggregate Supply and Consumption- Saving – Investment Functions, The Keynesian Approach – Basics of Aggregate Demand and Aggregate Supply and Consumption, Saving,

Investment Functions; The Principle of Effective Demand; Income Determination in a Simple 2-Sector Model; Changes in Aggregate Demand and Income- The Simple Investment Multiplier

***LO: Upon completion of this module, the students shall get to know the classical and Keynesian theories of income and employment determination*.**

SEMESTER II

Core I **3. Basic Economics II**

Course Description

This course is designed to expose the students to the basic principles of how the economy works at the microeconomic level with some basic concepts like production, firms and input markets. This course also aims to introduce the students to the basic macroeconomic concepts of money, inflation, and the theories of determination of income and employment in the aggregate economy.

Course Outcomes

- *To have a clear idea about the principles that govern the economy's running at the micro and macro levels*.
- *To understand about the working of the input market*.
- *To gain clarity about dynamic concepts of Inflation, Employment, money, and income*.
- *To understand of the theories of determination of income and employment in the aggregate economy*.

Unit I: The Firm and Market Structures

Cost concepts; Production and Costs; The various measures of cost – Fixed and Variable cost, Average and Marginal cost; Cost curves and their shapes; Costs in the short run and the long run; Economies and diseconomies of scale. Firms in Competitive Markets – What is a competitive market; Profit maximization and the competitive firm‘s supply curve; The marginal cost curve and the firm‘s supply decision; Firm‘s short-run decision to shut down; Firm‘s long-run decision to exit or enter a market; The supply curve in a competitive market – short run and long run

***LO: Upon completion of this module, the students will have a clear understanding of the traditional theory of cost and different cost concepts, and be able to distinguish between short-run and long-run costs, and relate them to a firm's decision-making under competitive markets*.**

Unit II: The Input Markets

The Demand for Labour – The production function and the marginal product of labour; Value of the marginal product of labour and demand for labour; Shifts in labour demand curve; The supply of labour – the trade-off between work and leisure; Shifts in the labour supply curve; Equilibrium in the Labour Market; Other factors of production: Land and Capital; Linkages among factors of production

LO: Upon completion of this module, the students will get an insight into the analysis of demand and supply of inputs and the linkages among the factors of production.

Unit III: Money and Changes in its Value

Evolution and Functions of Money, Quantity Theory of Money – Cash Transactions, Cash Balances and Keynesian Approaches, Value of Money and Index Number of Prices

Inflation – Meaning, Causes, and Anti-Inflationary Measures; Classical, Keynesian, Monetarist and Modern Theories of Inflation, Inflationary Gap, Deflation- Meaning, Causes, and Anti- Deflationary Measurers, Depression and Stagflation; Inflation vs. Deflation

LO: Upon completion of this module, the students shall understand the evolution of money and the classical theories of money supply and be able to explain the causes of inflation and deflation in an economy and the impact and solution thereto.

Unit IV: Determination of National Income

The Classical Approach - Say's Law, Theory of Determination of Income and Employment with and without saving and Investment; Basics of Aggregate Demand and Aggregate Supply and Consumption- Saving – Investment Functions, The Keynesian Approach – Basics of Aggregate Demand and Aggregate Supply and Consumption, Saving, Investment Functions; The Principle of Effective Demand; Income Determination in a Simple 2-Sector Model; Changes in Aggregate Demand and Income- The Simple Investment Multiplier

LO: Upon completion of this module, the students shall get to know the classical and Keynesian theories of income and employment determination.

Core I **4. Indian Economy II**

Course Description

This course examines sector-specific policies and their impact in shaping trends in key economic indicators in India. It highlights major policy debates and evaluates the Indian empirical evidence. Given the rapid changes taking place in the country, the reading list should be updated annually.

Course Outcomes

- To analyze the current state of Indian agriculture, including production trends, factors influencing production, and policy initiatives like land reforms and the green revolution.
- To evaluate the development of Indian industries, including historical industrial policies, challenges faced by small-scale industries, and the role of labor.
- To assess the contribution of the tertiary sector to the Indian economy, and understand the concept of Human Resource Development (HRD) and its role in India's development.
- To explain India's foreign trade scenario, including trade composition, export promotion strategies, and the role of foreign capital.
- To analyze the environmental policies implemented in India and the global response to climate change, considering India's specific situation.

Unit I: Agricultural Development in India

Indian Agriculture: nature, importance, trends in agricultural production and productivity, factors determining production, land reforms, new agricultural strategies and green revolution, rural credit; Agricultural marketing and warehousing.

LO: Students will be able to analyze the structure, challenges, and advancements in Indian agriculture, including policies, credit, and marketing.

Unit II: Industrial Development in India

Trends in industrial output and productivity; Industrial Policies of 1948, 1956, 1977, and 1991; Industrial Licensing Policies – MRTP Act, FERA, and FEMA; Growth and problems of SSIs, Industrial sickness; Industrial finance; Industrial labor.

LO: Students will know about industrial output and productivity trends, industrial policies, the impact of licensing policies, small-scale industries' growth, industrial finance, and labor issues in India.

Unit III: Tertiary Sector, HRD, and the External Sector

Tertiary Sector: growth and contribution of the service sector to GDP of India, share of services in employment; Human development – concept, evolution, measurement; HRD: indication, importance, education in India, Indian educational policy; Health and Nutrition. Foreign Trade: role, composition, and direction of India‘s foreign trade, trends of export and import in India, export promotion versus import substitution; Balance of Payments of India; India‘s Trade Policies; Foreign Capital – FDI, Aid and MNCs.

LO: Students will have an understanding of the growth of India's service sector, human development strategies (education & health), and international trade dynamics (exports, imports, foreign investment)

Unit IV: Indian Economy and Environment

Environmental Policies in India: The Environment (Protection) Act 1986, The Environment (Protection) Rules 1986, The National Forest Policy 1988, Policy statement for Abatement of Pollution 1992, National Conservation Strategy and Policy Statement on Environment and Development 1992, The National Environment Appellate Authority Act 1997, National Environmental Policy 2006; Global deal with Climate Change: Introduction, Intergovernmental Panel for Climate Change (IPCC), Impact of Climate Change on India, Global Response on Climate Change, Possible Role of India.

LO: Students will be able to analyze key environmental policies in India, the global deal on climate change, IPCC's role, climate change impacts, and global responses to India's role.

SEMESTER III

Core I **5. Microeconomics I**

Course Description

The course is designed to provide sound training in microeconomic theory to formally analyze the behavior of individual agents. Since students are already familiar with the quantitative techniques in the previous semesters, mathematical tools are used to facilitate understanding of the basic concepts; this course looks at the behavior of the consumer and the producer and also covers the behavior of a competitive firm.

Course Outcomes:

- To develop an understanding of preferences and consumer choice and formally analyze the behavior of individual agents
- To be able to use mathematical tools to facilitate understanding of the basic concepts of Economics.
- To understand the behavior of the consumer and the producer.
- To understand the behavior of a competitive firm.

Unit I: Consumer Theory I

Preferences and Utility, Axioms of Rational Choice, Utility, Trades and Substitutions, Indifference curves; Mathematics of Indifference curves, Utility functions for specific preferences, the many good cases; Utility Maximization and choice: the 2-good case (graphical analysis), the n-good case, Indirect utility function, the Lump sum principle, Expenditure minimization, properties of the expenditure function

LO: This module will enable the students to understand the basic concepts in consumer behavior like utility, choice, optimization, and Indifference curves using mathematical tools; and differentiate between direct and indirect utility, and explain expenditure function and its properties.

Unit II: Consumer Theory II

The Income and Substitution Effects: Demand function, changes in income, changes in goods price- Direct and Indirect Approaches (Slutsky), the Individual‘s Demand Curve, Compensated (Hicksian) demand curves and functions, demand elasticity, Consumer Surplus, Demand relationships among goods, the 2-good case, substitutes and complements, Net (Hicksian) substitutes, and Complements, Substitutability with many goods

LO: This module will enable the students to analyze the effects of changes in income and prices on demand; differentiate between Ordinary and compensated demand; explain the concepts of price and income elasticities, and substitutability between goods; and understand the concept of Consumer Surplus

Unit III: Production Theory and Costs

Production Functions: Marginal productivity, Production with One Variable Input (labour) and with Two-Variable Inputs, Isoquant Maps and the Rate of Technical Substitution, Returns to Scale, Elasticity of Substitution, Some Simple Production Functions: Linear, Fixed Proportions; Technical Progress. Definition of Cost and its properties, Cost minimizing input choices (Optimization principles, Expansion Path), Cost Functions and Shift in Cost Curves, Long-Run versus Short-Run Cost Curves

***LO: This module will enable the students to understand concepts like production function in the short run and the long run, isoquants, and substitution between inputs; and explain concepts of cost, and optimization in the short run and long run*.**

Unit IV: Profit Maximization

The Nature and Behaviour of Firms, Marginal Revenue – Relationship between Average and marginal revenue, Short-Run Supply by a Price-Taking Firm, Profit Functions and its Properties, Profit maximization – General conditions, Input demands

LO: This module will enable the students to understand the behavior of the competitive firm and concepts like average and marginal revenue; and learn the conditions for profit maximization, properties of profit function

Core I **6. Macroeconomics I**

Course Description

This course introduces the students to formal modelling of a macro-economy in terms of analytical tools. It discusses various alternative theories of output and employment determination in a closed economy in the short run as well as long run, and the role of policies in this context.

Course Outcomes:

- To understand the basics of consumption function and its relation with income, and factors influencing consumption function.
- To get a knowledge about various types of investment spending and evaluate the impact of investment through multiplier and accelerator in economies.
- Discuss the various approaches to demand and supply of money.
- Analyse and interpret the IS-LM model as a step toward understanding economic fluctuations.

Unit I: Consumption

Consumption – Income Relationship, Propensities to Consume and the Fundamental Psychological Law of Consumption; Implications of Keynesian Consumption Function; Factors Influencing Consumption Function; Measures to Raise Consumption Function; Absolute, Relative, Permanent, and Life-cycle hypothesis

LO: This module shall enable the students to find out how consumption is affected by income and other factors.

Unit II: Investment

Autonomous and Induced Investment, Residential and Inventory Investment, Determinants of Business Fixed Investment, Decision to Invest and MEC, Accelerator and MEI, Theories of Investment: The Accelerator and Tobin‘s theory

LO: Students will gain an understanding of different forms of investment spending and theories of investment

Unit III: Demand for and Supply of Money

Demand for Money – Classical, Neoclassical, and Keynesian Approaches, The Keynesian Liquidity Trap and its Implications, Supply of Money – Classical and Keynesian Approaches, The Theory of Money Supply Determination and Money Multiplier, Measures of Money Supply in India, RBI approach to money supply, Determination and Money multiplier. High-powered money and money multiplier

LO: Students will be able to understand the workings of money in an economy.

Unit IV: Aggregate Demand and Aggregate Supply

Derivation of Aggregate Demand and Aggregate Supply Curves in the IS-LM Framework; Nature and Shape of IS and LM curves; Interaction of IS and LM curves and Determination of Employment, Output, Prices and Investment; Changes in IS and LM curves and their Implications for Equilibrium

LO: This module shall help to gain knowledge about the way the goods market and money market serve as a basis for the determination of employment, output, price, and investment.

Core I **7. Mathematical Methods for Economics I**

Course Description

This is the first of a compulsory two-course sequence. The objective of this sequence is to transmit the body of basic mathematics that enables the study of economic theory at the undergraduate level, specifically the courses on microeconomic theory, macroeconomic theory, statistics and econometrics set out in this syllabus. In this course, particular economic models are not the ends,but the means for illustrating the method of applying mathematical techniques to economic theoryin general. The level of sophistication at which the material is to be taught is indicated by the contents of the prescribed textbook.

Course Outcomes:

- To use mathematical techniques in analyzing economic problems
- To get a fair idea about the number system, set theory, and different types of functions.
- Evaluate and use the concept of derivative of functions involving single variables to link the total and marginal concepts in Economics.
- Understand major concepts of Linear Algebra

Unit I: **Preliminaries and Functions of One Real Variable**

Sets and set operations; Cartesian product; relations; functions and their properties; Number systems. Types of Functions: constant, polynomial, rational, exponential, logarithmic; Graphs and graphs offunctions; Limit and Continuity of functions; Limit theorems.

LO: This module will enable the students to know the theory of sets, ordered pairs, and Cartesian products; and learn the concepts of relation and function and limit and continuity of functions.

Unit II: Derivative of a Function

Rate of change and derivative; Derivative and slope of a curve; Continuity and differentiability of a function; Rules of differentiation for a function of one variable; Application- Relationship between total, average and marginal functions.

LO: This module will enable the students to know the concept of the derivative and the rules for derivatives; and about the economic applications of differentiation in establishing the relationship between total, marginal, and average functions in Economics.

Unit III: Functions of two or more Independent Variables

Partial differentiation techniques; Geometric interpretation of partial derivatives; Partial derivatives in Economics; Elasticity of a function – demand and cost elasticity, cross and partial elasticity.

LO: This module will enable the students to find out partial derivatives of multivariate functions; and calculate elasticities of multivariate functions.

Unit- IV: Matrices and Determinants

Matrices: concept, types, matrix algebra, transpose, inverse, rank; Determinants: concept, properties, solving problems using properties of determinants, solution to a system of equations - Crammer's rule and matrix inversion method.

LO: This module will enable the students to understand different types of matrices and determinants; and learn about the matrix operations and solve systems of linear equations using matrices.

Semester IV

Core I **8.Microeconomics II**

Course Description

This course is a sequel to Microeconomics I. The emphasis will be on giving conceptual clarity to the student coupled with the use of mathematical tools and reasoning. It covers the Market, general equilibrium and welfare, imperfect markets, and topics under information economics.

Course Outcomes:

- To understand short-run and long-run supply decisions of a competitive firm & industry equilibrium
- To have a basic understanding of concepts of Pareto efficiency in consumption & production; general equilibrium, and welfare theorems
- To develop an understanding of imperfect markets such as Oligopoly
- To understand basic concepts of game theory.

Unit I: Firm Supply and Equilibrium

Supply decision of a competitive firm and Exceptions; Inverse Supply Function; Profits and Producer's Surplus; Long Run Supply Curve of a Firm; Long Run Average Costs; Short Run and Long Run Industry Supply; Industry Equilibrium in Short and Long Run; Meaning of Zero Profits; Economic Rent

LO: Upon completion of this module, students will understand the short-run and long-run supply decisions of a competitive firm and the concept of industry equilibrium; and gain an idea about long-run average costs, zero profit, and economic rent.

Unit II: General Equilibrium, Efficiency and Welfare

The Edgeworth Box; Trade; Pareto Efficient Allocations; Existence, Stability and Uniqueness of equilibrium; Walras Law; The Welfare Theorems and their implications; The Firm; Production and the Welfare Theorems; Production possibilities, comparative advantage and Pareto efficiency

LO: This module shall help to understand concepts like Pareto efficiency, and general equilibrium in consumption and learn welfare theorems, comparative advantage, production possibilities, and general equilibrium in production

Unit III: Market Imperfections: Monopoly and Monopolistic Competition

Barriers to Entry, Profit Maximization and Output Choice, Monopoly and resource Allocation, Price Discrimination, Degrees of Price Discrimination, Regulation of Monopoly, Dynamic Views of Monopoly. Monopolistic competition – product differentiation, Selling costs and excess capacity

LO: This module shall aid in understanding the nature of monopoly markets and the role of barriers to entry and explain price discrimination; and to explain features of monopolistic competition and the question of economic inefficiency in equilibrium

Unit IV: Oligopoly and Game Theory

Non-collusive oligopoly models: Cournot, Bertrand, Stackelberg, Sweezy, Chamberlin, Collusive oligopoly models: Cartels, Price leadership. The Payoff Matrix of a Game; Nash Equilibrium, Pure and Mixed Strategies, The Prisoner‘s Dilemma, Repeated Games, Tit-for tat strategy, Enforcing a cartel, Sequential Games, A Game of entry deterrence

LO: Upon completion of this module, students will be able to understand and explain the features of oligopoly and learn different models thereof; and the meaning and use of game theory in oligopoly; understand concepts like Nash equilibrium and different types of games, especially Prisoner’s dilemma.

Core I **9. Macroeconomics II**

Course Description

This paper deals with growth models and the classical school of thought, and its evolution into Keynesian economics. The students are introduced to long-run dynamics in growth and technical progress. This paper also familiarizes about the open economy and its dynamics.

Course Outcomes:

- To emphasize on conceptual understanding and some applications of important growth models.

- To enable critical appreciation of the classical school of thought and the evolution of Keynesian economics.
- To understand the theoretical underpinnings of economic policy in open economies, such as monetary and fiscal policy, the basic Mundell-Fleming model, and nominal and real exchange rate determination.
- To understand the trade-off between Unemployment and Inflation; get a critical understanding of Long-run and Short-run Phillips Curve, unemployment, and Expectations.

Unit I: Economic growth model:

Accumulation of capital in the basic Solow model; supply and demand for goods, growth in the capital stock and the steady state, Golden rule level of capital, comparing steady states, transition to the golden rule steady state with too much and too little capital, population growth technological progress – Solow version

LO: The module shall enable the students to get conceptual clarity and strengthen theoretical foundations of the Solow growth model

Unit II: Classical and Keynesian Macroeconomic thought

Classical macroeconomics, Employment and output determination: Say's law; the quantity theory of money, Keynes General theory: Keynes main propositions, Analysis of the labour market, Keynes critique of Says law and Quantity Theory of Money, the orthodox Keynesian school, underemployment equilibrium in the Keynesian model.

LO: This module shall help students in developing a clear, comprehensive understanding of how and in what ways the Classical and Keynesian schools of economic thought differ from each other.

Unit III: Open Economy and Macroeconomic policies

Balance of payments –concepts, meaning of equilibrium and disequilibrium in Balance of payments measures to correct disequilibrium. Determination of foreign exchange rate- the balance of payments theory, fixed versus flexible exchange rate; the short run open economy model: The basic Mundell-Fleming model: Macroeconomic policies – Fiscal policy - Crowding- out and Crowding-in; Monetary policy and instruments, the Transmission Mechanism, Effectiveness of macroeconomic policies in the open and closed economies.

LO: This module will enable students to get clarity on macroeconomic theories and models in the context of open economies, the interdependent nature of key macroeconomic variables, sectors, and markets, and the dynamics of responses to exogenous domestic and international economic shocks

Unit IV: Inflation, Unemployment and Expectations

Inflation – Unemployment trade-off and the Phillips curve – short run and long run analysis, Adaptive and Rational expectation hypothesis. The policy ineffectiveness debate. Phillips curve and orthodox Keynesian school. Solow and Tobin‘s modified Philips curve.

LO: Upon completion of this module, students shall be able to derive the Phillips Curve from the Aggregate Supply Curve, the short-run and long-run Phillips curve, and understand the role of adaptive expectations and rationale expectations.

Core 1 10. Statistical Methods for Economics

Course Description:

This is a course on statistical methods for economics. It begins with some basic concepts and terminology that are fundamental to statistical analysis and inference. It is followed by a study and measure of the relationship between variables, which are the core of economic analysis. This is followed by a basic discussion on index numbers and time series. The paper finally develops the notion of probability, followed by probability distributions of discrete and continuous random variables, and introduces the most frequently used theoretical distribution, the Normal distribution.

Course Outcomes:

- To summarize data effectively using measures of central tendency, dispersion, and graphical techniques.
- To analyze relationships between variables through correlation and regression analysis.
- To understand and interpret time series data by identifying trends and seasonality.
- To apply probability theory and sampling techniques to solve statistical problems and assess data validity.

Unit I: Data Collection and Measures of Central Tendency and Dispersion

Basic concepts: population and sample, parameter and statistics; Data Collection: primary and secondary data, methods of collection of primary data; Presentation of Data: frequency distribution; cumulative frequency; graphic and diagrammatic representation of data; Measures of Central Tendency: mean, median, mode, geometric mean, harmonic mean, their relative merits and demerits; Measures of Dispersion: absolute and relative - range, mean deviation, standard deviation, coefficient of variation, quartile deviation, their merits, and demerits; Measures of skewness and kurtosis.

LO: At the end of this module, students will be able to distinguish between population and sample, collect and organize data, and calculate measures of central tendency and dispersion to understand a data set's characteristics.

Unit II: Correlation and Regression Analysis

Correlation: scatter diagram, sample correlation coefficient - Karl Pearson‘s correlation coefficient and its properties, probable error of correlation coefficient, Spearman‘s rank correlation coefficient. Two variable linear regression analysis - estimation of regression lines (Least square method) and regression coefficients - their interpretation and properties, standard error of estimate.

LO: This module shall help students master the techniques to measure the strength and direction of relationships between variables (correlation) and use linear regression analysis to model and predict those relationships.

Unit III: Time Series and Index Number

Time Series: definition and components, measurement of the trend- freehand method, methods of semi-average, moving average and method of least squares (equations of first and second degree only), measurement of the seasonal component; Index Numbers: Concept, price relative, quantity relative and value relative; Laspeyer‘s and Fisher‘s index, family budget method, problems in construction and limitations of index numbers, test for ideal index number.

LO: Upon completion of this module, students will be able to analyze time series data for trends and seasonality, and construct and interpret index numbers to measure price and quantity changes.

Unit IV: Probability Theory and Sampling

Probability: Basic concepts, addition, and multiplication rules, conditional probability; Meaning of Sampling, Types of Sampling: Probability Sampling versus Non-Probability Sampling; Simple Random Sampling and its selection, Systematic Sampling, Multi-stage Sampling, Quota Sampling; Error: Sampling and Non-sampling.

LO: Upon completion of this module, students will be able to calculate probabilities, understand different sampling methods (probability vs. non-probability), and identify potential errors associated with sampling.

SEMESTER V

Core I **11. Development Economics I**

Course Description:

This is the first part of a two-part course on economic development. The course begins with a discussion of alternative conceptions of development and their justification. It then proceeds to aggregate models of growth and cross-national comparisons of the growth experience that can help evaluate these models. The axiomatic basis for inequality measurement is used to develop measures of inequality and connections between growth and inequality are explored. The course ends by linking political institutions to growth and inequality by discussing the role of the state in economic development and the informational and incentive problems that affect state governance.

Course Outcomes:

- The course will enhance the understanding of concepts of development and the need for it.
- It helps students learn about aggregate models of growth.
- It examines the axiomatic basis for inequality measurement and explores the connections between growth and inequality.
- It familiarizes the students with the socio-economic and political institutions while showing their contribution to economic development.

Unit I: Study of Economic Development

Conceptions of Development economic growth and economic development; Alternative measures of development, documenting the international variations in these measures, comparing development trajectories across nations and within them measures of economic development – national and per capita income, basic needs approach, capabilities approach, three core values of development, PQLI, HDI, HPI, MDPI, GDI; Happiness Index

LO: Upon completion of this module, students learn the alternative concepts associated with the development and the changes in the measurement of development over time.

Unit II: Theories of Economic Growth and Development

Classical theory, Marxian theory; Schumpeterian theory; Rostow's stages of economic growth; Harrod-Domar model, Solow model and convergence with population growth and technical progress.

LO: Upon completion of this module, students gain an elaborate knowledge about the growth theories put forth by different Schools of Economics.

Unit III: Poverty, Inequality, Agriculture, Industry and Development:

Measuring poverty: Head Count Ratio, Poverty Gap Ratio, Squared Poverty Ratio, FGT Ratio; Measuring Inequality – Lorenz curve and Kuznets' inverted U hypothesis; Growth, poverty and inequality; Policy options – some basic considerations

Agriculture, Industry and Economic Development: Interdependence between agriculture and industries – A model of complementarities between agriculture and industry; terms of trade between agriculture and industry; functioning of markets in agrarian societies; interlinked agrarian markets

LO: This module shall help the leraners to understand different measures of poverty and inequality in an economy and gain an insight into the role of agriculture and industry in economic development and the dynamic complementarity between the two sectors.

Unit IV: Institutions and Economic Development:

Role of institutions in economic development; Characteristics of good institutions and quality of institutions; The pre-requisites of a sound institutional structure; Different measures of institutions – aggregate governance index, property rights and risk of expropriation; The role of democracy in economic development; Role of markets and market failure; Institutional and cultural requirements for operation of effective private markets; Market facilitating conditions; Limitations of markets in LDCs; Corruption and economic development – tackling the problem of corruption

LO: Upon completion of this module, students get to know the importance and role of institutions in the process of economic development.

Core I 12. Mathematical Methods for Economics II

Course Description:

This course is the second part of a compulsory two-course sequence. This part is to be taught in Semester II following the first part in Semester I. The objective of this sequence is to transmit the body of basic mathematics that enables the study of economic theory at the undergraduate level, specifically the courses on microeconomic theory, macroeconomic theory, statistics and econometrics set out in this Syllabus. In this course, particular economic models are not the ends, but the means for illustrating the method of applying mathematical techniques to economic theoryin general. The level of sophistication at which the material is to be taught is indicated by the contents of the prescribed textbook.

Course Outcomes:

- To use mathematical techniques to analyze economic problems.
- To have an understanding of the input-output models.
- To be able to use second and higher-order derivatives and integration to analyze the nature of functions.
- To develop the ability to optimise objective functions subject to satisfaction of constraints.

Unit I: **Linear models:**

Input-Output Model: Basic concepts and structure of Leontief‘s open and static Input-Output model; Solution for equilibrium output in a three-industry model; The closed model.

LO: This module will enable the students to get an idea of the static input-output model in its closed and open versions, which are of great practical importance in Economics.

Unit II: Second and Higher Order Derivatives and Integration:

Technique of higher order differentiation; Interpretation of second derivative; Second order derivative and curvature of a function; Concavity and convexity of functions; Points of inflection, Derivative of Implicit Function; Higher Order Partial Derivative. Indefinite Integrals; Rules of Integration; Techniques of Integration: Substitution Rule, Integration by parts, and Partial Fractions; Definite Integral – Area Interpretation.

LO: This module will enable the students to know the concept of higher-order derivatives and integration, definite and indefinite; and the applications of higher-order derivatives and integration in Economics.

Unit III: Single and Multivariable Optimization:

Optimum values and extreme values; Relative maximum and minimum; Necessary versus sufficient conditions - First and Second derivative tests (using Hessian Determinants); Economic applications thereof, First and second order condition for extrema of multivariable functions; Convex functions and convex sets.

LO: This module will enable the student to learn the concept of optimization of single and multi-variable functions.

Unit IV: Optimization with Equality Constraints:

Effects of a constraint; Finding stationary value – Lagrange-Multiplier method (Two variable singleconstraint case only): First and second order condition; The Bordered Hessian determinant.

LO: This module will enable the student to understand the meaning and definition of constraint optimization, and the use of the Lagrange multiplier method and the Bordered Hessian determinant to optimize an objective function with respect to a constraint.

Core I **13. History of Economic Thought**

Course description

This course provides a perspective to our intellectual history, development of economic thought and helps relate this to the current thinking. It introduces the students to the philosophers and economists who developed economic reasoning and modeling of economic activities. It also helps create critical abilities and attitudes.

Course Outcomes:

- Understanding economic theories from Mercantilism to the Classical Economists of the eighteenth century and allowing the study of particular economic ideas and theories in considerable depth.
- To facilitate an understanding of economics effectively and comparing different theories of economists from the classical to Marxism.

- Exploring the contrasting theoretical approaches of different economists.
- Understanding the historical evolution of Indian economic thought and its comparison with Western economic thought.

Unit I: Introduction and Early Economic Thought

Mercantilism-main characteristics, Thomas Mur‘s views; Physiocracy- main features, Tableau Economique, taxation; Early Classicism: Adam Smith- Theory of Value, Division of labour, capital accumulation, distribution, views on trade and economic progress; David Ricardo-theory of value, theory of rent, distribution, ideas on international trade and development.

LO: This module summarizes the contributions of Adam Smith, David Ricardo, and Thomas to the field of economics.

Unit II: Classicism Vs Marxism

Thomas Malthus- population theory, glut theory; Karl Marx-dynamic of social change, theory of value, surplus value, theory of profit, crisis of capitalism, Johns Stuart Mill-ideas on value, distribution, views as a synthesizer.

LO: This module shall enable the students to get general insights into the two schools of thought, namely the Classical and Marxian.

Unit III: The Marginalists’ Revolution

Economic ideas of Jevons, Walras and Menger, Bohm-Bowerk, Wicksell ; Marshall – Role of time element in price determination, ideas on consumer surplus, Marshal as a synthesizer.

LO: This module will help the students in gaining knowledge and understanding of the development of ideas within the field of economics and get a deeper understanding of the Marginalists’ Revolution.

Unit IV: Indian Economic Thought

Main themes of Kautilya‘s Arthasashtra; Modern Economic Ideas: Dada Bhai Naoroji, M.K. Gandhi, village swaraj, non-violence, machines and labour, cottage industries; Comparison of Indian Economic thought with western Economic thought.

LO: This module aids the student in evaluating the relevance and applicability of Indian economic thought in contemporary times.

Or

Money and Banking

Course Description

This course exposes students to the theory and functioning of the monetary and financial sectors of the economy. It highlights the organization, structure and role of financial markets and institutions. It also discusses interest rates, monetary management and instruments of monetary control. Financial and banking sector reforms and monetary policy with special reference to India are also covered.

Course Outcomes:

- Understanding money and its types along with their functions and different measures of money supply.
- Understanding the basic concepts of banking, and its functions and to examine the banking scenario in India.
- To gain knowledge of the functions of central banks and monetary policies and how they have evolved.
- Get an understanding of the conceptual framework of the financial market and institutions of India.

Unit I: Money

Definition and functions of money; Types of money: legal tender money and bank money, near money; Value of money and index number; construction of index number; WPI, CPI, PPI, GDP deflator, Cost of living index. Demand for money- Classical and Keynesian approaches, Patinkin and the Real Balance Effect; Friedman's Quantity theory of money. Supply of Money- Measures of money supply: M1, M2, M3 and M4 ; High powered money and money multiplier.

LO: This module will enable students to understand various concepts of money and money substitutes, functions of money, and monetary aggregates.

Unit II: Commercial Banking

Meaning and types; Functions of commercial banks; the process of credit creation and its limitations; Balance sheet and portfolio management, Banking sector reforms in India; Lessons from Global Financial Crisis and Policy Response in India.

LO: This module will make the students aware of basics of commercial Banking and Finance.

Unit III: Central Banking

Functions of a central bank; Quantitative and qualitative methods of credit control; Central Bank's Supervision and prudential measures for financial stability; current

monetary policy of India, liquidity adjustment facility (LAF) through Repo and reverse repo operation, MSF.

LO: Upon completion of this module, students will be able to appreciate the effects of the major policy tools and understand how central banks affect the financial system of the economy.

Unit IV: Financial Markets

Financial Market, Meaning, Types, Money market and Capital Market, Primary and Secondary Market, Stock Exchanges, SEBI; Role of Financial Markets for Economic Development. Financial Instruments: Government securities, derivatives, futures and options, bond, debentures.

LO: This module shall help students to understand the nature of financial instruments and their usage.

Or

Economy of Odisha

Course description

Using appropriate analytical frameworks, this course reviews major trends in economic indicators and policy debates in Odisha in pre- and post-Independence period, with particular emphasis of paradigm shifts and turning points. Given the rapid changes taking place in Odisha, the reading list will have to be updated annually.

Course Outcomes:

- To obtain a basic overview of the economy of Odisha in the pre-Independence period.
- To analyze the strengths and weaknesses of the macroeconomic scenario of Odisha's economy.
- To gain an understanding of the important economic sectors of Odisha and the challenges faced by them in recent times.
- To grasp the current economic problems in Odisha.

Unit I: Odisha Economy before 1947

Orissa's Economy in the Nineteenth Century: Benevolence or Exploitation, Forces of Nature, Animal Power, The Company Steps in, Public Works and Public Health, Education, Disintegration of Village Economy, New Social Environment, Changing Position of Social Classes, The Moneylenders, The Borrowers, Money-flows from Village to Metropolis, Pauperization of Peasantry, The Wage Earners, Demographic Changes, Profiting from Rural Adversity; Diarchy in 1919 and Separation of Provincial Finances from Central Government in 1937; Emergence of Federal Finance.

LO: This module will ensure that the students understand the features of Odisha's economy in the pre-independence period.

Unit II: Macro Economy of Odisha

A macro glance of Odisha economy: aggregate income, broad sectoral decomposition, performance of districts, employment, child labour and bonded labour, employment programmes, consumption expenditure, cost of living; Odisha State public finances.

LO: This module presents the ground realities of Odisha's macro-economic situation to the students.

Unit III: Agriculture, Industry, Infrastructure and Environment in Odisha

Agriculture: land ownership and land tenure, agricultural wages and rural unemployment, production and productivity of major crops, agricultural inputs, agricultural policy; Animal Husbandry; Fisheries

Industry: Investment, industrial policy, and the growth of large industries, mining and quarrying; Construction; tertiary sector: tourism, transport and power; Water Resources, Forest Resources

LO: Upon successful completion of this module, students will be able to appreciate the importance and contribultion of two important sectors, agriculture and industry, to Odisha's Economy.

Unit IV: Social Sector in Odisha

Poverty: income poverty and inequality; health sector: outcomes, infrastructure, finance, public health, NRHM; education: Literacy, Primary education, secondary education, higher education, SSA; human development

LO: This module presents the salient features of the social sector in Odisha to the students.

SEMESTER VI

Core I **14. Introductory Econometrics**

Course Description:

This course provides a comprehensive introduction to basic econometric concepts and techniques. It covers statistical concepts of hypothesis testing, estimation and diagnostic testing of simple and multiple regression models. The course also covers the consequences of and tests for misspecification of regression models.

Course Outcomes:

- To have a comprehensive introduction to basic econometric concepts and techniques.
- To gain an understanding of the statistical concepts of hypothesis testing, estimation, and diagnostic testing of simple and multiple regression models.
- To gain knowledge about the consequences, tests, and remedies of violation of Least Square assumptions.

Unit I: Introduction

Definition, Nature and scope of econometrics; Theoretical Probability Distributions: Binomial, Poisson and Normal distributions: their properties. Theory of Estimation: Estimation of parameters; properties of estimators – small sample and asymptotic properties; point and interval estimation.

LO: This module will enable the students to know about some common discrete and continuous theoretical probability distributions; and to know about estimators, point and interval, and the desirable properties of point estimators.

Unit II: Hypothesis Testing

Testing of hypotheses: defining statistical hypotheses; Simple and composite hypotheses; Null and alternative hypothesis; Type I and Type II errors, Critical region; Neyman-Pearson lemma; Power of a test; Test statistics: z, chi square, t and F.

LO: This module will enable the student to gain knowledge about statistical hypotheses and the procedure of testing of hypothesis; and have an understanding of type I and type II errors in the procedure of hypothesis testing.

Unit III: Linear Regression Analysis

Two variable linear regression model – Assumptions; Least square estimates, Variance and co- variance between Least square estimates; BLUE properties; Standard errors of estimates; Co- efficient of determination; Inference in a two variable linear regression model; ANOVA; Forecasting. Introduction to multiple regression models.

LO: This module will enable the students to understand the concept and usefulness of regression analysis and differentiate between Linear and non–linear relations; understand the difference between simple & multiple linear regression models and their estimation as well as inference drawn therefrom.

Unit IV: Violation of Classical Assumptions

Heteroscedasticity, Multicollinearity and Auto-correlation: Meaning, consequences, tests and remedies.

LO: This module will enable the student to understand the consequences, tests, and remedies of violation of Least Square assumptions.

Or

Public Economics I

Course description:

Public economics is the study of government policy from the points of view of economic efficiency and equity. The paper deals with the nature of government intervention and its implications for allocation, distribution and stabilization. Inherently, this study involves a formal analysis of government taxation and expenditures. The subject encompasses a host of topics including public goods, market failures and externalities.

Course Outcomes:

- The course will familiarize the students with the relevance, responsibilities, and sources of receipts of the government.
- Students will be able to understand the rationale behind the public provision of specific goods and services and what can be left to market for provision.
- Students will be able to understand the normative ideas behind public expenditure, taxation, and public debt as well as the budget of government and its impact on the economy.
- Students will be able to understand the methods of fiscal management by the government in India.

Unit I: Introduction to Public Finance and Public Budgets

The concept of Pareto Optimality. Pareto improvement and potential Pareto improvement. Public good verses private good; Free riding and public Good provision. Maximum Social advantage. Market failure and role of government; Public Budget: kinds of budget, economic and functional classification of the budget; Balanced and unbalanced budget; Balanced budget multiplier; Budget as an instrument of economic policy

LO: This module will give an idea of the goods to be provided by the government and market and the challenges faced by the government to provide public goods; and will also teach about different types of budgets and their implications for the economy.

Unit II: Public Expenditure

Meaning, classification, principles, cannons and effects, causes of growth of public expenditure, Wagner‘s law of increasing state activities, Peacock-Wiseman hypotheses. Pareto Optimality Criterion, social Allocation

LO: This module will educate on the principles behind public expenditure and the causes behind the rise in the public expenditure.

Unit III: Public Revenue

Sources of Public Revenue; Taxation - meaning, cannons and classification of taxes, impact and incidence of taxes, division of tax burden, the benefit and ability to pay approaches, taxable capacity, effects of taxation, characteristics of a good tax system, major trends in tax revenue of central and state governments in India, Introduction of GST in India. Issues and Challenges relating to GST.

***LO: This module will educate on the sources of receipts for the government, theoretical ideas behind taxation, and implementation of GST in India*.**

Unit IV: Public Debt

Sources, effects, debt burden – Classical/ Ricardian views, Keynesian and post-Keynesian views; shifting - intergenerational equity, methods of debt redemption, debt management, tax verses debt.

LO: This module will give a fair idea of different aspects of the implications of public debt on the economy

Or

Development Economics II

Course Description:

This is the second Module of the economic development sequence. It begins with basic demographic concepts and their evolution during the process of development. The structure of markets and contracts is linked to the particular problems of enforcement experienced in poor countries. The governance of organizations is studied and this is then linked to questions of sustainable growth. The course ends with reflections on the role of globalization and increased international dependence on the process of development.

Course Outcomes:

- This course shall provide an introduction to basic demographic concepts and their evolution during the process of development.
- It will instill the ability to present a new interpretation of the dualistic structure of an economy and its implication for economic development.
- Thecourse will give an in-depth understanding of environmental economics and application of economic principles to resolve specific environmental problems and issues.
- It will equip the students with an ability to explain the phenomenon of globalization, the economics, and the politics of international agreements, trade, and production patterns.

Unit I: Population and Development

Demographic concepts: birth and death rates, age structure, fertility and its determinants, the Malthusian population trap and the microeconomic household theory of fertility; costs and benefits of population growth and the model of low-level equilibrium trap; rural-urban migration – the Harris Todaro migration model and policy implications.

LO: Upon successful completion of the module, the students will learn about the basic demographic concepts of birth and death rates, age structure, fertility and mortality, demographic transition and development, fertility choices and human capital formation, and migration models.

Unit II: Dualism and Economic Development

Dualism – geographic, social and technological; the theory of cumulative causation (Myrdal); the regional inequalities in the context of economic development; the inverted U relationship; international inequality and the centre periphery thesis; dependency, exploitation and unequal exchange; the dualistic development thesis and its implications.

LO: This module shall provide an understanding of the various concepts of dualism and the manner it has hindered the development of developing countries.

Unit III: Environment and Development

Basic issues of environment and development – Development and environment inter-linkage; Poverty, environmental degradation and externalities; common property resources, renewable and non-renewable resources; concept of sustainable development; basics of climate change.

LO: This module shall help students getting an idea about the global perspectives on contemporary environmental and natural resource issues and appropriate economic concepts for analyzing them.

Unit IV: International Trade and Economic Development and Financing Economic Development

Trade and economic development; export-led growth; terms of trade and economic growth – the Prebisch Singer Hypothesis; trade strategies for development – import substitution vs. export promotion; international commodity agreements; trade vs aid; Foreign finance, investment and foreign aid – controversies and support Modalities.

LO: The learners shall acquire an understanding of the linkage between International Trade and Economic Development, and trade strategies for development.

Core I 15. Computational Methods in Economics

Course Description

This course introduces the students to understand uses of computers and their applications in economics. After completion of the course, students will develop professional competency in working with MS Office.

Course Outcomes:

- To understand the uses of computers and their applications in Economics.
- To develop professional competency in working with MS Office.
- To get hands-on use of Microsoft Office applications- Word, Excel, PowerPoint, and Access.
- To gain basic soft skills in handling data, creation, and formatting of Word documents, and making presentations.

Unit I: Computer Fundamentals

The basic architecture of CPU and its functions – Input device and output device – Primary and secondary memory. Operating systems - concept and types, Windows-concepts and components; Basics of a computer network: LAN, WAN, and MAN; Introduction to internet and its applications; booting process, Machine language, and assembly language; Applications of computer in Economics, other fields.

LO: This module shall make the students understand the basics of computers – parts, memory, network, and internet.

Unit II: MS Word, PowerPoint, and Access Applications

MS Word: Word basics, creation of a document, use of tables, pictures, and charts; editing, formatting, and printing documents; MS PowerPoint: Features, Creation of Slides for presentation, Types of view, Slide master, Templates and Slide transition; MS-Access: Data Field, Record, Database file, Types of files, Types of records, Data type, Database evolution, Data transfer from Excel to Access

LO: Upon completion of this module, students shall be able to create text documents using MS Word, create interesting and appealing presentations using MS PowerPoint, and apply Database Management Software (DBMS) like MS Access to manage data of businesses and enterprises.

Unit III: Worksheet & MS Excel

Basics of worksheet –creating a worksheet, entering data into a worksheet, sorting data, autofill, saving & protecting a worksheet, Formatting of a worksheet. Previewing & Printing worksheet; Create an Excel chart; Drawing charts: Area, Bar, Column, Line, Pie, Scatter, etc. Move and Resize your chart; Charts Styles and Layouts; Chart Titles and Series Titles; Format chart Panel; Add labels to a Chart; Format chart segments; Format Axis titles; Format your Axis titles

Or

Environmental Economics

Course Description

This course introduces the students to the basics of environmental economics to understand the fundamentals of environmental concerns and develop insights into valuation of environment.

Course Outcomes:

- To understand the basic concepts/principles of Environmental Economics
- To be able to analyse and apply the concepts to understand specific case studies.
- To develop insights into the valuation of the environment.
- To become capable to execute/create the Project or field assignment as per the knowledge gained in the course.

Unit I: Economy and Environment

Concepts of Environmental Economics, Natural Resource Economics, and Ecological Economics. Important environmental Problems (Air pollution, water pollution, deforestation, climate change and global warming), Economy-Environment inter-linkages, Role of environment for economic development, Effect of economic development (industrialization, urbanisation, modernization of agriculture) on environment, Consequences of environmental degradation on the economy and the wellbeing of the people and other living beings, concept of Environment-Kuznets Curve hypothesis.

LO: This module will aid in acquiring knowledge of the concepts related to Environmental Economics and in understanding the Environment-Economy interlinkage.

Unit II: The Economics of Pollution and Climate change

Environment and Market Failure, Nature of environment quality (Non-rivalry and non-excludability), Pollution as public bad, Pollution as negative externality. Pigouvian tax for optimal pollution, Property rights and bargaining for optimal pollution (Coase Theorem), Government‘s Command and Control method for controlling pollution. Climate change as market failure (Green house gas externality, lack of incentives for developing low carbon technology), policy measures for mitigations of climate change (carbon taxes and tradable carbon rights).

LO: This module will be useful for the students in understanding the nature of pollution and getting knowledge of pollution control and climate change mitigating tools.

Unit III: Valuation of Environment

Difficulties of valuation of eco-system services, Concepts of Economic value of environment (Use and non- use value, Option value, Existence value); Willingness to pay (WTP) and willingness to accept (WTA) compensation for improvement/deterioration of environment quality, Revealed Preference Method of valuation of environment (The hedonic price approach, Travel Cost approach)

Contingent Valuation method.

LO: Upon completion of this module, the learner shall gain knowledge of the different methods of valuing environmental services.

Unit IV: Natural Resources and Sustainable Development

Natural resources; renewable and exhaustible; management of exhaustible resources and the Hotelling's rule; management of renewable resources (case of fishery only) optimally, Concept of carrying capacity of Environment (related to resource use and pollution), Issues of irreversibility, uncertainty in the natural resource use and waste disposal, Sustainable Development: Concepts and Components (Social, Economic and Environmental), Daly's operational principles for sustainability, Sustainable Development Goals (SDGs).

LO: This module shall initiate an understanding of the limits of the use of natural resources from the point of view of their sustainability and Sustainable development.

Or

International Economics

Course Description

This course introduces the students to international trade and finance to understand the theories of international trade and develop insights into trade policy and balance of payments. The course also develops insight into the international financial system and the trade policy of India.

Course Outcomes:

- To understand the basic concepts/principles of International Trade and Finance.
- To acquire the ability to analyse the concepts to understand specific case studies and practical issues.
- To develop insights into trade policy and balance of payments.
- To develop an insight into the international financial system and the trade policy of India.

Unit I: Importance of Trade and Trade Theories

Importance of the study of International Economics; Inter-regional and international trade; Theories of Trade-absolute advantage (Adam Smith), comparative advantage (David Ricardo) and Opportunity cost (Haberler); Heckscher-Ohlin theory of trade – assumptions (Irreversible Factor intensity of goods, Perfect competition with homogeneous products, Constant returns to scale, equal access to technology to producers of all countries, difference in factor endowment between the countries), factor abundance, factor intensity and limitations (Leontief Paradox); Factor Price Equalization theorem.

LO: This module shall endow the knowledge of the different trade theories to the learners.

Unit II: Trade Policy

Concepts of terms of trade; Doctrine of reciprocal demand – Offer curve technique; Gains from trade, types; Free Trade vs Protected Trade, Tariffs- types, effects under partial and general equilibrium analysis; Quotas- effects its impact in partial equilibrium analysis; General Equilibrium analysis of tariff; the concept of optimum tariff.

LO: Upon successful completion of the module, students shall get an understanding of the different tools used by the Government to intervene in trade and their welfare implications.

Unit III: Exchange Rate and International monetary system

Concept and Types of Exchange Rate (bilateral vs. trade-weighted exchange rate, cross exchange rate, spot, forward, futures), Demand for and Supply of foreign exchange, Exchange Rate Determination: Mint Parity Theory, Purchasing-Power Parity Theory, Fixed versus Flexible exchange rate; IMF: Objectives of IMF, IMF‘s assistance to member countries (Rapid Financing

Instrument, Rapid Credit Facility Stand only) for BoP deficit correction., World Bank and WTO; Their achievements and failures; Their Role from the point of view of India

LO: This module will be useful for the students in getting to know about the exchange rate and theories relating to its determination and gaining knowledge of the different international financial institutions.

Unit IV: Balance of Payments Concepts and components of balance of trade and balance of payments; deficit and surplus in the balance of payments, Disequilibrium in balance of payments; Various measures to correct deficit in BOPs (Expenditure switching and expenditure reducing policies, Direct control), Depreciation Vs. Devaluation; Elasticity approach to devaluation, Foreign trade multiplier.

LO: This module shall enable an understanding of the concept of disequilibrium in Balance of Payment (BOP) and the different measures for correcting the same.

Multi-Disciplinary Course - SEMESTER-I

Paper-III: Economics in Everyday Life (Economics)

This objective of this course is to expose the non-economics students to the subject matter of economics by introducing them with the most basic concepts of economics.

Unit I: Basic Concepts in Economics

Meaning and Definition of economics, Economics is a Science or an Art, Microeconomics verses Macroeconomics, Basic economic issues of a household: (How to address the different needs with the limited income?) Needs, resource scarcity and optimal allocation of resources Important economic concepts: Goods, Service, Value, Price, Utility, Types of Utility, Firm, Industry, Supply and Demand, Market (only concept)

LO: Upon completion of this module, students will get a basic idea about the basic concepts in economics and understand the importance of economics in their day to day life.

Unit II: Money and Banking

Definition of Money, Evolution of Money, Value of Money, Functions of Money, Types of Money, Banking, Different types of Banks, Functions of Commercial bank, Functions of Central Bank.

LO: Upon completion of this module, students will get a basic idea about money and banking which they can used and get benefited in their day to day life.

Unit III: Public Finance and Budget

Meaning of Public Finance, Difference between Public Finance and Private Finance, meaning of Budget, Objectives of Budget, Types of Budget (only concept)

LO: Upon completion of this module, the students will be introduced to concepts of public finance and budget.

Unit IV: Indian Economy Concepts

Basic Characteristics of Indian Economy, Meaning ad Significance of Demographic Statistics, Analysis of Size of Population, Sex Ratio, Literacy Rate, Human Development, Sustainable Development Goal (SDG) (Concept only)

LO: This module shall enable the students to gain an in-depth understanding of the Indian economy, including its demographic profile, human development and sustainable development goals.

Multi-Disciplinary Course - SEMESTER-II

Paper-IX: ***Demography (Economics)***

Unit-1:

LO. *Understand of key concepts of demography as a discipline*

Introduction: Demography - *Its Definition, Nature and Scope; Relationship with other disciplines; Demographic Balancing Equation; Sources of Demographic Data in India: Salient Features of Census, Civil Registration System, National Sample Survey, National Family Health Survey; Population Distribution and Growth – Measures and Determinants; Concepts of Rate, Ratio and Proportion.*

Unit -II:

LO. *Examine population dynamics and resultant socioeconomic issues and problems.*

World Population Growth; Doubling time; Population Growth in India; *Population Dynamics: Fertility, Mortality and Migration - Measures, Determinants and Implications; Theories of Population - Malthusian Theory and theory of Demographic Transition, Population policies and programmes in India.*

Unit-III: Practical

LO. *Compare and relate population growth and distribution of developed and developing countries*

1. Arithmetic and Geometric Projection - Calculation and Graphical display;

2. Construction of population pyramid,

3. Construction of Lorenz Curve

4. Calculation and presentation of Population Growth Rate, Crude Birth Rate, Age-Specific Fertility Rate, Infant and Neonatal Mortality Rate, Maternal Mortality Ratio Based on Supplied Data.

5. Practical Record and Viva-Voce.

DEPARTMENT OF POLITICAL SCIENCE
SARBATI DEVI WOMEN'S COLLEGE,RAJGANGPUR
PO,CO,PSO- NEP-2020

Core I Semester-I

Fundamentals Of Political Science

Course Objectives

This course will familiarize students with the basic normative concepts in political theory and encourage them to understand how these concepts manifest in social practices. The course will also help students learn how we make use of these concepts in organizing our social living. The main objective is to project the plural, interdisciplinary orientation of political theory and to emphasise its deep engagement with the political process.

Expected Learning Outcomes

The course would provide students with a rudimentary understanding of political concepts, theories, and their application in contemporary society and their interplay with societal and economic factors. The unit-wise outcomes are given below.

Unit-I: Upon completion of this Unit, students will have acquired a comprehensive understanding of the multifaceted nature of politics, its theoretical underpinnings across disciplines, and its intricate interplay with societal and economic spheres.

Unit-II: After completing this Unit, student's understanding on the state as a political entity will be deepened and students would be able to critically examine its relationship with sovereignty, governing structures, and the multifaceted challenges posed by globalization.

Unit-III: Upon completion of Unit III, students will be able to critically analyse and synthesize the intricate concepts of power, authority, and legitimacy, as well as the interrelated notions of rights, freedoms, equality, and justice, thereby enabling them to comprehend the theoretical underpinnings that shape socio political constructs and inform discourse on contemporary issues.

Unit-IV: Upon completion of this Unit, students would have developed a nuanced and multidimensional understanding of democracy along with its models, and the critical roles played by pluralism and diversity in shaping democratic ideals, practices, and discourse. This will deepen democratic values among students.

Course Content:

Unit-I: Introduction

a) What is Political?

b) Political Philosophy, Political Theory, Political Science

c) Politics and Society, Politics and Economy

Unit-II: State

a) State: Meaning, Origin and Development

b) State and Sovereignty

c) State and Government

d) State and Globalization

Unit-III: Concepts

a) Power, Authority, and Legitimacy

b) Rights and Freedom

c) Equality and Justice

Unit-IV: Democracy

a) Meaning of Democracy

b) Models of Democracy: Representative, Participatory, Deliberative

c) Pluralism, Diversity, and Democracy

Core II

Introduction To The Constitution Of India

Course Objectives:

This course introduces students to the Constitution of India – the supreme law of the land. The primary objective of this course is to provide students with a comprehensive understanding of the constitutional framework and political institutions in India. Through a critical examination of the constitutional design, the learners will explore the foundational principles of the Indian Constitution. By tracing the historical contestations surrounding the incorporation of these values into the Constitution and their practical manifestations, learners will develop an appreciation for the intricate interplay between institutional practices and political contexts. Furthermore, the course aims to cultivate an understanding of the institutional dynamics within the Indian governance matrix, characterized by both conflict and cooperation, asymmetrical federal arrangements, and mechanisms for safeguarding vulnerable populations against discrimination. Additionally, students will gain insight into the powers and functions of key governmental figures such as the President, Prime Minister, and Chief Minister and other constitutional and non-constitutional bodies, while also delving into the intricacies of Union-State relations.

Expected Learning Outcomes:

This course endeavours to equip students with the necessary knowledge and analytical tools to engage critically with the constitutional structures and processes that underpin Indian democracy. The unit-wise outcomes are given below.

Unit-I: The learners would gain basic understanding of Indian Constitution and its underlying values. This would enable them to analyse the operation of the Constitution of India from a policy perspective, and in the context of social and cultural diversity. This would strengthen the foundation of constitutional ethics among the learners.

Unit-II: The learners would develop awareness regarding the basic structures and processes of government at both union and state levels with a specific focus on power and responsibilities of highest constitutional dignitaries. This will help them to acquire administrative skills and political insights for engaging in various institutions.

Unit-III: The learners would be familiar with the judicial structures and procedures in India. Further, the awareness about Writs, Judicial Review, PIL, Basic Structure Doctrine would enable them to develop an understanding about their rights and entitlements as citizens and methods to secure these within the legal framework, in case of violation.

Unit-IV: The learners would understand the division of power between Union and States with focus on different constitutional bodies. This would enable them to understand and analyse the manner in which the Indian federal system functions.

Course Content:

Unit-I: Basic Structure of the Indian Constitution

a) Making of the Indian Constitution: Formation and Working of Constituent Assembly

b) Preamble: Nature of State and Constitutional Values

c) Fundamental Rights, Directive Principles of State Policy, Fundamental Duties

Unit-II: Legislature and Executive in Union and State

a) Structure of the Parliament and Legislative procedures; State Legislatures

b) President; Governor

c) Prime Minister and Council of Ministers; Chief Minister

Unit-III: Judiciary

a) Supreme Court of India: Structure and Functions

b) High Courts: Structure and Functions

c) Judicial Review and Basic Structure Doctrine, Public Interest Litigation (PIL)

Unit-IV: Union-State Relationship

a) Division of Power: Administrative, Legislative and Financial

b) Election Commission, Finance Commission, CAG

c) NITI Ayog, Inter-State Council, GST Council

Core III SEMESTER II

Introduction To Political Theory

Course Objectives:

The course seeks to foster a comprehensive and nuanced understanding of political theory, its significance within the discipline of Political Science, and its profound influence on conceptualizing and interpreting various facets of social life. Through a critical examination of influential traditions and perspectives, students will gain insights into how theoretical frameworks shape debates and discourses on socio political issues. Furthermore, the course aims to equip learners with the ability to critically analyse and deconstruct contemporary theories and perspectives that delve into the intricate interplay between politics and social constructs. It begins with an overview of why we study political theory and what are the approaches and forms of political theory. It then proceeds to elaborate in a detailed manner on the key concepts in political theory such as 'Liberty', 'Equality', 'Rights' 'Justice', 'Democracy'. It will also focus on recent trends of Political Theory. Each concept is explained through the thoughts and writings of noted theorists who have deliberated at length on that particular issue with emphasis given on readings of original writings.

Expected Learning Outcomes:

This course aims to cultivate a sophisticated understanding of the theoretical foundations that inform and shape the ever-evolving political landscape. The unit-wise outcomes are given below.

Unit-I: This unit familiarises the students with the basic concepts of political theory, how political theory has evolved as well as the nature of political theory. It also introduces the students to the normative and empirical dimensions of political theory. The necessity of values and the importance of empirical investigation in the theory building exercise is the primary objective of this unit. This unit also makes an attempt to explain how modernity influenced the theory building exercise and how it reshaped some of the important debates on politics and society.

Unit-II: This unit makes an attempt to study important traditions in political theory. These traditions influence our political decisions. Even since the evolution of industrial revolution, nation state, political questions and debates have revolved round the concepts of liberalism and Marxism. Students will be exposed to various debates in each of these traditions and their importance in the present-day context.

Unit-III: Political theory, fifty years back, was only concerned about liberalism and Marxism. Of late, with the advancement of society and our understanding of society, new ideas have emerged. They have expanded the horizon of political theory. New theories have evolved and they have thrown new challenges to the society. Modernity encouraged societies to engage in theory building exercise. The emergence of post modernity challenged the grand narratives and encouraged all of us to have micro perspective and challenge everything as modern. Similarly, new theories emerged challenging the existing power structure of the state and society. The

understanding of a monocultural society has also changed with people shifting their choice of living from one country to another country. This unit promises to throw many interesting ideas to the students of political science.

Unit-IV: This unit makes an attempt to understand some of the important political ideas within the nation state framework. Once nation state is strongly established, it is important to understand the political concepts in detail. Even though concepts like citizenship and civil society are old yet these concepts need some sort of redefinition in the modern context. Similarly, the emergence of welfare state in a political system also has reinforced its presence in the modern context. A student of Political Science needs to take concepts like welfare state and swaraj seriously as it throws many new challenges to the already existing political ideas.

Course Content:

Unit-I: Introduction

a) What is Political Theory? Why do we need Political Theory?

b) Approaches to Political Theory: Normative and Empirical

c) Modernity and Political Theory

Unit-II: Traditions

a) Liberalism

b) Neo-Liberalism

c) Marxism

d) Neo-Marxism

Unit-III: Recent Trends

a) Feminism

b) Post-Modernism

c) Green Political Theory

d) Multiculturalism

Unit-IV: Concepts

a) Citizenship

b) Civil Society

c) Welfare State

d) Idea of Swaraj

Core IV

Comparative Governments

Course Objectives:

This course willfamiliarize the students with the basic concepts and approaches to the study of comparative governments. It enables the students to critically examine politics in historical and contemporary perspectives while engaging with various themes of comparative analysis in developed and developing countries. This course is designed to address the various elements of constitutional systems in the world including political parties, interest groups, election process, in addition to an analysis of the dominant executive, legislature and judicial systems all over the world.

Expected Learning Outcomes:

This course would enable the students to understand concepts and various approaches relevant to the study of comparative politics. The students would familiarise with a vast range of relevant political concepts and processes supposed to train their critical thinking to understand comparative politics and government. The unit-wise outcomes are given below.

Unit-I: This will help students to engage with the topics of comparative government, institutionalism, neo-institutionalism, and the comparison of democratic and authoritarian regimes in a comprehensive and critical manner.

Unit-II: This unit will aware students about a structured framework for engaging with the concepts, theories, and empirical research associated with comparative government, institutionalism, neo-institutionalism, and the comparison of democratic and authoritarian regimes.

Unit-III: This unit will help students in developing a comprehending skill on the working of legislatures, the executive branch, and bureaucracies in political systems, including their structures, functions, and dynamics in both democratic and authoritarian states.

Unit-IV: This unit will enhance the analogical capacities and critical thinking about elections, political parties, and interest groups in political systems, including their roles,

dynamics, and implications for democratic governance in both democratic and authoritarian contexts.

Course Content:

Unit-I: Introduction

a) Comparative Government: Meaning and Evolution

b) Institutionalism and Neo-Institutionalism

c) Comparing Democratic and Authoritarian Regimes

Unit-II: Legislature, Executive and Bureaucracy

a) Legislatures: Concept, Functions, Structures, Legislature in Democratic and Authoritarian states

b) Executive: Concept, Presidential and Parliamentary Forms, Executive in Democratic and Authoritarian states

c) Bureaucracy: Concept, Organisation, New Public Management, Bureaucracy in Democratic and Authoritarian states

Unit-III: Constitution, Judiciary and Multi-level Governments

a) Constitutionalism and New-Constitutionalism; Constitution in Democratic and Authoritarian states

b) Judiciary: Concepts, Judicial Review, Judicial Activism, Judicial Independence, Judiciary in Democratic and Authoritarian states

c) Multi-level Governments: Unitary and Federal, Local Government

Unit-IV: Elections, Political Parties and Interest Groups

a) Elections: Role and Importance, Types; First-Past-the-Post System and Proportional Representation, Elections in Democratic and Authoritarian states

b) Political Parties: Concept, Origin and Role, Party System, Parties in Democratic and Authoritarian states

c) Interest Groups: Concept, Role of Interest Groups in Democratic and Authoritarian states

Core V Semester-III

Colonialism And Nationalism In India

Course Objectives:

The purpose of this course is to help the students understand India's colonial past, the shaping of the nationalist ideology and the unfolding of the national movement. Integral to the course is understanding the ideas of democracy and freedom along with corresponding social relations as well as political and institutional practices that took shape in the context of the anti-colonial struggles. The institutions of the state, its policies, and the social and economic structures that exist today, reflect the imprint of the colonial experience and the manner in which they have been transformed in the course of social struggles and the national movement.

Expected Learning Outcomes:

This course will enable the learners to understand India's colonial history and shaping of its identity as a nation. The students would be well versed with the major streams of socio-political thought as well as socio-political and religious reform movements which contributed to our nation building. The unit-wise outcomes are given below.

Unit-I: This unit will give the students a conceptual understanding of colonialism from different perspectives as well as an analysis of Indian nationalism through various approaches.

Unit-II: This unit help the students to develop a critical understanding of colonial ideology and its civilizing mission based on an assertion of cultural superiority. It will also help the students to assess the various impacts of colonialism on society, economy, polity and agrarian structure.

Unit-III: This unit will give an understanding about various reform movements as well as various types of resistance during the first century of British rule in India.

Unit-IV: This unit will help the students willlearn about the historical context in which the nationalist movement emerged in India and took different forms in subsequent periods. It will also provide a broad understanding about the role, ideologies and contributions of great nationalist leaders and organisations in nationalist struggle till the achievement of independence.

Course Content:

Unit-I: Colonialism and Nationalism

a) Main Perspectives on Colonialism: Liberalism, Marxism, Post-colonialism

b) Approaches to the study of Nationalism in India: Liberal Nationalist, Religious Nationalist, Marxist and Subaltern

Unit-II: Colonial Rule in India and Impact

a) Colonial Ideology and Civilizing Mission: Assertion of Cultural and Racial Superiority

b) Impact on Forest, Agriculture, Land relations, Industry and Ecology

c) Constitutional Development and the Colonial State

Unit-III: Reform and Resistance

a) Religious Reform Movements

b) Other Social Reform Movements: Anti-Caste Movements and Women Emancipation Initiatives

c) Tribal, Peasants and Working-Class Resistance

d) Education and the rise of the New-middle Class

Unit-IV: Nationalist Politics and Expansion of its Social Base

a) Nationalist Movement: Formation of Indian National Congress, Liberal Constitutionalist, Swadeshi and the Radicals, Muslim League and Hindu Mahasabha

b) M.K. Gandhi and Mass Mobilisation, Non-cooperation, Civil Disobedience and Quit India Movement

c) Revolutionaries: Communists, Socialists and INA

d) Two-Nation Theory, Partitions and India's Independence

Core VI

International Relations

Course Objectives:

This paper seeks to equip students with the basic intellectual tools for understanding International Relations and its major theories. The course begins by historically contextualizing the evolution of the international state system before discussing the agency-structure problem through the levels-of- analysis approach. After having set the parameters of the debate, students are introduced to different theories in International Relations. It provides a fairly comprehensive overview of the major political developments and events starting from the twentieth century. Students are expected to learn the economic relation between developed and under developed nations and emerging world order after globalization.

Expected Learning Outcome:

This course would enable the learners to understand the international relations and major theories. Also, this course would make students aware about major political and historical phenomenon occurred in 20th century which have shaped the International Relations. The unit-wise outcomes are given below.

Unit-I: This unit would provide fundamental ideas to the students about International Relations & evolution of state system with reference to pre- Westphalia, Westphalia& post- Westphalia.

Unit-II: This unit would help the students to familiarise with the basic theoretical perspectives of International Relations.

Unit-III: This unit would make students understand about the causes & consequence of World War I & II. It also makes the students understand about the creation of League of Nation and UNO and the formation of former USSR, Fascism & Nazism.

Unit-IV: This unit would familiarise the students with different dimensions of Cold War & the contemporary ideas like the third world, new economic world order, north- south co-operation, development & under-development, globalisation & emerging world order.

Course Content:

Unit-I: Study of International Relations

a) Meaning, Nature & Scope

b) Evolution of state system: pre-Westphalia, Westphalia & post-Westphalia

Unit-II: Theoretical Perspectives

a) Classical Realism, Idealism, Realism and Neo- Realism

b) Liberalism and Neo- Liberalism

c) Marxist and Feminist perspectives

Unit-III: An Overview of 20th Century International History-I

a) World War- I: Causes & Consequences, League of Nations

b) Bolshevik Revolution and the formation of USSR

c) Rise of Fascism and Nazism

d) World War- II: Causes & Consequences, United Nations

Unit-III: An Overview of 20th Century International History-II

a) Cold War: Phases, End of Cold War & post-Cold War world order.

b) Emergence of Third World, New Economic World Order, North- South Cooperation, Theories of Development and Under-Development

c) Globalisation and Emerging World Order

Core VII

Western Political Thought-I

Course Objectives:

This course deals with the classical thinkers and themes of western political philosophy. It will probe the key concerns of political thought such as the good ideal and possible regimes; citizenship and civil virtues; contract, consent and trust as the alternative bases of political obligation; the relative autonomy of politics vis-à-vis philosophy or economy; and concepts such as justice, liberty, and rights. There will be an attempt to understand thinkers and texts both from philosophical and historical perspectives. The main objective is to train students in the foundational texts and thinkers of Political Science.

Expected Learning Outcomes:

The course will familiarize students with the questions, ideas and values of political philosophy addressed by political thinkers and contextualize the same to contemporary political thinking.This will enhance their comprehending and analytical capacities to read and decode the classics and use them to engage contemporary socio-political issues and clearly present their own arguments and thoughts about contemporary issues and develop ideas to engage with the latter. The unit-wise outcomes are given below.

Unit-I: Students would gain comprehensive understanding of the foundational ideas and frameworks proposed by the seminal thinkers of ancient Greece. Thus, students could make an appraisal of the enduring influence of these pioneering thinkers on subsequent political discourse and the evolution of socio -political ideologies.

Unit-II: Upon completion of this Unit, students will be able to critically examine the transformative ideas that emerged during this pivotal period in intellectual history. Through the exploration of Renaissance and early modern political thought, students will gain insights into the paradigm shifts that reshaped the understanding of power, authority, and the role of

the state, laying the foundations for subsequent political philosophies and ideologies. This will enable them to connect with historically written texts and their interpretations.

Unit-III: Through this Unit students will gain a nuanced understanding of the tension between individualistic and collectivist ideologies, and would develop a critical thinking in assessing the impact of social contract theories on shaping subsequent political discourse, governance structures, and societal norms.

Unit-IV: Through this exploration of utilitarian thought, students will gain a comprehensive understanding of the principles underlying this utilitarianism, its potential applications in governance and policymaking, as well as its limitations and criticisms.

Course Content:

Unit-I: Greek Political Thought

a) **Plato:** Concept of Ideal State, Theory of Justice, Philosopher King, Concept of Communism, Concept of Education

b) **Aristotle:** State and Its Classification, Theory of Revolution, Concept of Law and Justice, Citizenship

Unit-II: Renaissance and the Rise of Modernism

a) **Machiavelli:** Politics and State Craft, Views on ends and means, Separation Morality and Politics

b) **Hobbes:** State of Nature and Contract; Theory of Absolute Sovereignty

Unit-III: Individualism and Collectivism

a) **Locke:** State of Nature and Contract; Theory of Natural Rights: Life, Liberty and Property, Concept of Limited Government,

b) **Rousseau:** State of Nature and Contract; General Will, Concept of Popular Sovereignty

Unit-IV: Utilitarianism

a) **Bentham:** Theory of Utilitarianism as the basis of moral and jurisprudence

b) **J.S. Mill:** Revision of Utilitarianism, Views on Liberty, Representative Government, Subjugation of Women

Semester-IV

Indian Politics

Course Objectives:

The course adopts a historical-analytical framework to foster a critical understanding of the Constitutional design and governmental institutional framework in India, along with the insight on the changing nature of state, situating them within historical political processes. It seeks to acquaint students with the multifaceted manifestations of politics in India, examining

the diverse mechanisms through which power is wielded and distributed across societal dimensions of caste, class, ethnicity, gender, region, language, and religion. It aims at elucidating how social power shapes and mediates the political processes. Learners would explore the interplay between caste, religion, and politics, as well as constitutional provisions for self-governance, autonomy, and development, particularly for tribal communities under the Fifth and Sixth Schedules. The course also elucidates the legal and constitutional mechanisms aimed at empowering the marginalized groups. Further, the course delves into the complex interplay between political parties, electoral systems, and governance structures in India's democratic landscape to render useful insights on the dynamics of Indian Politics.

Expected Learning Outcomes:

The course would develop among students a critical and comprehensive understanding of India's nation-building process, identity politics, political parties, and electoral process. This would enable them to analyse state policies, socio-political contexts, and democratic participation across diverse segments of Indian society. The unit-wise course outcome is given below.

Unit-I: The learners would be familiarised with the process of nation building and the changing dynamics of state in terms of policy intervention for vulnerable groups. Further, the complex understanding of the social cleavages would enable them to critically assess state's response within the broader socio-political context of India.

Unit-II: The learners would develop awareness on different social groups like caste, tribe, gender, their sense of self, persistence, and demand for recognition in the broader socio-political and historical contexts in India. Further, the complex understanding of identity politics, constitutional safeguards, issues of privileges, discrimination, mobilisation, and politicization in the context of these sections of the society would enable them to develop insights for policy formulation and identify gaps in effective policy making.

Unit-III: The learners would gain comprehensive understanding of the debates surrounding secularism, communalism, minority rights, regionalism, language diversity and demand for separate statehood. This will enable them to critically analyse the dynamics of Indian politics and the interplay of these identities in shaping the political process in India. This will harness their domain skills for future engagement in the public sector.

Unit-IV: The learners would demonstrate knowledge of political parties and party system in India. The awareness of the manner in which representation and electoral competition play out in Indian politics will enable them to evolve critical insights on voting behaviour and democratic participation of different segments of the population.

Course Content:

Unit-I: Major Contestations in Indian Politics

a) Nation Building: Processes & Challenges

b) Changing Nature of Indian State: Social Base of Power- Class, Caste, Ethnicity, & Gender; Welfare State & Neo-liberal State

c) Social Justice and Affirmative Action Policies

Unit-II: Identity Politics – I

a) Caste in Politics and Politicization of Caste, Dalits, and Backward Castes

b) Tribe: Constitutional Provisions- Fifth & Sixth Schedules, Development and Displacement, Forest Rights Act& Challenges

c) Gender: Participation and Representation of women in democratic institutions

Unit-III: Identity Politics - II

a) Religion: Debates on Secularism and Communalism, Minority Rights

b) Region and Regionalism: Autonomy and Statehood movements

c) Language: Linguistic Diversity and Constitutional Provisions, Linguistic Reorganization of states

Unit-III: Party System and Electoral Process

a) Indian party system: National and State parties, Trends in party system, Politics of Defection, Coalition Politics

b) Electoral Process in India: Electoral reforms, Trends in voting behaviour

c) Electoral Politics: Participation, Representation, and Mobilisation of different sections.

Core IX

Western Political Thought-II

Course Objectives: In continuation with the first course of Western Political Thought the structure of this course is designed in such a way as to enable the students to understand the continuity in Western Political Thought. This paper focuses on thinkers and themes of western political philosophy of the medieval and modern periods. An attempt has been made to understand thinkers and texts both from philosophical and historical perspective. The main objective is to train students in the foundational texts and thinkers of western political philosophy. Taking forward from the earlier thinkers belonging to Western Political Thought, this course highlights the modern advances in political philosophies ranging from socialism, critical theory, feminism, and so on.

Expected Learning Outcome: After going through the seminal and perennial ideas of the political thinkers, the learners would be able to understand various political ideas and

constructs influencing and shaping the society. They would be informed about the key debates across different streams of political thought. The unit-wise outcomes are given below.

Unit-I: This unit analyses the contribution of Hegel and Karl Marx to ideas related to state, dialectic process, freedom, history, class, exploitation, and revolution.

Unit - II: This unitexplains about the critical theory with the contributions of Gramsci and Jurgen Habermas.

Unit-III: This unitbroadly discusses about the role of Marry Wollstonecraft and Carole Pateman in the development of Feminism.

Unit-IV: This unitwill give an understanding related to the concepts of John Rawls and Michel Foucault

Course Content:

Unit- I: Idealism and Socialism

a) Hegel: Dialectical Idealism; Concept of State; Theory of Freedom

b) **Karl Marx:** Dialectical Materialism; Historical Materialism; Concept of Class; Capitalist exploitation, State; and Revolution

Unit-II: Critical Theories

a) **Gramsci:** Power, Hegemony and Civil Society, Role of Intellectuals, Types of War

b) **Jurgen Habermas:** Legitimation Crisis, Theory of Communicative Action

Unit- III: Feminist Thinkers

a) **Marry Wollstonecraft**: Men's right and women's freedom, Idea of Women Education

b) **Carole Pateman:** The Sexual Contract; Democracy, Participation and Obligation; Patriarchy, Contract and Property

Unit- IV: Contemporary Liberalism & Its Critics

a) **John Rawls:** Justice as Fairness, Original Position, Veil of Ignorance

b) **Michel Foucault:** Power and Freedom, Governmentality and Ethics

Core X

Public Administration

Course Objectives:

This course aims at familiarizing the learners with the foundation of Public Administration as a discipline and identifying its core concepts and theories. In addition to a conceptual

understanding of public administration, this course will enable the learners to analyze various administrative theories and identify the key principles of organization. Highlighting the advantages and disadvantages of these principles may help the learners to contextualize the administrative system in the present system of governance and note the changes in application of such principles in Indian administrative system. The learners will also be introduced to the concepts of Good Governance, New Public Management, and New Public Administration as the developments in the discipline to meet the changing demands of society. Through the study of traditional binaries- such as politics-administration dichotomy, public-private administration, along with the emerging issues of public-private partnership, the ideas of e-Governance, and changing role of state and market will enable the students to note the changes in objectives and processes of administration. Further, the students will have an understanding of the structure and processes of civil service system in India.

Expected Learning Outcomes:

The course will equip the students with theoretical understanding of the core principles of public administration as well as enable them in examining the practical functioning of the administrative system in India. The topics are divided into four units with each unit dealing with a unique aspect of the discipline of public administration.

Unit-I: The learners will be introduced to the origin and evolution of the discipline of public administration. This unit will discuss the debates over politics-administration dichotomy and help the learners identify the different characteristics of public and private administration. By noting the various interventions in the discipline, the learners will be able to reflect on the changing goals of administration through different periods.

Unit-II: This unit is designed to familiarize the learners with the core principles of organization and enable them to differentiate between different types of organization. The learners will be able to understand the significance of principles like hierarchy, unity of command, delegation, etc. while noting their advantages and disadvantages.

Unit-III: This unit will offer alternative models of organizational management through analysis of dominant organizational theories. An understanding of these theories will enable the learners to evaluate the effectiveness of current structural and procedural principles and deliberate on alternative solutions to meet the contemporary challenges.

Unit-IV: After going through this unit, the learners will have a basic understanding of the prevailing administrative system in India. By studying the recruitment and training procedures of civil servants, and steps to incorporate ethics in Indian administrative system, the learners will gain insights into the working of bureaucratic system in India. The learners will also be encouraged to deliberate on the emerging issues and challenges in governance in India.

Course Content:

Unit-I: Introduction to Public Administration

a) Public Administration as a Discipline: Meaning, Nature & Scope, Evolution

b) Politics-Administration Dichotomy, Public vs. Private Administration

c) New Public Administration, New Public Management & Good Governance

Unit-II: Principles of Administration

a) Organizations: Formal & Informal, Line and staff organizations

b) Principles of Organization: Hierarchy, Span of Control, Unity of Command, Delegation, Decentralization, Coordination

Unit-III: Administrative Theories

a) Administrative Management theory, Bureaucratic Theory

b) Scientific Management Theory, Human Relations Theory

Unit-IV: Public Administration in India

a) Bureaucracy: Structure& Processes; Recruitment, Training, Ethics in Administration

b) Contemporary challenges & Perspectives: e-Governance, Public-Private Partnership, State vs Market Debate

Core XI Semester-V

Global Politics

Course Objectives: This course introduces students to the key debates on the meaning and nature of globalization by addressing its political, economic, social, cultural and technological dimensions. In keeping with the most important debates within the globalization discourse, it imparts an understanding of the working of the world economy, its anchors and resistances offered by global social movements while analysing the changing nature of relationship between the state and trans- national actors and networks. The course also offers insights into key contemporary global issues such as the proliferation of nuclear weapons, ecological issues, international terrorism, and human security before concluding with a debate on the phenomenon of global governance.

Expected Learning Outcomes:

The course intends to equip students with a comprehensive understanding of contemporary global issues, fostering critical thinking skills and analytical capabilities essential for engaging with complex international dynamics and contributing to informed decision-making in global contexts.

Unit -I: Learners would gain a comprehensive understanding of international relations, global power dynamics, and the political debates surrounding sovereignty and territoriality and the various factors influencing global political processes.

Unit-II: Learners would develop insights oncultural diversity and its impact on global interactions and conflicts and how technological advancements influence political, economic, and social structures globally.

Unit-III: This unit will aware learners aboutthe objectives and provisions of the NPT (Non-Proliferation Treaty) and CTBT (Comprehensive Nuclear-Test-Ban Treaty) and the impact of these

treaties on global security and nuclear disarmament. This would also enable learners to understand the causes, types, and impacts of international terrorism.

Unit- IV: This unit would expand learners' knowledge about the goals related to food security and poverty alleviation within the SDG framework and the objectives and outcomes of major climate summits (e.g., COP meetings) and principles and practices of managing epidemics and natural disasters as well as strategies for preparedness, response, and recovery in the face of epidemics and natural disasters.

Course Content:

UNIT-I: Globalisation: Perspectives

a) Understanding Globalisation and its alternative perspectives

b) Global Economy: its significance & anchors of global political economy; IMF, World Bank, WTO, TNCs

c) Political Debates on Sovereignty & Territoriality

UNIT-II: Globalisation: Issues & Dimensions

a) Cultural &Technological Dimensions

b) Gender and Human Rights

c) Ecological Issues

UNIT-III: Issues of Global Commons

a) Proliferation of Nuclear Weapons: NPT, CTBT

b) International Terrorism& Counter Terrorism Measures

c) Crisis of Human Security: Refugee & Migration

UNIT-IV: Global Multilateral Governance

a) Sustainable Development Goals (SDGs): Food Security & Poverty Alleviation

b) Climate Summit, Energy Security& Solar Alliance

c) Management of Epidemic &Natural Disaster

Core XII

Comparative Politics

Course Objectives:

This course aims to familiarise students with basic concepts, methods and scope of comparative politics, different approaches with their strengths and weaknesses. The objective is to provide a deeper understanding of structures and functions of institutions in a comparative

perspective. The course will examine politics in a historical framework while engaging with various themes of comparative analysis in developed and developing countries. The historical context of modern state, constitutional development and their political economy could be understood through an analysis of modern state and its processes of communication and culture.

Expected Learning Outcomes:

After the completion of the course,the learners will be able to understand the concept of comparative politics, different methods and approaches used to study comparative politics and also to evaluate some of the major policies in India. They would be aware about different development approaches and political regimes which distinguishes the political culture of developing countries from that of the developed countries. The unit-wise outcomes are given below.

Unit-I: This unit will aware the students about political systems, institutions, and their influence on behaviour, governance, and policy outcomes. It covers voting, public opinion, decision-making processes, rational choice theory, and the Interpretative Approach in comparative politics. Students will also learn about colonialism and decolonization, their historical, political, social, and cultural dynamics, and their significance in comparative politics.

Unit-II: The students can develop a comprehensive understanding of the modern nation-state in the Western context and its significance in comparative politics, including its political, economic, social, and cultural dimensions. Pupils can gain a thorough grasp of the Welfare State and its relevance in comparative politics, covering its evolution, challenges in the modern world, ideological underpinnings, historical antecedents, and policy implications. It helps the students to develop a comprehensive understanding of the state, ethnicity, nationalism, and nation-building in the developing world, including their historical roots, contemporary dynamics, and implications for governance, stability, and development.

Unit-III: The students may gain a comprehensive understanding of political culture, civic culture, political trust, social capital, post-materialism, and thesis of Huntington's clash of civilizations. This unit may enable the students to understand political communication, mass media's role in democratic societies, and media's influence on political attitudes and outcomes.

Unit-IV: This unit explores democratization, a process of regime transformation from authoritarian to democratic systems, analysing key features, drivers, and challenges, and identifying factors facilitating or hindering democratization. The students can develop a comprehensive understanding of the theoretical frameworks and debates surrounding development and under-development, and their implications for policies and practices aimed at promoting global development and social justice.

Course Content:

Unit: I: Introduction

a) Approaches: Institutional and Neo-Institutional Approaches

Behavioural Approach: Systems Theory and Structural Functionalism

Rational Choice Approach, Interpretative Approach

b) Colonialism in Comparative Perspective, Decolonization

Unit: II: States and Nations

a) Modern Nation State in the West

State Theories: Constitutional, Ethical and Moral, Conflict and Pluralist

b) The Welfare State: Emergence, Development and Challenges

c) The State in the Developing World; Ethnicity and Nationalism, Nation building in the developing world

Unit: III: Culture and Communication

a) Political Culture: Overview

The Civic Culture, Political Trust and Social Capital

Post Materialism, Huntington's Clash of Civilization

b) Political Communication, Mass Media and Democracy: Media influence, Social Media, impact of new technology

Unit- IV: Democratization and Development

a) Democratization: Regime Transformation, Democracy and Democratization, Waves of Democratization, Democratic consolidation, Role of Civil society in democracy

b) Theories of Development and Under-development: Political Development, Modernization, Under-development and Dependency, Globalization and Development

Core XIII

Indian Political Ideas-I

Course objective:

This course introduces the specific elements of Indian Political Thought spanning over two millennia. The basic focus of the study is on individual thinkers whose ideas are however framed by specific themes and within specific contexts. The course as a whole is meant to provide a sense of the broad streams of Indian thought while giving an understanding about

specific knowledge of individual thinkers and texts. Selected extracts from some original texts are also given to discuss in class.

Expected Learning Outcome:

This course will enable students to gain a comprehensive understanding of the evolution of Indian political thought, its historical and contemporary relevance, and its role in shaping the socio-political landscape of the nation. This knowledge will enable them to critically engage with the complex and dynamic nature of Indian politics and contribute to the ongoing discourse on the country's democratic and developmental trajectories.

Unit-I: The students will be able to understand and evaluate the political ideas and theories of Manu including his social laws and Kautilya with a focus on his theory of the state and foreign policy

Unit-II: This unit would familiarize the students about the political ideas of Barani, particularly theory of kingship and Abul Fazal's ideas on monarchy, and will enable them to evaluate their contributions to the Indian political thought.

Unit-III: This unit will enhance the understanding of students on political and social ideas of Ram Mohan Roy and Pandita Ramabai and their contributions in the field of social reforms.

Unit-IV: This unit will enable students to critically analyse the ideas of spiritual nationalism and universalism of Vivekananda, and Savarkar's concept of Hindutva.

Course Content:

Unit-I

a) Manu: Social Laws and Dharmic Government

b) Kautilya: Theory of State; Statecraft and Government

Unit-II

a) Barani: Theory of Kingship, Ideal Polity

b) Abul Fazl: Monarchy, Views on Administration

Unit-III

a) Ram Mohan Roy: Liberalism and Social Reforms

b) Pandita Ramabai: Gender and Social Reforms

Unit-IV

a) Swami Vivekananda: Ideal Society, Ideas on Hinduism

b) V. D. Savarkar: Hindutva, Nationalism

Core XIV Semester-VI

India's Foreign Policy

Course Objectives:

This course has been designed to provide the students with critical insights into the different Determinants, the fundamental goals, and numerous dimensions of India's foreign policy. It engages in the areas of economic, political, diplomatic, and strategic relations with major powers like the USA, Russia, and China. It aims to highlight the need for promoting peace and stability in the South Asian countries. The ambition to become a global power can never be accomplished without having strong ties with the regional organizations. Further, India's presence in different regional organizations has not only strengthened its global presence, it has also enhanced diplomatic possibilities. To further enhance India's aim to pursue strategic autonomy, this course attempts to study India's foreign policy like SAARC, BIMSTEC, G20+, QUAD, SCO.

Expected Learning Outcomes: After completion of the course, students will be able to understand the foreign policy of India in the changing time, its relationship with major powers as well as its engagement with the neighbours and regional powers. The unit-wise outcomes are given below.

Unit-I: This unit would benefit the students by providing a background understanding about evolution of India's foreign policy & also about some pivotal factors that play a very significant role in formulation of India's foreign policy.

Unit-II: This unit would make the students understand about different dimension of India's relationship with the major powers.

Unit-III: This unit is meant to provide broad ideas to the students about India's relationship with prominent South Asian nations in the field of culture, trade & politics.

Unit-IV: This unit, with an emphasis on existence and relevance of important regional

organisations, will help the students to understand the significant role of India in the global context in coordinating the member states.

Course Content:

Unit-I: India's Foreign Policy in a Changing World

a) Evolution of India's Foreign Policy

b) Major Bases & Determinants

c) Idealism, Realism, and pragmatism in India's Foreign Policy

Unit-II: Relationship with Major Powers: Political, Economic, Strategic

a) India's relationship with USSR/Russia

b) India's relationship with USA

c) India's relationship with China

Unit-III: Relationship with South Asian Countries

a) Relationship with Pakistan

b) Relationship with Nepal & Bangladesh

c) Relationship with Sri Lanka & Afghanistan

Unit-IV: India and Regional Organisations

a) SAARC, BIMSTEC

b) BRICS, SCO

c) QUAD, G20+

Core XV

Government And Politics In Odisha

Course Objectives:

This course aims to provide students with a comprehensive understanding of the political landscape at the provincial level, focusing on the state of Odisha. By delving into the sociopolitical history of the region, including resistance movements for provincial autonomy, learners will grasp the contextual background shaping contemporary politics. The course attempts to study the political structure and process in Odisha, while reflecting on the role of CM in Odisha politics. Additionally, it seeks to analyze the growth and development of political parties, coalition politics, electoral trends in Odisha. The course investigates the

intricate interplay of caste, class, gender, and tribe in Odisha's political arena to sharpen the understanding on inclusive development in the context of Odisha. Further, the course critically examines grassroot movements led by marginalized communities, offering insights into their agency within the political landscape of Odisha.

Expected Learning Outcomes:

The course intends to develop a nuanced understanding of political dynamics and political leadership in Odisha, fostering critical insights into its socio-economic fabric and governance paradigms which shape the discourse of development in Odisha. The unit-wise outcomes are given below.

Unit-I: This unit would help in developing a basic understanding of the demographic and economic profile of the state. Further, the awareness about the creation of Odisha as a separate province and other political movements in the pre-independence period would enable the learners to gain critical insights on political developments in Odisha in the postindependence

period.

Unit-II: The understanding of political leadership along with the political parties, electoral trends and patterns, regionalism, coalition politics etc. would enable learners to critically analyze the political dynamics and political culture in Odisha.

Unit-III: The knowledge of social cleavages e.g., Class, Caste, Tribe and Gender and their role in shaping the larger spectrum of politics as well as state's response to the aspirations of people through various interventions and policy initiatives would develop learners' capacity to analyze socio-political factors and government's role on the path of inclusive development.

Unit-IV: This unit would enable the learners to understand the significance of people's movement in shaping the state politics. This will enable them to appreciate the engagement of people in the democratic framework and the role of dissent in preserving the voices from the margins. Further, it will equip them with insights to formulate policies catering to the needs and aspirations of every section of the society.

Unit-I: Background of Odisha Politics

a) Land and the People: Demography and Economy

b) Odia Nationalism and Emergence of Odisha as a separate province

c) Odisha in Nationalist movement, Praja Mandal movement, Communist and Socialist movements

Unit-II: Political Structure and Process in Odisha

a) Role of Chief Minister in Odisha Politics

b) Growth and development of political parties: National and Regional parties, Pattern of Coalition politics in Odisha, Regionalism in Odisha Politics

c) Electoral Trends and patterns of electoral behaviour in Odisha

Unit-III: Social Structure, Development and Politics

a) Role of Class, Caste, Tribe, and Gender in Politics

b) Role of State in Development: Industrial and Mining Policies

c) Social Welfare policies in Odisha: Poverty alleviation programmes, Self-Help Groups

Unit IV: Dynamics of People's Movements in Odisha

a) Tribal Development: Tribal Advisory Council, Integrated Tribal Development Agency, Implementation of Forest Right Act, 2006

b) Development and Dispossession: Anti-displacement movements, Naxalite movement

c) Women's Movement, Dalit Movement and Tribal Movement

Multi-Disciplinary Course - SEMESTER-I

Paper-VI: Political Process in India (Political Science)

Course Objectives:

- ***To impart quality of knowledge about Political Theory.***
- ***It helps the students to know about the Meaning and Theories of Democracy.***
- ***To increase awareness among students about the Rights and Duties of a Citizen.***

Course outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- ***Demonstrate a broad and coherent body of knowledge with depth in the underlying principles and concepts.***
- ***Integrate knowledge of the diversity of cultures and peoples***
- ***Apply critical thinking, independent judgment, intercultural sensitivity and regional, national and global perspectives to identify and solve problems in the discipline of the Political Science***
- ***Demonstrate capacity for reflection, planning, ethical decision making and inter - disciplinary team work indiverse contexts of community engagement.***

Unit I

- ***Origin and Development of the Indian party system Nature and trends of Indian party system Regional parties: role and significance in Indian federalism***
- ***Political defection in India Coalition politics and parties Role of opposition parties in Indian parliamentary system***
- ***Determinants of voting behaviour: Populism Caste as a determinant of voting behavior***

Unit II

- ***Ethnicity Region & Language as determinants of voting behaviour***

• Class as a determinant of voting behaviour Gender as a determinant of voting behaviour Voting behaviour of Rural-Urban India

• Religion and voting behaviour Determinants of voting behaviour:

• Cult/Charisma/Personality Regionalism in India: a conceptual analysis Regionalism and Indian federalism

Unit III

• Accommodation of regional aspirations—Linguistic reorganization Regional aspirations: Case study of Northeast India Autonomy and secessionism: Case of

Punjab and Nagaland Statehood and Sub regional movements: Jharkhand, Chhattisgarh, and Uttarakhand.

• Autonomy movements: Bodo homeland movement and the Gorkhaland movement Impact of globalization on regional movements: Telangana Exploring the nature of identity politics in India Meaning and nature of communalism

• Variants of communal politics in post independent India Factors responsible for the growth of communal politics in India Hindu nationalism: a historical analysis

• Rise of Hindutva politics in India: contemporary scenario

Unit IV

• Indian aspect of secularism Religion-State relationship: implications for right to equality Caste as an identity in India Dominant and entrenched caste and their role in Indian politics: a contemporary scenario Caste and Indian constitutional provisions

• Electoral politics and the changing nature of caste Political mobilization of caste identities in India caste and politics: a changing scenario

• Affirmative Action Policies in India: Sources, directions and implications for class, caste and tribes A case of Affirmative Action in favour of the Adivasis: The Forest Rights Act. The Reservation Policy in India Affirmative Action for women

Multi-Disciplinary Course - SEMESTER-III

Paper-IV: ***Human Rights (Political Science)***

Course Objectives:

The course on Human Rights aims to provide a comprehensive understanding of the concept, evolution, and theoretical foundations of human rights, emphasizing their significance in contemporary society. It explores the historical development of human rights and examines various theories, including Natural, Legal, Utilitarian, and Marxist perspectives, to enable students to make broad examination of issues and policies taking into account diverse perspectives. The course delves into the universality of human rights amidst cultural diversity and assesses key international human rights instruments such as the Universal Declaration of Human Rights and subsequent international covenants and protocols. The course seeks to enable students to critically analyse the role of major international institutions like the UN, UNHRC, and UNOHCHR and their functions in promoting and protecting human rights. The course addresses contemporary issues and multidimensional threats to human rights to sensitize students on human rights issues in the local contexts. In the Indian context, it highlights the foundational principles of human rights, the institutional frame works along with the role of NGOs and civil society in human rights movements. Through this course, students will gain critical insights and analytical skills necessary to understand and address human rights challenges globally and within India.

Expected Learning Outcome:

After the completion of this course, the students would be competent in following skills and acquire adequate knowledge on the issues of Human Rights.

Unit I: *They would understand the significance of human rights and its evolution over the period of time. Also, they would learn different human right theories and connotation of human rights across cultures.*

Unit II: *This unit would make them familiarise with international covenants on Human rights; the changing dynamics of state and role of global organisations working for the cause of Human Rights.*

Unt III: *After learning this unit, they would be aware about the multidimensional nature of human rights violation.*

Unit IV: *This unit would enlighten the students on Indian perspective of Human rights drawing upon ancient philosophy, Human rights issues in contemporary India, the institutional framework to address the human rights issues.*

Unit I: Understanding Human Rights

a) Connotation of 'Rights'; Meaning, Nature and Significance of Human Rights. Evolution and Historical Development of Human Rights.

b) Theories of Human Rights: Natural, Legal, Utilitarian and Marxist;

c) Universality of Human Rights and cultural diversity.

Unit II: International Human Rights

a) International Covenants on Human Rights: Universal Declaration of Human Rights; International Covenants: Civil and Political Rights-1966, Economic, Social and Cultural Rights 1966; Optional Protocols-1976 and 1989, World Conference on Human Rights: Tehran 1968 and Vienna 1993.

b) Institutional Framework: UN, UN Human Rights Council (UNHRC), UN office of the High Commissioner for Human Rights (UNOHCHR).

c) State sovereignty and Human Rights; Human rights activism and role of Global Human Rights Organisations.

Unit III: Contemporary issues and Multidimensional aspect of threats to Human Rights.

a) Atrocities against Women, Children, SCs, STs, Minorities, Differently abled people.

b) Impact of Globalisation on Human Rights; Environment and Human rights issue.

c) Refugee crisis and Migrations, Displacement, Bonded Labour, Custodial abuse, War crimes.

Unit III: Human Rights in India

a) Underlying Human Rights Principles of Indian society: Dharma, Nyaya, Neeti, Ahimsa.

b) Institutional Framework: Constitutional provisions, NHRC, SHRC; Judicial Activism.

c) Human Rights Movements in India: Engagement of NGOs and Civil society in Protecting Human Rights.

DEPARTMENT OF EDUCATION
SARBATI DEVI WOMEN'S COLLEGE,RAJGANGPUR
PO,CO,PSO- NEP-2020

CORE COURSE I

Semester-I Paper I Philosophical Foundations of Education

Course Outcomes (COs):

On completion of the course, the students will be able to:

• To understand the philosophical foundation of education as a discipline under the faculty of the Liberal Arts

and Social Science.

• To understand various schools of thought, to develop ability to distinguish one from the other and critically

analyze each school of thought.

• To understand the basic Indian schools of thought.

• To develop the ability to relate the philosophical foundation with educational practices.

Course Contents:

UNIT-I: Education in Philosophical Perspective

Learning Outcomes

 Understand concept of education along with individual and social aims.

 Explain relationship between Philosophy and education.

 Relate the functions of philosophy in our life.

• Concept of Education, Narrower and broader concept of education.

• Concept of Lifelong Education. Individual and Social Aims of Education.

• Meaning and nature of philosophy of education. Branches of Philosophy- Metaphysics, Epistemology and

Axiology, and its educational implications.

• Functions of Philosophy in relation to education.

UNIT-II: Western Schools of Philosophy and their Educational Implications

Learning Outcomes

 Describe the nature of schools of philosophy and its branches.

 Understand Western Schools of Philosophy and their Implications to the current system of education.

• Idealism with reference to: Aims of Education, Curriculum, Methods of Teaching, Role of Teacher, Discipline.

• Naturalism with reference to: Aims of Education, Curriculum, Methods of Teaching, Role of Teacher,

Discipline

• Pragmatism with reference to: Aims of Education, Curriculum, Methods of Teaching, Role of Teacher,

Discipline

• Existentialism with reference to: Aims of Education, Curriculum, Methods of Teaching, Role of Teacher,

Discipline.

UNIT-III: Indian Schools of Philosophy and their Educational Implications

Learning Outcomes

 Understand Indian Schools of Philosophy and their Implications to the current system of education.

 Compare and contrast Indian and Western philosophies of education.

• Common Characteristics of Indian Philosophy with reference to Metaphysics, Epistemology, Axiology,

Orthodox and Heterodox

• Sankhya, Vedanta, Buddhism, Jainism with reference to: Philosophical doctrines, Aims of education,

Curriculum, Methods of Teaching, Role of Teacher

UNIT-IV: Contributions of Great Educational Thinkers Learning

Outcomes

 Critically examine contributions of great thinkers to the field of education and its reflections in curriculum

at school and higher education.

• Contributions of Western thinkers: Plato and Aristotle with reference to their philosophical orientation, aims

of education, method of teaching, role of teacher.

• Rousseau and John Dewey with reference to their philosophical orientation, aims of education, method of

teaching, role of teacher.

• Paulo Freire and Ivan Illich with reference to their philosophical orientation, with reference to their

philosophical orientation, aims of education, method of teaching, role of teacher and student.

Mode of Course Transaction: Seminar, Team Teaching, Dialogue, Peer-Teaching, Peer Group Discussion,

Collaborative and Cooperative Learning, Field Trip, Concept Mapping, Lecture Method, Self-Learning.

Practicum: 30 Marks (Any one of the following)

1) Field visit to a seat of learning/educational institute in the locality and prepare report and submission.

2) Presentation (through PPT) of a paper in Department level seminar on any topic from the above course and

submit full paper along with handout of PPT.

3) Appraisal of aims of education and curriculum proposed by one of the educational thinkers in the present

sociocultural context of India and submit the report.

(N.B.: The report will be evaluated by both internal and external examiners)

Paper II Psychological Foundations of Education (4 Credits)

Course Outcomes (COs):

On completion of the course, the students will be able to:

• Understand the concept of educational psychology

• Know different methods of educational psychology to understand

learners • Explain the different stages of growth and development

Course Contents:

UNIT-I: Educational Psychology in Developmental Perspective

Learning Outcome

1. ***Explain concept of educational psychology and its relationship with psychology.***

2. ***Describe various methods to understand learners.***
3. ***Understand concepts of growth and development of child and adolescence, and underlined general principles of growth and development.***
4. ***Describe the typical characteristics of growth and development during childhood and adolescence.***
5. ***Explain theory of cognitive development and its educational implications.***

• Concept, nature, scope and relevance of educational psychology.

• Methods to understand learners: Observation, Experimentation and Case Study.

• Concept and difference between growth and development. Principles of growth and development.

• Characteristics of development during childhood and adolescence in different areas: Physical, Cognitive, Social

and Emotional.

UNIT-II: Intelligence, Creativity and Individual difference

Learning Outcome

1. ***State different forms and characteristics of individual differences and the ways of meeting the classroom issues arising out of the differences.***
2. ***Understand concept and nature of intelligence.***
3. ***Develop insight into the theories and measurement of intelligence and creativity.***

• Individual difference: concept, nature, factors and role of education

• Intelligence: concept and nature of intelligence, concept of IQ, theories of intelligence- Two factor theories,

Guildford's structure of intelligence (SI) model, Gardner's multiple theory of intelligence.

• Measurement of intelligence: individual and group test, verbal, non-verbal test

• Creativity: meaning, nature and stages of creative thinking, strategies for fostering creativity

UNIT-III: Learning and Motivation

Learning Outcome

1. ***Develop critical ideas on various theories of learning and processes of learning with their educational implications.***
2. ***Explain concept of motivation and theories of personality.***

• Learning: Concept, nature and factors of learning.

• Learning and Maturation. Factors affecting learning.

• Theories of learning and its educational implications: Classical conditioning, operant conditioning, insightful

learning and constructivist approach to learning.

• Motivation: concepts, types, and techniques of motivation.

UNIT-IV: Personality and Mental health

Learning Outcome

- **Critically examine relevance of learning about mental health, and adjustment mechanisms.**

• List of characteristics of individual differences

• Find out the concept of intelligence

• Examine the relevance of learning about mental health and adjustment mechanism

• Personality: Concept and nature of personality. Relevance of studying personality for learning.

• Theories of personality: Type theory and Trait theory with implications. Assessment of personality: Subjective,

objective and projective techniques.

• Mental health: Concept, mental health of teacher, factors affecting mental health and role of teacher.

• Adjustment mechanism: Concept and Types.

Sample Question

1. What is behavior? [1 mark]

2. Mention any two educational implications of case study. [2 Marks] [Within 50 Words]

3. Describe the steps of creativity. [3 Marks] [Within 300 words]

4. Explain the factors affecting mental health of the learner? [8 marks] [Within 500 to 800 words]

Practicum: 30 Marks (Any one of the following)

1) Administration and interpretation of any psychological test relating to intelligence, creativity, and personality

and preparation of a report and submission.

2) Case Study of a problem child / a slow learner/ a disadvantaged child and preparation and submission of report.

3) Analysis of the common behavioral problems observed in the classroom. Suggesting the ways to address them,

Preparation and submission of report.

(N.B.: The report will be evaluated by both the Internal and External examiners.)

Mode of Course Transaction:Seminar, TeamTeaching,Dialogue, Peer-Teaching, PeerGroupDiscussion,Collaborative and Cooperative Learning, Field Trip, Concept Mapping, Lecture Method, Self-Learning.

Semester-II Paper III Sociology of Education

Course Outcomes (COs):

On completion of the course, the students will be able to:

- **Know the concept of educational sociology with its nature, scope and importance.**
- **Understand the social process**
- **Analysis the functions of different agencies of education for socialization of children.**
- **Describe the role of different agencies of education**
- **Find out the linkage between education and modernization**
- **Understand the concept of equality and equality**

Course Contents:

UNIT 1: Concept and approaches to sociology of education

Learning Outcomes

- **Understand concept of educational sociology along with its nature, scope and importance. Explain relationship between Education and Sociology.**

- **Concept, nature, scope and importance of Sociology of education.**
- **Relationship between education and sociology.**
- **Understanding the evolution of sociology of education as a discipline.**
- **Sociological theories; functionalism, conflict theory, interactionism and post modernism.**
- **Thought of Antonio Gramsci and Pierre Bourdieu**

UNIT -2: Education and social system Learning

Outcomes

1. ***Relate the functions of different agencies of education for socialization of children.***
2. ***Describe the different agencies of education and their functions***

• Agencies of education (Family, School, Society, Mass media and State) – it's Importance and functions

• Understanding education as a factor of social stratification and social mobility.

• Socialization: concept and theories of socialization (theory of G.H.Mead, Cooley's theory of the lookingglass

self, Durkheim's theory of collective representation);

UNIT-3: Education, Social change and Modernization

Learning Outcomes

1. *Describe the role of education in modernization and globalization*

• Concept, Factors and theories of Social Change, Education as an instrument of social change and social control.

• Modernization; Concept and attributes, Education for accelerating the process of modernization.

• Concept of globalization and its impact on education.

Unit-4: Social group and their educational implications

Learning Outcomes

Describe the function of education to ensure equality and equity

 Explain the process of equalization of educational opportunity and the steps taken towards its attainment

• Concept of equality, equity and inclusion: its educational implication

• Educational Opportunity and Participation in Education of Scheduled Castes, Scheduled Tribes, Women,

Minority and CWSN.

• Group dynamic- cohesion and conflict; conflict resolution

• Classroom climate; Understanding interpersonal relationship of classrooms technique (socio-metric and guess

who technique) and its educational effects.

• Social responsibility of Higher education.

Practicum: 30 Marks (Any one of the following)

1. Field visit to Study a social unit (School/Village/Slum) in the locality and prepare a report

2. Organizing some community activities, social intervention, and awareness camp in the locality for participation

of disadvantaged groups in education.

3. Presentation (through PPT) of a paper in Department level seminar on any topic from the above course and

submit full paper along with handout of PPT.

4. Make a compendium of news articles published in social media and print media about the education of

disadvantage groups.

N.B.: The report will be evaluated by both internal and external examiners)

Mode of Course Transaction:

Seminar, Team Teaching, Dialogue, Peer-Teaching, Peer Group Discussion, Collaborative and Cooperative Learning,

Field Trip, Concept Mapping, Lecture Method, Self-Learning.

Paper IV Pedagogical Perspectives in Education

Course Outcomes (COs):

On completion of the course, the students will be able to:

• *Understand the concept of pedagogy.*

• *Explain different teaching Strategies.*

• *Find out the relationship between teaching and learning.*

• *Enlist different approaches and methods of teaching.*

• *Know the core teaching skills.*

• *Prepare lesson plans following different designs.* ***Course Contents:***

UNIT I- Concept of Teaching and Learning

Learning Outcomes

- *Explain the concept of pedagogy*
- *Explain different teaching task with example*
- *Prepare a lesson plan following different designs*

• *Meaning and definition of teaching and learning, Relationship between teaching and learning*

• *Variables involved in teaching task: independent, dependent and intervening*

• Phases of teaching: Pre-active, inter- active and post- active

• Levels of teaching: memory, understanding and reflective

• Lesson plan design- The Herbartian steps, 5 E and ICON design model

UNIT II - Theories of Teaching

Learning Outcomes

- *Differentiate pedagogy from other allied concepts*
- *Establish relationship between teaching and learning • Meaning and nature of teaching theory*

• Types of teaching theories:

• Formal theories of teaching- communication theory of teaching

• Descriptive theories of teaching– Gagne's hierarchical theory of instruction and

• Bruner's cognitive theory of instruction

• Normative theories of teaching - Mitra's psychological theory of teaching and

• Clarke's general theory of teaching

UNIT III Principles and maxims of teaching

• General principles of teaching

• Psychological principles of teaching

• Maxims of teaching

• Core teaching skills: Introducing the lesson, explaining, illustrating with examples,

• stimulus variation, and reinforcement, questioning, probing questions, closure.

UNIT IV Approaches and methods of Teaching

Learning Outcomes

- *List out different approaches and methods of teaching*

• Concept of approach, method, strategy and techniques

• Methods of teaching: inductive-deductive, analytic- synthetic, problem solving and • project

• Shift in focus from teaching to learning- constructivist approach to learning

Practicum: 30 Marks

Preparation of rating scale/ checklist /observation schedule to evaluate classroom Teaching

and reporting.

NB: It will be evaluated by both the internal and external examiners.

Mode of Course Transaction:

Seminar, Team Teaching, Dialogue, Peer-Teaching, Peer Group Discussion,

Collaborative and Cooperative Learning, Field Trip, Concept Mapping, Lecture Method, Self-Learning.

Semester-III

Paper V Assessment and Evaluation in Education

Course Outcome (COs):

On completion of this course, the students will be able to:

- *Understand the meaning of assessment and evaluation*
- *Know different types of evaluation*
- *Explain the scales of measurement*
- *State the taxonomy of instructional learning objectives*
- *Describe the characteristics of Good test*
- *Analyze the principles of construction of tests*
- ***CO7:*** *Prepare a list of non- standardized*

Course Content:

UNIT 1: Assessment and Evaluation in Education

Learning Outcomes

- *Understand the concept of measurement, evaluation and assessment*
- *Gain knowledge about the nature, purpose and types of educational assessment and evaluation.*
- *Understand different scales of measurement –nominal, ordinal, interval and ratio*

- *Understanding the meaning and purpose of test, measurement, assessment and evaluation*
- *Scales of measurement- nominal, ordinal, interval and ratio*
- *Types of test- teacher made and standardized*
- *Approaches to evaluation- placement, formative, diagnostic and summative*
- *Types of evaluation- norm referenced and criterion referenced*
- *Concept and nature of continuous and compressive evaluation*

UNIT 2: Instructional Learning Objectives

Learning Outcomes

- *Explain the importance of instructional objectives for learning and its processes for enhancing the quality of learning*

and teaching

• Taxonomy of instructional Learning Objectives with special reference to cognitive domain

• Criteria of selecting appropriate Learning Objectives, and stating of general and specific instructional Learning

Objectives

• Relationship of evaluation procedure with Learning Objectives

• Difference between objective based objective type test and objective based essay type test

UNIT 3: Tools and Techniques of Assessment and construction of Test

Learning Outcomes

- *Develop and use different types of tools and techniques for continuous and comprehensive assessment of learning in the school situation*
- *Describe the characteristic of a good test.*
- *Illustrate the principles of test construction in education.*

• Steps of test construction: planning, preparing, trying out and evaluation

• Principles of construction of objective type test items- matching, multiple choice, completion and true – false

• Principles of construction of essay type test

• Non- standardized tools: Observation schedule, interview schedule, rating scale, check list, portfolio and rubrics.

UNIT 4: Characteristics of a good Test

Learning Outcomes

- *Analyze and interpret results of the assessment using standard scores.*

• Validity-concept, types and methods of validation

• Reliability- concept and methods of estimating reliability

• Objectivity- concept and methods of estimating objectivity

• Usability- concept and factors ensuring usability

Practical

Construction of Unit test on a school subject based on blueprint and reporting.

NB: It will be evaluated by both Internal and External examiners.

Paper VI Historical Bases of Indian Education

Course Outcomes (COs):

On completion of the course, the students will be able to:

• Understand the features of education during Vedic period.

• Know the relevance of Gurukal system.

• Enlist the features of education during medival period.

• Conceptualize the charter's Act (1813), Maculay's minute (1835) and other reports.

• Analyse the recommendations of committees and commissions in post-independence period.

Course Contents:

Unit – I: Education during Ancient period

Learning Outcomes

- *Know the features , aims of education during Vedic period*
- *Understand the relevance of Gurukul System*

• Education in Vedic Period - Aims of Education, Curriculum, Method of Teaching, System of Admission, Role

of Teacher. Types of Educational Institutions, Merits and limitations

• Education during Buddhist period, Concept of Buddhist Philosophy, features of Buddhist system of Education;

Admission system, Aims of Buddhist Education, curricular method of Teaching, Role of the Teacher Discipline.

Merits of Buddhist Education, Criticism of Buddhist Education.

Unit – II: Education during medieval Period

Learning Outcomes

- *Point out the features of education during medieval period*

• Education in medieval India - Aims of Education, Curriculum, method of Teaching, System of Admission, Role

of Teacher, Medium of instruction,

• Types of Educational institutions, merits and demerits of Medieval Education.

Unit – III: Education during Colonial Period

Learning Outcomes

- *Conceptualise education during pre- independence period*

• Education in British India – Charter Act of 1813, Macaulay's Minute 1835, Woods Despatch of 1854, Hunter

Commission Report – 1882, Sadler Commission – 1917, Hartog Commission Report – 1929 and Sargeant Plan

– 1944.Wardha Scheme of Education -1937NEP-2020

Unit – IV: Education during Post-Independence Period Learning

Outcomes

- *Analyse the recommendations of committees and commissions during post-independence period*
- *Examine the impact of policies and programmes one education in the present context*

• Education in post-Independence India (1948-49), The University Education Commission, Secondary Education

Commission (1952-53), Report of Kothari Commission (1964-66), National Policy on Education (1968),

National Policy on Education 1986 and Its Revised policy 1992. NEP-2020

PRACTICAL

Study on implementation of NPE (1986) in respect for elementary level. It will be evaluated by both Internal and External Examiners.

Paper VII Educational Thinkers of Modern India

Course Outcomes (COs)

On completion of this course, the learners will be able to:

• Gain insight into the fundamental ideologies of Indian philosophers.

• Develop understanding about the educational significance of philosophical ideas of Indian thinkers.

• Compare and contrast educational philosophies of modern Indian thinkers.

• Critically examine the contributions of great philosophers to the field of education.

• Relate Indian philosophy to present system of education.

• Appreciate and adopt philosophies of education in life.

COURSE CONTENTS:

UNIT-I: Contributions of Swami Dayanand Saraswati and Swami Vivekananda Learning

Outcomes

- *Develop an understanding of the contributions of Swami Dayanand Saraswati to the field of education.*
- *Analyze the educational implication of Swami Vivekananda and Ramakrishna Mission to present education.*

Part A

• Brief life sketch and philosophical orientation of Swami Dayanand Saraswati

• Contribution of Swami Dayanand Saraswati with reference to aims of education, methods of teaching, role of

teacher. ***Part B***

• Brief life philosophy of Swam Vivekananda.

• Contribution of Swam Vivekananda with reference to aims of education, methods of teaching and role of

teacher.

UNIT-II: Contributions of Mahatma Gandhi and Gopabandhu Das

Learning Outcomes

- *Critically analyze the teaching-learning practices of Satyabadi Bana Vidyalaya and its relevance to modern education.*
- *Understand the concept of Basic education of Mahatma Gandhi.*
- *Apply the principles of truth and non-violence in life.*

Part A

• Life philosophy of Mahatma Gandhi-Truth, Non-violence and Nai Talim.

• Contribution of Mahatma Gandhi with reference to Basic education, aims of education, methods of teaching,

role of teacher.

Part B

• Life philosophy of Gopabandhu Das with reference to Satyabadi Bana Vidyalaya.

• Contribution of Gopabandhu Das with reference to aims of education, methods of teaching and role of teacher.

UNIT-III: Rabindra Nath Tagore and Sri Aurobindo

Learning Outcomes

- ❖ *Reflect on the educational precepts of Rabindra Nath Tagore.*
- ❖ *Understand the concept of integral education and relate it to life.*

Part A

• *Brief life sketch and philosophies of education of Rabindra Nath Tagore.*

• Contribution of Rabindra Nath Tagore with reference to aims of education, methods of teaching, role of

teacher, Shantiniketan. **Part B**

• Brief life sketch and philosophies of education of Sri Aurobindo.

• Contribution of Sri Aurobindo with reference to aims of education, methods of teaching, role of teacher.

UNIT-IV: Mahatma Jyotibarao Phule and Gijubhai Badheka

Learning Outcomes

- ❖ *Gain insight into the salient features of Mahatma Jyotibarao Phule's effort towards educational reformation.*
- ❖ *Understand the basic concept of children's education as perceived by Gijubhai Badheka.*

Part A

• Life philosophy of Mahatma Jyotibarao Phule.

• **Relevance of Jyotiba Raophule's educational philosophy** with reference to aims of education,

methods of teaching, role of teacher and teacher-taught relationship. **Part B**

• Life philosophy of Gijubhai Badheka.

• **Relevance of** Gijubhai Badheka**'s educational philosophy** with reference to aims of education,

methods of teaching, role of teacher and Nutan Bal Shikshan Sangha.

Mode of Course Transaction: Team Teaching, Dialogue, Peer-Teaching, Peer Group Discussion,

Collaborative and Cooperative Learning, Field Trip, Self-Learning.

Practicum/Activities

Each student will be required to prepare and submit a report on any one of the following**:**

• Write a report on the origin and growth of Satyabadi Bana Vidyalaya.

• Visit to a school run by RamKrishna Mission / DAV School/ Integral School/ Saraswati Sishu Mandir

etc.

prepare a report on their educational activities.

• Prepare an album of Indian philosophers and write their thoughts on education. It will be evaluated by both internal and external examiners

Semester-IV

Paper VIII Early Childhood Care and Education (ECCE)

Course Outcomes (COs):

On completion of the course, the students will be able to:

• Describe need and importance of early childhood care and education

• State different policies, programmes and curriculum frameworks on ECCE

• Critically analyse the relevance of different methods and strategies of planning and management of ECCE

• Explain role of teacher in collaboration with school and community

• Reflect on different models and strategies of professional development of teachers at foundational stage

• Prepare exemplar holistic report card for children at ECCE

Course Content:

Unit 1: Meaning Nature and Significance of Early Childhood Care and Education

Learning Outcomes

 Understand the concept of ECCE

• Definition and objectives of holistic ECCE

• Significance of ECCE and foundational learning for holistic development

• Rationale for extending ECCE to 8 years for smooth transaction

Unit 2: Policies and Programmes and on ECCE

Learning Outcomes

 State different policies, program on ECCE

• Integrated Child Development Services (ICDS)

• National Policy on Education 1986 and PoA 1992 and on ECCE

• National Education Policy 2020 on Foundational Learning, National Curriculum Framework for Foundational

Stage (NCF-FS) 2022

• NIPUN BHARAT 2021, Nutritional support, Immunization

Unit 3: Planning and Management of ECCE Curriculum

Learning Outcomes

Analyse the principles of balanced and contextualized ECCE curriculum

• Principles of planning a balanced and contextualized ECCE curriculum.

• Long-term and short-term objectives and planning.

• Toy based Pedagogy

• Maintaining an appropriate and inclusive classroom environment.

Unit 4: Role of Teachers for ECCE

Learning Outcomes

Prepare a report on Holistic assessment of ECCE level • Partnership with parents and family care and

learning of children.

• Professional development of ECCE teachers.

• Issues of ECCE Teachers- autonomy, interaction with parents, community and authority. Issues relating to

administration, management and academics

• Holistic assessment and report card

• Foundational stage/ Preparatory stage under NEP-2020

Practicum:

A case study on unique practices of Anganwardi/ Balwardi/Pre-school Education Institution

Mode of Course Transaction:

Seminar, Team Teaching, Dialogue, Peer-Teaching, Peer Group Discussion, Collaborative and Cooperative Learning, Field Trip and visit to ECCE Center, Lecture Method, Self-Learning.

Paper IX Trends, Policies and Practices in Education

Course Outcomes (COs):

• Understand the importance of Pre-School and Elementary education.

• Analyze various problems and ensuring quality education.

• Point Out the role of SMC for Education.

• State the importance of secondary education.

• Enlist the importance of Higher Education.

• Know the emerging concerns of Indian Education.

• Elaborate life skill concept.

Course Contents:

Unit- I ECCE and Elementary School Education

Learning Outcomes

 Understand the need and importance of ECCE

• Meaning, Nature and ECCE, Challenges with regard to ECCE.

• Foundational Literacy, Numeracy (FLN) meaning nature and aims.

• Universalization of Elementary Education (UEE) – Concepts, Indicators, Efforts to achieve UEE, SSA,

Samagra Siksha Abhiyan, RTE Act, 2000 – Objectives, Issues and Problems.

• SMC – Role and import6ance. Problems of bringing the community to school.

• Concept of Vocational Education as per NEP-2020 at primary level

Unit- II Secondary Education

Learning Outcomes

 Know the impact of SSA, Samagra siksha on UEE

• Organization Structure of Secondary Education as per NEP 2020.

• RMSA – Rashtriya Sikhya Abhiyan Objectives, Features.

• Role of SMDC in promoting Secondary Education

• Secondary Education through non-formal mode- NIOS & Correspondence courses. Problems of

vocationalisation at Secondary level.

Unit- III Higher Education and Teacher Education

Learning Outcomes

 Conceptualize the structure of Higher Education as per NEP-2020

• Structure of Higher Education as per NEP 2020

• Challenge of Higher Education expansion, quality and inclusion, Concept, Objectives and Role of RUSA and

NAAC for quality education, Concept of Lokvidya.

• Role of ODL, MOOCS SWAYAM, Sodh Ganga – Concept & Importance

• Pre- Service Teacher Education- Concept, Objectives and problems. Reforms as per NCFTE-2009. Role of

DIET and CTE, IASE.

Unit- IV Emerging Concerns

Learning Outcomes

 Understand 360-degree multidimensional report.

• Reforms - Examination Systems Defects, Internal Assessment, Semester System, Grading

• Open Examination, Online Examination, Peer Assessment, Self-Assessment. Analysis of Knowledge Holistic

Development 360 Degree multi-dimensional report, Holistic Assessment, Large scale assessment.

• PARAKH (Performance Assessment, Review and Analysis of Knowledge for Holistic development) –

Concept, Objectives, Importance, Problems and issues.

• Peace Education, Concept, Objectives, Importance, Problems and Education

PRACTICAL:

• Study of Perception of Stakeholder's of Education on any of the current issues and concerns and reporting.

• It will be evaluated both by the Internal and External examiners.

Paper X: **ICT in Education**

Course Outcomes (COS):

On completion of the course, the student will be able to

• Understand the concept of educational technology and ICT in education

• Explain the concept, nature, and scope of ICT in Education.

• Explain the relationship between information technology, communication technology and information and

communication technology.

• Describe the importance of the Free and Open-Source software in education

• Demonstrate the use of various application software in education.

• Develop the ability to use various tools connect the world.

• Explore tools and techniques of ICT for assessment and evaluation.

• Understand the ethical, social and legal issues of ICT in education

• Appreciate the various policy and practice of technology in education

Course Content:

UNIT I Educational Technology

I. Meaning, nature, and scope of educational technology

II. Needs and importance of educational technology for the teachers and students.

III. Approaches to educational technology: Hardware, software, and system approach.

IV. Innovations in educational technology: Open Educational Resources (OER). Massive Open Online Course

(MOOCs)

UNIT II ICT in Education

I. Conceptual Understanding: Information Technology, communication technology, and Information

communication and technology (ICT)

II. Meaning, nature, and Scope of ICT in Education

III. Integration of technology: technology, Pedagogy, and content (TPACK), assessment and evaluation

IV. Relevance of ICT in education

UNIT III ICT Ecosystem in school

I. ICT for teaching and Learning: Hardware, application Software and FOSS

II. ICT for planning: Scheduling educational activities, ideating, and organizing events

III. ICT for documentation and classroom management: creation, storing, retrieval, manipulation and sharing of

digital information.

IV. ICT for assessment: e-portfolio, rubrics, concept map, digital storytelling, hot-potatoes. V. ICT for

continuous professional development: webinar, web conference, e-groups, MOOCs etc.

UNIT IV Emerging Issues of Educational Technologies

I. National Policy on ICT 2013, NEP 2020, Curricula for ICT in Education II.

ICT for inclusion: assistive and adaptive technology.

III. Social, ethical and Legal Issues of ICT: Security threat and measures, cyber privacy and netiquette, ethical

practices in cyber space, cyber law, and cyber safety. IV. Challenges of ICT in education.

Practicum (30 Marks) (Any two of the following)

1. Create and Develop a LMS using google classroom and design various teaching, learning and assessment activities.

2. Use assessment tools like rubistar, hot potatoes and c-map tools on any topic and submit the report.

3. Prepare a PowerPoint presentation on any topic from the course and present in the form of seminar.

4. Attend an online programme on cyber safety and security from any National or International organization and prepare a report on cyber safety and security.

Semester- V

Paper XI **Pedagogy of Odia**

Course Outcomes (COs):

On completion of this course, the learners will be able to:

• State the importance and place of Odia as mother tongue in school curriculum.

• Develop the strategies to address the problems of Odia language acquisition in multilingual context.

• Use various strategies for facilitating the acquisition of language skills in Odia.

• Decide appropriate pedagogic approaches to transact different types of lessons in Odia.

• Prepare appropriate tools for comprehensive assessment of learning in Odia.

• Explain the fundamentals of Odia linguistics and their relevance in teaching learning Odia.

• Plan appropriate pedagogic treatment of the prescribed textual contents (in Odia) of classes IX and X.

UNIT 1: Odia as Mother Tongue in School Curriculum *LO:*

Understand the issues related to teaching Odia.

• Importance of mother tongue in the life and education of an individual

• Place of Odia as mother tongue in school curriculum in Odisha (both at elementary and secondary levels) in

the context of language policy recommended by NPE, 1986 (three language formula) and NCF-2005

• Learning Objectives of teaching-learning Odia at elementary and secondary levels

• Inter-dependence of language skills in Odia and Strategies for facilitating acquisition of four-fold language

skills in Odia

UNIT 2: Pedagogic Approaches to Teaching-Learning Odia *LO:*

Acquiring skills related to methods of teaching Odia.

• Psychology of language learning and acquisition with reference to Odia as mother tongue.

• Problems and issues related to acquisition of Odia language in multi-lingual context (iii)Traditional versus

modern methods of teaching-learning Odia.

• (iv)Different approaches and strategies to the teaching-learning of: – Odia prose (detailed and non- detailed),

Odia poetry, Odia composition, Odia grammar.

UNIT 3: Curricular Activities in Odia

LO: *Develop ability to useappropriate pedagogic approaches to transact different types of lessons in Odia*.

• Pedagogic analysis:

• Content analysis- analysis of topics of Odia text book for identification of language items (new vocabulary,

structural words, grammar components), learning Objectives,

• Methods and strategies, teaching learning materials including ICT materials, assessment strategies

• Preparing Lesson Plans following Herbartian, 5E and Interpretation Construction Design Model (ICON)

UNIT 4: Assessment in Odia

LO: *Develop ability to conduct evaluation for Odia language.*

• Types of Assessment-self assessment, peer assessment, teacher assessment, internal assessment and external

assessment.

• Techniques of Assessment in Odia: Continuous Assessment of Learners performance in Odia, preparation of

different types of objective-based test items (Extended Response Type, Restrictive Response Type and Objective Type), preparation of check list, rating scale and rubric, Portfolio assessment in Odia.

PRACTICAL

• School internship (delivery of 5 Lessons following Herbartian/5E/ICON model)

• It will be evaluated by both Internal and External examiners.

Paper XII **Pedagogy of English**

Course Outcomes (COs):

On completion of this course, the learners will be able to:

• Understand the place of English in school curriculum,

• Use various methods, approaches and strategies for teaching-learning English and transact various types of

lesson plans covering all aspects of English language following different approaches

• Develop test items to assess learning in English and provide feedback as well as prepare enrichment materials

• Use the understanding of phonetics for facilitating students' speaking in English

• Plan appropriate pedagogical treatment of the prescribed contents for effective classroom transaction

UNIT 1: English in School Curriculum

LO: *Understand issues related to teaching English as a second language*.

• Language policy in India with reference to NPE 1986 and NCF 2005

• Place of English as a compulsory subject in school curriculum (both at elementary and secondary levels)

• Learning Objectives of learning English at elementary and secondary levels

• English language skills –components, their independence and interdependence

UNIT 2: Approaches, Methods and Strategies of Teaching English

LO: *Acquire skills of various methods of teaching English*

• Understanding of different methods and strategies: Bi-lingual Method, Translation Method, Direct Method,

Structural Approach, Communicative Approach.

• Listening Skill: Tasks for developing Listening Comprehension (iii)Speaking Skill: Tasks for developing

Speaking skills

• Reading skill: Types of Reading, Strategies to develop reading comprehension

• Writing Skill: Strategies to improve writing skill, Qualities of good writing (simplicity, logicality and

organization in writing)

UNIT 3: Transaction of Contents

LO: *Develop ability to organise teaching transaction*.

• Teaching of Prose (detailed and non-detailed), poetry, grammar and composition – • Approaches, Methods

and Strategies

• Pedagogic analysis: Content analysis- analysis of topics of English text book for identification of language

items(new vocabulary, structural words, grammar components),Learning Objectives, Methods and Strategies,

Teaching Learning Materials including ICT materials

• Preparing Lesson Plan following 5E and Interpretation Construction Design Model (ICON)

• Preparation of Lesson Plans following Herbartian approach.

UNIT 4: Lesson Delivery Strategies and Assessment

LO: *Develop ability amongst students to teach and to conduct evaluation for English subject*.

• Lesson Delivery Strategies: Lecturing, Role play and Dramatization, Collaborative Approach, Ability

Grouping, Group Work; Learning through Narratives and Discourses; Concept Mapping and Brain Storming

• Techniques of Assessment in English: Continuous Assessment of Learners performance in English, preparation

of different types of objective-based test items (Extended Response Type, Restrictive response Type

Practical

• School Internship (Delivery of 5 Lessons following Herbartian/5E/ICON model) It will be evaluated by both Internal and External examiners.

Paper XIII

Pedagogy of Social Science (History, Political Science and Geography)

Course Outcomes (COs):

On completion of the course, the students will be able to:

• State the meaning, scope and importance of Social Studies.

• Specify the skills and competencies to formulate specific learning outcomes for Social Studies.

• Identity the different methods and skills of teaching History, Political Science and Geography for transacting

the content effectively.

• Explain the importance of time sense and prepare timeline for teaching History.

• Prepare unit plans and lesson plans in History, Political Science and Geography.

Course Contents:

UNIT-1: Concept, Objectives and Values of Teaching Social Studies

LO: Understand basics of teaching Social Studies.

• Meaning, nature and scope of Social Studies; Values of teaching Social Studies, Social Studies in Elementary

and Secondary levels.

• Recommendations of NCF-2005 and NEP-2020 on teaching of History, Political Science and Geography;

correlation of Social Science with other school subjects.

• Formulation of specific learning outcome in Social Studies.

UNIT-II: Methods and Approaches to teaching-learning in Social Science

LO: Acquire the skills of various teaching methods of Social Science

• Story-telling.

• Narration-cum-discussion,

• Source method, project method,

• Observation, lecture-cum-discussion, problem solving.

• Teaching of Social Studies using monuments, field trip in History and Geography, History and Geography

Room.

• Qualities of a good Social Science teacher; Characteristics of a good text book in Social Studies.

UNIT-III: Development of Resource Materials

LO: Prepare teaching aids for Social Science.

• Curriculum as Resource Material

• Approaches to Curriculum in History, Bio-graphical, Chronological and Concentric

• Preparation, Collection, Procurement and use of teaching – learning materials – Maps, Atlas, Globes, Models,

T.V., Video, OHP, Computer.

• Timeline – Concept, types and use.

• ICT in learning of Social Studies.

UNIT-IV: Transaction Strategies

***LO: Apply different teaching transaction skills*.**

• Preparation of Unit Plans in Social Studies.

• Preparation of lesson plans – Traditional and 5E Model.

• Activities in History visits to historical places, maintenance of portfolio, group discussion, debate etc.

• Activities in Geography- Field trip, Geography Club and exhibition.

• Assessment in Social Studies

• Evaluation devices – written, oral, practical, project work, portfolio.

• Panning for continuous assessment of classroom learning in History, Political science and Geography.

Practicum: 30 Marks (Any one of the following)

• Identify the learning difficulties in any topic of Social Studies of Class-VI or VII and prepare remedial

materials. Preparation of low cost, no cost teaching aids on any one topic.

• Content analysis of any topic of Social Studies.

• Preparation of a blue print and test items of an achievement test in Social Studies for Class-VI or VII.

(N.B.: The report will be evaluated by both internal and external examiner).

Semester- VI

Paper XIV Knowledge and Curriculum

Course Outcomes (COs):

On completion of this course, the student-teachers will be able:

• State and explain the nature of knowledge

• Describe the process of constructing knowledge

• Differentiate different types of curriculum

• Explain the processes and principles of curriculum planning and development

• Elaborate the transaction, evaluation and renewal processes of curriculum.

Course Content:

UNIT I Understanding the Nature of Knowledge *LO:*

***Understand the concept of knowledge*.**

***LO:* Differentiate between knowledge and skill.**

• Knowledge: Concept (difference between knowledge and skill, knowledge Information, teaching and training,

reason and belief) and Nature

• Types and theories of knowledge

• Knowledge Acquisition: Source of knowledge and process of acquisition

UNIT II Construction of Knowledge

***LO: Analyze the theories of Piaget and Vygotsky on knowledge construction*.**

• Knowledge transmission (teacher-centric) vs. Knowledge construction (learner-centric)

• Process of knowing: activity, discovery and dialogue-views of Dewey, Ausubel and Bruner

• Construction of knowledge: theories of Piaget and Vygotsky; implications for curriculum

UNIT III Understanding Curriculum

***LO: Analyze various components of curriculum*.**

• Concept of curriculum and syllabus, types of curriculum (subjectcentred , teacher centred, learning-centred,

experience-centred, activity-centred, learner centred,) and components of curriculum.

• Mandates for formulation of curriculum policy (Constitutional, socio-cultural, political, economic, global

concerns, environmental, etc.)

• Curriculum framework- Concept, principles and coverage; NCF 2005, SCF 2009 and NCFTE-2009 and its

objectives, aspects and recommendations.

UNIT IV Curriculum Planning and Development *LO:*

***Explain the determinants of curriculum*.**

***LO: Understand* the principles of curriculum development.**

• Determinants of curriculum development

• Principles of curriculum development

• Approaches to curriculum planning

• Processes/stages of curriculum development and curriculum evaluation
Practical/ Assignments/Activities:

Each student is required to submit Practical/Project report/Assignments selecting any one of the following:

• Preparation of an appraisal report on any one aspect of the Systemic Reform envisaged in the NCF- 2005 and

its reflection in current practices.

• Identification of learning resources and designing of beyond classroom activities for transacting a lesson.

• Preparation of a transactional blue print of any content unit in any school subject at the secondary level.

• Preparation on of an appraisal report on the curriculum renewal process based on NEP-2020 and its reflection

in current practices

***It will be evaluated by both internal and external examiner.**

Books Recommended

Transaction Mode

Workshop, ICT-Lab Learning. Lecture Method, Seminar, team teaching, tutoring, peer group discussion, mobile

teaching, self-learning, Collaborative learning. Cooperative learning.

• Aggarwal, J.C. (1990). Curriculum reform in India – world overviews, Doaba World Education Series-3 Delhi,

Doaba House, Book seller and Publisher.

• Arora, G.L. (1984). Reflections on curriculum. New Delhi: NCERT.

• Brady, L. (1995). Curriculum development. Prentice Hall.

Paper XV Community Engagement and Services

Course Outcomes (COs):

On completion of the course, the students will be able to:

• Understand the concept of community engagement.

• State the relationship between educational institution and community linkage.

• Critically reflect on community participation and mobilization activities under Samagra Siksha.

• Prepare a field engagement report based on planning and follow up activities.

• Elaborate Sustainable Development Goals with examples.

UNIT-I Community Engagement: Need and Importance

***LO: Describe meaning and scope of community engagement*.**

LO: State different tasks involved in community engagement and mobilization

• Community engagement :Meaning and Scope

• School /educational institution and community linkage and collaboration

• Vidyanjali:School Volunteer Programme

UNIT-II Community Mobilization and Services

LO: Explain different activities under Vidyanjali: School Volunteer Programme

LO: List the qualities and skills of a teacher as community mobilizer/facilitator

LO: Critically reflect on Community participation and mobilization activities under Samagra Sikshya

• Community mobilization: Meaning and importance

• Tasks involved, role and skills of community mobilisers

• Community participation and mobilization under Samagra Sikshya UNIT-III Planning and Implementation

of Community Engagement Services *LO:* Prepare plan of action through need assessment for community

engagement.

• Identification of community needs through survey

• Organization of community service activities in different areas based on need assessment i.e. school education,

sustainable development, health and hygiene, plantation etc. UNIT-IV Reporting and follow-up of

Community Engagement Services *LO:* Prepare exemplar reports based on filed engagement activities.

• Analysis of the information received from field survey

• Reporting community engagement : different components of report i.e. introduction, method and procedure,

analysis , Critical reflection and conclusion

• Planning follow-up activities based on the field report

Multi-Disciplinary Course - SEMESTER-I

Paper-IX: Educational Psychology (Education)

Introduction:

This course provides an introduction to concepts, theories, and recent trends, in educational psychology. The topics covered include cognitive development during the school years, classroom management, instructional approaches, motivation and individual differences.

Course Outcomes:

- *To provide students with an overview of the purpose and uses of educational psychology.*
- *To make students understand the ways that educators motivate their students to learn and strive for excellence*
- *To make student explore the ways that educators manage learning environments to maximize learning and providing inclusive education*

Unit-I Foundations of Educational Psychology & Motivation

- Concept of Educational Psychology. The Teaching-learning process. Goals of Teaching and Objectives for Learning. Transfer of training. Reinforcement in learning process.

 Meaning of Motivation, Intrinsic and extrinsic motivation, Motivational techniques in classroom teaching

Unit-II Theories of Cognitive Development

 Jean Piager

 Jerome Bruner

 Lev Vygotsky

Unit-III Classroom Management

 The goals of classroom management, Characteristics of an effective teachings

 Creating inclusive environment and teaching children with learning disability & ADHD

Multi-Disciplinary Course - SEMESTER-II

Paper-III: Gender and Education (Education)

Learning Outcomes:

After reading this paper, students will:

1. understand the relationship between gender and education.

2. get overall idea on educational policies which have incorporated gender.

3. familiarize with feminist perspective on education, educational content, and pedagogy.

4. understand and comprehend the inter-linkages between gender and education.

5. critically evaluate how these inter-linkages operate towards discrimination and exclusion of women.

Unit-I: Introduction to Gender and Education

- Gender Concepts Definition of Gender and difference with sex
- Introduction to Gender and Education; Objectives and Aims of Schooling Women

- ❖ Nation, Education, and Gender Review of Policies: Kothari Commission, National Education Policy 1986, NEP-2020

Unit-II: Gender Issues & Inequalities in Education

- ❖ Gender as the Basis of Inequality in Education; Issue of patriarchy, hierarchy, power, dominance, subjugation and their relation to equality regarding Gender; Barriers to Gender Equality
- ❖ Gender Gap in Educational Access: Reasons and Implications Gender Gap in Educational Access: Reasons and Implications, Gap in Educational Access
- ❖ Dynamics of gender in the classroom in reference to girl-friendly school, co-education and single-sex schooling

Unit-III: Education from Gender Perspectives

- ❖ Developing a Feminist Perspective in Education: Curriculum Analysis
- ❖ The Report of the Committee on Status of Women in India (CSWI), The Beijing Platform for Action
- ❖ State initiated Policies and Programmes in Education from the perspectives of gender equalities
- ❖ Education for Women ‘s Equality

Transaction Mode

Lecture, Seminar, tutoring, dialogue, peer group discussion, mobile teaching, self-learning, Collaborative learning, Cooperative learning.

DEPARTMENT OF HISTORY
SARBATI DEVI WOMEN'S COLLEGE,RAJGANGPUR
PO,CO,PSO- NEP-2020

Semester-I

Core I History of India- I (From Prehistory to Vedic Age)

Course Objectives

- What were the major changes in Indian history and how did they come about?
- What were the particular institutions and cultural elements in Indian society which may be considered different from those in other societies?
- Students will acquire knowledge regarding the early life and socio-cultural status of the people of ancient India. They can gather knowledge about the society, culture, religion and political history of Ancient India. They will learn about trade and urbanization of ancient civilization, like Harappan Civilization, Vedic civilizations etc
- Students will be oriented to appreciate the changes and continuity in ancient India and also learn about how various sources which are corroborated in order to construct the history of Ancient India

Course Outcomes

- Describe the antiquity of India's past and methods of construction of past
- Describe the different sources which are scientifically corroborated to construct the past
- Describe the beginning of farming communities and scientific methods which have come up in recent years
- Understand the Vedic roots of Indic civilisation

Unit-I: Reconstructing Ancient Indian History

1. Early Indian notions of History

2. Sources of Historical Writings and the Historiography concerned with this Period

3. Historical Geography (Major Harappan Sites and Sixteen Mahajanapadas).

Unit-II: Pre-historic Hunter-Gatherers and Food Production

1. Paleolithic Cultures: Upper, Middle and Lower; Tool Typologies in Three Phases, Distribution of Sites, Subsistence Pattern

2. Mesolithic Culture: Distribution of Sites, Tool typologies, Subsistence Pattern, Evidence of Foraging

3. Neolithic: Zones of Early Farming Cultures of Indian Subcontinent (Ash Mound sites of South India, Eastern India, Vindyan Fringe, North-Western India), Crops, Subsistence Pattern, Habitation Structure

Unit-III: The Harappan Civilization

1. Origin and nature; Harappa as Saraswati-Sindhu civilisation: Settlement Patterns and Town Planning (Study of Harappa, Mohenjodaro, Kalibangan, Dholavira and Lothal

2. Economic Life: Agriculture, Craft Productions and Trade (External and Internal)

3. Social and Political Organization; Religious Beliefs and Practices; Art

Unit-IV: Cultures in Transition

1. Early Vedic Age: Sources, Geography, Society, Polity, economy Religion and Literature

2. Later Vedic Age: Social Stratification (Varna and Gender), Polity, Religion, and Culture; Philosophy of Upanishads

3. Non-Harappan Chalcolithic Cultures and Megaliths: Malwa, Kayatha, Ahar, OCP, Eastern India, Megaliths in South India

Unit I:

The unit aims to familiarise the prehistoric cultures of the Indian subcontinent. There were several changes happening as part of evolution of human being: Tool typo-technology, gene mutation resulting in changes in biological changes, migration and human colonisation. The unit also acquaints students about the emergence of early farming communities in various agro-climatic regions of India from seventh millennium BC onwards covering the early farming settlements in Deccan, Central and eastern India. Students will be encouraged to list various tools of different prehistoric periods by visiting internet based sites of various museums such as Smithsonian, US. Odisha is quite rich in prehistoric rock art and sites. Students will be encouraged to visit these sites, if possible.

Unit II:

This unit makes people appreciate that history is source-based enterprise of knowing the past and hence, it requires acquaintance and mastery of the use and analysis of various sources of the past. Questions such as what kinds of sources used in the historical narrative, issues of authorial intention, such as why Asoka wrote in edicts what he wrote, authenticity of sources and use of selective sources in construction are made acquaintance to the students. Further, the students are encouraged to appreciate the differences between India's Ithihasa Purana tradition and modern historical tradition. It is also important to understand that when we study history, national political boundary should not come in the way of understanding a historical region.

Unit III:

The Harappan was the first urban civilisation of the Indian subcontinent. How was a civilisation different from culture? Students will be asked to do map pointing of the Harappan sites and internet search to understand the social differentiation, urban character and other features of the Harappan civilisation. At the end of this unit, students shall be familiar with various aspects of Harappan Civilization as well as the contested ways of looking at the Harappan Civilisation and its attributes, such as the recent nomenclature of Saraswati-Sindhu civilisation given to the Harappan civilisation.

Unit IV:

At the end of this unit, students will be able to understand that diffusion of agriculture and use of metal technology had wide variations in the Indian Sub-continent. It also makes people understand the ways the Vedic culture, which in many ways, shaped Indian civilisation

Core II

Social Formations and Cultural Pattern of Ancient World

Course Objectives

- Students will be able to understand the evolution of human society & how the society of agricultural and animal husbandry had begun in ancient times.

 They also learn how the human society had transformed from nomadic to civilized society in ancient history of the World.

 They can acquire knowledge about the Ancient Greek polities, society and cultural life.

Course Outcome

 Critical understanding on the interdisciplinary in understanding the evolution of homo sapiens

 Develop team spirit to make group presentation on Migration, evolution, tool technology

 Skill in developing prehistoric tool technology

 Develop appreciation of the global heritage

 Appreciate the difference between Senatorial democracy and popular democracy of Rome and Greece respectively

Unit-I: Evolution of Man

 Evolution of Man: From Hominoid to Homo Sapiens

 Paleolithic Cultures: Lower, Middle and Upper Paleolithic Cultures, Tool typologies and technologies, Migration of Homo Sapiens and Colonisation

 Mesolithic Cultures, Tool Typology, Foraging, Rock Art, Religion,

Unit-II: Neolithic Culture:

 Food Production : Major Sites in Fertile Crescent, Food Production, Habitation Structure, Pottery, Neolithic Revolution

 Development of Agriculture: Early Domesticated Plants in Fertile Crescent, China, India

 Animal Husbandry: Archaeological Evidence of Animal domestication, Characteristics of Domesticated Animals

Unit-III: Bronze Age Civilizations

 Egypt: (Natural and Cultural Settings, Major Developments in Old Kingdom, Middle Kingdome and New Kingdom, Society, economy, Religion, Art and Temple Architecture

 Mesopotamia: Developments in Sumerian, Babylonian and Assyrian periods: Natural and Cultural Setting, Cultural Developments from Ubaid period to emergence of Uruk as a state, religion, society, economy and cultures of Sumer; Developments in Imperial Ur, Code of Hammurabi, and Babylonian expansion, Introduction of Iron and Neo-Assyrian Empire

 China (Shang): Pre Shang Culture, Oracle Bones, Major Developments, Chinese Society

Unit-IV: Ancient Greece:

 Athens and Sparta: Natural & Cultural Setting of Ancient Greece, Development of Polis, Evolution of Oligarchic Spartan State, its Intuitional structure, and society;

 Polity, Economy & Society: Evolution of Athenian Democracy from Solon to Peloponnesian War), Athenian Economy

 Culture: Literature, Religion, Art and Architecture, Science

Unit I:

The unit aims at making students understand the interplay of environment, biology, gene in the evolution of human beings from hominoid to homonins. It aims to make students categorise different tools based on typo-technological classification. The unit adopts a multi-displinary approach to understand human evolution and culture.

Unit II

This unit familiarises the archaeobotanical and archaeozoological evidence of agriculture and domestication of animals in different regions of the world and diversities in crop production. The beginning of agriculture accelerated numerous

other changes in human culture- growth of village settlements, more evidence of organised religions, technological changes such as pottery making. The paper would emphasise on understanding

Unit III

This unit makes people acquaint with the emergence of state and civilisation in few river valley civilisations of the world. It looks at patterns of similarities and changes in this civilisation so far as nature and ideology of kingship, religion is concerned. It looked at interrelation between religion and organisation of economic activities in these complex cultures.

Unit IV

The unit looks at various aspects of Ancient Greece as it is considered to have significantly to intellectual thought of the west. The paper looks at the evolution of city states of Ancient Greece and different trajectories of growth of various form of polities such oligarchy in Sparta and Democracy in Greece. It also examines Greek contribution in Mathematics, art, architecture and literature.

Semester II

Core III History of India-II: From State formation to early medieval (c.600BCE- c.750CE)

Course Objectives

 Understand the process of state formation and 2nd urbanism in the period of Buddha

 Analyse the relation of socio-economic changes in early historical period and rise of heterodoxy religions such as Buddhism, Jainism, Ajivakas, Lokayat

 To make students appreciate the emergence of Asokan empire and Critically understand socio-economic and political changes ushered by them

 Understand the emergence of state system in the Deccan and Odisha in the post Mauryan period

 Understand the expanding cultural arc of India by analysing the influence of India in Southeast Asia

 Make students appreciate the changes and excellences in various spheres in the Gupta period

 Understand the changes and continuities between ancient India and the beginning of early medieval, especially the beginning of Samanta system

Course Outcomes

 Students will be able to understand the linkages between social, political, economic and cultural processes of early Historical Development

 They will be able to appreciate the context and the structure of the Mauryan empire and the policy of Asoka in a multicultural past of India

 Able to identify various Indo Greek and Kushana Coins

 Students will be able to understand the nature of Puranic religion and how Puranic-agamic religion created a sacred geography of India

Unit-I: Economy and Society (circa 600 BCE to circa CE 300):

1. Urban growth: Material conditions such as agricultural expansion, Janapada nivesa, Sixteen Mahajanapada, Urban centres: Trade & Commerce, Organisation of Production (Srenis), Trade Routes

2. Social stratification: Class, Varna, Jati, Gender

3. Buddhism and Jainism: Material milieu of Heterodoxies , Social Significance, Buddhist Sects,, Major Principles of Jainism,

Unit-II: Changing Political Formations (circa 300 BCE to circa CE 300):

1. The Mauryan Empire: Asoka's Policy of Dhamma, Reading Asokan inscriptions, Administration, economy, Decline

2. Post-Mauryan Polities: Kushanas, and Satavahanas and Sangam in deep South

3. Indic Cultural Arc: India's contact with China, Central Asia and Southeast Asia; Silk route and expansion of Buddhism

Unit-III: The Guptas:

1. Political Developments: Expansion, Fragmentation and Huna Invasion from Samudra Gupta to Skanda Gupta

2. Literary and Scientific Developments during the Guptas; education in Nalanda

3. Development of Puranic Religions: Temples, Tirthas, Hindu pantheon

Unit-IV: Towards Early Medieval India [circa CE fourth century to CE 750]:

1. Agrarian Expansion, Land Grants, Graded Land Rights and

2. Peasantry.

3. Varna, Proliferation of Jatis: changing norms of marriage and property.

4. Post- Gupta Polities - Pallavas, Chalukyas, and Vardhanas

Core IV Social Formations and Cultural Patterns of the Medieval World

Course Objectives

 The Course seeks to develop a historical understanding of the major developments in some parts of the Ancient and Medieval world.

 The Course provides a scope for understanding the subject of slavery in its varied dimensions in the Ancient world. One of the objectives of the course is to highlight the interconnectedness of Greek and Roman religion, culture and society. We discuss the medieval world in the Course by analysing the nature of European 'feudal' society and economy of the 8th to the 14th centuries.

 Explores the process of emergence of Christendom and Papacy and the2nd Order

 The objective of paper is to the making of the three orders in Medieval Europe. By studying how the European social world shaped into an intricate structure comprising powerful institutions like monarchy and the Church.

 The Course provides a scope to understand the medieval economy of Western Europe, particularly through its agrarian dimensions and relatively newer labour systems like serfdom.

 And finally, the Course allows an undergraduate student to reflect on questions related to the emergence and spread of Islam. An enquiry into the role that it played in the transformation of a tribal identity to a Caliphal State in West Asia from the 7th to the 9th centuries widens the quest for 'training' students to understand the long-term historical processes.

Course Outcomes

 Upon completion of this course the student shall be able to: Identify the main historical developments in Ancient Greece and Rome.

 Gain an understanding of the restructuring of state and society from tribe-based polities to those based on territorial identity and citizenship.

 Trace the emergence and institutionalization of social hierarchies and marginalization of dissent.

 Explain the trends in the medieval economy.

 Analyse the rise of Islam and the move towards state formation in West Asia.

 Understand the role of religion and other cultural practices in community organisation.

Unit-I: Polity and Economy in Ancient Rome

1. Polity, Society and economy in Ancient Rome

2. Expansion and Crisis, -Rise and fall of Julius Caesar, Augustus Caesar, Political Expansion, Crisis of roman empire

3. Cultural Developments: literature: Vigil, Ovid, Seneca, Histories: Livy, Tacitus; Art and Architecture

Unit-II: Economic Developments in Europe from 7th to 14th Centuries:

1. Feudalism- Major Debates, Origin, Forms, Structure, Two Phases of Feudalism & its Decline

2. Agricultural Production in Two Phases of Feudalism

3. Towns and Trade

Unit-III: Religion and Culture in Medieval Europe:

1. Medieval Church: Expansion of Christianity, Early Bishopries, Papacy at Rome, Schism in Church-Ecumenical Councils and Greta Schism between Eastern and Western Church of 1054

2. Monastic Communities: Benedictine, Dominicans, Franciscan order, Anchoress; Monasteries and Education & Health

3. Papacy: Growth of Papacy from St. Peter to Avingon Papacy

Unit-IV: Societies in Central Islamic Lands:

1. The Tribal background, Rise of Islam; Major pillars of Islam, expansion of Islam

2. Religious Developments: the Origins of Shariah, Ummah, Islamic Jurisprudence, Sufism,

3. Cultural Developments in Islamic World: Tarik Tardition of Historiography,

Unit I:

This unit makes students understand the differences between the democratic forms of polity of Greek versus the roman Republican form of Government. It makes people critically analyse how the Republican institutions emerged as a checks and balances between not only institutions such as Plebeian council and Senate but as largely emerged out of the assertions of certain social groups. It also examines the shortcomings of the republican institutions and circumstances leading to the emergence of empire and rule of Caesars. Studnets are also acquainted with the slave mode of production and the crisis in it.

Unit II:

Christianity found its social support base from the poor and proletariat population of the Roman Empire. However, apart from the social base of Christianity which promised them a Kingdom of Heaven, the paper makes students understand that the spread of Christendom was also due to institution of Church. However, like other religion Christendom developed schism and split spread over many ecumenical types of council. Further it also explains how the Seas of Rome became

primus parus status among other bisopries and became the seat of Pope. The Unit also looks at the politics-religious role of Pope as well.

Unit III:

This Unit will provide a detailed understanding of European feudalism and shifts in medieval society and economy. It deals with debates on the origin of Feudalism in order to make students appreciate that there exists no divergence of opinion on the forms and structures of Feudalism. Was it a strictly legalistic, militaristic relation between lord and vassals or it is mode of production characterised by serfdom of peasants or was it characterised by Chain of Dependencies? These debates on the origin as well the forms of feudalism are dealt in this unit

Unit IV

Apart from Unit II, Unit IV also deals with another Abrahmic religion, i,e Christianity. Rather than treating it as an imminent religion, the rise and Islam has been explained in terms of historical contingencies of time. Further, the unit deals with key concepts such as contractual origin of the State of Medina, the fusion of religious & political authority in the institution of Caliphate, the notion of Umma and Sultanates in the Islamic Caliphate, and the attitude of Islamic states towards non-Muslim

Semester III

Core V History of India-III (circa 750 -1206)

Course Objectives

 They can acquire knowledge about the society, economy and culture in early medieval India and can gather knowledge towards the Arabs Conquest of Northern part of India from this paper.

 Knowledge about the religious and Cultural changing scenarios especially impact Bhakti cult and Tantricism.

 With its focus on multiple historiographical approaches to various issues of historical significance during this period, the course will also apprise students of the divergent ways in which historians approach, read and interpret their sources.

 The paper debates about urban decay and emergence of new kind of cities in early medieval

Course Outcomes

 Understand the new periodisation and its basis

 critical analysis of the relation between political realm and religious realm

 interrelation between economy, society, polity and culture in the making of vernacular region

 Debates the emergence of medieval social order, including condition of peasantry

 Discusses the nature of brahmanical social order and relations with law books which reinforced an andro-centric brahmanical social order

 Explain, in an interconnected manner, the processes of state formation, agrarian expansion, proliferation of caste and urban as well as commercial processes.

 Discuss the major currents of development in the cultural sphere, namely bhakti movement, Puranic Hinduism, Tantricism, architecture and art as well as the emergence of a number 'regional' languages.

Unit –I: Studying Early Medieval India: Political Structures

1. Sources of early medieval and Debates on early Medieval

2. Evolution of Political structures: Rajputs, Tripartite Struggle and Cholas

3. Legitimization of Kingship; Brahmanas and Temples, Tirthas and Courtly culture

4. Issues of Islam Rule: Arab conquest of Sindh

Unit-II: Social and Economic Processes:

1. Agricultural Expansion: forest-dwellers, peasants and landlords

2. Proliferation of Castes: Varna Jatis, Peasantisation of tribes.

3. Trade and Commerce: Urban Centres, Inter-regional Trade, Maritime Trade and Forms of Exchange, Ayyavole, Manigrama Guilds

Unit-III: Religious & Cultural Developments:

1. Puranic Traditions & Vajrayana Buddhism

2. Islamic Intellectual Traditions: Al-Biruni

3. Regional Languages and Literature

Unit IV: Cultural Strands: Art, Architecture and religion

1. Evolution of Regional styles: Kalingan and Dravidian style of Temple Architecture

2. Tantric Saiva and Sakta Tradition: Kashmir Saivim

3. Bhaktism and Issue of Monism and Dualism: Alvars & Nayanars of South India; Sankara, Ramanuja, Madhava

Unit I:

The early medieval period is nowadays considered to be a distinct period in the periodisation of the Indian History. It was during this period that vernacular regions like Karnataka, Andhra, Odisha, Banga emerged as distinct cultural zones. The unit deals with Feudalism Model, Integrative Model and Segmentary Model of R.S. Sharma, Hermann Kule & B.D Chattopadhyaya and Burton Stein respectively. It tries to make students aware that Arab Invasion of Sindh did not mark a rupture from

ancient India; rather changes in the social, economic and political sphere started emerging from the post Gupta period, the process of which was further accelerated in this period.

Unit II:

This unit looks at the proliferation of Jatis, the tribe and caste continuum, peasantisation of tribes and variation in caste systems within the framework of Chaturvana in India as a result of the spread of brahmanical-Puranic religion.

Core VI RISE OF THE MODERN WEST – I

Course Objectives:

 The focus of the course is on transition from feudalism to capitalism in Europe.

 The paper familiarises the student with important transitions and transformations in the economy, polity, and socio-cultural life from late medieval period to 1600 in various parts of Europe.

 The course shall critically examine the dynamics of economic and political power within Europe, and contact with the New World. The processes by which Europe's economy benefited from colonial expansion and exploitation of indigenous and slave labour will be explained.

 Students shall also engage with continuities and changes in intellectual and artistic realms; the social and economic milieu which influenced developments in religion;

 Will understand the emergence of nation state in the aftermath of 100 year religious War

Course Outcomes

 Upon completion of this course the student shall be able to: Outline important changes that took place in Europe from the medieval period.

 Acquire an integrated approach to the study of economic, social, political and cultural developments in Europe.

 Explain the processes by which major transitions occurred in Europe's economy, state forms, social structure and cultural life. Examine elements of early modernity in these spheres.

 Critically analyse linkages between Europe's state system and trade and empire.

 Understand the historically contingent nature of nation state in history and its locus in the Western Europe

Unit-I: Transition from Feudalism to Capitalism:

1. The problems of Transition: Economic Expansion, Industrial production

2. Trade and Commerce

3. Urban Development, Town Life

Unit-II: Early Colonial Expansion:

1. Motives, Voyages and Explorations.

2. The Conquests of America

3. Mining and Plantation, the African Slaves.

Unit-III: Renaissance and Reformation:

1. Its Social Roots Spread of Humanism in Europe.

2. The Renaissance: Art, Architecture, Sculpture, Painting and Literature

3. Origins and Spread of Reformation Movements.

4. Emergence of European State system: Spain, France, England, Russia

Unit-IV: Economic Developments of the Sixteenth Century:

1. Shift of economic balance from the Mediterranean to the Atlantic.

2. Commercial Revolution- Causes and Nature

3. Growth of Industries and its Impact

Unit I:

The unit makes students acquaint with debates on the decline of Feudalism in order to make students aware of the different perspectives of historians on past. The geographical discovery also brings in the issue of euro-centrism in our syllabus. Long before the European discovery of the New World and India, Arab and Viking traders traded with India in South East Asia. What is novel about geographical discovery was the colonialism of the European and destruction of indigenous people and civilisation in the New World. White Colonialism and Modernity of Europe are conjoint twins of the European project.

Unit II:

Renaissance marked the discovery of man and reason. Renaissance opened up a new world which was different from medieval Europe. The unit also makes students understand the European project of modern nation state was marred by religious wars, persecution and long period of blood which partially ended with the treat of Westphalia of 1648.

Unit III: This unit deals with different avatars of capitalism. Starting with mercantile and commercial capital, Europe slowly went to industrial capital. In the process, new financial institutions such as Bank of England, Shareholding Company, ledger account, etc emerged. The unit also acquaints with mercantilism as a school of thought and how it was challenged by Adam Smith and Ricardo.

Unit IV

As a result of the Atlantic route, theatre of commercial activities shifted from the Mediterranean to Atlantic. Empires such as Portuguese and Spanish empire emerged but later it was French, Dutch

and English who controlled the Atlantic route. With the colonisation of the New World, triangular slave trade emerged. Colonialism provided capital and market so crucial for the start of the Industrial Revolution

Core VII History of India (c.1206 - 1526)

Course Objectives:

 This course seeks to engage students in an analytical understanding of the varied perspectives from which historians study the three centuries between the thirteenth and the fifteenth centuries. It provides them with a basic understanding of the political, economic and socio-cultural processes of the time especially with reference to Rajput polities, Gujarat sultanate, Vijayanagara state as well as the Delhi Sultanate. Sufism and major trends in bhakti 'movement' are explained to the students.

 Learners are also encouraged to engage with diverse corpus of sources available to historians for the period under study.

 The objective of the course is to understand the nature of sources and nature of historical construction by analyzing tarikh tradition and historical construction by colonial, Marxist and nationalist historians

Course Outcomes

 On completion of this course, the students shall be able to: Discuss different kinds of sources available for writing histories of various aspects of life during the thirteenth to the fifteenth centuries.

 Critically evaluate the multiple perspectives from which historians have studied the politics, cultural developments and economic trends in India during the period of study.

 Appreciate the ways in which technological changes, commercial developments and challenges to patriarchy by certain women shaped the times.

 Critically evaluate the way uncritical acceptance of a particular genre of historical sources would lead to a linear flat historical construction

Unit-I: Sultanate: Political Structures

1. Survey of Sources: (a) Persian Tarikh Tradition, (b) Vernacular Histories; (c) Epigraphy.

2. Consolidation of the Sultanate of Delhi: Balban, AlauddinKhaljis and MahammadbinTughluqs.

3. Theories of kingship: The Ruling Elites: Ulema, Sufis and the Imperial Monuments (art and architecture)

Unit-II: Emergence of Regional Powers

1. Bahamanis, Vijayanagar and Odisha.

2. Regional Art, Architecture and Literature in Vijayanagar and Odisha

Unit-III: Society and Economy:

1. Iqta and the Revenue-free Grants.

2. Agricultural production, Technology.

3. Market Regulations, Growth of Urban Centres.

4. Trade and Commerce, Indian Overseas Trade.

Unit-IV: Religion, Society and Culture:

1. Sufi Silsilas: Chishtis and Suhrawardis; doctrines and practices, Social roles

2. Bhakti Movements and Monotheistic Traditions: Kabir, Nanak, Ravidas and Sri Chaitanya.

3. Social Impact of the Bhakti Tradition: Rise of Liberal Thought, Ideology of Equality and Gender Relations

Unit I:

his course seeks to engage students in an analytical understanding of the varied perspectives from which historians study the three centuries between the thirteenth and the fifteenth centuries. It provides them with a basic understanding of the political, economic and socio-cultural processes, such as the emergence of Sultanate, Regional states, south Indian polity with the emergence of Vijayanagara, vernacular polity in Odisha, etc. Question such as did the Muslims rule mark the beginning of Islamic rule in India will be debated. However, the rule seems to have not only ushered political Islam, it also introduced new historical sources in Arabic, Persian and vernacular sources. Students will be acquainted with the tarikh. Malfuzat tradition of historical writing as well as to vernacular sources such Kaifiyat, Buruzi, Bhaktiaksyana tradition of tradition available at the vernacular level.

Unit II:

It deals with diverse and heterogeneous political developments in different geographies of India.

Unit III:

This unit will apprise students of the economic, ecological and technological changes during **this period and explore the inter-linkages between them.**

Unit IV:

This unit is chiefly focussed on the religio-cultural sphere with regard especially to Sufi and Bhakti doctrines and practices, but also with regard to gender and cross-confessional interactions.

Semester-IV

Core VIII Rise of the Modern West– II

Course Objectives

 The paper is oriented to make students understand the making of modern Europe and growth of institutions in Western Europe in its march towards modernity.

 This paper offers an in-depth historical analysis of economic, political and social transformations in Europe during the 17th and 18th centuries. Scientific and secular trends in history, important political shifts, modern scientific

views, and intellectual developments of the 17th and 18th centuries will be analysed closely.

 The paper will trace the development of socio-economic and technological forces which went into the making of the Industrial Revolution in late 18th century Britain.

 The role of trade and empire, colonial networks, and slavery will be examined to emphasize their contribution to industrial capitalism.

 The course paper deals with the divergence debate will further help draw parallels and subsequent differences between Europe and Asia, and broaden our understanding of early modern Europe.

Course Outcome

 Upon completion of this course the student shall be able to: Explain major economic, social, political and intellectual developments in Europe during the 17th and 18th centuries.

 Contextualize elements of modernity in these realms.

 Discuss the features of Europe's economy and origins of the Industrial Revolution.

 Analyse the relationship between trade, empire, and slavery and industrial capitalism.

 Examine the divergence debate i.e the trajectory of History of western Europe and Asia and Africa

Unit-I: The English Revolution and European Politics in the 18th century:

1. Background: Socio-Economic and Political Crisis in 17th Century Europe.
2. Major Issues-Political and Intellectual Currents;
3. Parliamentary Monarchy;
4. Patterns of Absolutism in Europe

Unit-II: Rise of Modern Science

1. Development of Science from Renaissance to the 17th century
2. Impact of Modern Science on European society

Unit-III: Mercantilism and European Economy

1. Origin and spread of Mercantilism
2. Impact of Mercantilism on European economy
3. Agricultural and Scientific Background to the Industrial Revolution

Unit-IV: The American Revolution

1. Political currents

2. Socio-Economic Issues

3. Significance of the American Revolution

Unit I:

The Unit seeks to engage students about the shift in political power from privileged landowning and clergy class to bourgeoisie class in 17th and 18th century England. The composition of Parliament before the Glorious Revolution was dominated by old political elite whereas there had been tectonic shifts in economy and society. The Glorious Revolution of 1688 was the outcome. However, in many states of Europe, absolute monarchy was the norm.

Unit II:

The unit deals with the emergence of new world view call scientific outlook. This world view of science, based on Newtonian revolution of gravity, mechanics and calculus, created philosophical anxiety in Europe as it challenged the notion of Authority of God. The unit deals with major scientific discoveries, its impact, its philosophical basis and debates around the issue of reason and new Method of Francis Bacon

Unit III:

This unit deals with the history of chartered share holding company anchored in the principle of mercantilism. This led to monopoly mercantilism. The unit also deals with the agricultural evolution which inaugurated scientific animal husbandry and agriculture in England leading to the Industrial revolution.

Unit IV:

Student will also learn about American Revolution, its nature and limits in the backdrop of colonisation of America and its diverse demography.

Core IX HISTORY OF INDIA-Mughal India (c. 1526 - 1750)

Course Objectives:

 The course intend to engage students into a critical discussion of political, institutional and cultural processes that led to the establishment and consolidation of the Mughal state in India.

 The students would familiarise themselves with the nature and variety of sources as well as the diverse and uneven ways in which historians have treated and interpreted them

 The Paper makes students appreciate students on the political, fiscal, revenue and other measures of the Mughals that led to stable political entity called Mughal empire

 The paper deals with in other geographies of the Indian subcontinent that were not ruled by the Mughals in the sixteenth century

Course Outcomes:

 Upon completion of this course the student shall be able to: Critically evaluate major sources available in Persian and vernacular languages for the period under study

 Compare, discuss and examine the varied scholarly perspectives on the issues of the establishment, consolidation and nature of the Mughal state.

 Explain the changes and continuities in agrarian relations, land revenue regimes, Bhakti and Sufi traditions

 Discuss how different means such as visual culture was used to articulate authority by the rulers

 Discern the nuances of the process of state formation in the areas beyond the direct control of the Mughal state.

Unit-I: Establishment of Mughal Rule:

1. India on the eve of advent of the Mughals

2. Military Technology: Fire Arms, gun powder

3. Sher Shah: Administrative and Revenue Reforms

Unit-II: Consolidation of Mughal Rule:

1. Incorporation of Rajputs and other Indigenous Groups in Mughal Nobility

2. Evolution of Administrative Institutions: zabti, mansab, jagir,madad-i-maash

3. Emergence of the Marathas; Shivaji; Expansion under the Peshwas

Unit-III: Society and Economy:

1. Land rights and Revenue system: Zamindars and Peasants

2. Trade Routes and patterns of Internal Commerce; overseas trade

3. Urban Centres, Craft and Technology

Unit-IV: Cultural Ideals:

1. Religious tolerance and sulh-i-kul; Sufi mystical and Intellectual Interventions

2. Art and Architecture

3. Mughal and Rajput Paintings: Themes and Perspectives

Unit I:

This unit seeks to engage students with the circumstances leading to Mughal rule in Delhi and the new military technology the Mughals brought to India. It also makes students appreciate various administrative and infraststutcural initiatives of Sher Shah Suri.

Unit II:

This unit seeks to locate the contribution of the Mughals. They brought about a political unity and stability by keeping a strict vigil on the northwest from which numerous foreign invasions were directed against India earlier. They brought revenue reforms by introducing Jarib system of Todarmal. Mughal mints ensured genuine currency in the Mughal Empire. Further, the Mansabdari system was military administrative structure which ensured position and status in the Mughal administration. The Mughals also pursued an inclusivity policy by including Hindu elements in the ruling nobility. Their inclusive policy is reflected not only in polity and administration but also in art, architecture and painting. The Policy of Sulh-i-Kul of Akabar was a bold attempt to bring about a unity of religions.

Unit III:

The unit seeks to highlight the economy of the Mughal Empire by focusing on trade, technology and agrarian structure. It seeks to make students aware of the structural strain in the Mughal economy vy pointing out the difference between Jama (Expected income) and Hasil (realisation of revenue)

Unit IV:

This unit focuses on the cultural landscape of India in the Mughal times.

Core X

Historical Theories & Methods

Course Objectives

 It explains the major interpretive frameworks that guide modern historical writings and identify the key elements of major contemporary theories of History.

 Students will learn to evaluate the similarities and differences between historical theories and identify the central issues and problems that a particular historical theory addresses.

 Students will also learn the use of appropriate analytical language in discussing historical interpretations and can formulate interpretation in historical narratives.

Course Outcomes

 Cognitive competence by understanding the theoretical underpinning of historical construction

 Analyse the changing discourse of history

 Critical aptitude about the nature and authenticity of sources

 Understand how historical theories shaped historical narrative in different periods

 Appreciate the evolution of the discipline of history as Humanities Subject to that of a Social science discipline to integration of archaeo-metric and other natural sciences in the construction of past

Unit-I: Meaning and Scope of History

1. Definition, Nature and Scope of History.

2. Object and Value of History.

3. History, Science and Morality.

Unit-II: Traditions of Historical Writing

1. Ancient Greek Traditions – Herodotus, Thucydides

2. Ancient Roman Traditions - Polybius, Livy and Tacitus

3. Medieval Understanding: Western – St. Augustine, Arabic – Ibn Khaldun.

Unit-III: History as Interdisciplinary Practice

1. History and Archaeology, History and Anthropology.

2. History and Psychology, History and Literature.

3. History and Political Science, History and Sociology

Unit-IV: Historical Methods

1. Sources of History: Written, Oral. Visual & Archaeological.

2. Historical facts.

3. Historical Causation.

4. Historical Objectivity

Unit I:

This unit deals with the nature of history as a knowledge discipline and its expanding scope in 20th century. Question such as whether it is a science or art, finality in history, difference between historical methods and scientific methods, nature of sources will be discussed.

Unit II:

This unit deals with the ancient Greco-Roman conception of history. It seeks to bring out difference between modern historiography and ancient and medieval notion of history.

Unit III:

The third unit deals with history's relation with other social sciences and how the development of sociology has changed the historical writing. Further it deals with the way methods of physical sciences are used in historical research

Unit IV:

It seeks to engage with students on historical causation and how historical causation is different from causation in natural sciences. It deals with the difference between evidence and historical facts and issues of objectivity in historical writing

Semester-V

Core XI **History of Modern Europe- I (c. 1780-1880)**

Course Objective:

 They will learn about the French Revolution and its impact of European countries. Unity and power Makes people to strength which has showed in the French revolution in 1789.

 It shall also trace the patterns and outcomes of social upheaval throughout Europe in the first half of 19th century.

 The debates on the development and impact of industrial capitalism shall be discussed.

 The birth of new social movements, political ideas and structures shall be contextualised within developing capitalism of the nineteenth century.

 The paper intends to explore the relation between Capitalism and Imperialism and imperial conflict and discusses theories such as theory of Lenin, Hobson and Rosa Luxemburg

 Students will know about alternative to Capitalism such as Socialism, Nihilism, anarchism

Course Outcomes

 At the end of the course students will be able to identify what is meant by the French Revolution.

 Trace short-term and long-term repercussions of revolutionary regimes and Empire-building by France.

 Understand ideological alternatives to the ideology of capitalism and

 Delineate diverse patterns of industrialization in Europe and assess the social impact of capitalist industrialization.

 Students will analyse the debates on Capitalism, development theories and conflict

 Analyse patterns of resistance to industrial capital and the emerging political assertions by new social classes

Unit-I: The French Revolution (1789):

1. Socio, Religious, Economic and Political Conditions

2. Intellectual Currents.

3. Role of the Middle Classes

Unit-II: Revolution and its European Repercussions:

1. National Constituent Assembly

2. National Legislative Assembly

3. Napoleonic Consolidation- Reform and Empire

Unit-III: Restoration and Revolution: c. 1815 - 1848

1. Congress of Vienna Restoration of old Hierarchies

2. Revolutionary and Radical Movements- A) July Revolution (1830) and B) February Revolution (1848)

Unit-IV: Socio-Economic Transformation and Remaking of States (Late 18th Century to Late 19th Century)

1. Process of Capitalist Development: Agrarian and Industrial Revolutions in England and German States.

2. Evolution of Social Classes: Land Owners, Peasantry: Bourgeoisie and Proletariat

3. Popular Movements and the Formation of National Identities in Germany and Italy, Ireland

Unit I:

This paper shall provide a critical overview of the French Revolution, and acquaint the students with the repercussions of the revolution, both within and beyond France.

Unit II:

This unit deals with the making of the democratic nation-state of France through the up heavens and violence that France saw after the fall of Bastille.

Unit III:

This unit locates the continuous struggle between forces of status quo versus forces of change ushered in by the French Revolution. The status quoits wanted to go back to the days of the Absolute monarchies while forces of changes were resented by the idea of nationalism, and democracy.

Unit IV:

At the end of this unit students will be expected to demonstrate an understanding of the transformations of the political systems, social and economic in nineteenth century Europe. As a case study of fruition of the ideology of nationalism, it takes up the issue of Italian and German unification

Core XII

HISTORY OF INDIA (c. 1750 - 1857)

Course Objectives:

 Students of history will learn how to raise regional powers in India after the downfall of the Mughal Empire and in the course of time how to rise of the Company's absolute power in India.

 They can understand about the colonial nature of state during 200 years rule of the British power in this land.

 They can gather knowledge about how the Indian society, politics, religion and economy had changed during the Company's rule in India.

 They will understand how the company's economic exploitation made Indian revolutionary against the British rule.

 That ultimately paved the background of the Great Revolt of 1857.

Course Outcomes

 Appreciate the relation between capitalism and colonialism in the context of a colonial country like India

 Understand the domestic political economic and foreign policy that operated from the standpoint of the British Imperialism

 Analyse the discourses of Development by the Raj and the incidental benefits of such development on national consciousness

 Critically examines the coercive and hegemonic basis of the Raj

 Students will be able to develop team to discuss on the nature of 1857 Revolt

Unit-I: Expansion and Consolidation of Colonial Power:

1. Foreign Trade and Early forms of Economic Exploitations in Bengal

2. Dynamics of Expansion, with special reference to Bengal, Mysore and Odisha

3. Expanding frontiers: Foreign Policy of British India

Unit-II: Colonial State and Ideology:

1. Arms of the Colonial state: army, Police, Law

2. Imperial Ideology: Orientalism and Utilitarianism

3. Education: Indigenous and Modern.

Unit-III: Economy and Society:

1. Land revenue systems- Permanent, Ryotwari and Mahalwari.

2. Commercialization of Agriculture- Consequences

3. Drain of Wealth- Causes and Consequences

4. Growth of Modern Industry

Unit-IV: Popular Resistance:

1. Santhal Uprising (1856-57)

2. Indigo Rebellion (1860)

3. Movement of 1857- Causes and Consequences

Unit I & II:

This unit will discuss the structure and apparatus of governability by the Imperial British Power. The unit also looks at the way the EEC rule brought about fundamental transformation in peasants relation with the land and how it brought about the notion of individualism and eminent domain in then sphere of property and natural resources. It deals with consolidation of Colonial state through law, judiciary, army, police. The unit also deals with the emergence of cartographic British India with emphasis on extending India's natural frontier which led to war with Afghanistan and frontier extension in the north-eastern India.

Unit III:

This unit engages with the issue of disruption and change that British policies brought about in India's economy. Students will be acquainted with debates regarding the linkage between British policy, and famine, deindustrialisation debate and changes in Indian society brought about by the colonial rule.

Unit IV:

the fundamental changes brought about by colonial policies dispossessed many Indians. Many sections of India rose in protest against the British rule. These revolts vary from restoration to millenarianism. The unit discusses forms and nature of these protests.

Core XIII **History of India (c. 1857 - 1950)**

Course Objectives:

 Students can acquire vast knowledge on local rebellion and movements like the Indigo rebellion, the Deccan Riots, the growth of the new middle class; the age of associations, the Aligarh movement, the Arya and the Prarthana Samaj aftermath of 1857.

 They will learn the real historiography of Indian Nationalism; Birth of Indian National Congress, The Moderates and the Extremists, Partition of Bengal, the Swadeshi movement in Bengal in 1905.

 They can acquire knowledge how to rise of Gandhi's power in Indian politics and his activities towards the freedom like, Rowlatt Satyagraha, Khilafat and Non-cooperation movement, The Swarajya party, Poona Pact, Civil Disobedience Movement, Quit India Movement.

 They also learn how to raise communal politics and opposition politics on the eve of the Freedom movement in India and aftermath of partition in India

 The paper deals with the making of independence and Constitution making in search of an equalitarian democratic society

Course Outcome

 After successful completion of the course, the students will be able to: Identify how different regional, religious, linguistic and gender identities developed in the late 19th and early 20th centuries.

 Outline the social and economic facets of colonial India and their influence on the national movement.

 Explain the various trends of anti-colonial struggles in colonial India.

 Analyse the complex developments leading to communal violence and Partition.

 Discuss the negotiations for independence, the key debates on the Constitution and need for socio-economic restructuring soon after independence

Unit-I: Cultural Changes, Socio and Religious Reform Movements:

1. The advent of Printing and its Implications

2. Reform and Revival: Brahmo Samaj, Arya Samaj, Aligarh Movement.

3. Emancipation of Women, Sanskritization and Anti-Caste Movements

Unit-II: Nationalism: Trends up to 1919:

1. Political Ideology and Organizations, Formation of INC

2. Moderates and Extremists.

3. Swedish Movement

4. Revolutionaries

Unit-III: Gandhian Nationalism after 1919: Ideas and Movements:

1. Mahatma Gandhi: His Perspectives and Methods

2. Non- Cooperation, Civil Disobedience, Quit India,

3. Subhas Chandra Bose and INA

4. Nationalism and Social Groups: Peasants, Tribes, Dalits and Women

Unit-IV: Communalism and Partition:

1. Ideologies and Practices, Muslim League

2. Hindu Maha Sabha

3. Partition and Independence

4. Making of the Constitution

Unit I: This unit looks at the different forms of responses to colonial encounter by various sections of India, including the rise of nationalism in literature

Unit II: This unit engages with the early forms of National movements in India

Unit III: This unit the fundamental transformation in National Movement with the coming of Gandhi. This unit deals with how Gandhi's politics represented a new model for mobilizing different social groups in the national movement.

Unit IV: It deals with events leading to partition of the British India and constitution making

Semester-VI

Core XIV **History and Culture of Odisha-I**

(The Making of a Region from Early Times to 1568)

Course Objectives:

 This paper aims at making students familiar with the major currents of political and socio-economic history of pre-colonial Odisha.

 The students will understand the significance of different ruling dynasties of ancient Odisha and the process of making of a region and state formation in ancient and early medieval Odisha

 This course paper will also make the students familiar with the political and administrative history of the Afghans, Mughals and the Marathas in Odisha.

Course Outcomes:

 The students will be able to appreciate the process of state formation in pre-colonial Odisha

 They will develop critical understanding of process of making of regional traditions.

 They will be able to trace the evolution of Odia script and language.

Unit-I: Locating Odisha as a Region

1. Historical Geography: Kalinga, Utkal, Kosala, Odra

2. Early Developments**:** Mauryan intervention and Kharavela(significance of Kalinga War and Understanding Hatigumpha Inscription).

3. Rise of Local States: Matharas, Eastern Gangas, Sailodbhavas

Unit-II: Towards Regional States

1. Bhaumakaras and Somavamsis: Land grants, Political Developments, Social formations: Occupational Groups under Bhaumakaras and Somavamsis

2. Imperial Gangas: Career and Achievements of Chodagangadeva and Narasimhadeva,

3. Emergence and Evolution of Kalinga Temple Architecture: Major Specimens of (Satrughneswara, Parsurameswara, Muketsvara, Lingaraja, Vaital, Hypetheral Temples of 64 Yoginis of Ranipur-Jharial and Hirapur)

Unit-III: Imperial Gajapatis: Apogee and Decline

1. Kapilendradeva's achievements, Setbacks to Kapilendra's Odisharajya from Bengal and South during the period of Purushottama and Prataparudra,

2. Administration and Culture under the Gajapatis

3. Historical events leading to the Decline of Hindu Kingdom of Odisha

Unit IV: Religion, Art and Architecture

1. Buddhism and Jainism in Odisha, Their art and architecture

2. Saiva-Sakta Religion: Origin and Growth, Iconogrraphic forms of Durga and Siva, Saptmatrkas

3. Vaisnava Religion: Origin and Growth, Forms of Visnu, Dasavatara sets and Cult of Jagannath

Unit I:

This unit acquaints students with the formation of distinct historical and cultural region called Odisha over centuries. In the dynamic formation of Odisha as historical regions, many sub regions such Kangoda, Kalinga, Odra and Kosala came together over time to form the region. This unit deals with early developments, such the Mauryan intervention and subsequent state formation under Kharavela.

Unit II:

This unit captures the formation of local and sub-regional entities such Kosala, Kangoda, Kalinga from 6th century CE. It also deals with the way regional kingdom emerged under the Gangas and Gajapatis. Before that the Somavasmis integrated Koasala and Utkala together

Unit III:

Unit III deals with the consolidation of a historical region under the Gajapatis

Unit IV:

This unit acquaints students with the way religions and sacred geography shaped Odisha as a historical region

Core XV **History of Orissa-I: The Making of a Region**

(Afghan Rule to Post Independence Period)

Course Objectives:

 This will also help students to understand and assess the nature, causes and impact of the several resistance movements in the 19th century Odisha with a special reference to the Paik rebellion of 1817.

 The paper will critically evaluate the process through which Odia nationalism emerged in late 19th century leading to the formation of a separate state on linguistic basis.

 It also focuses on the forms and agencies of colonial capitalism in changing the pre-colonial social order in Odisha as well as political arithmetic during colonial period.

Unit I: Afghan to Maratha Occupation of Odisha (1568-1803)

1. Afghan, Mughal and Maratha Occupation of Odisha: Events, Administration and Impact

2. Emergence of Garjat States: Case of Sambalpur and Mayurbhanj

3. Evolution of Odia literature (Panchasakhas and Riti Yuga)

Unit II:

1. British Occupation and Early Colonial Administration: Land Revenue, Salt Policy, Currency Policy, Jail and Police Administration.

2. Nature, form, Limitations and causes of Resistance Movements: Ghumsar Rebellion, Paik rebellion, Keonjhar Uprisings. Revolt of 1857 and Surendra Sai

3. Famine of 1866 – Causes, Consequences and significance

Unit III:

1. Growth of Press, Education, Language Movement and Odia Nationalism

2. Nationalist Politics in Odisha (Non-cooperation, Civil Disobedience and Quit India movements in Odisha)Developments leading to Formation of a separate Province of Orissa

3. Prajamandal Movement and Merger of Princely States

Unit IV: Odisha after Independence

1. Political Developments from 1952 to 1977

2. Economic and Industrial Development in Post Independent Odisha

3. Social Development in Post Independent Odisha: Education, women empowerment: policies and Programme.

Unit I: This unit acquaints u the shift in political power with the coming of the Afghans, Moghuls and Marathas. This also deals with the developments in Odia literature from 15th to 18th century

Unit II:

The unit seeks to explain the structural changes brought about in Odisha after the British occupations of Odisha in 1803. It deals with various forms of resistance in different forms to these structural changes

Unit III:

This unit engages students with the quest for a united Odisha and rise of Odia consciousness. It also sees how both the aspirations- that of united Orissa province and struggle against colonial rule under Gandhian leadership merged. It also deals with the Garjat states and their unification after Independence leading to a united Odisha state.

Unit IV:

The unit seeks to explain the challenges of a backward region like Odisha and governance measures taken in the first quarter of Post-Independence period

Multi-Disciplinary Course - SEMESTER-I

Paper-IV: History of Education in Modern India (History)

Course Objective:

• To get general awareness on education in India over centuries and to understand its evolution.

• To understand what it meant 'to be educated' in the pre-modern India, and how the terms

• To understand and get a general awareness about the establishment of modern schools and universities, and how shaping of these institutions, ideas, and practices made India "modern."

Course Outcome:

• Students will learn about the different policies and practices that reshaped the conception of modern education.

• Students will get to appreciate the evolution of educational practices from Early India to Modern India.

• Students will learn and grasp the diversities of educational practices and how they were made uniform with the advent of colonialism and its reshaping forces.

Unit I: Pre Colonial education, Western Challenge Western Encounter and Educational Challenges

Educational activities of East India company (1600-1765), Educational Policy of the East India Company (17651813), Danish Mission (1706-92), Work of Serampore Trio and others in Bengal (1758-1813), Indigenous education in early 19th century: Reports of Madras, Bombay and Bengal presidencies.

Unit II: Before and After Macaulay:

• Private educational enterprise by British Officials and non-officials (1813 – 53), Private Indian enterprise in education (1813-53), Macaulay's Minutes on Education (1835) & its main recommendations,

• Wood's Despatch (1854) and its significance,

• Understanding ideological and administrative influences on Education

Unit III: Education between Command, Commissions and National Alternatives

• Indian Education Commission (1882-83) & its main recommendations; Indian Universities Commission

(1902), Calcutta University Commission (1917-19) & its critical appraisal

• Zakir Husain Committee Report (1938) &Nai Talim,

• Post-war educational developments (Sergeant Plan, 1944).

Unit IV: Education in Contemporary India: Issues in the foundation of Aided and autonomous educational institutions and Politics

• Establishment of IITs and IIMs, Growth of Indian Universities,

• Kothari Commission Report and NEP of 1986

• NEP 2020

Unit I: Students will learn about the pre-colonial education models, and how the Western encounter changed the face of education. Basically, they will be equipped to think and know what is "modern" about the "Modern Education".

Unit II: Students will learn about the impact of TB Macaulay and his legacy for education in India. By closely reading different Minutes on Education, students will be able to adjudge the impact and influence of Macaulay on education.

Unit III: Students will learn how different commissions and committees shape educational policies and curriculum design. They will grasp the political and historical context under which educational policies are made and changed, and what rationale justify such moves.

Unit IV: Students will learn about education in contemporary India, and how different institutions of national importance came into being. What is the role of education in making India developed, and how are we dealing with the issues of equity and fairness in education historically.

DEPARTMENT OF ODIA
SARBATI DEVI WOMEN'S COLLEGE, RAJGANGPUR
PO,CO,PSO- NEP-2020
Core I ପ୍ରଥମ ପର୍ଯ୍ୟାୟ (Semester-I)

ଭ୍ାଷାବିଜ୍ଞାନ

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି):

ଭାଷା ଭାବବିନିମୟର ମାଧ୍ୟମ । ଭାଷା ବ୍ୟବହାର କ୍ରି ସଜଚନଶୀଳ ସ୍ରଷ୍ଟା ସାହିତ୍ୟସୃଷ୍ଟି କ୍ରିଥାଏ । ଫତଣୁ ସାହିତ୍ୟ ବିଷୟକ୍ ପାଠ୍ୟଖସଡାର ଅୋୟଫର ଭାଷା ସମ୍ପକ୍ଟଫର ସାଧାରଣ ଉପଲବ୍ଧି ଆଣିବା ନିମିର୍ତ୍ ଏହି ପତ୍ରଟି ଉପଫଯାଗୀ ଫହବ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳଶ୍ରୁତି):

୧ମ ଏକକ : ଭାଷା କ୍'ଣ, ତାହାର ପରିଚୟ, ଭାଷାର ସ୍ୱରୂପ ଓ ବିବିଧ ପ୍ରକ୍ାରଫଭେ ସମ୍ପକ୍ଟଫର ଏହି ଏକ୍ ଉପଲବ୍ଧି ଆଣିବ ।

୨ୟ ଏକକ : ଭାଷା କ୍ିପରି ଉପର୍ତ୍ି ଫହଲା, ଫସ ସମ୍ପକ୍ଟଫର ପ୍ରଚଳିତ ବିବିଧ ସିଦ୍ଧାନ୍ତର ପରିଚୟ ଲାଭକ୍ରି ଛାତ୍ରଛାତ୍ରୀ ଭାଷା ସୃଷ୍ଟିର େିଗୈଗନ୍ତକ୍ୁ ଜାଣିପାରିଫବ ।

୩ୟ ଏକକ : ବିଶ୍ୱଫର ବହୁଭାଷା ପ୍ରଚଳିତ । ଭାଷାତତ୍ତ୍ୱ େ୍ଟିରୁ ଫସହି ସମୁେ୍ାୟ ଭାଷାକ୍ୁ ଫନଇ ପୃଥ୍ବୀର ଭାଷା ପରିବାର ଗଠିତ। ଫସହି ଭାଷା ପରିବାର ସମ୍ପକ୍ଟଫର ଛାତ୍ରଛାତ୍ରୀ ଜାଣିବା ନିତାନ୍ତ ଆବଶୟକ୍ । ଏହି ଏକ୍ଟି ଫସହି ଉଫେଶୟ ପୂରଣ କ୍ରିବ ।

୪ଥ୍ ଏକକ : ଫଗାଟିଏ ନିେ୍ିଷ୍ଟ ପ୍ରଫେଶଫର ଫଯଉଁ ମୁଖୟ ଭାଷା ପ୍ରଚଳିତ, ତାହା ସାଧାରଣତଃ ମାନକ୍ ଭାଷା ରୂଫପ ପରିଚିତ ହୁଏ। ମାତ୍ର ବିବିଧ ଅ୍ଚଳଫର ମାନକ୍ଭାଷା ବୟତିଫରକ୍ ଅନୟ ଫକ୍ତକ୍ ଆ୍ଚଳିକ୍ ଭାଷାର ପ୍ରଚଳନ ପରିଲକ୍ଷିତ ଫହାଇଥାଏ । ଏହି ଏକ୍ଟର ମାନକ୍ଭାଷା ଓ ଉପଭାଷା ସମ୍ପକ୍ଟଫର ଶିକ୍ଷାଥଚୀ ଜ୍ଞାନଲାଭ କ୍ରିପାରିଫବ ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : ଭାଷାର ସାଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ପ୍ରକ୍ାରଫଭେ

୨ୟ ଏକକ : ଭାଷା ଉପର୍ତ୍ି ସମ୍ପକ୍ଟୀୟ ବିଭିନ୍ନ ସିଦ୍ଧାନ୍ତ

୩ୟ ଏକକ : ପୃଥ ିବୀର ଭାଷା ପରିବାର

୪ଥ୍ ଏକକ : ମାନକ୍ଭାଷା ଓ ଉପଭାଷା

ସହାୟକ ଗ୍ର୍ସୂଚୀ (Book of Reference) :

୧. ଭାଷାବିଜ୍ଞାନର ରୂପଫରଖା –ବାସୁଫେବ ସାହୁ, ଫେଷ୍ଟସ୍ ପବି ିଶସଚ, କ୍ଟକ୍ ।

୨. ଭାଷାଶାସ୍ତ୍ର ପରିଚୟ –ଫଗାଫଲାକ୍ ବିହାରୀ ଧଳ, ଓ.ରାଜୟ ପା.ପୁ.ପ୍ର. ଓ ପ୍ର. ସାଂସ୍ଥା, ଭୁବଫନଶ୍ୱର ।

୩. ଓଡିଆ ଭାଷାର ସୃଷ୍ଟି ଓ ବିକ୍ାଶ –ଉଫପନ୍ଦ୍ର ପ୍ରସାେ େଳାଇ, ଏ.ଫକ୍ ମିଶ୍ର ପବି ିଶସଚ , କ୍ଟକ୍ ।

୪. ଓଡିଆ ଭାଷାର ଉଫନେଷ ଓ ବିକ୍ାଶ –ବାସୁଫେବ ସାହୁ,ଫେଷ୍ଟସ୍ ପବି ିଶସଚ, କ୍ଟକ୍ ।

୫. ଭାଷା ଭାବନା - ସାଂ. ବିଜୟଲକ୍ଷ୍ମୀ ମହାନ୍ତି, ବିେୟା ପ୍ରକ୍ାଶନୀ, ଭୁବଫନଶ୍ୱର ।

୬. ଓଡିଆ ଭାଷା ଓ ଭାଷାବିଜ୍ଞାନ –ଫେବୀ ପ୍ରସନ୍ନ ପଟ୍ଟନାୟକ୍, ଗ୍ରନ୍ଥମନ୍ଦିର, କଟକ୍ ।

୭. ଓଡିଆ ଭାଷାର ଉପ ଭାଷା-ସତ୍ୟନାରାୟଣ ରାଜଗୁରୁ, ଓଡିଶା ସାହିତ୍ୟ ଏକାଡମୀ, ଭୁବନେଶ୍ୱର ।

୮. ମଣିଷର ଭାଷା- ନଗାନେଲାକ୍ ବିହାରୀ ଧଳ, ନେଶନ୍ସ୍ ପବ୍ଲିଶିଂସଚ, କଟକ୍ ।

୯. ଭାଷା ଚର୍ଚ୍ଚା ପରାମ୍ପରା-ଗଗନେନ୍ଦ୍ରନାଥ ଦାଶ, ନେଶନ୍ସ୍ ପବ୍ଲିଶିଂସଚ, କଟକ୍ ।

Core II

ପ୍ରଥମ ପର୍ଯ୍ୟାୟ (Semester-I)

ସାହିତ୍ୟର ସ୍ୱରୂପ

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି):

ସାହିତ୍ୟ ବିବିଧରୂପର ସମାହାର । କାବ୍ୟ କବିତା, ଗଳ୍ପ ଉପନ୍ୟାସ, ନାଟକ ,ଏକାଙ୍କିକା ଏବାଂ ଗେୟ ସାହିତ୍ୟର ଭିନ୍ନଭିନ୍ନ ରୂପ ସାହିତ୍ୟକୁ କିଛି ପରିପୁଷ୍ଟ । ଛାତ୍ରଛାତ୍ରୀମାନେ ସାହିତ୍ୟର ସହି ରୂପଗତ ବୈଚିତ୍ର୍ୟ ଓ ତାର ତାତ୍ତ୍ୱିକ୍ ବୋଧ ଉପର ଅବଗତ ହବା ଆବଶ୍ୟକ୍ । ଏହି ପତ୍ରଟି ଶିକ୍ଷାର୍ଥୀମାନଙ୍କୁ ସେ ସମ୍ପର୍କର ଧାରଣା ପ୍ରଦାନ କରିବ ।

Unit Wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳଶ୍ରୁତି) :

୧ମ ଏକକ : କାବ୍ୟ, ମହାକାବ୍ୟ ଓ କବିତାର ସାଂଜ୍ଞା ସ୍ୱରୂପ ଓ ବିବିଧତା ସମ୍ପର୍କରେ ଛାତ୍ରଛାତ୍ରୀ ଏଥିରୁ ଜ୍ଞାନ ଲାଭ କରିବ ।

୨ୟ ଏକକ : କଥାସାହିତ୍ୟର ଜଗତ ମଧ୍ୟ ବର୍ତ୍ତିଳ, ବିଶେଷତଃ ଗଳ୍ প ଓ ଉପନ୍ୟାସର ତାତ୍ତ୍ୱିକ୍ ବୋଧ ସହ ତାହାର ବିଶେଷତ୍ୱ ଓ ପ୍ରକାରଭେଦ ଏହି ଏକକୁ ଜାଣି ହେବ ।

୩ୟ ଏକକ : ନାଟକ ଓ ଏକାଙ୍କିକା ସାହିତ୍ୟର ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ଅଂ । ଏହା ଏକାଧାରରେ ପାଠକ ଓ ଦର୍ଶକକୁ ଆକୃଷ୍ଟ କରିଥାଏ । ତେଣୁ ଏ ଉଭୟର ସାଂଜ୍ଞା, ସ୍ୱରୂପ, ରୂପଭେଦ ଉପରେ ଏହି ଏକ୍ଟ ଅବଗତ କରାଇବ ।

୪ର୍ଥ ଏକକ : ଗେୟ ରଚନାର ବିଭିନ୍ନତା ମଧ୍ୟରୁ ପ୍ରବନ୍ଧ, ରମ୍ୟ ରଚନା, ଭ୍ରମଣ କାହାଣୀ ତଥା ଜୀବନୀ ଓ ଆତ୍ମଜୀବନୀ ଆଧୁନିକ୍ ସାହିତ୍ୟକୁ କିଛି ସମୃଦ୍ଧ ।ଏହି ରଚନାମାନଙ୍କର ତାତ୍ତ୍ୱିକ୍ ଓ ଗୁଣାତ୍ମକ୍ ବୈଶିଷ୍ଟ୍ୟ ଜାଣିବା ପାଇଁ ଏହି ଏକ୍ଟ ଉଦ୍ଦିଷ୍ଟ ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : କାବ୍ୟକବିତା - କ) କାବ୍ୟ, ମହାକାବ୍ୟର ସାଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ପ୍ରକାର ଭେଦ

ଖ) ଗୀତିକବିତା, ଗାଥାକବିତା, ସନେଟ୍, ସନେଟାଧନଗୀତିକାର ସାଂଜ୍ଞା ଓ ସରୂପ

୨ୟ ଏକକ : ଗଳ୍ପ ଓ ଉପନ୍ୟାସ – (କ) ଗଳ୍ପର ସାଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ପ୍ରକାରଭେଦ

(ଖ) ଉପନ୍ୟାସର ସାଂଜ୍ଞା, ସରୂପ, ଓ ପ୍ରକାରଭେଦ

୩ୟ ଏକକ : ନାଟକ ଓ ଏକାଙ୍କାଂକିକା - (କ) ନାଟକ୍ର ସାଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ପ୍ରକାରଭେଦ

(ଖ) ଏକାଙ୍କାଂକିକାର ସାଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ପ୍ରକାରଭେଦ

୪ଥି ଏକକ : ଗେୟ ସାହିତ୍ୟ – (ପ୍ରବନ୍ଧ, ରମ୍ୟରଚନା, ଭ୍ରମଣ କ୍ାହାଣୀ, ଜୀବନୀ-ଆତ୍ମଜୀବନୀର ସାଂଜ୍ଞା ଓ ସ୍ୱରୂପ)

Core III **ଦ୍ୱିତୀୟ ପର୍ଯ୍ୟାୟ (Semester - II)**

ପ୍ରାଚୀନ ଓଡ଼ିଆ ସାହିତ୍ୟର ଇତିହାସ

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି):

ଓଡିଆ ସାହିତ୍ୟର ପ୍ରାଚୀନ ଐତିହ୍ୟ ଫଗୌରବାବହ । ବିଫଶଷତଃ ଫବୌଦ୍ଧ ସିଦ୍ଧାଚାଯଚଯମାନଙ୍କ ଚଯଚଯାଗୀତିକ୍ାଠାରୁ ପ୍ରସଖା ପଯଚଯନ୍ତ ଓଡିଆ ସାହିତ୍ୟଫର ଓଡିଶାର ଧମଚଧାରା, ସାମାଜିକ୍ ଓ ସାଂସ୍କୃତିକ୍ ପ୍ରାଣପ୍ରବାହ ତଥା ଓଡିଆ ଜାତିର ଅସ୍ମିତା ପ୍ରସ୍ଫୁଟିତ । ଏହି ପତ୍ରଟିର ଅଧ୍ୟୟନ ମାଧ୍ୟମଫର ଶିକ୍ଷାଥଚୀମାଫନ ପ୍ରାକ୍-ସାରଳା, ସାରଳା ଓ ପ୍ରସଖା ସାହିତ୍ୟର ଐତିହାସିକ୍ ବିକ୍ାଶ ଓ ବିଫଶଷତ୍ୱକ୍ୁ ଉପଲବ୍ଧି କ୍ରିପାରିଫବ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳଶ୍ରୁତି) :

୧ମ ଏକକ : ପ୍ରାକ୍-ସାରଳା ଯୁଗର ସାହିତ୍ୟ ମୁଖ୍ୟତଃ ଧମଚଫକ୍ଂେନ୍ଦ୍ରିକ୍, ତନେଧରୁ ଫବୌଦ୍ଧଧମଚ ଓ ନାଥଧମଚ ସମ୍ପକ୍ଟଫର ରଚିତ ସାହିତ୍ୟ ଉପଫର ଏହି ଏକ୍ଟ୍ ଧାରଣା ପ୍ରୋନକ୍ରିବ । ପ୍ରସ୍ଫୁକ୍ରଫମ ଛାତ୍ରଛାତ୍ରୀ ତତ୍ କ୍ାଳୀନ ସାମାଜିକ୍ ଓ ସାହିତ୍ୟକ୍ ପରିଚୟ ସମ୍ପକ୍ଟଫର ମଧ୍ୟ ଅବଗତ ଫହାଇପାରିଫବ ।

୨ୟ ଏକକ : ମହାକ୍ବି ସାରଳା ଂୋସଙ୍କ ସାହିତ୍ୟ ଓଡିଶାର ସାମାଜିକ୍ ଓ ସାଂସ୍କୃତିକ୍ ଜୀବନର ଫବୈଶିଷ୍ଟ୍ୟ ବହନ କ୍ଟର । ଶାଂସିତ ଏକ୍ଟ୍ଟର ତାହା ଉପଲବ୍ଧ ଫହବ ।

୩ୟ ଏକକ : ପ୍ରସଖା ସାହିତ୍ୟକ୍ଟ୍ଟ ମଧ୍ୟରୁ ବଳରାମ ଂୋସ ଓ ଜଗନ୍ନାଥ ଂୋସଙ୍କ ଭୂମିକ୍ା ଅଗ୍ରଗଣ୍ୟ । ଏହି ଂେୁଇ ସାହିତ୍ୟ ସାଧକ୍ଟ୍ଟ ସମ୍ପକ୍ଟଫର ଏହି ଏକ୍ଟ୍ର ଅଧ୍ୟୟନ ଉପାଫେୟ ଫହବ ।

୪ଥି ଏକକ : ଅଚୁୟତାନନ୍ଦ, ଯଫଶାବନ୍ତ ଓ ଶିଶୁ ଅନନ୍ତଙ୍କ ସାରସ୍ୱତ ସୃଷ୍ଟିର ମହତ୍ତ୍ୱ ଏହି ଏକ୍ଟ୍ଟୁ ମିଳିପାରିବ ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : ପ୍ରାକ୍-ସାରଳା ସାହିତ୍ୟ : ଚଯୟାଗୀତିକ୍ା ଓ ନାଥ ସାହିତ୍ୟ

(ସାମାଜିକ୍, ସାହିତ୍ୟକ୍, ଧାମିକ୍ ମୂଲୟାୟନ)

୨ୟ ଏକକ : ସାରଳା ସାହିତ୍ୟ

(ସାମାଜିକ୍, ଐତିହାସିକ୍, ସାଂସ୍କୃତିକ୍ ଓ ସାହିତ୍ୟକ୍ ମୂଲୟ)

୩ୟ ଏକକ : ପାଂଚସଖା ସାହିତ୍ୟ : ବଳରାମ ଂୋସ ଓ ଜଗନ୍ନାଥ ଂୋସ (ବିଫଶଷ ଅଧ୍ୟୟନ)

୪ଥି ଏକକ : ଂେଚସଖା ସାହିତ୍ୟ : ଅନନ୍ତ ଂୋସ, ଯଫଶାବନ୍ତ ଂୋସ ଓ ଅଚୁୟତାନନ୍ଦ ଂୋସ (ବିଫଶଷ ଅଧ୍ୟୟନ)

ସହାୟକ ଗ୍ରନ୍ଥ ସୂଚୀ

Core IV **ଦ୍ୱିତୀୟ ପର୍ଯ୍ୟାୟ (Semester - II)**

ମଧ୍ୟଯୁଗୀୟ ଓଡ଼ିଆ ସାହିତ୍ୟର ଇତିହାସ

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି):

ମଧ୍ୟଯୁଗୀୟ ଓଡିଆ ସାହିତ୍ୟ ଆ□ିକ୍ ଓ ଆତ୍ମିକ୍ େୃଷ୍ଟିରୁ ଫବଶ୍ ବିଭବଶାଳୀ । ଏହାର ପୃଷ୍ଠଭୂମି ସମକ୍ାଳୀନ ସାହିତ୍ୟର ଆଳଙ୍କାରିକ୍ ଫବୈଚିତ୍ର୍ୟ, ରସଫଚତନା, ଛନ୍ଦିଭବ, ଫସୌନ୍ଦ୍ୟଚୟ ଫଚତନା ଆଦି ବିଫଶଷ ପ୍ରଣିଧାନଫଯାଗୟ । ପ୍ରସ୍ତୁତ ପତ୍ରର ପାଠ୍ୟଖସଡାରୁ ଶିକ୍ଷାଥଚୀମାଫନ ମଧକ୍ାଳୀନ ଓଡିଆ ସାହିତ୍ୟର ରୂପଗତ ଓ ଗୁଣଗତ ବିଫଶଷତ୍ୱ ଜାଣିପାରିଫବ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳଶ୍ରୁତି):

୧ମ ଏକକ : ଧମଚଧାରା, ରାଜନୀତି, ସାମାଜିକ୍ତା ତଥା ସା।ଂସ୍କୃତିକ୍ ପୃଷ୍ଠଭୂମି ଉପଫର ଏହି ଏକ୍ଟି ପଯଚୟବସିତ ଫହାଇଥିବାରୁ ଏହି ସମୟର ସାହିତ୍ୟର ସୃଷ୍ଟି ପୃଷ୍ଠପଟ୍ଟଫର ରହିଥିବା େିଗଗୁଡିକ୍ ବିଷୟଫର ଛାତ୍ରଛାତ୍ରୀ ଅବଗତ ଫହଫବ ।

୨ୟ ଏକକ : ଆ□ିକ୍ େୃଷ୍ଟିରୁ ମଧ୍ୟଯୁଗୀୟ ଓଡିଆ କ୍ାବୟ ସାହିତ୍ୟ କ୍ିପରି ବହୁ ବିବିଧତାପୂର୍ଣ୍ଣଚ ତାହାର ଧାରଣା ଏଠାଫର ମିଳିପାରିବ।

୩ୟ ଏକକ : ମଧ୍ୟଯୁଗୀୟ ଓଡିଆ ସାହିତ୍ୟର ଭାବାେଶଚ, ରସଫଚତନା ଓ ଫସୌନ୍ଦ୍ୟଚୟଫବାଧ ସାହିତ୍ୟର ଆତ୍ମିକ୍ େିଗକ୍ୁ କ୍ିପରି ବିମଣ୍ଡିତ କ୍ରିଛି, ତାହା ଏହି ଏକ୍ଟୁ ଉପଲବ୍ଧ ଫହବ ।

୪ଥ୍ ଏକକ : ମଧ୍ୟଯୁଗୀୟ ସାହିତ୍ୟର ଫଗାଟିଏ ଜନପ୍ରିୟ ବିଭାଗ ଫହଉଛି ଗୀତିକ୍ବିତା । କ୍ଷୁଦ୍ରକ୍ଷୁଦ୍ର ଗୀତିରଚନା ମାଧମଫର ତଥା ଚମ୍ପୂ, ଚଉପୋ, ଭଜନ, ଜଣାଣ ଓ ମୁଷ୍ଟିଫମୟ ଗେୟ ରଚନା ଦ୍ୱାରା ଏ ଯୁଗର ସାହିତ୍ୟ କ୍ିପରି ପରିପୁଷ୍ଟ , ତାହାର ଧାରଣାଫେବ ଏହି ଏକ୍ ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : ମଧ୍ୟଯୁଗୀୟ ଓଡିଆ ସାହିତ୍ୟର ପୃଷ୍ଠଭୂମି (ସାମାଜିକ୍, ସା।ଂସ୍କୃତିକ୍, ରାଜନୀତିକ୍ ଓ ଧମଚୀୟ)

୨ୟଏକକ : ମଧ୍ୟଯୁଗୀୟ କ୍ାବୟର ଆ।ଂଗିକ୍ ଫବୈଚିତ୍ର୍ୟ (ବିଷୟବିନୟାସ, ଭାଷା ,ଛନ୍ଦ୍, ଆଳା।ଂକ୍ାରିକ୍ତା ଓ ବର୍ଣ୍ଣଚନା ଫବୈଚିତ୍ର୍ୟ)

୩ୟ ଏକକ : ମଧ୍ୟଯୁଗୀୟ କ୍ାବୟର ଆତ୍ମିକ୍ ବିଭବ (ରସ, ଫସୌନ୍ଦ୍ୟଚୟ ଫଚତନା ଓ ଭାବାେଶଚ)

୪ଥ୍ ଏକକ : ମଧ୍ୟଯୁଗୀୟ ଓଡିଆ ଗୀତିକ୍ାବୟ ଓ ଗେୟଧାରା -

(କ୍) ଚମ୍ପୂ, ଚଉପୋ, ଫକ୍ାଇଲି, ଚଉତିଶା, ଭଜନ, ଜଣାଣ

(ଖ) ମଧ୍ୟଯୁଗୀୟ ଓଡିଆ ଗେୟର ପରିଚୟ

Core V **ତୃତୀୟ ପର୍ଯ୍ୟାୟ (Semester-III)**

ଆଧୁନିକ ଓଡ଼ିଆ ସାହିତ୍ୟର ଇତିହାସ : ନବଜାଗରଣ ର୍ଯୁଗ ଓ ସତୟବାଦୀ ଧାରା

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି): ଆଧୁନିକ୍ ଯୁଗଫର ଓଡିଆ ସାହିତ୍ୟଫର ଆସିଛି ବୟାପକ୍ ପରିବର୍ତ୍ତନ। ବିଭିନ୍ନ ପତ୍ରପତ୍ରିକ୍ା ପ୍ରକ୍ାଶନ ସହିତ କ୍ାବୟସାହିତ୍ୟ ଓ ଗେୟସାହିତ୍ୟର ଘଟିଛି ଅଭିନବ ଉପନେଷ । ଶା।ଂସିତ ପାଠ୍ୟପତ୍ରଫର ଆଧୁନିକ୍ ଯୁଗର ନବଜାଗରଣ ଓ ସତୟବାେୀ ପଯଚୟାୟ ସମ୍ପକ୍ଫର ଅବଗତ ଫହବାର ସୁଫଯାଗ ରହିଛି ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳଶ୍ରୁତି) :

୧ମ ଏକକ : ସାହିତୟଫର ନବଜାଗରଣର ପୃଷ୍ଠଭୂମିଫର ଇାଂରାଜୀ ଶିକ୍ଷା, ପାଠୟପୁସ୍ତକ୍, ମୁଦ୍ରଣଯନ୍ତ୍ର, ପତ୍ରପତ୍ରିକ୍ା ତଥା ଭାଷା ଆଫନ୍ଦ୍ାଳନ କ୍ିପରି ମୁଣ୍ଡ ଫଟକ୍ିଥିଲା, ତାହାର ସୂଚନା ଉପଲବ୍ଧ ଫହବ ଏହି ଏକ୍ଟର।

୨ୟ ଏକକ : ନବଜାଗରଣର ରୂପଫରଖ ସହିତ ସତୟବାେୀ ସାହିତୟଧାରାର ଆଭାସ ଏହି ଏକ୍ଟିଫର ଛାତ୍ରଛାତ୍ରୀ ପାଇପାରିଫବ।

୩ୟ ଏକକ: ନବଜାଗରଣ ସମୟର ବିଶିଷ୍ଟ ବ୍ଦ୍ଧି ଓ କ୍ଲାକ୍ାର ରାଧାନାଥ, େକ୍ୀରଫମାହନ, ଗ?ାଧର, ଫଗାପବନ୍ଧୁ ଓ ଫଗାୋବରୀଶଙ୍କ ସମ୍ପକ୍ଟଫର ଏହି ଏକ୍ଟର ଚର୍ଚ୍ଚା କ୍ରାଯିବ। େଳଫର ଶିକ୍ଷାଥଚୀମାଫନ ଏହି ସମୟର ବିଶିଷ୍ଟ ସାହିତୟସ୍ରଷ୍ଟାଙ୍କ କ୍ୃତିତ୍ୱ ଜାଣିପାରିଫବ।

୪ଥ୍ ଏକକ : ସମକ୍ାଳୀନ ପ୍ରାବନ୍ଧିକ୍ ଓ ନାଟୟକ୍ାର ଭାଫବ ଖୟାତିସିଦ୍ଧ ଜଗଫନୋହନ ଲାଲ, ରାମଶଙ୍କର ରାୟ, କ୍ାମପାଳ ମିଶ୍ର, ମଧୁସୂେନ ରାଓ, ବିଶ୍ୱନାଥ କ୍ର ଓ ନୀଳକ୍? ୋସଙ୍କ ସମ୍ପକ୍ଟଫର ଏହି ଏକ୍ ଧାରଣା ପ୍ରୋନ କ୍ରିବ ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : ଆଧୁନିକ୍ ଓଡିଆ ସାହିତୟର ପୃଷ୍ଠଭୂମି ଓ ନବଜାଗରଣ

(ଇାଂରାଜୀଶିକ୍ଷା ବିସ୍ତାର, ପାଠୟପୁସ୍ତକ୍ ଓ ପତ୍ରପତ୍ରିକ୍ା ପ୍ରକ୍ାଶନ, ମୁଦ୍ରଣଯନ୍ତ୍ର ପ୍ରତିଷ୍ଠା ଓ ଭାଷାସୁରକ୍ଷା ଆଫନ୍ଦ୍ାଳନ)

୨ୟ ଏକକ : ନବଜାଗରଣ ଓ ସତୟବାେୀ ସାହିତୟଧାରାର ଫବୈଶିଷ୍ଟୟ

୩ୟ ଏକକ : ସମକ୍ାଳୀନ ପ୍ରମୁଖ ବ୍ଦ୍ଧି ଓ କ୍ଲାକ୍ାର

(ରାଧାନାଥ ରାୟ, େକ୍ୀରଫମାହନ, ଗାଂଗାଧର ଫମଫହର, ଫଗାପବନ୍ଧୁ ଓ ଫଗାୋବରୀଶ)

୪ଥ୍ ଏକକ : ସମକ୍ାଳୀନ ପ୍ରମୁଖ ପ୍ରାବନ୍ଧିକ୍ ଓ ନାଟୟକ୍ାର

(ଜଗଫନୋହନ ଲାଲ, ରାମଶଙ୍କର ରାୟ, କ୍ାମପାଳ ମିଶ୍ର, ମଧୁସୂେନ ରାଓ, ବିଶ୍ୱନାଥ କ୍ର, ନୀଳକ୍ାଂଠ ୋସ)

Core VI **ତୃତୀୟ ପର୍ଯ୍ୟାୟ (Semester-III)**

ଆଧୁନିକ ଓଡ଼ିଆ ସାହିତୟର ଇତିହାସ : ସବୁଜ, ପ୍ରଗତିବାଦୀ ଧାରା ଓ ସ୍ୱାଧୀନତା ପରବର୍ତ୍ୀକାଳ(୨୦୦୦ ପର୍ଯ୍ୟନ୍ତ)

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି) :

ଆଧୁନିକ୍ ଯୁଗର ସବୁଜ ଧାରାଠାରୁ ସ୍ୱାଧୀନତା ପରବର୍ତ୍ତୀକ୍ାଳ(୨୦୦୦ ପଯଚୟନ୍ତ) ଓଡିଆ ସାହିତୟ ରୂପଫରଖ ଉପଫର ଏହି ପତ୍ରଟି ଧାରଣା ଫେବ। ବିଫଶଷତଃ ସବୁଜ କ୍ାବୟଧାରା, ପ୍ରଗତିବାେୀ ସାହିତୟ ଓ ସ୍ୱାଧୀନତା ପରବର୍ତ୍ତୀ ଓଡିଆ ସାହିତୟର ବିବିଧ ରଚନା ସମ୍ପକ୍ଟଫର ପରିଚୟାମ୍ମକ୍ ଜ୍ଞାନ ଛାତ୍ରଛାତ୍ରୀ ଲାଭକ୍ରିଫବ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳଶ୍ରୁତି) :

୧ମ ଏକକ : ସତୟବାେୀ ଯୁଗପଫର ବିଶ୍ୱବ୍ଦ୍ଧି ରବୀନ୍ଦ୍ରନାଥ ଓ ଇାଂରାଜୀ ଫରାମା?ିକ୍ ବ୍ଦ୍ଧିମାନଙ୍କ ଅନୁଫପ୍ରରଣାଫର ଓଡିଆ ସାହିତୟଫର କ୍ିପରି ସବୁଜ କ୍ାବୟଧାରାର ସୂତ୍ରପାତ ଘଟିଥିଲା ଏବାଂ ଏକ୍ାଳର ତରୁଣ ବ୍ଦ୍ଧି ଫଲଖକ୍ାଫନ ସାହିତୟକ୍ୁ କ୍ିପରି ଶୟାମଳିମାମୟ କ୍ରିଥିଫଲ, ତାହା ଶିକ୍ଷାଥଚୀମାଫନ ଏହି ଏକ୍ଟର ଉପଲବ୍ଧି କ୍ରିଫବ ।

୨ୟ ଏକକ : ସବୁଜଫଗାଷ୍ଟୀଙ୍କ ପଫର ମାର୍କ୍ସବାେର ପ୍ରଭାବଫର ଓଡିଶାଫର ନିପୀଡିତ ସବଚହରା ମଣିଷର ଜୀବନ କ୍ଲାକ୍ଁ ଫନଇ ପ୍ରଗତିବାେୀ କ୍ାବୟଧାରା କ୍ିପରି ପ୍ରସାରଲାଭ କ୍ରିଥିଲା, ତାହା ଶି କ୍ଷାଥଚୀମାନଙ୍କୁ ଉପଲବ୍ଧ କ୍ରାଇବ ଏହି ଏକ୍ସ୍ର ପାଠୟକ୍ରମ ।

୩ୟ ଏକକ : ସ୍ୱାଧୀନତା ପ୍ରାପ୍ତି ପଫର ଓଡିଆ କ୍ବିତା ଓ ନାଟକ୍ ଫକ୍ଷତ୍ରଫର କ୍ିପରି ପରିବର୍ତ୍ତନ ଆସିଥିଲା, ଫସ ସମ୍ପକ୍ଟୀୟ ତଥୟମୂଳକ୍ ଜ୍ଞାନ ଏହି ଏକ୍ସ୍ରର ହାସଲକ୍ରିଫବ ଛାତ୍ରଛାତ୍ରୀ ।

୪ଥ୍ ଏକକ : ଏହି ଏକ୍ସ୍ରର ସ୍ୱାଧୀନତା ପରକ୍ାଳର କ୍ଲାସାହିତୟ ଓ ଗେୟସାହିତୟ ଉପଫର ଛାତ୍ରଛାତ୍ରୀ ଅବଗତ ଫହଫବ ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : ଓଡିଆ ସାହିତୟଫର ସବୁଜ କ୍ାବୟଧାରା

୨ୟ ଏକକ : ପ୍ରଗତିବାେୀ କ୍ାବୟଧାରା

୩ୟ ଏକକ : ସ୍ୱାଧୀନତା ପରବର୍ତ୍ତୀ ଓଡିଆ ସାହିତୟ (କ୍ବିତା ଓ ନାଟକ୍)

୪ଥ୍ ଏକକ : ସ୍ୱାଧୀନତା ପରବର୍ତ୍ତୀ ଓଡିଆ ସାହିତୟ (କ୍ଲାସାହିତୟ ଓ ଗେୟସାହିତୟ)

ସହାୟକ ଗ୍ର?ସୂଚୀ

Core VII **ତୃତୀୟ ପର୍ଯ୍ୟାୟ (Semester-III)**

ପ୍ରାଚୀନ ଓ ମଧୟର୍ଯୁଗୀୟ ଓଡ଼ିଆ କବିତା

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି) :

ଓଡିଆ ସାହିତୟର ଐତିହାସିକ୍ ବିବର୍ତ୍ତନ ଧାରା ଅବଗତ ଫହବାପଫର ଏହି ପାଠୟପତ୍ରଫର ଛାତ୍ରଛାତ୍ରୀ ପ୍ରାଚୀନ ଓ ମଧୟଯୁଗୀୟ ଓଡିଆ କ୍ବିତାର ପ୍ରାସ?ିକ୍ େିଗଗୁଡିକ୍ ନିଦ୍ଧଚାରିତ ପାଠୟବିଷୟ ମାଧୟମଫର ଜାଣିବାର ସୁଫଯାଗ ଲାଭ କ୍ରିଫବ । ବିଫଶଷତଃ ଚଯଚୟାଗୀତିକ୍ାଠାରୁ ଆରମ୍ଭକ୍ରି ସାରଳା ମହାଭାରତ, ଜଗନ୍ନାଥ ୋସଙ୍କ ଭାଗବତ ଓ ରୀତିକ୍ବି େୌନକ୍୍ଷ, ଉତ୍ପଳ ଭଞ୍ଜ, ଭକ୍ତଚରଣ, ବଳଫେବ ପ୍ରମୁଖଙ୍କ ରଚନାର କ୍ିୟୋଂଶ ପାଠକ୍ରି କ୍ବିତାର କ୍ରମିକ୍ ବିକ୍ାଶଧାରା ଉପଲବ୍ଧି କ୍ରିପାରିଫବ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧୟୟନ ଫଳଶ୍ରୁତି) :

୧ମ ଏକକ : କ୍ାହ୍ନୁପାେ ଓ ଲୁଇପାେ ଚଯଚୟାଗୀତିକ୍ାର େୁଇ ପ୍ରମୁଖ କ୍ବିଙ୍କ ଗୀତିକ୍ା ମାଧୟମଫର ଚଯଚାପେର ଗୁଣାତ୍ମକ୍ ଫବୈଶିଷ୍ଟୟ ଚିହ୍ନିତ ଫହାଇପାରିବ ।

୨ୟ ଏକକ : ସାରଳା ୋସଙ୍କ ମହାଭାରତ ଓ ଜଗନ୍ନାଥ ୋସଙ୍କ ଭାଗବତ ଶାଂସିତ ସମୟଖଣ୍ଡର କ୍ାଳଜୟୀ ରଚନା । ଏହି ଉଭୟ ରଚନାରୁ ଏକ୍ ଏକ୍ ଅାଂଶ ଅଧୟୟନକ୍ରି ଛାତ୍ରଛାତ୍ରୀ େୁଇ ମହାନ୍ ସ୍ରଷ୍ଟାଙ୍କ କ୍ବି ପ୍ରତିଭାର ଅବଧାରଣା କ୍ରିପାରିଫବ।

୩ୟ ଏକକ : ଭଞ୍ଜ ଓ େୌନକ୍୍ଷ ରୀତିଯୁଗୀୟ କ୍ାବୟ ସାହିତୟର ପ୍ରମୁଖ ସ୍ରଷ୍ଟା। େୌନକ୍୍ଷଙ୍କ ରସକ୍ୋଳ ଓ ଭଞ୍ଜଙ୍କ ଫକ୍ାଟିବ୍ରହ୍ମାଣ୍ଡ ସୁନ୍ଦରୀର ଫଗାଟିଏ ଫଗାଟିଏ ଛାନ୍ଦ ଆଧାରଫର ରୀତିଯୁଗର ଫପୌରାଣିକ୍ ଓ କ୍ାଳ୍ପନିକ୍ କ୍ାବୟଧାରାର ଧାରଣା ମିଳିପାରିବ।

୪ଥ୍ ଏକକ : କ୍ାବୟ ବୟତିଫରକ୍ ଫକ୍ାଇଲି, ଚଉତିଶା ଓ ଚମ୍ପୂ ରଚନା ରୀତିଯୁଗୀୟ ସାହିତୟକ୍ୁ ସମୃଦ୍ଧ କ୍ରିଛି । ତାହାର ଝଲକ୍ ଏହି ଏକ୍ର ପାଠୟ ଖସଡାରୁ ମିଳିପାରିବ ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : କ୍) ଲୁଇପାେ – କ୍ାୟାତରୁ ଚଯଚୟା

ଖ) କ୍ାହ୍ନୁପାେ – ବାଟଓଗାଳ ଚଯଚୟା (ଚଯଚୟା ନାଂ – ୭)

୨ୟ ଏକକ : କ୍) େୁଫଯଚୟାଧନଙ୍କ ରକ୍ତନୋ ସନ୍ତରଣ – ସାରଳା େୋସ (ସାରଳା ମହାଭାରତ – ଆର୍ତ୍ତବେଭ ମହାନ୍ତି ସମ୍ପାେିତ)

ଖ) ଭାଗବତ (ଚବିଶ ଗୁରୁ ପ୍ରସ) – ଜଗନ୍ନାଥ େୋସ

୩ୟ ଏକକ : କ୍) ରସକ୍ଲୋଳ (୩୪ଶ ଛାନ୍ଦ) – େୀନକ୍ୃଷ୍ଣ େୋସ

ଖ) ଫକ୍ାଟିବ୍ରହ୍ମାଣ୍ଡ ସୁନ୍ଦରୀ (ପ୍ରଥମ ଛାନ୍ଦ) – ଉଫପନ୍ଦ୍ର ଭଞ୍ଜ ।

୪ଥ୍ ଏକକ : କ୍) ଫକ୍ଲବ ଫକ୍ାଇଲି – ମାକ୍ଟଣ୍ଡ େୋସ

ଖ) କ୍ଲାକ୍ଟଳବର ଚଉତିଶା – ଭକ୍ତଚରଣ େୋସ

ଗ) କ୍ିଫଶାର ଚନ୍ଦ୍ରାନନ୍ଦ ଚମ୍ପୂ – ('ଘ' ଗୀତ) – କ୍ଟିସୂଯଚୟ ବଳଫେବ ରଥ

Core VIII **ଚତୁଥ୍ ପର୍ଯ୍ୟାୟ (Semester-IV)**

ଆଧୁନିକ ଓଡ଼ିଆ କବିତା

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି):

ରାଧାନାଥଙ୍କ ସମୟରୁ ସାମ୍ପ୍ରତିକ୍ କ୍ାଳ ପଯଚୟନ୍ତ ଆଧୁନିକ୍ ଓଡିଆ କ୍ବିତାର ଉର୍ତ୍ତଣଧାରା ଅବଗତ ଫହବା ନିମିର୍ତ୍ତ ଏହି ପାଠୟପତ୍ରଟି ଉିଷ୍ଟ । ଏହି ସମୟଖଣ୍ଡର ପ୍ରତିନିଧି ଫଶ୍ରଣୀୟ କ୍ବିମାନଙ୍କର କ୍ାବୟାାଂଶ ବା କ୍ବିତାପଠନ ମାଧମଫର ଛାତ୍ରଛାତ୍ରୀ ଏ େିଗଫର ଜ୍ଞାନ ଆହରଣ କ୍ରିଫବ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧୟନ ଫଳଶ୍ରୁତି) :

୧ମ ଏକକ: ଏହି ଏକ୍ଟର ରାଧାନାଥଙ୍କ ମହାଯାତ୍ରା, ଗ ାଧରଙ୍କ ତପସ୍ୱିନୀ ଓ ଭୀମ ଫଭାଇଙ୍କ ସ୍ତୁତି ଚିନ୍ତାମଣିର ଫଗାଟିଏ ଫଗାଟିଏ ଅାଂଶ ଅଧୟନଦ୍ୱାରା ଛାତ୍ରଛାତ୍ରୀ ପ୍ରାରମ୍ଭିକ୍ ପଯଚୟାୟର ଆଧୁନିକ୍ କ୍ାବୟଧାରା ବିଷୟଫର ଜାଣିପାରିଫବ ।

୨ୟ ଏକକ: ମଧୁସୂେନ, ଫଗାେୋବରୀଶ ଓ କ୍ୁନ୍ତଳା କ୍ୁମାରୀଙ୍କ ଫଗାଟିଏ ଫଗାଟିଏ କ୍ବିତା ଏହି ଏକ୍ଟର ସ୍ଥାନିତ। ଏଥିରୁ ଆଧୁନିକ୍ ଓଡିଆ ଗୀତିକ୍ବିତାର ଫବୈଚିତ୍ରୟ ଓ ବିଫଶଷତ୍ୱ ସାଫଙ୍କତିକ୍ଫପ ଉପଲବ୍ଧ ଫହବ ।

୩ୟ ଏକକ: ରାଧାଫମାହନ ଗଡନାୟକ୍, ମାୟାଧର ମାନସିାଂହ ଓ ସର୍ତ୍ତିେୋନନ୍ଦ ରାଉତରାୟ ପ୍ରମୁଖ ଆଧୁନିକ୍ ଓଡିଆ ସାହିତୟର ସୁପ୍ରତିଷ୍ଠିତ କ୍ବିଙ୍କ କ୍ବିତାଗୁଡିକ୍ ଅଧୟନକ୍ରି ଛାତ୍ରଛାତ୍ରୀ ଉପକ୍ୃତ ଫହାଇପାରିଫବ।

୪ଥ ଏକକ: ସ୍ୱାଧୀନତା ପରବର୍ତ୍ତୀ କ୍ାଳର ବିଶିଷ୍ଟ ଲ୍ଖିତାମାନଙ୍କ ମଧ୍ୟର ବିଫନାେ ଚନ୍ଦ୍ର ନାୟକ୍ଙ୍କ ‘ଗ୍ରାମପଥ’, ଫସୌରୀନ୍ଦ୍ର ବାରିକ୍ଙ୍କ ‘କ୍ରଣ୍ଚ’ ଓ ବ୍ରଫହ୍ମାତ୍ରୀ ମହାନ୍ତିଙ୍କ ‘ମୃତ୍ୟୁୟ ସମ୍ପର୍କ୍ଟର’ ଲ୍ଖିତାତ୍ରୟ ଏକ୍ଏକ୍ ବିଫଶଷ େିଗର ପ୍ରତିନିଧିତ୍ୱ କ୍ରୁର । ଫତଶୁ ଏହାର ଅଧ୍ୟୟନଦ୍ୱାରା ଅତୟାଧୁନିକ୍ ଲ୍ଖିତାର ମହତ୍ତ୍ୱ ବୁଝାପଡିବ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : କ୍) ମହାଯାତ୍ରା – ୧ମ ସଗଚ – ରାଧାନାଥ ରାୟ

ଖ) ତପସ୍ୱିନୀ-୩ୟ ସଗଚ - ଗ୍ାେଧର ଫମଫହର

ଗ) ସ୍ମୃତି ଚିନ୍ତାମଣି-୩୭ଶ ଫବାଲି – ଭୀମ ଫଭାଇ

୨ୟ ଏକକ : କ୍) ବିଫଚ୍ଛଫେ (ବସନ୍ତ ଗାଥା) – ମଧୁସୂେନ ରାଓ

ଖ) ନିମିଷକ୍ ଫେଖା - ଫଗାେୋବରୀଶ ମିଶ୍ର

ଗ) ଫଶୋଳି ପ୍ରତି – କ୍ୁନ୍ତଳା କ୍ୁମାରୀ ସାବତ

୩ୟ ଏକକ : କ୍) ବୀରରାଣୀ ଶୁକ୍ଲେଇ (ଉତ୍ସଲିକ୍ା)- ରାଧାଫମାହନ ଗଡନାୟକ୍

ଖ) ବିରହୀ ଘନ – ମାୟାଧର ମାନସିଂହ

ଗ) ପ୍ରତିମା ନାୟକ୍ – ସର୍ବ୍ିେୋନନ୍ଦ ରାଉତରାୟ

୪ଥ ଏକକ : କ୍) ଗ୍ରାମପଥ – ବିଫନାେ ଚନ୍ଦ୍ର ନାୟକ୍

ଖ) କ୍ରଣ୍ଚ – ଫସୌରୀନ୍ଦ୍ର ବାରିକ୍ MODEL SYLLABUS –ODIA (+3 ARTS/SCIENCE/COMMERCE) BASED ON NEP-2020 Page 17

ଗ) ମୃତ୍ୟୁୟ ସମ୍ପର୍କ୍ଟର – ବ୍ରଫହ୍ମାତ୍ରୀ ମହାନ୍ତି

Core IX **ଚତୁଥ୍ ପର୍ଯ୍ୟାୟ (Semester-IV)**

ଓଡ଼ିଆ ନାଟକ ଓ ଏକାାଂକିକା

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି):

ଓଡିଶାର ନାଟୟ ପରମ୍ପରା ସୁପ୍ରାଚୀନ ଫହଫଲ ଫହଁ, ଆଧୁନିକ୍ ଯୁଗଫର ହିଁ ଲିଖ୍ିତ ନାଟକ୍ ଓ ଏକ୍ାଙ୍କିକ୍ାର ଯଥାଥଚ ପରିପ୍ରକ୍ାଶ ଘଟିଛି। ଜଗଫନୋହନ ଲାଲଙ୍କ ବାବାଜୀଠାରୁ ଏଯାବତ୍ ଆମର ନାଟୟସାହିତୟ ଆ୍ିକ୍ ଓ ଆତ୍ମିକ୍ େୃଷ୍ଟିରୁ ପରିବର୍ତ୍ିତ ଫହାଇଆସିଛି । ସାଂସ୍କାରଫବାଧ, ଭକ୍ତିଫଚତନା, ଜାତୀୟ ଜାଗରଣ ଓ ରାଜନୀତି ଫକ୍ଷତ୍ରଫର ପଙ୍ଗ ପରିବର୍ତ୍ତନ ତଥା ସାମାଜିକ୍ ଜୀବନର ବିବିଧ ରୂପ ଓ ସମସୟାକ୍ୁ ନାଟକ୍ ଅ୍ିାଭୂତ କ୍ରିଛି । ଓଡିଆ ନାଟକ୍ର ଏହି ବିବର୍ତ୍ତନଧାରା ଶାଂସିତ ପାଠୟପତ୍ରଫର ଛାତ୍ରଛାତ୍ରୀ ଉପଲବ୍ଧି କ୍ରିପାରିଫବ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳଶ୍ରୁତି):

୧ମ ଏକକ : ଏହି ଏକ୍ର ପ୍ରଥମ ଓଡିଆ ନାଟକ୍ ବାବାଜୀ ସମ୍ପକ୍ଟଫର ଅଥବା ଫଗାପାଳ ଫଛାଟରାୟଙ୍କ ବିଶିଷ୍ଟ ରାଜନୀତିକ୍ ନାଟକ୍ ପରକ୍ଲମର ବାର୍ତ୍ତା ଉପଫର ଅବଗତ ଫହାଇପାରିଫବ ।

୨ୟ ଏକକ : ମଫନାରଞ୍ଜନଙ୍କ ଅପରାଧପ୍ରବଣ ନାଟକ୍ ସାଗରମଛନ ଅଥବା କ୍ାର୍ତ୍ତିକ୍ ରଥଙ୍କ ଈଶ୍ୱର ଜଫଣ ଯୁବକ୍ ପରି ନାଟକ୍ର ପ୍ରଭାବଶାଳୀ କ୍ଲାବସ୍ତୁ ଓ ଆଭିମୁଖ୍ୟୟ ସମ୍ପକ୍ଟଫର ଏହି ଏକ୍ଟ୍ଟର ଜାଣିବାର ସୁଫଯାଗ ରହିଛି ।

୩ୟ ଏକକ : ଆମ ସମୟର େ୍ରଇଜଣ ବିଶିଷ୍ଟ ନାଟୟକ୍ାର ନାରାୟଣ ସାହୁ ଓ ବିଜୟ ଶତପଥୀଙ୍କ ଯଥାକ୍ରଫମ ରାଜରାଣୀ ଉପାଖୟାନ ଓ ଫକ୍ାକ୍ୁଆ ନାଟକ୍ ସାମ୍ପ୍ରତିକ୍ ଓଡିଆ ନାଟକ୍ର ଗୁଣାତ୍ମକ୍ ମୂଲୟ ଓ ଉପସ୍ଥାପନ ଫକ୍ୌଶଳକ୍ୁ ଚିହ୍ନଟ କ୍ରିବ ।

୪ଥି ଏକକ : ଛାତ୍ରଛାତ୍ରୀମାଫନ ରତ୍ନାକ୍ର ଚଇନି ଓ ସୁଫରନ୍ ମହାନ୍ତିଙ୍କ େ୍ରଇଟି ବଳିଷ୍ଠ ଏକ୍ାଙ୍କିକ୍ା ଅଥବା ମ୍ଲୁ ଚରଣ ବିଶ୍ୱାଳଙ୍କ ପ୍ରସିଦ୍ଧ ଭୁଖା ନାଟକ୍ର ମମତବାଣୀ ଜାଣିବାର ସୁଫଯାଗ ଏହି ଏକ୍ଟ୍ଟର ରହିଛି ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : ବାବାଜୀ -ଜଗଫନୋହନ ଲାଲ୍ **କିମବା** ପରକ୍ଲମ – ଫଗାପାଳ ଫଛାଟରାୟ

୨ୟ ଏକକ : ସାଗରମଛନ - ମଫନାରଞ୍ଜନ େ୍ରାସ **କିମବା** ଈଶ୍ୱର ଜଫଣ ଯୁବକ୍ – କ୍ାର୍ତ୍ତିକ୍ ଚନ୍ଦ୍ର ରଥ

୩ୟ ଏକକ : ରାଜରାଣୀ ଉପାଖୟାନ – ନାରାୟଣ ସାହୁ **କିମବା** ଫକ୍ାକ୍ୁଆ – ବିଜୟ ଶତପ ଥୀ

୪ଥି ଏକକ : ଏକ୍ାାଂକ୍ିକ୍ା-

ପାହାଡର ଆତ୍ମକ୍ଥା- ସୁଫରନ୍ ମହାନ୍ତି ଏବାଂ ଅନୟ ଏକ୍ ଶ୍ରବଣକ୍ୁମାର - ରତ୍ନାକ୍ର ଚଇନି

କ୍ିମି।

ଭୁଖା - ମ୍ଲୁଚରଣ ବିଶ୍ୱାଳ **ସହାୟକ ଗ୍ରନ୍ଥସୂଚୀ**

Core X **ଚତୁଥି ପର୍ଯ୍ୟାୟ (Semester-IV)**

ଓଡ଼ିଆ କଥାସାହିତୟ

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି) :

କ୍ଲାସ୍ରାଟ େକ୍ୀରଫମାହନଙ୍କଠାରୁ ଆରମ୍ଭକ୍ରି ରାମଚନ୍ଦ୍ର ଫବଫହରାଙ୍କ ପଯଚୟନ୍ତ ଓଡିଆ କ୍ଲାସାହିତୟର ଫବୈଭବମୟ ବିକ୍ାଶ ସହିତ ବିଭିନ୍ନ ଫମାଡଫେଇ ଆମର ଗଳ୍ପ ଓ ଉପନୟାସ କ୍ିପରି ଗତିକ୍ରି ଆସିଛି, ତାହା ଏହି ପାଠୟପତ୍ରରୁ ଉପଲବ୍ଧ ଫହବ । ଫକ୍ୁତଜଣ ପ୍ରତିନିଧିଫଶ୍ରଣୀୟ ଫଲଖକ୍ଙ୍କ ରଚନାକ୍ୁ ଏହି ପତ୍ରଫର ଅଧୟନ କ୍ରି ଛାତ୍ରଛାତ୍ରୀ ଓଡିଆ ଗଳ୍ପ ଓ ଉପନୟାସ ସାହିତୟ ସମ୍ପକ୍ଟଫର ଧାରଣା ଲାଭକ୍ରିଫବ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧୟନ ଫଳଶ୍ରୁତି):

୧ମ ଏକକ : େକ୍ୀରଫମାହନଙ୍କ 'ଲଛମା' ଏକ୍ ସ୍ମରଣୀୟ ଐତିହାସିକ୍ ଉପନୟାସ । ଓଡିଶାଫର ବଗଚୀ ଅତୟାଚାରର ବିଷୟ ଏଥିଫର ସମନ୍ିତ । ଫସହିପରି କ୍ାଳିନ୍ଦ୍ୀ ଚରଣଙ୍କ 'ଆଜିର ମଣିଷ' ଉପନୟାସଫର ଭାରତ ସ୍ୱାଧୀନତାକ୍ାଳୀନ ବିବିଧ ଘଟଣାବଳୀର ପ୍ରତିବିମି କ୍ିପରି ଉଭାସିତ, ତାହା ଛାତ୍ରଛାତ୍ରୀ ଅଧୟନ ମାଧ୍ୟମଫର ଜାଣିପାରିଫବ ।

୨ୟ ଏକକ : ଫଗାପୀନାଥ ମହାନ୍ତିଙ୍କ 'େ ାେିବୁଢା' ଫହଉ ବା ସୁଫରନ୍ଦ୍ର ମହାନ୍ତିଙ୍କର 'କ୍ାଳାନ୍ତର', ଉଭୟଫର ଯଥାକ୍ରଫମ ଓଡିଶାର ଔବାସୀ ଜନଜୀବନ ଓ ପ୍ରାକ୍୍ତିକ୍ ବିପଯଚୟୟର ସାଂଫକ୍ତ ନିହିତ । ଆମ ଉପନୟାସ ସାହିତୟଫର ସାମାଜିକ୍ ବାସ୍ତବତାର ଲକ୍ଷଣକ୍୍ ଛାତ୍ରଛାତ୍ରୀ ଅବଶୟ ଅଧୟୟନ ମାଧମଫର ଜାଣିପାରିଫବ ।

୩ୟ ଏକକ : ଫରବତୀ, ଏଫବ ମଧ୍ୟ ବ୍ିଛି, ଶିକ୍ାର ଓ ଡିମିରି େ୍ଲ ଓଡିଆ ସାହିତୟର ଚାରିଫଗାଟି ଫଲାକ୍ଟ୍ରି ୟ ଗଳ୍ପ । ଏଥିରୁ ଶିକ୍ଷାବୟବସ୍ଥା, ଫେଶଫପ୍ରମ ଓ ଓଡିଆ ଜାତିର ସ୍ୱାଭିମାନ ସହିତ ମାର୍କ୍ସବାେୀ ଫଚତନା ଓ ମାନବୀୟ ମନସ୍ତତ୍ତ୍ୱର ନିଖୁଣ ଚିତ୍ର ଛାତ୍ରଛାତ୍ରୀ ଅବଗତ ଫହାଇପାରିଫବ ।

୪ଥି ଏକକ : ରଚନାର ପରିମାଣ ଓ ଗୁଣବର୍ତ୍ତା େ୍ଷ୍ଟିରୁ ମଫନାଜ େ ାସ, ଶାନ୍ତନୁ ଆଚାଯଚୟ, ବୀଣାପାଣି ମହାନ୍ତି ଓ ରାମଚନ୍ଦ୍ର ଫବଫହରାଙ୍କ ଗଳ୍ପ ଓଡିଆ ସାହିତୟକ୍୍ ରଦ୍ଧିମନ୍ତ କ୍ରିଛି । ଫସମାନଙ୍କର ଏକ୍ ଏକ୍ ଗଳ୍ପ ପଠନଦ୍ୱାରା ଶିକ୍ଷାଥଚୀମାଫନ ଓଡିଆ ଗଳ୍ପ ସାହିତୟର ସାମଗ୍ରିକ୍ ମୂଲୟଫବାଧକ୍୍ ଆକ୍ଳନ କ୍ରି ପାରିଫବ ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : ଲଛମା – େକ୍ୀର ଫମାହନ ଫସନାପତି **କିମବା** ଆଜିର ମଣିଷ - କ୍ାଳିନ୍ଦ୍ୀ ଚରଣ ପାଣିଗ୍ରାହୀ

୨ୟ ଏକକ : େ ାେିବୁଢା - ଫଗାପୀନାଥ ମହାନ୍ତି **କିମବା** କ୍ାଳାନ୍ତର- ସୁଫରନ୍ଦ୍ର ମହାନ୍ତି

୩ୟ ଏକକ : ଫରବତୀ –େକ୍ୀରଫମାହନ ଫସନାପତି, ଏଫବ ମଧ୍ୟ ବାଂବିଛି–ଫଗାେ ାବରୀଶ ମହାପାତ୍ର,

ଶିକ୍ାର - ଭଗବତୀ ଚରଣ ପାଣିଗ୍ରାହୀ, ଡିମିରି େ୍ଲ- ଅଖିଳ ଫମାହନ ପଟ୍ଟନାୟକ୍

୪ଥି ଏକକ : କ୍) ସୁନା ଫମଡାଲ - ମଫନାଜ େ ାସ

ଖ) କ୍ଲାପେଚାର ଆରପଫଟ- ଶାନ୍ତନୁ କ୍୍ମାର ଆଚାଯଚୟ

ଗ) ପାଟଫେଇ- ବୀଣାପାଣି ମହାନ୍ତି

ଘ) ଫଗାପପୁର- ରାମଚନ୍ଦ୍ର ଫବଫହରା

Core XI **ପଞ୍ଚମ ପର୍ଯ୍ୟାୟ (Semester-V)**

ଆଧୁନିକ ଓଡ଼ିଆ ଗଦୟସାହିତୟ

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି):

ଜୀବନୀ, ଆତ୍ମଜୀବନୀ, ଭ୍ରମଣ କ୍ାହାଣୀ, ପ୍ରବନ୍ଧ, ରମୟରଚନା ଔ ଓଡିଆ ଗେୟସାହିତୟର ବିଭିନ୍ନ ରୂପକ୍୍ ଚିହ୍ନିବା ପାଇଁ ଏହି ପତ୍ରଟି ପରିକ୍ଳ୍ପିତ । ଛାତ୍ରଛାତ୍ରୀମାଫନ ବିଭିନ୍ନ ରୂପର ଗେୟସାହିତୟର ବିବିଧ ରଚନା ଅଧୟୟନକ୍ରୁଳ ଓଡିଆ ଗେୟର ସମୃଦ୍ଧ ଧାରାକ୍୍ ଉପଲବ୍ଧି କ୍ରିପାରିଫବ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧୟୟନ ଫଳଶ୍ରୁତି) :

୧ମ ଏକକ : ଏହି ଏକ୍ସ୍ଟର ଓଡିଆ ସାହିତୟର ଫଗାଟିଏ ପ୍ରସିଦ୍ଧ ଆତ୍ମଜୀବନୀ ଅଥବା ଏକ୍ ବିଶିଷ୍ଟ ଜୀବନୀର କ୍ିୟୋଂଶ ଅଧୟନ କ୍ରିବାର ସୁଫଯାଗ ରହିଛି । 'ଫମା ସମୟର ଓଡିଶା' ଫର କ୍୍ଷଚନ୍ଦ୍ର ପାଣିଗ୍ରାହୀଙ୍କ ଜୀବନକ୍ଥା ସହିତ ସମକ୍ାଳୀନ ଓଡିଶାର ପ୍ରାଣ୍ଦ୍ଧ ତଥା 'ଗାନ୍ଧୀ ମଣିଷ' ଫର ଜାତିର ପିତା ମହାମ୍ା ଗାନ୍ଧୀଙ୍କ ଜୀବନର ବାର୍ତ୍ତା ଛାତ୍ରଛାତ୍ରୀଙ୍କ ପାଖକ୍୍ୁ ପହ୍ିପାରିବ ।

୨ୟ ଏକକ : ଓଡିଆ ଭ୍ରମଣକ୍ାହାଣୀର ବିଫେଶାନୁଭୂତିକ୍୍ୁ 'ପଶ୍ଚିମ ଔକ୍ାଫର ଓଡିଆ ଫଢଙ୍କି' ଅଥବା 'ଆଫମରିକ୍ା ଅନୁଭୂତି ' ଭ୍ରମଣ କ୍ାହାଣୀ ମାଧମଫର ଜାଣିବାର ଅବକ୍ାଶ ରହିଛି ଏହି ଏକ୍ସ୍ଟର ।

୩ୟ ଏକକ : ଓଡିଆ ଗେୟ ସାହିତୟଫର ରମୟରଚନାର ସ୍ଥାନ ସ୍ୱତନ୍ତ୍ର । ଫଗାପାଳଚନ୍ଦ୍ର ପ୍ରହରାଜ ଓ ନିତୟାନନ୍ଦ୍ ମହାପାତ୍ର େ୍ଇଜଣ ରମୟରଚନାର ରଚୟିତା । ତାଙ୍କର ଏକ୍ ଏକ୍ ସ୍ମରଣୀୟ ରମୟରଚନାର କ୍ିୟୋଂଶ ପାଠକ୍ରି ଛାତ୍ରଛାତ୍ରୀ ଓଡିଆ ରମୟରଚନାର ସ୍ୱରୂପ ଅବଶୟ ଉପଲବ୍ଧି କ୍ରିପାରିଫବ ।

୪ଥ୍ ଏକକ : ଓଡିଆ ପ୍ରବନ୍ଧ ସାହିତୟ ସମ୍ପକ୍ଫର ବିଫଶଷ ଧାରଣା ସୃଷ୍ଟି କ୍ରିବାପାଇଁ 'ଆଯଚୟ ଜୀବନ,' 'ମଧୁସନ୍ଧାନ ' ଏବା' 'ଭଗବାନ ଓ ଓଡିଆ ଜାତି' ପ୍ରବନ୍ଧ ଉପଫଯାଗୀ ଫହବ ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : ଫମା ସମୟର ଓଡିଶା (ପ୍ରଥମ ଛଅଟି ପରିଫଚ୍ଛେ- ୮୬ ପୃଷ୍ଠା ପଯଚୟନ୍ତ)—କ୍୍ଷଚନ୍ଦ୍ର ପାଣିଗ୍ରାହୀ **କିମବା** ଗାନ୍ଧୀ ମଣିଷ (ପ୍ରଥମ େଶଟି ପରିଫଚ୍ଛେ, ୫୫ ପୃଷ୍ଠା ପଯଚୟନ୍ତ)- ଶରତ କ୍୍ମାର ମହାନ୍ତି

୨ୟ ଏକକ : ପଶ୍ଚିମ ଔକ୍ାଫର ଓଡିଆ ଫଢଙ୍କି- ଭୁବଫନଶ୍ୱର ଫବଫହରା (ଭ୍ରମଣକ୍ାହାଣୀ)

କିମବା ଆଫମରିକ୍ା ଅନୁଭୂତି - ଫଗାଫଲାକ୍ ବିହାରୀ ଧଳ (ଭ୍ରମଣକ୍ାହାଣୀ)

୩ୟ ଏକକ : ଭାଗବତ ଟୁ୍ୀଫର ସନ୍ଧୟା (ପ୍ରଥମ ଚାଫରାଟି ସନ୍ଧୟା)- ଫଗାପାଳ ଚନ୍ଦ୍ର ପ୍ରହରାଜ

କିମବା ପତ୍ର ଓ ପ୍ରତିମା (ପ୍ରଥମ ଚାଫରାଟି ରଚନା)- ନିତୟାନନ୍ଦ୍ ମହାପାତ୍ର

୪ଥ୍ ଏକକ : ପ୍ରବନ୍ଧ ସାହିତୟ – କ୍) ଆଯଚୟଜୀବନ – ନୀଳକ୍୍ େ୍ାସ

ଖ) ମଧୁସାଂଧାନ – ଚନ୍ଦ୍ରଫଶଖର ରଥ

ଗ) ଭଗବାନ ଓ ଓଡିଆ ଜାତି - ଚିର୍ତ୍ ରଞ୍ଜନ େ୍ାସ

Core XII **ପଞ୍ଚମ ପର୍ଯ୍ୟାୟ (Semester-V)**

ଓଡ଼ିଆ ଲ ାକସାହିତୟ

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି):

ଫଲାକ୍ସାହିତୟ ହିଁ ବି େ୍ସାହିତୟର ଜନନୀ । ଓଡିଶାର ଫଲାକ୍ସାହିତୟ ବହୁମୁଖୀ ଓ ବିଭବଶାଳୀ । ଏଥିଫର ଫଲାକ୍ ଜୀବନର ପ୍ରାଣବାଣୀ ପ୍ରସ୍ଫୁଟିତ । ଏହି ପତ୍ର ଅଧୟନ ମାଧମଫର ଛାତ୍ରଛାତ୍ରୀମାଫନ ତାହା ଅବଗତ ଫହାଇପାରିଫବ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧୟନ ଫଳଶ୍ରୁତି) :

୧ମ ଏକକ : ଓଡିଶାଫର ପ୍ରଚଳିତ ପ୍ରବାେ ଓ ପ୍ରବଚନ, ଢଗଢମାଳି, ଛଟା ଔର ତାତ୍ତ୍ୱିକ୍ େିଗ ଓ ତା'ର ପ୍ରାଫୟାଗିକ୍ ମୂଲୟ ଏହି ଏକ୍ସ୍ଟ ଉପଲଢ ଫହବ ।

୨ୟ ଏକକ : ଓଡିଆ ଫଲାକ୍ସ୍ୀତର ସ୍ୱରୂପ, ରୂପଫଭେ ଓ ପ୍ରାଚୁଯଚୟ ବିଷୟଫର ଅବଗତ ଫହବାପାଇଁ ଏହି ଏକ୍ ସହାୟକ୍ ଫହବ ।

୩ୟ ଏକକ : ଓଡିଆ ଫଲାକ୍ଷ୍ାହାଣୀର ଧାରା ଫଯପରି ପ୍ରାଚୀନ ଫସହିପରି ମଫନାଙ୍କ । ଏହି ଏକ୍ସ୍ଟର ଫଲାକ୍ଷ୍ାହାଣୀର ବିବିଧତା ଓ ମହତ୍ତ୍ୱ ଉପଲଢ ଫହବ ।

୪ଥ୍ ଏକକ : ଓଡିଶାର ବିଭିନ୍ନ ଅ୍ଚଳଫର ଭିନ୍ନଭିନ୍ନ ଫଲାକ୍ଟାଟକ୍ ପ୍ରଚଳିତ । ଫଲାକ୍ଟାଟକ୍ର ସାଂଜ୍ଞା ସ୍ୱରୂପ ସହ ଓଡିଆ ଫଲାକ୍ଟାଟକ୍ ବିଷୟଫର ଜାଣିବା ପାଇଁ ଏହି ଏକ୍ସ୍ର ପାଠୟ ଖସଡା ସୁଫଯାଗ ସୃଷ୍ଟି କ୍ରିବ ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : ଓଡିଆ ଫଲାକ୍ଟାଣୀର ସାଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ପ୍ରକ୍ାରଫଭେ

(ପ୍ରବାେ, ପ୍ରବଚନ, ଛଟା, ଢଗଢମାଳି, ନଁାେିଆ)

୨ୟ ଏକକ : ଓଡିଆ ଫଲାକ୍ସ୍ୀତର ସାଂଜ୍ଞା, ସ୍ୱରୂପ, ପ୍ରକ୍ାରଫଭେ ଓ ବିଭିନ୍ନ େିଗ

୩ୟ ଏକକ : ଓଡିଆ ଫଲାକ୍ଷ୍ାହାଣୀର ସାଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ପ୍ରକ୍ାରଫଭେ

୪ଥ୍ ଏକକ : ଓଡିଆ ଫଲାକ୍ଟାଟକ୍ର ସାଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ପ୍ରକ୍ାରଫଭେ (ପାଲା,େ୍ାସକ୍ାଠିଆ,ପ୍ରହ୍ଲାେନାଟକ୍, େଷ୍ଠନାଚ,ଛଉନାଚ,ଲୀଳା,ଡାଲଖାଇ,କ୍ରମା)

Core XIII ପଞ୍ଚମ ପର୍ଯ୍ୟାୟ (Semester-V)

ଓଡ଼ିଆ ଭ୍ାଷା ଓ ିପିର ଐତିହାସିକ ବିବର୍ତ୍ନ

Course Outcome (ପାଠ୍ୟକ୍ରମ ଫଳଶ୍ରୁତି):

ଓଡିଆ ଭାଷା ଓ ଲିପିର ଉଫନେଷ ଏବାଂ ବିକ୍ାଶ ପ୍ରସ୍ଙ୍ଗ ଅବଗତଫହବା ପାଇଁ ଶାଂସିତ ପାଠୟପତ୍ରଟି ଡିଜେଷ୍ଟ । ଫମୌଖିକ୍ ସ୍ତରରୁ ଭାଷା ଲିଖିତ ସ୍ତରକ୍ୁ ଉନ୍ନୀତଫହବା ପାଇଁ ଫଲାଡାହୁଏ ଲିପି । ଓଡିଆ ଏକ୍ ସ୍ଙ୍ଗିଧାନ ସ୍ୱୀକ୍ୃତ ଶାସ୍ତ୍ରୀୟ ଭାଷା । ତାହାର ଉଦ୍ଭବ ସହିତ ବିକ୍ାଶପବଚ ଓ ଓଡିଆ ଲିପିର ଐତିହାସିକ୍ ବିବର୍ତ୍ତନଧାରା ସମିନ୍ଧଫର ଛାତ୍ରଛାତ୍ରୀ ଅବଗତଫହବାର ସୁଫଯାଗ ଏଠାଫର ରହିଛି ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧୟନ ଫଳଶ୍ରୁତି):

୧ମ ଏକକ : ପୃଥିବୀର ଭାଷା ପରିବାର ମଧୟରୁ କ୍ିପରି ଓଡିଆ ଭାଷାର ଉଫନେଷ ଘଟିଛି ଏବାଂ କ୍ାଳକ୍ରଫମ ବିକ୍ାଶ ଲାଭ କ୍ରିଛି, ଶିକ୍ଷାଥଚୀମାଫନ ତାହା ଏଠାଫର ଉପଲଢି କ୍ରିପାରିଫବ ।

୨ୟ ଏକକ : ଭାରତୀୟ ଲିପି ତତ୍ତ୍ୱ ସହିତ ଓଡିଆ ଲିପିର ଉଦ୍ଭବ ଓ ବିବର୍ତ୍ତନ ଜାଣିବା ନିମିର୍ତ୍ତ ଏହି ଏକ୍ଟି ସାଂଫଯାଜିତ ।

୩ୟ ଏକକ : ଓଡିଆ ଭାଷାର ସବଚପ୍ରାଚୀନ ଲିଖିତରୂପକ୍ୁ ଜାଣିବା ନିମିର୍ତ୍ତ ଓଡିଆ ଅଭିଫଲଖକ୍ୁ ଅନୁଧାନକ୍ରିବା ଆବଶୟକ୍ । ସୁତରାଂ ଏହି ଏକ୍ସ୍ଟର ଶିଳାଫଲଖ, ତାମ୍ରେଳକ୍ ଓ ପ୍ରାଚୀନ ସନନ୍ଦ୍ଗୁଡିକ୍ ଉପଫର ଚର୍ଚ୍ଚାର ଅବକ୍ାଶ ରହିଛି ।

୪ଥ ଏକକ : ସାହିତୟ-କ୍ଲା େ୍ଷ୍ଟିରୁ ଚଯଚୟାପେ ହିଁ ଲିଖ୍ତ ସାହିତୟର ଔମତମ ରୂପ । ଏହି ଚଯଚୟାପେ ଓ ସାରଳା ସାହିତୟର ଭାଷାଗତ ବିଫଶଷତ୍ୱ ଛାତ୍ରଛାତ୍ରୀ ଏହି ଏକ୍ଟୁର ଉପଲବ୍ଧି କ୍ରିଫବ ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : ଓଡିଆ ଭାଷାର ଉଦ୍ଭବ ଓ ବିକ୍ାଶକ୍ରମ

୨ୟ ଏକକ : ଓଡିଆ ଲିପିର ଐତିହାସିକ୍ ବିବର୍ତ୍ତନ

୩ୟ ଏକକ : ଓଡିଆ ଅଭିଫଲଖର ଭାଷା (ଶିଳାଫଲଖ, ତାମ୍ରଫଲଖ, ପ୍ରାଚୀନ ସନନ୍ଦ)

୪ଥ ଏକକ : ଚଯଚୟାପେ ଓ ସାରଳା ସାହିତୟର ଭାଷା

ସହାୟକ ଗ୍ର୍ସୂଚୀ

Core XIV **ଷଷ୍ଠ ପର୍ଯ୍ୟାୟ (Semester-VI)**

ଓଡ଼ିଆ ଭ୍ାଷା : ଧ୍ୱନିତତ୍ତ୍ୱ, ଶବ୍ଦ ସମ୍ଭାର, ଅନୟ ଭ୍ାଷାର ପ୍ରଭ୍ାବ ଓ ଶାସ୍ତ୍ରୀୟତା

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି) :

ଶାସ୍ତ୍ରୀୟ ଓଡିଆ ଭାଷାର ଶ୍ଗତ ଓ ଧ୍ୱନି ତାତ୍ତ୍ୱିକ୍ ଗୁରୁତ୍ୱ ଉପଲବ୍ଧି କ୍ରିବା ପାଇଁ ଏହି ପତ୍ରଟି ଗଠିତ । ଫସହିପରି ତତ୍ସମ, ତଭବ, ଫେଶଜ, ଫବୈଫେଶିକ୍ ଐା ଶ୍ ସମ୍ଭାରଫର ଓଡିଆ ଭାଷା କ୍ିପରି ପରିପୁଷ୍ଟ ଏବାଂ ଅନୟ ଭାଷାର ପ୍ରଭାବଫର ଏହା କ୍ିପରି ରଦ୍ଧିମନ୍ତ, ତାହା ଛାତ୍ରଛାତ୍ରୀମାଫନ ଜାଣି ରଖ୍ବା ଆବଶୟକ୍ । ଭାଷାର ଶାସ୍ତ୍ରୀୟତା ପ୍ରସ୍ ମଧ ଶିକ୍ଷାଥଚୀଙ୍କ ପାଇଁ ଉପଫଯାଗୀ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧୟନ ଫଳଶ୍ରୁତି) :

୧ମ ଏକକ : ଧ୍ୱନିର ସାଂଜ୍ଞା ଓ ବଗଚୀକ୍ରଣ ସହିତ ଆମ ଭାଷାର ଧ୍ୱନିତତ୍ତ୍ୱ ଉପଫର ଶିକ୍ଷାଥଚୀ ଏଠାଫର ଜ୍ଞାନଲାଭ କ୍ରିପାରିଫବ । ଭାଷାର ବିବିଧ ଶ୍ ସମ୍ଭାର ମଧ ଶିକ୍ଷାଥଚୀଙ୍କ ଜ୍ଞାତବୟ ବିଷୟ ।

୨ୟ ଏକକ : ମାନକ୍ ଓଡିଆ ଭାଷା ସହିତ ଓଡିଶାଫର ତାହାର ଅଫନକ୍ ଆ୍ଳିକ୍ ରୂପ ବିଷୟଫର ଏହି ଏକ୍ଟ୍ ଧାରଣା ପ୍ରୋନ କ୍ରିବ ।

୩ୟ ଏକକ : ଓଡିଆ ଭାଷା ଉପଫର ଭିନ୍ନଭିନ୍ନ ଭାଷାର ପ୍ରଭାବ ସ୍ୱୀକ୍ାଯଚୟ । ତନେଧରୁ ଦ୍ରାବିଡ, ଯାବନିକ୍ ଓ ଇାଂରାଜୀ ଭାଷାର ପ୍ରଭାବ ସମ୍ପକ୍ଟଫର ଏହି ଏକ୍ଟୁ ଛାତ୍ରଛାତ୍ରୀ ଅବଗତ ଫହଫବ ।

୪ଥ ଏକକ : ଭାରତର ୬ଷ୍ଠ ଶାସ୍ତ୍ରୀୟ ଭାଷା ରୂଫପ ଓଡିଆ ଭାଷା ଫଗୌରବ ଅଜ୍ଚନ କ୍ରିଛି । ତାହାର ପ୍ରାଚୀନ ଐତିହୟ ଓ ଭାଷାଗତ ମଯଚୟାେ୍ାକ୍ୁ ଅବଗତ ଫହବା ସହିତ ତାର ଶାସ୍ତ୍ରୀୟ ମାନୟତା ବିଷୟଫର ଏହି ଏକ୍ ଛାତ୍ରଛାତ୍ରୀମାନଙ୍କୁ ପରିଚିତ କ୍ରାଇବ ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : କ୍) ଓଡିଆ ଧ୍ୱନିତତ୍ତ୍ୱ (ଧ୍ୱନିର ସାଂଜ୍ଞା ଓ ବଗଚୀକ୍ରଣ)

ଖ) ଶ୍ ସମ୍ଭାର (ତତ୍ସମ, ତଦ ଭବ, ଫେଶଜ ଓ ଫବୈଫେଶିକ୍)

୨ୟ ଏକକ : ଓଡିଆ ଭାଷାର ଆାଂଚଳିକ୍ ରୂପ(ଉର୍ତ୍ତା□ଳୀୟ, େକ୍ଷିଣା□ଳୀୟ ଓ ପଶ୍ଚିମା□ଳୀୟ)

୩ୟ ଏକକ : ଓଡିଆ ଭାଷା ଉପରର ବିଭିନ୍ନ ଭାଷାର ପ୍ରଭାବ : ଦ୍ରାବିଡ, ଯାବନିକ୍ ଓ ଇାଂରାଜୀ

୪ଥ୍ ଏକକ : ଓଡିଆ ଭାଷାର ଶାସ୍ତ୍ରୀୟତା

Core XV ଷଷ୍ଠ ପର୍ଯ୍ୟାୟ **(Semester-VI)**

ଓଡ଼ିଆ ବୟାବହାରିକ ବୟାକରଣ

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି) :

ଭାଷା ବୟବହାରରର ତୁଟିଶୂନୟତା ଓ ଶୁଦ୍ଧତା ନିମିର୍ତ୍ତ ବୟାକ୍ରଣ ଜ୍ଞାନ ନିତାନ୍ତ ଆବଶୟକ୍। ଏହି ପାଠୟପତ୍ରରର ଓଡିଆ ଭାଷାର ବୟାବହାରିକ୍ ବୟାକ୍ରଣିକ୍ ଜ୍ଞାନ ଅଜ୍ଜନ କ୍ରିବାର ସୁରଯାଗ ରହିଛି ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧୟନ ଫଳଶ୍ରୁତି) :

୧ମ ଏକକ : ଓଡିଆ ପେପ୍ରକ୍ରଣ ବିଷୟକ୍ ଜ୍ଞାନ ହାସଲକ୍ରି ବିରଶଷୟ, ବିରଶଷଣ,ସବଚନାମ ,ଅବୟୟ ଓ କ୍ରିୟାପେର ନିଭୁଲ ପ୍ରରୟାଗରର ସକ୍ଷମ ରହରବ ଛାତ୍ରଛାତ୍ରୀ ।

୨ୟ ଏକକ : ଓଡିଆ ଭାଷାରର କ୍ାରକ୍ ଓ ବିଭକ୍ତିର ସାଂଜ୍ଞା ସହିତ ତାର ପ୍ରକ୍ାରରଭେ ଜାଣିବାପାଇଁ ଏହି ଏକ୍ଟି ଉେିଷ୍ଟ ।

୩ୟ ଏକକ : ଓଡିଆ ଭାଷାର କ୍ୃେନ୍ତ ଓ ତଦ୍ଧିତ ପେ ତଥା ଉପସଗଚଗୁଡିକ୍ ସମ୍ପକ୍ଟରର ଜାଣିବା ନିମିର୍ତ୍ତ ଏହି ଏକ୍ସ ପରିକ୍ଳ୍ପନା ।

୪ଥ୍ ଏକକ : ଓଡିଆ ଭାଷାରର ସମାସ, ସନ୍ଧି ଆୌର ଗୁରୁତ୍ୱ ସ୍ୱୀକ୍ାୟଚୟ। ଶ□ ସାଂରକ୍ଷପଣ ବା ଏକ୍ସ୍ପୋକ୍ରଣ ଜ୍ଞାନ ମଧ ଭାଷା ପ୍ରରୟାଗରର ଆବଶୟକ୍ ହୁଏ । ଏ ସମ୍ପକ୍ଟରର ଛାତ୍ରଛାତ୍ରୀଙ୍କୁ ଅବଗତ କ୍ରିବା ଏହି ଏକ୍ସ ଲକ୍ଷୟ ।

ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକକ : ପେ ପ୍ରକ୍ରଣ (ବିରଶଷୟ, ବିରଶଷଣ, ସବଚନାମ, ଅବୟୟ, କ୍ରିୟା)

୨ୟ ଏକକ : କ୍ାରକ୍, ବିଭକ୍ତି

୩ୟ ଏକକ : କ୍ୃେନ୍ତ, ତଦ୍ଧିତ ଓ ଉପସଗଚ

୪ଥ୍ ଏକକ : ସନ୍ଧି, ସମାସ ଓ ଏକ୍ସ୍ପୋକ୍ରଣ

Multi-Disciplinary Course - SEMESTER-I

Paper-V: **ତୁଳନାତ୍ମକ ସାହିତ୍ୟ (Odia)**

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି):

ବିବିଧ ଭାଷାର ସାହିତ୍ୟ ମଧ୍ୟରେ ତୁଳନାତ୍ମକ ଅଧ୍ୟୟନ ସାମ୍ପ୍ରତିକ ସମୟର ଏକ ପ୍ରାସଙ୍ଗିକ ବିଷୟ । ଏହାଦ୍ୱାରା ବିଶ୍ୱ ପରିପ୍ରେକ୍ଷୀରେ ସାହିତ୍ୟିକ ସମ୍ପର୍କ ବୃଦ୍ଧିପାଏ ଓ ବିଶ୍ୱ କଲ୍ୟାଣ ସାଧିତହୁଏ । ସ୍ନାତକଶ୍ରେଣୀର ବିଦ୍ୟାର୍ଥୀମାନେ ତୁଳନାତ୍ମକ ସାହିତ୍ୟ ଅଧ୍ୟୟନ ମାଧ୍ୟମରେ ବିବିଧ ଭାଷା ଓ ସାହିତ୍ୟର ଜ୍ଞାନ ଆହରଣ କରିପାରିବେ । ତେଣୁ ବହୁମୁଖୀ ପାଠ୍ୟଖସଡ଼ାରେ ତୁଳନାତ୍ମକ ସାହିତ୍ୟ

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳଶ୍ରୁତି):

୧ମ ଏକକ : ତୁଳନାତ୍ମକ ସାହିତ୍ୟର ତାତ୍ତ୍ୱିକଦିଗ ଉପରେ ଛାତ୍ରଛାତ୍ରୀ ଏଠାରେ ଅବଗତ ହୋଇପାରିବେ । ବିଶେଷତଃ ତୁଳନାତ୍ମକ ସାହିତ୍ୟର ସଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ବିବିଧରୂପ ଜାଣିପାରିବେ ।

୨ୟ ଏକକ : ସଂସ୍କୃତ ହେଉଛି ଭାରତର ସର୍ବପ୍ରାଚୀନ କାବ୍ୟଭାଷା । ସଂସ୍କୃତ ସାହିତ୍ୟର ବିଖ୍ୟାତ କବି ଓ ନାଟ୍ୟକାର କାଳିଦାସଙ୍କ ସୁପ୍ରସିଦ୍ଧ 'ଅଭିଜ୍ଞାନ ଶାକୁନ୍ତଳମ୍' ନାଟକ ଓ ଆଧୁନିକ ଓଡ଼ିଆ କାବ୍ୟକାର ଗଙ୍ଗାଧରଙ୍କ 'ପ୍ରଣୟବଲ୍ଲରୀ'ର ତୁଳନାତ୍ମକ ଅଧ୍ୟୟନ କରିବାପାଇଁ ଏହି ଏକକରେ ସୁଯୋଗ ରହିଛି ।

୩ୟ ଏକକ : ହିନ୍ଦୀ ଭାଷାର ବିଖ୍ୟାତ ଲେଖକ ପ୍ରେମଚାନ୍ଦଙ୍କ 'ଗୋଦାନ' ଉପନ୍ୟାସ ଓ ବିଶିଷ୍ଟ ଓଡ଼ିଆ କଥାକାର ଫକୀରମୋହନଙ୍କ 'ଛମାଣ ଆଠଗୁଣ'ର ତୁଳନାତ୍ମକ ସମୀକ୍ଷା ବେଶ୍ ଗୁରୁତ୍ୱ ରଖେ । ଏହି ଏକକରୁ ବିଦ୍ୟାର୍ଥୀମାନେ ତୁଳନାତ୍ମକ ଜ୍ଞାନ

୪ର୍ଥ ଏକକ: ନୋବେଲ ପୁରସ୍କାର ପ୍ରାପ୍ତ 'The Waste Land' କାବ୍ୟ ଗ୍ରନ୍ଥଟି ବିଶ୍ୱବ୍ୟାପୀ ପ୍ରଭାବ ବିସ୍ତାର କରିଛି । ତାହା ସହିତ ଯଶସ୍ୱୀ ଆଧୁନିକ କବି ଗୁରୁପ୍ରସାଦଙ୍କ 'କାଳପୁରୁଷ'ର କିପରି ସାମଞ୍ଜସ୍ୟ ବା ତାରତମ୍ୟ ରହିଛି, ଛାତ୍ରଛାତ୍ରୀ ତାହା ଏଠାରେ ଅନୁଶୀଳନ କରିବେ ।

ପାଠ୍ୟ ବିଷୟ

୨.ପାଶ୍ଚାତ୍ୟ ସାହିତ୍ୟ ଓ ସମୀକ୍ଷା ତତ୍ତ୍ୱ - ସଂ. କୃଷ୍ଣଚନ୍ଦ୍ର ପ୍ରଧାନ, ପ୍ରାଚୀ ସାହିତ୍ୟ ପ୍ରତିଷ୍ଠାନ, କଟକ ।

୩.ସାମ୍ପ୍ରତିକ ପାଶ୍ଚାତ୍ୟ ସମାଲୋଚନା ତତ୍ତ୍ୱ – ଚିତ୍ତ ରଞ୍ଜନ ମିଶ୍ର, ଗ୍ରନ୍ଥ ମନ୍ଦିର, କଟକ ।

୪.ପାଶ୍ଚାତ୍ୟ ସମାଲୋଚନା ତତ୍ତ୍ୱ – ଜିତେନ୍ଦ୍ର ନାରାୟଣ ପଟ୍ଟନାୟକ ।

୫.ତୁଳ୍ୟ କଷଟି – ସନ୍ତୋଷ ତ୍ରିପାଠୀ, ଏଥେନା, କଟକ ।

୬.ଗବେଷଣା ଅନୁବାଦ ଓ ସମ୍ପାଦନାକଳା – ନାରାୟଣ ସାହୁ, ସତ୍ୟ ନାରାୟଣ ବୁକ୍ ଷ୍ଟୋର, କଟକ ।

ନମୁନା ପ୍ରଶ୍ନ (Sample Questions) :

୧.କାହାକୁ ତୁଳନାତ୍ମକ ସାହିତ୍ୟର ପିତା ବୋଲି କୁହାଯାଏ ? (୧ ମାର୍କ)

୨.ବିଶ୍ୱର କେଉଁ ଦୁଇଜଣ ପ୍ରସିଦ୍ଧ କବି ତଥା ନାଟ୍ୟକାରଙ୍କ ଉପରେ ମାୟାଧର ମାନସିଂହ ତୁଳନାତ୍ମକ ଗବେଷଣା କାର୍ଯ୍ୟ କରିଛନ୍ତି?

(୨ ମାର୍କ)

୩. ଗୋଦାନ ଓ ଛମାଣ ଆଠଗୁଣ୍ଠର ପାଞ୍ଚୋଟି ସାମଞ୍ଜସ୍ୟ ଲେଖ । (୫ ମାର୍କ)

୪.ଦୁଷ୍ମନ୍ତ ଚରିତ୍ରକୁ ଚିତ୍ରଣ କରିବାରେ କାଳିଦାସ ଓ ଗଙ୍ଗାଧରଙ୍କ ଦୃଷ୍ଟିକୋଣର ତୁଳନା କର । (୮ ମାର୍କ)

DEPARTMENT OF HOME SCIENCE
SARBATI DEVI WOMEN'S COLLEGE,RAJGANGPUR
PO,CO,PSO- NEP-2020

Semester I

Core I Food and Nutrition

Course Outcome:

• The students will get basic knowledge on food, nutrients and their contribution.

• The students will gain practical knowledge on market survey and locally available food stuffs from each food group.

Learning Outcome:

• The students will learn the basic concepts in food, nutrition and health.

• The students will gain an insight into the classification, functions, dietary sources, and daily requirements of various nutrients.

• The students will understand about different food groups and their nutritional contribution.

• The students will be aware of different methods of cooking along their advantages and disadvantages.

Unit I: Basic Concepts in Food and Nutrition

• Introduction to Food and Nutrition Science- Definitions (food, food science, food additive, fermented food, food fortification, functional food, nutrition, health, nutrients, nutritional status, optimal nutrition, nutrition security).

• Classification and Functions of Food- Physiological, psychological, and socio-cultural.

• Food Groups- Basic five and seven food groups, their nutritional contribution.

• Methods of Cooking- Different methods of cooking and their advantages and disadvantages: Dry methods - frying, sautéing, parching, roasting, grilling/broiling, toasting and baking. Moist methods - boiling, steaming, stewing, simmering, poaching, blanching, pressure cooking. Combination method- braising.

Unit II: Macro Nutrients

• Carbohydrates- Introduction, classification, functions, dietary sources and daily requirements.

• Proteins- Introduction, classification, functions, dietary sources and daily requirements.

• Lipids- Introduction, classification, functions, dietary sources and daily requirements.

Unit III:Micro Nutrients

• Fat Soluble Vitamins (A, D, E and K)- Introduction, functions, dietary sources, daily requirements and deficiency diseases.

• Water Soluble Vitamins (Thiamin, Riboflavin, Niacin, Folate, Vitamin B12 and Vitamin C)- Introduction, functions, dietary sources, daily requirements and deficiency diseases.

• Minerals (Calcium, Iron, Zinc and Iodine)- Introduction, functions, dietary sources, daily requirements and deficiency diseases.

Unit IV: Practical

• Conduct a market survey (On-line/ offline of nearby locality) and prepare a list of food stuffs and food products of the following food groups:

• Cereals, Millets, Pulses, Fruits, Vegetables, Milk and Milk Products, Fish Meat and Poultry Products.

• Weights and Measures: Standardization of household measures for raw and cooked foods.

• Food preparations using different methods of cooking and understanding the principles involved in it - Dry heat-frying, broiling, parching, baking) and Moist heat- boiling, stewing, cooking under pressure: (One item from each method).

• Preparation of food exchange list of cereals/pulses/fruits/vegetables.

Core II Child Development

Course Outcome:

• Students will be able to understand the crucial aspects of child development.

• Students will understand about the developmental patterns of child development.

Learning Outcome:

• The students will gain an insight on scientific methods of studying child development.

• The students will be aware of the stages of prenatal development and factors affecting pre- natal development.

• The students will understand the developmental patterns during early childhood years (0- 5years).

• The students will gain practical knowledge on development tasks in childhood.

Unit I: Fundamentals of Child Development:

• Child Development- Meaning, definition, principles, stages, and methods of studying child development.

• Prenatal Growth and Development - Meaning, significance and stages of prenatal growth and development, conception, period of ovum, period of embryo and period of foetus.

• Prenatal Environmental Influences- Maternal age, nutrition, drugs, irradiation, alcohol, smoking, maternal emotions, maternal health, Rh factor, diseases and birth hazards.

Unit II: Developmental Milestones (During First Five Years of Child's Life):

• Physical Development- Physical growth cycles, body size, body proportions,

bones, teeth, muscles and fat, development of the nervous system.

• Motor Development – Meaning, principles and sequence of motor development.

• Speech Development – Meaning, pre-speech forms of communication, essentials in learning to speak, major tasks in learning to speak and speech disorders.

Unit III: Developmental Milestones (During First Five Years of Child's Life):

• Emotional Development - Meaning, common emotional patterns, and characteristics of childhood emotions.

• Social Development – Meaning, process and importance of early social experiences, factors influencing social development.

• Cognitive Development - Meaning and importance, factors influencing cognitive development.

Unit IV: Practical

• Assessing developments (physical/motor/emotional/social/cognitive/speech) using different methods of child study – interview schedule / observation schedule / anthropometry/ psychometry tests.

• Assessment of existing knowledge, attitudes and practices of parents and field functionaries (ANM/anganwadi workers/teachers) related to developmental milestones of children (any five samples).

• Plan and develop activities for children to facilitate motor and cognitive development through preparation of learning materials such as posters/charts/ toys etc.

• Plotting growth monitoring chart for children from one to five years and its interpretations.

Semester II

Core III Family Resource Management

Course Outcome:

• Students will be oriented about the available human and non-human resources in the family and their management.

• Students will learn the importance of judicious management of resources and their conservation techniques for sustainability.

Learning Outcome:

• The students will gain an insight on family resource management and its application. LO2: The students will be aware of the management process.

• The students will learn about judicious utilization of resources management for conservation and sustainability.

• The students will get practical knowledge on event planning and management.

Unit I: Resource Management in Family Setting

• Family Resource Management- Concept, definition and scope of family resource management.

• Resources- Meaning, classification and characteristics of family resources, factors affecting utilization of resources.

• Decision making- Types of decisions, steps of decision making.

Unit II: Motivating Factors in Management and Management Process:

• Motivating Factors in Management- Motivation in management, theories of motivation, Maslow's hierarchy of needs theory

• Motivating Factors- Values, goals and standards, interrelatedness of values, goals, and standards.

• Management Process- Definition and steps in management process: planning, organizing, controlling and evaluating, qualities of a good home maker.

Unit III: Resource Conservation:

• Money- Types of income, supplementing family income.

• Time- Concept and steps in time management, factors to be considered in making time and activity plan.

• Energy-Efforts, fatigue, work simplification techniques and Mundel's classes of change.

• Space – Meaning, importance, functional storage space management.

Unit IV: Practical

• Conduct a SWOC analysis of self/organization.

• Event planning for departmental activity (Celebration of any special day/seminar/workshop).

• Decision making through management games (Chess/tug of war/UNO).

• Plan and evaluate time activity chart for one day.

Core IV Home Science Extension Education

Course Outcome:

• To enrich students about relevance of extension education and its application.

• To understand about the application of extension teaching methods for teaching and training purpose. **Outcome Learning:**

• The students will be enriched with the principle and behavioral changes brought about by extension education.

• The students will understand extension education in community development.

• The students will be aware of the methods of teaching in extension education.

• The students will learn about the educative materials preparation of for different training purposes and get experience of various extension organizations.

Unit I: Introduction to Extension Education:

• Definition, needs, objectives and scope of extension education.

• Philosophy and principles of extension education.

• Behavioral changes through extension education.

Unit II: Role of Home Science Extension Education in Community Development:

• Meaning, definition and areas of community development. Home science extension education and it is inter-relationship with community development.

• Role & qualities of Home Science extension workers.

• Home Science Extension Programmes- Mission Shakti, MGNREGA, National Mission for empowerment of women, ICDS, Green India Mission (GIM).

Unit III: Teaching Methods in Extension Education:

• Classification of Extension Teaching Methods- Individual, group and mass methods. individual methods: farm and homevisits, office calls, telephone calls, personal letters.

• Group Methods- Method demonstration, campaign, puppetry, general meeting result demonstration, roup discussion, tours, field trips, lecture, seminar, and workshop, advantages and disadvantages.

• Mass Methods- Leaflets and folders, exhibition, circular letter, radio, television, bulletins, s t o r y f i l m s h o w , a n d news articles, advantages & disadvantages.

Unit IV: Practical

• Prepare a leaflet/poster on various issues related women, children and environment.

• Prepare a project report within one thousand words on women/children/environment.

• Prepare a flow chart on the steps of method demonstration by extension worker.

• Visit to Mission Shakti centers/ NGO and prepare a report (Objectives, Functions, Achievements) **Text Books:**

- *V. K Dubey, Indira Bishnoi, Extension Education and Communication, New Age International Publishers*.
- *S. V Supe, An Introduction to Extension Education, Oxford and Publishing Co. Pvt. Ltd*
- *Nibedita Mishra and Gayatri Biswal, Text Book of Home Science Extension Education, Recent Edition*.

Semester III

Core V Introduction to Textiles

Course Outcome

• Students will develop an idea about different textile fibers.

• Students will develop the skills to analyse yarn construction techniques.

Learning Outcome:

• The students will learn about classification, usage and production of textile fibres.

• The students will know the manufacturing process and yarn construction techniques.

• The students will gain an insight on techniques of fabric construction, dyeing and printing.

• The students will be enriched about different types of dyeing and printing techniques.

Unit I: Introduction to Textile Fibres:

• Definition of textile fibres, terminology and classification of textile fibres.

• Production, Manufacturing Process, Properties and usage of fibres- Natural fibre (cotton, silk and wool).

• Production, Manufacturing Process, Properties and Usage of Fibres- Man-made fibers (rayon (Viscose), polyester, nylon). **Unit II: Yarn Construction**

• Types and Classification of Yarns- Simple, ply yarns, cord yarns, novelty yarns. twist in yarn:

"s" and "z" twist.

• Staple yarn formation.

• Woolen and worsted yarn formation process.

• Chemical spinning (wet, dry, melt)

Unit III: Techniques of Fabric Construction

• Weaving- Meaning, essential weaving operation, classification of weaves (plain, basket, ribbed, twill, satin, sateen)- structure, properties, usages.

• Dyeing and Printing Methods – Raw stock dyeing, skein-dyeing, piece dyeing, cross dyeing, tie-die, batik dyeing, printing methods – direct printing, block printing, stencil printing and printing by machine.

Unit IV: Practical

1. Fiber identification: Identification of natural and manmade fibers by following three methods - microscopic test, burning test.

2. Characteristics of Fabric (following standards): Fabric count using pick glass

3. Printing of fabrics using:

i. Direct style - Block, stencil and screen

ii. Resist style - Tie and dye, batik

4. Weaves- Prepare sample weave on plain, basket, ribbed, twill, satin, sateen.

Core VI Dynamics of Communication

Course Outcome:

- Understand the need of communication and communicate effectively.
- Gain the knowledge about the different aspects of communication.

Learning Outcome:

- The students will understand the concept, functions, types and scope of communication.
- The students will be aware of the principles, elements and models of communication.
- The students will learn about the concept of effective communication.
- The students will learn skills of writing scripts and preparation of educational aids for effective communication.

Unit I: Introduction to Communication

- Meaning, definition concept, nature and scope of communication
- Types of Communication- Formal and informal communication, verbal and non-verbal communication.
- Functions and characteristics of communication.

Unit II: Principles, Elements, and Models of Communication:

- Elements of communication and principles of communication
- Barriers to communication- Mental, physical, technical, environmental, semantic.
- Models of communication- Aristotle, Laswell, Shannon and Weaver, Osgood and Schramm, Riley model.

Unit III: Effective Communication

- Meaning, concept, and importance of effective communication.
- Factors influencing and hindering effective communication, importance of communication process.
- Role of empathy, persuasion, perception, listening, propaganda and publicity for effective communication.

Unit IV: Practical

1. Plan and conduct a small group communication in classroom setting on any topic and prepare

a report.

2. Visit to a nearby slum/community/village and communicate with the people on specific issues (health/ environment / social and write a report.

3. Write a short story with any social message related to Home Science.

4. Prepare a power point presentation on any contemporary social issue.

Core VII Development in Late Childhood and Adolescence

Course Outcome:

CO1- Students will able to gain understanding about the various needs of adolescent years.

CO2-This course will help to provide guidelines about the developmental tasks of adolescent years.

Learning Outcome:

LO1: The students will know about the characteristics, body changes and effect of puberty

LO2: The students will earn about the characteristics, developmental tasks and body changes

during adolescence.

LO3: The students will gain an insight on characteristics, developmental tasks, and changes in early adulthood.

LO4: The student will understand about various adjustments of family.

Unit I: Late Childhood Years:

• Characteristics and developmental tasks of late childhood.

• Physical development, speech improvements and emotional expressions in late childhood.

• Social grouping and personality changes in late childhood.

Unit II: Puberty:

• Meaning, characteristics and age at puberty

• Body changes at puberty, puberty growth spurt: age and stages of puberty growth.

• Physical, psychological, and emotional changes during puberty.

Unit III: Adolescence:

• Meaning, characteristics of adolescent years.

• Developmental tasks during adolescence.

• Physical, emotional, hormonal and behavioral changes.

Unit-IV: Practical:

• Prepare a poster on developmental tasks of late childhood / adolescence.

• Develop an interview schedule for identifying adolescent's problems / issues and drawing inferences (at least 2 boys and 2 girls).

• Assess physical/social/emotional development among boys and girls during late childhood /adolescence.

Semester IV

Core VIII Maternal And Child Nutrition

Course Outcome:

• The students will gain knowledge about the fundamentals of maternal and child nutrition.

• The students will be able to prepare diets for different stages of life.

Learning Outcome:

• The students will learn about the recommended dietary allowance and principles of balanced diet.

• The students will have an insight about nutritional requirements during infancy, preschool and school going age.

• The students will able to understand about the nutrition requirement during adolescence and nutrition for women in special conditions.

• The students will gain practical knowledge on menu planning for different stages of women and children.

Unit I: Menu Planning

• Explanation of terms related to menu planning (health, nutrient requirement, dietary standards, dietary reference intake, RDA, adequate intake, Estimated Average Requirement), determinants of food choice

• Food Guide- Food pyramid, my plate, mediterranean diet.

• Balanced Diet- Meaning, principles of planning balanced diet, steps involved in planning a diet.

Unit II: Nutrition in Infancy, Preschool and School Going Age

• Nutrition during Infancy- Introduction, growth and development during infancy, nutritional requirements, food requirements, breast feeding, weaning and artificial feeding.

• Nutrition in Preschool- Introduction, nutritional requirements, food requirement, factors affecting nutritional status, nutritional related problems and feeding programs for preschool children.

• Nutrition in School Going Age- Introduction, nutritional requirement, food requirement, nutritional problems of school children, packed lunches, and school lunch program.

UnitIII: Nutrition in Adolescents and Women in Special Conditions:

• Nutrition in Adolescence- Introduction, nutritional requirements, food requirement, nutritional problems, nutritional program for the adolescents

• Nutrition during Pregnancy- Introduction, physiological changes during pregnancy, nutritional requirement, food requirement, general dietary problems.

• Nutrition during Lactation- Introduction, role of hormones during lactation, nutritional requirements and dietary guidelines for lactating women.

Unit-Iv: Practical

• Plan and prepare one day menu, calculate calorie, protein, and fat for the following age groups: infant, children and adolescent.

• Plan a one-day menu for pregnant / lactating woman and calculate calorie, protein, calcium, and iron.

• Plan and prepare one set of packed lunch for school going children (vegetarian/non-vegetarian).

• Develop and prepare one weaning food mix from local available foods.

Core IX Human Physiology

Course Outcome:

• The students will understand the structure and function of different organ systems of the body.

• The students will be able to get practical knowledge in human physiology.

Learning Outcome:

• The students will be able to understand the physiology of cell, blood, and heart.

• The students will gain knowledge on the structure and functions of digestive, excretory and reproductive system.

• The students will be able to understand the structure and functions of nervous, respiratory, and endocrine system.

• The students will be able to get practical experience on human physiology.

Unit I: Cell and Blood Circulation

• Human Cell - Structure and functions of cell organelles, cell division.

• Blood - Composition, structure and functions of RBC, WBC, blood platelets, blood coagulation, blood groups and Rh factor.

• Heart- Structure and function of heart, cardiac cycle, blood pressure. **Unit II: Digestive, Excretory and Reproductive Systems**

• Digestive System – Structure and functions of different parts of digestive system and accessory glands (liver, pancreas, and gall bladder).

• Excretory System- Structure and functions of Urinary system and mechanism of urine formation.

• Reproductive System- Structure and functions of reproductive system (male and female), physiology of menstrual cycle.

Unit III: Nervous, Respiratory and Endocrine Systems

• The Nervous System- Structure and function of brain, sympathetic and parasympathetic nervous system.

• The Respiratory System - Structure and functions of lungs, mechanism of respiration, external and internal respiration and vital capacity.

• The Endocrine System - The location and functions of various endocrine glands – Pituitary, Thyroid, Parathyroid, Adrenal, Islets of Langerhans and Gonads.

Unit IV: Practical

• Prepare posters (any two) showing the organs and functions of human system. (Digestive/ Reproductive / Respiratory/Endocrine).

• Record blood pressure of five persons by using sphygmomanometer.

• Measure and record pulse rate, oxygen level and body temperature of five persons using oximeter and thermometer.

• Prepare any one model of (Cell/Digestive system/Circulatory systems/Respiratory system/Renal system/ Reproductive system/Skin).

Core X Fundamentals of Clothing and Fashion Design

Course Outcome:

• Students will acquire a comprehensive understanding on clothing and its dimensions. • Students will learn the fundamentals on fashion and its application in textile industry.

Learning Outcome:

• The students will be aware about the origin, functions, and importance of clothing.

• The students will learn about the selection, use of clothing and evaluation of ready-made garments.

• The students will get advanced knowledge on fashion and role of a fashion designer.

• The students will understand the aesthetics in dress and will gain practical knowledge in it

Unit I: Importance of clothing:

• Clothing: Meaning, history, importance, functions of clothing: Protection and comfort, Identity, status, and prestige, ornamental and aesthetic, sociability and conformity, self-expression, and actualization function.

• Clothing for Different Activities - Sports and athletic activities, formal events and celebrations, casual outings and everyday wear, work environments, outdoor and adventure activities, gym and fitness workouts, formal education settings, entertainment and performance.

• Theories of Origin of Clothing **–** Modesty theory, immodesty theory, adornment theory, protection theory, new advances in clothing: Water-repellent clothing, antibacterial clothing, wrinkle-free clothing, clothing with protection against UV radiation , concept and advantages.

Unit II: Selection of Clothing:

• Selection of clothing according to body build, age group (infant, toddler, teenager, adolescent, and old age), Selection and evaluation of ready-made garments (design, fit, workmanship, price, comfort, care, maintenance), use of colors in clothing.

• Factors Influencing Buying of Ready-made Garment- Size, suitability, durability, aesthetic appeal, occupation, labels (basic information and care labels), brand, socio economic-conditions, location, climate.

• Types of Design and Components in Garments - Structural and applied design, components of garments (sleeves, necklines, collars, pockets).

Unit III: Fashion Design

• Definition and origin of fashion in India, factors favoring and retarding fashion.

• Fashion cycle, classic fashion, and fashion fad, theories of fashion: trickle-down, trickle up, trickle across, role of a fashion designer.

• Leading fashion designing centers in India NIFT, NID, SID, NIIFT.

Unit-IV: Practical

• Flat sketching of sleeves and necklines.

• Flat sketching of collars and pockets.

• Preparation of an album of garment feature collections of famous designers.

• Prepare a catalogue of different garment labels available in market.

Semester V

Core XI Marriage and Family Studies

Course Outcome:

• Students will able to understand about relevance of marriage in sustenance of social life.

• This course will help to bring a harmonious society and family life.

Learning Outcome:

• The students will learn about marriage, types of marriage and marriage in contemporary society.

• The students will gain an insight on marriage rituals and ceremonies in different Indian communities.

• The students will understand the family, kinship relationship and stages of family life cycle.

• The students will understand about the problems of family.

Unit I: Marriage as an Institution:

• Meaning, definitions, functions of marriage and importance of marriage.

• Types of marriages -Monogamy, polygamy, exogamy, endogamy, polyandry, polygyny.

• Marriage in contemporary society–Arranged marriage, free-choice marriage, inter-caste marriage, inter-religion marriage.

Unit II: Marriage Rituals and Ceremonies:

• Significance of marriage rituals and ceremonies among various Indian communities: Hindus, Muslims, and Christians community.

• Adjustments in marriage- Sexual, financial, within-in-laws family and among working couples.

• Changes in marriage system in India **Unit III: Family System**

• Meaning, definition, importance, characteristics of family

• Functions of family (Traditional and Modern)

• Family Life Cycle: meaning, importance and stages of family life cycle.

• Family-in-Transition –Merits and demerits, contemporary family types prevalent in India.

Unit IV: Problems Of Family Life:

• Prevailing Family Problems- Prolonged sickness/illness, accidents, widowhood, unemployment, economic distress/poverty, broken family, family with a disables and suicide in the family.

• Marital Problems- Marital disharmony and conflict, separation and divorce, single parenthood, loss of spouse.

• Counseling and other strategies to overcome the family and marital problem

Core XII

Family Finance and Consumer Studies

Course Outcome:

• The students will be enabled to understand the principles of household economics.

• The students will learn the importance and scope of consumer education and consumer protection measures.

Learning Outcome:

• The students will gain knowledge about household income and expenditure.

• The students will be educated on consumer education and problems.

• The students will learn the importance of consumer protection.

• The students will gain practical knowledge on banking system and consumer organizations.

Unit I: Household Income and Expenditure:

• Maintaining household accounts, budget: meaning, significance, types, items of budget and steps in formulating budget.

• Factors influencing expenditure, family savings: concept, importance, objectives, types of savings and institutions of savings.

• National income (GDP, NDP, GNP, NNP) and per capita income: meaning and significance in national growth.

Unit-II: Consumer Education and Problems

• Definition and role of consumers, consumer awareness and education - Concept, Objectives, Importance

• Consumer rights and responsibilities

• Consumer problems- Products and service-related problems and solution **Unit-III: Consumer Protection**

• Basic legislative framework for consumer protection in India, consumer protection act 1986, alternative redressal mechanisms, mediation centers.

• Consumer organizations– role and functions

• Quality marks (Handloom Mark, AGMARK, FPO, FSSAI, BIS, ECO MARK, Hall Mark), standardization and quality control measures.

Unit IV: Practical

• Conduct a case study of banker, post office to understand their services and products

• Learn to fill different bank forms for depositing money – fixed deposit or recurring deposit

• Preparing labels for any packaged food product

• Evaluate the packaging of any packaged food item

Core XIII

Community Health and Nutrition

Course Outcome:

• The course will enable the students to know about the concept of community health and nutrition and the nutritional problems.

• The students will learn about the assessment of nutritional status and gain experience on the planning of nutrition and health education programs.

Learning Outcome:

• The students will understand the definition, concept and scope of community health and nutrition.

• The students will gain an insight into nutritional problems and their implications.

• The students will learn about the objectives and methods of assessment of nutritional status.

• The students will gain experience about diet planning of Kwashiorkor and Marasmic child and planning and implementation of nutrition education programs.

Unit I: Nutrition Education and Assessment of Nutritional Status

• Definition and concept of community health and nutrition, concept of nutrition education, methods and teaching aids used in nutrition education.

• Meaning, importance and objective of assessment of nutritional status

• Methods of Assessment: Direct (Anthropometry, Biochemical estimation, Clinical examination, and Biophysical examination) and Indirect (Diet survey, Vital Statistics)

Unit II: Nutritional problem and their implications

• Protein Energy Malnutrition- Introduction, prevalence, classification, etiology, clinical features, nutritional requirement, treatment, and prevention.

• Iron Deficiency Anemia (IDA), and Iodine Deficiency Disease (IDD) – Types, prevalence, etiology, symptoms, prevention/treatment and prophylaxis programs.

• Vitamin A Deficiency (VAD) and Fluorosis - Etiology, prevalence, symptoms, prevention/treatment and prophylaxis programs.

Unit III: Nutritional Policies and Programs and Agencies to combat malnutrition

• Nutrition related Policies, Programs: National Nutrition Policy, ICDS, PDS, TPDS, Antyodaya Anna Yojana, National Food for Work Program

• National Agencies: ICAR, ICMR, NIN, NNMB

• International Agencies: WHO, UNICEF, FAO, CARE.

Unit IV: Practical

• Assessment of nutritional status of five children (1-5 years) by anthropometric measurements.

• Interpretation of data based on BMI of ten numbers of adolescents (boys/girls).

• Plan, prepare and calculate diet for kwashiorkor child /marasmus child/anemic adolescent girls.

• Visit to organizations implementing nutrition programs for children and women in your locality and prepare a report.

Core XIV Semester VI

Research Methodology

Course Outcome:

• The students will be oriented towards the importance and need of research in Home Science

• The students will be able to identify various issues in Home Science and will carry out research in the pertinent areas for societal development.

Learning Outcome:

• The students will become aware of meaning, purpose and types of research.

• The students will learn about various types of research designs.

• The students will gain an insight on sampling techniques.

• The students will be educated on research process.

Unit I: Research Methodology

• Research - Meaning, objectives and significance

• Types of research- Descriptive Vs. Analytical, Applied Vs. Fundamental, Qualitative Vs.

Quantitative, Conceptual Vs. Empirical.

• Criteria of a good research. **Unit-II Research Design**

• Research design - Meaning, concept, need

• Features of a good research design.

• Types of research design-Exploratory, Descriptive, Experimental **Unit III Sampling Techniques and Data Collection:**

• Sampling – Meaning and Types (Probability and Non-Probability Sampling)

• Collection of data-Primary and secondary data.

• Tools and techniques of data collection-observation, interview schedule, questionnaire, case study, Focus Group Discussion (FDG).

Unit IV: The Research Process

• Formulating the problem, formulation of objectives and hypothesis, preparing the research design, review of literature.

• Data analysis, measures of central tendency- Mean, median and mode.

• Data interpretation, bibliography and report writing.

Core XV

Housing and Interior Design

Course Outcome:

• The students will gain knowledge in House Planning for different income levels

• The students will gain insight on elements and principles of design and their household application **Learning Outcome:**

• The students will gain understanding of the basic principles of housing and house planning.

• The students will get familiarized with the elements of interior design

• The students will be educated on principles of interior design.

• The students will acquire practical knowledge of House planning for different income groups

Unit I: Housing and Principles of House Planning:

• Meaning, Importance, Types of Housing and Housing terms; Significance, functions, and types of houses; Selection of site and Factors influencing it- Location, Size and Shape, physical features, soil condition, sanitary condition, practical convenience

• Principles of House Planning I - Aspect, Privacy, Grouping, Roominess, Flexibility; Principles of

House Planning II – Circulation, Sanitation, Furniture Requirements, Prospect, Economy,

Elegance

• Building plans for Family Living – Importance and advantages of planning space, Meaning and Concepts of building plans, Site plan, Floor plan, Elevation, Cross sectional view, Perspective view, Land Scape plan

Unit II: Elements of Design:

• Meaning and Concept of Interior design; Aims of Interior Design-Beauty, Expressiveness and Functionalism

• Elements of Design- Meaning, importance, characteristics of each element and their use in designing - Line, shape, form, space, size, texture and color

• Types of Motifs and arrangement- Motif development and fundamental steps in designing process

Unit III: Principles of Design

• Meaning, nature, types, and significance of design

• Principles of Design- Balance, rhythm, emphasis, proportion, harmony

• Flower Arrangement- History, meaning, types (line, mass, line-mass) and forms (circular, crescent, vertical, horizontal, miniature), tools and equipment required for flower arrangement **Unit IV: Practical**

• Draw floor plans of houses for Low/ Middle/ High Income Groups

• Draw different kitchen plans (L-shape, U-shape, Single wall)

• Make a flower arrangement using flowers and foliage (Circular, Crescent, Vertical, Horizontal, Miniature)

• Prepare a poster of different color combinations (Primary, Secondary and Tertiary)

Multi-Disciplinary Course - SEMESTER-II

Paper-VII: ***Food and Nutrition (Home Science)***

Credits: 3

Lectures:45 Hours Full Mark:100 (Theory)

Course Outcome:

CO1: *The students will get basic knowledge on macro and micro nutrients and different types of food and their nutritional contribution.*

CO2: *The students will gain practical knowledge on market survey and locally available food stuffs from each food group.*

Learning Outcome:

- ***LO1:*** *The students will learn the basic concepts in food, nutrition, and health.*
- ***LO2:*** *The students will gain an insight into the classification, functions, dietary sources, and daily of requirements various nutrients.*
- ***LO3:*** *The students will understand about different food groups and their nutritional contribution.*

Unit-I: Basic Concepts in Food and Nutrition:

- *Introduction to Food and Nutrition Science- Definitions (food, food science, food additive, fermented food, food fortification, functional food, nutrition, health, nutrients, nutritional status, optimal nutrition, nutrition security).*
- *Classification and Functions of Food- Physiological, psychological, and socio- cultural.*
- *Food Groups-Basic five and seven food groups, their nutritional contribution.*
- *Methods of Cooking- Different methods of cooking and their advantages and disadvantages: Dry methods - Frying, Sautéing, Parching, Roasting, Grilling/Broiling, Toasting, And Baking. Moist methods-boiling, steaming, stewing, simmering, poaching, blanching, pressure cooking. Combination method- braising.*

Unit-II: Macro Nutrients:

- *Carbohydrates-Introduction, classification, functions, dietary sources, anddaily requirement.*
- *Proteins-Introduction, classification, functions, dietary sources, and daily requirement.*
- *Lipids- Introduction, classification, functions, dietary sources and daily requirement. Unit-III: Micro Nutrients:*
- *Fat Soluble Vitamins (A, D, E and K)- Introduction, functions, dietary sources, daily requirement, and deficiency diseases.*
- *Water Soluble Vitamins (Thiamin, Riboflavin, Niacin, Folate, Vitamin B12and Vitamin C)- Introduction, functions, dietary sources, daily requirement, and deficiency diseases.*
- *Minerals (Calcium, Iron, Zinc, and Iodine)-Introduction, functions, dietary sources, daily requirement, and deficiency diseases.*

DEPARTMENT OF PHYSICS
SARBATI DEVI WOMEN'S COLLEGE,RAJGANGPUR
PO,CO,PSO- NEP-2020

SYLLABUS OF UG PHYSICS (MAJOR) UNDER NEP-2020

CORE COURSE - I

PAPER-I SEMESTER – I

MATHEMATICAL PHYSICS-I

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30hrs)

CO1 Basic understanding of Differential equations and their solutions, conceptual understanding of calculus.

CO2 Basic understanding of vector calculus and its differentiation.

CO3 Use of vector calculus to understand vector integration. Dirac delta function and its properties.

CO4 Understanding of orthogonal curvilinear coordinates and its application in vector differentiation.

CO5 To Understand the basic algorithm in application to functional algebra and error analysis.

UNIT-I

Calculus -I: Plotting of functions, Intuitive ideas of continuous, differentiable functions and plotting of curves, Approximation: Taylor and binomial series (statements only), First Order Differential Equations and Integrating Factor, Second Order Differential equations: Homogeneous Equations with constant coefficients, Wronskian and general solution, Statement of existence and Uniqueness Theorem for Initial Value Problems, Particular Integral.

Calculus- II: Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor with simple illustration, Constrained Maximization using Lagrange Multipliers

UNIT-II

Vector algebra: Recapitulation of vectors: Properties of vectors under rotations. Scalar product and its invariance under rotations, Vector product, Scalar triple product and their interpretation in terms of area and volume respectively, Scalar and Vector fields.

Vector Differentiation: Directional derivatives and normal derivative, Gradient of a scalar field and its geometrical interpretation, Divergence and curl of a vector field, Del and Laplacian operators, Vector identities.

UNIT-III

Vector Integration: Ordinary Integrals of Vectors, Multiple integrals, Jacobian, Notion of infitesimal line, surface and volume elements, Line, surface and volume integrals of Vector fields, Flux of a vector field, Gauss ' divergence theorem, Green's and Stokes Theorems and their applications (no rigorous proofs) **Dirac Delta function and its properties:** Definition of

Dirac delta function. Representation as limit of a Gaussian function and rectangular function, Properties of Dirac delta function.

UNIT- IV

Orthogonal Curvilinear Coordinates: Orthogonal Curvilinear Coordinates, Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems, Comparison of velocity and acceleration in cylindrical and spherical coordinate system.

CORE –I: PAPER-I

LAB: Credit-1

The aim of this Lab is not just to teach computer programming and numerical analysis but to emphasize its role in solving problems in Physics.

- Highlights the use of computational methods to solve physical problems

- Evaluation done not on the programming but on the basis of formulating the problem

- Aim at teaching students to construct the computational problem to be solved

- Students can use any one operating system Linux or Microsoft Windows.

Introduction and Overview: Computer architecture and organization, memory and Input/output

devices. Basics of scientific computing: Binary and decimal arithmetic, Floating point numbers, algorithms, Sequence, Selection and Repetition, single and double precision arithmetic, underflow and overflow emphasize the importance of making equations in terms of dimensionless variables, Iterative methods. Algorithm Errors and error Analysis: Truncation and round off errors, Absolute and relative errors, Floating point computations. Systematic and Random Errors, Propagation of Errors, Normal Law of Errors, Standard and Probable Error.

Review of C and C++ Programming: Introduction to Programming, constants,Variables andFundamentals data types, operators and Expressions, I/O statements, scanf and printf, c in and c out, Manipulators for data format- ting, Control statements (decision making and looping statements) (If Statement, Ifelse Statement, NestedIfstructure, ElseIfStatement, Ternaryoperator, Goto Statement. Switch Statement. Unconditional and Conditional Looping. While Loop. Do-While Loop. FOR Loop. Break and Continue Statements. Nested Loops), Arrays (1D and 2D) and strings, user defined functions, Structures and Unions, Idea of classes and objects.

Programs: Sum and average of a list of numbers, largest of a given list of numbers and its location in the list, sorting of numbers in ascending descending order, Binary search.

Random number generation: Area of circle, area of square, volume of sphere, value ofτ.

PAPER-II SEMESTER – I

MECHANICS:

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30hrs)

CO-1 To Learn the basic concepts of Rigid body dynamics, Radius of Gyration, Moment of Inertia,Non- Inertial Systems

CO-2 To Understand the concept of Elasticity, Fluid motion and Types of Vibration

CO-3 To understand the concept of Newtonian theory through Gravitation, Central force motion, Keplar's laws, GPS

CO-4 To learn the concept of Special theory of Relativity, Michelson- Morley experiment, Lorentz transformation, Relativistic Doppler effect.

CO-5 Apply the basic concepts of Mechanics in experiments.

UNIT-I

Rotational Dynamics: Centre of Mass, Motion of CoM, Centre of Mass and Laboratory frames, Angular momentum of a particle and system of particles, Principle of conservation of angular momentum, Rotation about a fixed axis, Moment of Inertia, Perpendicular and Parallel Axis Theorems, Routh Rule, Calculation of moment of inertia for cylindrical and spherical bodies, Kinetic energy of rotation, Euler's Equations of Rigid Body motion, Motion involving both translation and rotation. Moment of Inertia of a Flywheel.

Non-Inertial Systems: Non-inertial frames and fictitious forces, uniformly rotating frame, Laws of Physics in rotating coordinate systems, Centrifugal force, Coriolis force.

UNIT-II

Oscillations:

Damped oscillation. Equation of motion and solution (cases of oscillatory, critically damped and overdamped) Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor, Bar Pendulum, Katers Pendulum

Elasticity: Relation between Elastic constants, Twisting torque on a Cylinder or Wire, Bending of beams, External bending moment, Flexural rigidity, Single and double cantilever

Fluid Motion: Kinematics of Moving Fluids: Poiseuilles Equation for Flow of a Liquid through a Capillary Tube, Surface tension, Gravity waves and ripple

Viscosity: Poiseuilles Equation for Flow of a Liquid with corrections.

UNIT-III

Gravitation and Central Force Motion: Law of gravitation, Gravitational potential energy, Inertial and gravitational mass, Potential and field due to spherical shell and solid sphere, Motion of a particle under a central force field, Two-body problem and its reduction to one-body problem and its solution, Differential Equation of motion with central force and its

solution, The first Integrals (two), Concept of power Law Potentials, Kepler's Laws of Planetary motion, Satellites. Geosynchronous orbits, Weightlessness, Basic idea of global positioning system (GPS).

UNIT-IV

Special Theory of Relativity: Michelson-Morley Experiment and its out-come, Postulates of Special Theory of Relativity, Lorentz Transformations, Simultaneity and order of events, Lorentz contraction, Time dilation, Relativistic transformation of velocity, Frequency and wave number, Relativistic addition of velocities, Variation of mass with velocity, Massless Particles, Mass- energy Equivalence, Relativistic Doppler effect, Relativistic Kinematics, Transformation of Energy and Momentum.

CORE –I: PAPER-II

LAB: Credit-1

(Minimum 4 experiments are to be done):

1. To study surface tension by capillary rise method.

2. To determine the height of a building using a Sextant.

3. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity.

4. To determine the Moment of Inertia of a Flywheel.

5. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuilles method).

6. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.

7. To determine the value of g using Bar Pendulum.

8. To determine the value of g using Kater's Pendulum.

PAPER-III SEMESTER – II

ELECTRICITY AND MAGNETISM:

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30hrs)

CO-1 To understand the basic concepts of Electricity and Magnetism

CO-2 To Understand the various phenomena in Electricity and Magnetism

CO-3 To Understand Circuit analysis and network theorems

CO-4 To Explain the Dynamics of Charged Particles

CO-5 To Apply the acquired knowledge in Experiment.

UNIT-1

Electric Field and Electric Potential

Electric field: Electric field lines, Electric flux, Gauss Law with applications to charge distributions with spherical, cylindrical and planar symmetry, Conservative nature of Electrostatic Field. Electrostatic Potential, Potential and Electric Field of a dipole, Force and Torque on a dipole, Potential calculation in different simple cases, Laplace and Poisson equations, The Uniqueness Theorem, Method of Images and its application to (1) Plane Infinite Sheet and (2) Sphere. Electrostatic energy of system of charges, Electrostatic energy of a charged sphere, Conductors in an electrostatic Field, Surface charge and force on a conductor.

UNIT-II

Magnetic Field: Magnetic Force, Lorentz Force, Biot Savarts Law, Cur- rent Loop as a Magnetic Dipole and its Dipole Moment (analogy with Electric Dipole), Amperes Circuital Law and its application to (1) Solenoid (2) Toroid (3) Helmhotz coil, Properties of curl and divergence, Vector Potential, Ballistic Galvanometer: Torque on a current Loop, Current and Charge Sensitivity, Electromagnetic damping, Logarithmic damping, CDR.

UNIT-III

Dielectric Properties of Matter: Electric Field in matter, Polarization, Polarization Charges, Electrical Susceptibility and Dielectric Constant, Capacitor (parallel plate, spherical, cylindrical) filled with dielectric, Displacement vector D, Relations between E, P and D, Gauss Law in dielectrics. Magnetic Properties of Matter: Magnetization vector (M), Magnetic Intensity (H), Magnetic Susceptibility and permeability, Relation between B, H, M, Ferromagnetism, B-H curve and hysteresis. Electromagnetic Induction: Faradays Law, Lenz's Law, Self -Inductance and Mutual Inductance, Reciprocity Theorem, Energy stored in a Magnetic Field, Introduction to Maxwell's Equations.

UNIT-IV

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

Network theorems: Kirchoff's law for electrical circuits, Ideal Constant-voltage and Constant-current Sources.

Network Theorems: Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem, Applications to DC circuits. Transient Currents Growth and decay of current in RC and LR circuits.

CORE –I: PAPER-III

LAB: Credit-1

(Minimum 4 experiments are to be done):

Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, c)DC Current, (d) Capacitances, and (e) Checking electrical fuses.

1. To study the characteristics of a series RC Circuit.

2. To determine an unknown Low Resistance using Potentiometer.

3. To determine an unknown Low Resistance using Carey Fosters Bridge.

4. To compare capacitances using DeSauty's bridge.

5. Measurement of field strength B and its variation in a solenoid (determine dB/dx)

6. To verify the Thevenin and Norton theorems.

7. To determine self-inductance of a coil by Andersons bridge.

8. To study response curve of a Series LCR circuit and determine its (a) Reso- nant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.

9. To study the response curve of a parallel LCR circuit and determine its (a)

10. Anti-resonance frequency and (b) Quality factor Q.

PAPER-IV SEMESTER – II

MATHEMATICAL PHYSICS-II:

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30h

The emphasis of the course is on applications in solving problems of interest to physicists. Students are to be examined on the basis of problems, seen and unseen.

CO-1: Conceptual understanding of Fourier series and its application in periodic function.

CO-2: Understanding the various special functions and its properties.

CO-3: Understanding various polynomials and special integrations.

CO-4: To learn the applications of partial differential equation.

CO-5: To apply the acquired knowledge to solve problems.

UNIT-I

Fourier Series-I: Periodic functions, Orthogonality of sine and cosine functions, Dirichlet Conditions (Statement only), Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coefficients, Complex representation of Fourier series, Expansion of functions with arbitrary period, Expansion of non-periodic functions over an interval, Even and odd functions and their Fourier expansions and Application, Summing of Infinite Series, Term-by-Term differentiation and integration of Fourier Series, Parseval Identity.

UNIT-II

Frobenius Method and Special Functions: Singular Points of Second Order Linear Differential Equations and their importance, Singularities of Bessel's and Laguerre Equations, Frobenius method and its applications to differential equations: Bessel, Legendre and Hermite Differential Equations, Legendre and Hermite Polynomials: Rodrigues Formula, G enerating Function, Orthogonality.

UNIT-III

Polynomials: Simple recurrence relations of Legendre and Hermite Polynomials, Expansion of function in a series of Legendre Polynomials, Associated Legendre Differential Equation, Associated Legendre polynomials, Spherical Harmonics. Spherical Bessel's Function (1st and 2nd kind).

Some Special Integrals: Beta and Gamma Functions and relation between them, Expression of Integrals in terms of Gamma Functions, Error Function (Probability Integral).

UNIT-IV

Partial Differential Equations: Solutions to partial differential equations using separation of variables: Laplace's Equation in problems of rectangular, cylindrical and spherical symmetry. Conducting and dielectric sphere in an external uniform electric field. Wave equation and its solution for vibrational modes of a stretched string.

CORE –I: PAPER-IV

LAB: Credit-1

The aim of this Lab is to use the computational methods to solve physical problems. Course will consist of

lectures (both theory and practical) in the Lab. Evaluation done not on the programming but on the basis of formulating the problem.

Topics

Introduction to Numerical computation software Scilab: Introduction to Scilab, Advantages and disadvantages, Scilab computation software Scilab environment, Command window, Figure window, Edit window, Variables and arrays, Initialising variables in Scilab, Multidimensional arrays, Subarray, Special values, Displaying output data, data file, Scalar and array operations, Hierarchy of operations, Built in Scilab functions, Introduction to plotting, 2D and 3D plotting (2), Branching Statements and program design, Relational and logical operators, the while loop, for loop, details of loop operations, break and continue statements, nested loops, logical arrays and vectorization (2) User defined functions, Introduction to Scilab functions, Variable passing in Scilab, optional arguments, preserving data between calls to a function, Complex and Character data, string function, Multidimensional arrays (2) an introduction to Scilab file processing, file opening and closing, Binary I/o functions, comparing binary and formatted functions, Numerical methods and developing the skills of writing a program(2).

Curve fitting, Least square fit Goodness of fit, standard constant Deviation: Ohms law to calculate R, Hookes law to calculate spring constant

Solution of Linear system of equations by Gauss elimination Solution method and Gauss Seidal method. Diagonalization matrices, Inverse of a matrix, Eigen vectors, problems: Solution of mesh equations of electric circuits (3meshes), Solution of coupled spring mass systems (3meshes).

Solution of ODE First order Differential equation Euler, modiftedEuler Runge-Kutta second methods Second order differential equation. Fixed difference method:

First order diferential equation

• Radioactivedecay

• Current in RC, LC circuits with DCsource

• Newtons law ofcooling

• Classical equations of motion

Second order Differential Equation

• Harmonic oscillator (no friction)

• Damped Harmonic oscillator

• Overdamped

• Critical damped

• Oscillatory

• Forced Harmonic oscillator

• Transient and Steady state solution

• Apply above to LCR circuits also

PAPER-V SEMESTER – III

WAVE AND OPTICS:

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30h

CO-1 Basic understanding ofpropagation of light, its application and wave nature.

CO-2 To Understand the concepts of wave motion.

CO-3 To Understand the concepts of interference and its application.

CO-4 To Understand the concepts of diffraction and its application.

CO-5 To Apply the acquired knowledge of optics in Experiment

UNIT - I

Geometrical optics: Fermat's principle, reflection and refraction at plane interface, Matrix formulation of geometrical Optics, Cardinal points and Cardinal planes of an optical system, Idea of dispersion, Application to thick Lens and thin Lens, Ramsden and Huygens eyepiece. Wave Optics : Electromagnetic nature of light. Definition and properties of wave front Huygens Principle. Temporal and Spatial Coherence.

UNIT - II

Wave Motion: Plane and Spherical Waves, Longitudinal and Transverse Waves, Plane Progressive (Traveling) Waves, Wave Equation, Particle and Wave Velocities, Differential

Equation, Pressure of a Longitudinal Wave, Energy Trans- port, Intensity of Wave. Superposition of two perpendicular Harmonic Oscillations: Graphical and Analytical Methods, Lissajous Figures (1:1 and 1:2) and their uses, Superposition of Harmonic waves.

UNIT- III

Interference: Division of amplitude and wave front, Young's double slit experiment, Lloyds Mirror and Fresnels Bi-prism, Phase change on reflection: Stokes treatment, Interference in Thin Films: parallel and wedge-shaped films, Fringes of equal inclination (Haidinger Fringes), Fringes of equal thickness (Fizeau Fringes), Newton's Rings: Measurement of wavelength and refractive index. Interferometer : Michelson's Interferometer-(1) Idea of form of fringes (No theory required), (2) Determination of Wavelength, (3) Wavelength Difference, (4) Refractive Index, and (5) Visibility of fringes, Fabry-Perot interferometer.

UNIT - IV

Fraunhoffer diffraction: Single slit, Circular aperture, Resolving Power of a telescope, Double slit, Multiple slits, Diffraction grating, Resolving power of grating. Fresnel Diffraction: Fresnel's Assumptions, Fresnel's Half-Period Zones for Plane Wave, Explanation of Rectilinear Propagation of Light, Theory of a Zone Plate: Multiple Foci of a Zone Plate, Fresnel's Integral, Fresnel diffraction pattern of a straight edge, as lit and a wire.

CORE –I: PAPER-V

LAB: Credit-1

(Minimum 5 experiments are to be done)

1. To determine the frequency of an electric tuning fork by Melde' s experiment and verify 2-T law.

2. To plot the I-D curve and to determine the refractive index of a prism

3. To determine refractive index of the Material of a prism using sodium source.

4. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.

5. To determine wavelength of sodium light using Newton' s Rings.

6. To determine wavelength of (1) Na source and (2) spectral lines of Hgsource using plane diffraction grating.

7. To determine dispersive power and resolving power of a plane diffraction grating.

PAPER-VI **SEMESTER – III**

MATHEMATICAL PHYSICS-III

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30h

CO-1 :Understanding and application of Complex function variables.

CO-2:Understanding the concept of Fourier Integral transform.

CO-3:To Understand the properties and application of Fourier integral transformation.

CO-4:To Understand the properties and application of Laplace integral transformation.

CO-5:To Apply the acquired knowledge to solve problems.

UNIT-I

Complex Analysis: Brief Revision of Complex Numbers and their Graphical Representation Euler's formula, De Moivres theorem, Roots of complex Numbers, Functions of Complex Variables, Analyticity and Cauchy-Riemann Conditions, Examples of analytic functions, Singular functions: poles and branch points, order of singularity, branch cuts, Integration of a function of a complex variable, Cauchys Inequality, Cauchys Integral formula, Simply and multiply connected region, Laurent and Taylors expansion, Residues and Residue Theorem, Application in solving Definite Integrals.

UNIT-II

Integral Transforms-I: Fourier Transforms: Fourier Integral theorem, Fourier Transform, Examples, Fourier Transform of trigonometric, Gaussian, finite wave train and other functions, Representation of Dirac delta function as a Fourier Integral, Fourier transform of derivatives, Inverse Fourier Transform.

UNIT-III

Integral Transforms-II: Convolution theorem, Properties of Fourier Trans- forms (translation, change of scale, complex conjugation), Three dimensional Fourier transforms with examples, Application of Fourier Transforms to differential equations: One dimensional Wave and Diffusion/Heat flow Equations.

UNIT-IV

Laplace Transforms: Laplace Transforms (LT) of Elementary functions,

Properties of Laplace Transforms: Change of Scale Theorem, Shifting Theorem, LTs of Derivatives and Integrals of Functions, Derivatives and Integrals of Functions, Derivatives and Integrals of LTs. LT of Unit Step function, Dirac Delta function, Periodic Functions, Inverse LT, Application of Laplace Transforms to Differential Equations: Damped Harmonic Oscillator, Simple Electrical Circuits.

CORE –I: PAPER-VI

LAB: Credit-1

Scilab based simulations (XCos) experiments based on Mathematical Physics problems like

. Solve simple differential equations like:

dy/dx = e−x with h y x = 0 = 0

dy/dx + e−x = x2 with h y x = 0 = 0

d^2y/dx^2 + 2dy/dx=-y with h y (x = 0 = 0, y' x = 0) = 1

d^2y/dx^2+ e−x dy/dx=-y with$h$ y (x = 0 = 0, y' x = 0 = 1

Direct Delta Function:

Evaluate , $\int_{-3}^{3} dx \frac{x=3}{\sqrt{2\pi a^2}} e^{\frac{(x-2)^2}{2a^2}}$ for σ = 0. 1, 0.01, 0.001 and show that it tends to 5.

Fourier Series:

Program to sum; evaluate the Fourier Coefficients of a given periodic function (Square Wave)

Frobenius Method and Special Functions:

$$\int_{-1}^{1} d\mu \; P_n\mu \, P_m\mu = \frac{2}{2n+1}\delta_{m,n}$$

Plot Pn(x), Legendre polynomial of degree n, and Jn(x), Bessel function of first kind. Show Recursion relation.

. Calculation of error for each data point of observations recorded in experiments done in previous semesters (choose any two)

. Calculation of least square fitting manually without giving weightage to error. Confirmation of least square fitting of data through computer Programme.

. Evaluation of trigonometric functions e.g. SinΘ, Given Bessel's function at N points, find its value at an intermediate point.

Complex analysis: Calculate ∫ dx/x2+2and check it with computer integration.

. Integral transform: FFT of e−x

PAPER-VII **SEMESTER – III**

THERMAL PHYSICS

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30h

CO-1:Basic understanding of thermodynamics and various thermal variables.

CO-2:Understanding various thermodynamics potential applications and their properties.

CO-3:To Understand the concepts of ideal gas and its thermal properties.

CO-4:To Understand the concepts of real gas and its thermal properties.

CO-5:To Apply the acquired knowledge of thermodynamics in Experiments

UNIT-I

Introduction to Thermodynamics Recapitulation of Zeroth and First law of thermodynamics,

Second Law of Thermodynamics: Reversible and Irreversible process with examples, Kelvin-Planck and Clausius Statements and their Equivalence, Carnot's Theorem, Applications of Second Law of Thermodynamics: Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale.

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

UNIT-II

Thermodynamic Potentials: Extensive and Intensive Thermodynamic Variables. Internal Energy, Enthalpy, Helmholtz Free Energy, Gibbs Free Energy, Their Definitions, Properties and Applications, Surface Films and Variation of Surface Tension with Temperature, Magnetic Work, Cooling due to adiabatic demagnetization.

Phase Transitions: First and second order Phase Transitions with examples, Clausius Clapeyron Equation and Ehrenfest equations.

Maxwells Thermodynamic Relations: Derivations and applications of Maxwells Relations, Maxwells Relations: (1) Clausius Clapeyron equation (2) Relation between *Cp and Cv (*3) TdS Equations, (4) Joule-Kelvin coefficient for Ideal and. Vander Waal Gases (5) Energy equations (6) Change of Temperature during Adiabatic Process.

UNIT-III

Kinetic Theory of Gases

Distribution of Velocities: Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and its Experimental Verification, Sterns Experiment, Mean, RMS and Most Probable Speeds, Degrees of Freedom, Law of Equipartition of Energy (No proof required), Specific heats of Gases.

Molecular Collisions: Mean Free Path, Collision Probability, Estimates of Mean Free Path,

Transport Phenomenon in Ideal Gases: (1) Viscosity, (2) Thermal Conductivity and (3) Diffusion. Brownian Motion and its Significance.

UNIT-IV

Real Gases: Behavior of Real Gases: Deviations from the Ideal Gas Equation, The Virial Equation, Andrews Experiments on CO2 Gas. Critical Constants, Continuity of Liquid and Gaseous State. Vapour and Gas, Boyle Temperature, Van der Waals Equation of State for Real Gases, Values of Critical Constants, Law of Corresponding States, Comparison with Experimental Curves, P-V Diagrams, Joules Experiment, Free Adiabatic Expansion of a Perfect Gas, Joule- Thomson Porous Plug Experiment, Joule- Thomson Effect for Real and Van der Waal Gases, Temperature of Inversion, Joule-Thomson Cooling.

CORE –I: PAPER-VII

LAB: Credit-1

(Minimum 5 experiments are to be done)

1. To determine Mechanical Equivalent of Heat, J, by Callender and Barnes constant flow method

2. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charltons disc method.

3. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT).

4. To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its Two Junctions.

5. To determine J by Caloriemeter.

6. To determine the specific heat of liquid by the method of cooling.

7. To determine the specific heat of solid by applying radiation of correction

PAPER-VIII SEMESTER – IV

ANALOG SYSTEMS

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30h

CO-1:Basic understanding of semiconductor diodes, devices and their applications.

CO-2 :To Understand the basic concepts in transistors and amplifiers.

CO-3:To Understand the concept of coupled amplifier and its application in feedback circuit.

CO-4:To Understand the concepts of operational amplifier and its application.

CO-5:To Apply the acquired knowledge of electronic circuits in Experiments.

UNIT-1

Semiconductor Diodes: P and N type semiconductors, energy level diagram, conductivity and Mobility, Concept of Drift velocity, PN junction fabrication (simple idea), Barrier formation in PN Junction Diode, Static and Dynamic Resistance, Current flow mechanism in Forward and Reverse Biased Diode, Drift velocity, derivation for Barrier Potential, Barrier Width and current Step Junction.

Two terminal device and their applications: (1) Rectifier Diode: Half-wave Rectifiers. center-tapped and bridge type Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, L and C Filters (2) Zener Diode and Voltage Regulation, Principle and structure of LEDS, Photo diode(3) Solar Cell.

UNIT II

Bipolar Junction Transistors: n-p-n and p-n-p transistors, Characteristics of CB, CE and CC Configurations, Current gains a and b, Relation between a and b, Load line analysis of

Transistors, DC Load line and Q-point, Physical mechanism of current flow, Active, Cut-off and Saturation Regions.

Transistors Biasing: Transistor Biasing and Stabilization circuits, Fixed Bias and Voltage Divider Bias.

Amplifiers: Transistors as 2-port network h-parameter Equivalent Circuit, Analysis of a single stage CE amplifier using Hybrid Model, Input and Output impedance, Current, Voltage and Power Gains.

UNIT-III

Classification of class A, B and C amplifiers, Push-pull amplifier (classB).

Coupled Amplifier: RC-coupled amplifier and its frequency response.

Feedback in Amplifiers: Effect of Positive and Negative Feedback on In- put Impedance, Output Impedance, Gain Stability, Distortion and Noise. Sinusoidal Oscillations: Barkhausens criterian for self- sustained oscillations. RC Phase shift oscillator, determination of Frequency, Hartley and Colpitts oscillators.

UNIT-IV

Operational Amplifiers (Black Box approach): Characteristics of an Ideal and Practical OP-AMP (IC741). Open-loop and Closed loop Gain. Frequency Response. CMRR, Slew Rate and concept of virtual ground.

Applications of Op-Amps: (1) Inverting and non-inverting amplifiers (2) Adder(3) Subtractor (4) Differentiator, (5) Integrator (6) Log amplifier, (7) Zero crossing detector (8) Wein bridgeoscillator.

CORE –I: PAPER-VIII

LAB: Credit-1

(Minimum 5 experiments are to be done)

1. To study the V-I characteristics of a Zener diode and its use as voltage regulator.

2. Study of V-I and power curves of solar cells, and find maximum power point and efficiency.

3. To study the characteristics of a Bipolar Junction Transistor in CE configuration.

4. T o study the various biasing configurations of BJT for normal class A operation.

5. T o study the frequency response of voltage gain of a RC-coupled transistor amplifier.

6. To design a Wien bridge oscillator for given frequency using a non-amp.

7. To design a phase shift oscillator of given specifications using BJT.

8. To study the Colpitt's oscillator.

PAPER-IX SEMESTER – IV

BASIC INSTRUMENTATION

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30h

CO-1: Conceptual understanding of different measurement of electronic circuit with measuring devices.

CO-2: Basic understanding of CRO and its applications.

CO-3: Basic understanding of signal generators and its analysis

CO-4.: Basic understanding of digital instruments and their applications.

CO-5: To Apply the acquired knowledge of different electronic measurement-based instruments in Experiments

UNIT- I

Basic of Measurement: Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects.

Multimeter: Principles of measurement of dc voltage and dc current, ac volt- age, ac current and resistance. Specifications of a multimeter and their significance.

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance.

AC milli voltmeter: Type of AC milli voltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac milli voltmeter, specifications and their significance.

UNIT-II

Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only no mathematical treatment), brief discussion on screen phosphor, visual persistence and chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance.

Applications of CRO: (1) Study of Wave Form, (2) Measurement of Volt- age, Current,

Frequency and Phase Difference.

Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.

UNIT-III

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators, pulse generator, and function generator, Brief idea for testing, specifications, Distortion factor meter, wave analysis.

UNIT-IV

Digital Instruments: Principle and working of digital meters, Comparison of analog and digital instruments, Characteristics of a digital meter, Working principles of digital voltmeter.

Digital Multimeter: Block diagram and working of a digital multimeter, Working principle of time interval, frequency and period measurement using universal counter/frequency counter, time-base stability, accuracy and resolution.

CORE –I: PAPER-IX

LAB: Credit-1

The test of lab skills will be of the following test items:

1. Use of an oscilloscope.

2. CRO as a versatile measuring device.

3. Circuit tracing of Laboratory electronic equipment.

4. Use of Digital multimeter/VTVM for measuring voltages.

5. Circuit tracing of Laboratory electronic equipment.

6. Winding a coil /transformer.

7. Study the layout of receiver circuit.

8. Trouble shooting a circuit.

9. Balancing of bridges.

Laboratory Exercises:

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.

2. To observe the limitations of a multimeter for measuring high frequency voltage and currents.

3. To measure Q of a coil and its dependence on frequency, using a Q-meter.

4. Measurement of voltage, frequency, time period and phase angle using CRO.

5. Measurement of time period, frequency, average period using universal counter/ frequency counter.

6. Measurement of rise, fall and delay times using a CRO.

7. MeasurementofdistortionofaRFsignalgeneratorusingdistortionfactor meter.

8. Measurement of R, L and C using a LCR bridge/universal bridge.

Open Ended Experiments:

1. Using a Dual Trace Oscilloscope

2. Converting the range of a given measuring instrument (voltmeter, ammeter) More emphasis should be given on hands-on experiments.

PAPER-X SEMESTER – IV

NUCLEAR AND PARTICLE PHYSICS

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30h

CO-1: Understanding the properties of atoms in electric and magnetic field.

CO-2: Understanding the concept Nuclear physics.

CO-3: Conceptual understanding nuclear models and nuclear reactions.

CO-4: Conceptual understanding of particle physics.

CO-5: To Apply the acquired knowledge in conducting the experiments.

UNIT- I

Atoms in Electric and Magnetic Fields: Electron angular momentum. Space quantization, Electron Spin and Spin Angular Momentum, Larmor's Theorem, Spin Magnetic Moment, Stern Gerlach Experiment, Vector Atom Model, L-S and J-J coupling, Zeeman Effect, Electron Magnetic Moment and Magnetic Energy, Gyromagnetic Ratio and Bohr Magnetron. Atoms in External Magnetic Fields: Normal and Anomalous Zeeman Effect, Paschen back and Stark-Effect (qualitative Discussion only).

UNIT- II

Nuclear Physics- : Nuclear composition, charge, size, shape, mass and density of the nucleus; Nuclear angular momentum; Nuclear magnetic dipole moment; Electric quadrupole moment; Mass defect; Packing fraction and Binding energy; Stability of nuclei (N vs Z curve), Binding e nergy curve. semi empirical mass formula; Nuclear Forces: General concept of nuclear force; Yukawa Meson field theory of nuclear forces; Properties of Nuclear forces.

Radioactive disintegration; Properties of alpha, beta, gamma rays; law of radioactive decay; successive radioactive decay; radioactive equilibrium; Radioisotopes; application of radioactivity (Agriculture, Medicinal, Industrial and Archaeological).

UNIT-III

Nuclear models: Liquid Drop model; Shell model; magic number in the nucleus; Alpha decay: Alpha particles spectra; Gamow's theory of Alpha decay; Beta decay: Shape of Beta ray spectrum; Explanation of Beta decay on the basis of Neutrino and Antineutrino hypothesis; Fermi theory of Beta decay; Selection rules; Gamma ray emission,

Nuclear reactions: Kinds of Nuclear reactions; Nuclear reaction kinematics; Q -value; Compound Nucleus and concept of direct reactions; Conservation laws; Nuclear reaction cross - sections. Nuclear energy: Nuclear Fission; Chain reaction and Critical Mass; Nuclear Reactors an d its basic components; Nuclear Fusion; Condition for the maintained Fusion reactions; Energy production in stars; Fusion reaction in Sun, Principle of atomic bomb and hydrogen bomb.

UNIT-IV

Particle Physics

Classification of particles-antiparticles and their interactions; Conservation laws; Charges; Isospin; Baryon number; Lepton number; Strangeness; Hyper charge; Parity; Charge

conjugation; CPT theorem; Conservation laws; Quark as the building blocks of Hadrons; Quark Model; Colour degree of freedom, Symmetry Classification of elementary particles; Higgs Boson Particle (God particle), elementary idea on Large Hadron collider (LHC), The future of universe, Dark matter and dark energy.

CORE –I: PAPER-X

LAB: Credit-1

(Minimum 4 experiments are to be done)

1. Study of photoelectric effect.

2. Basics of GM counter characteristics and counting statistics.

3. Study of Gamma ray spectroscopy by SCA and MCA.

4. To determine the Planck's constant using LEDs of at least 4 different colours.

5. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.

6. To setup the Millikan oil drop apparatus and determine the charge of an electron.

PAPER-XI SEMESTER – V

DIGITAL SYSTEMS

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30h

CO-1: To Understand IC's and scales of Integration, Digital Circuits and their realization, Applications

CO-2: Build strong knowledge about Boolean Algebra, Truth tables, Equivalent Circuits, Theory and application of CRO.

CO-3: Gain a clear understanding of Data processing circuits, Arithmetic Circuits, different types of Timers: IC 555

CO-4: To Explain the knowledge of computer organization, Shift registers and counters.

CO-5: To Apply the acquired knowledge to realize various types of circuits in experiment

UNIT-1

Integrated Circuits (Qualitative treatment only): Active and Passive Components, Discrete components, Wafer Chip, Advantages and Drawbacks of ICs, Scale of Integration: SSI, MSI, LSI and VLSI (basic idea and definitions only), Classification of ICs, Examples of Linear and Digital ICs.

Digital Circuits: Difference between Analog and Digital Circuits, Binary Numbers, Decimal to Binary and Binary to Decimal Conversation, BCD, Octal and Hexadecimal numbers, AND, OR and NOT. Gates (realization using Diodes and Transistor), NAND and NOR Gates as Universal Gates, XOR and XNOR Gates and application as Parity Checkers.

UNIT-II

Boolean algebra: De Morgan's Theorems: Boolean Laws, Simplification of Logic Circuit using Boolean Algebra, Fundamental Products, Idea of Minterms and Maxterms, Conversion of truth table into Karnaugh Map and SOP and POS simplification. Universal logic implementation (NAND & NOR).

UNIT-III

Data Processing Circuits: Basic Idea of Multiplexers, De-multiplexers, Decoders, Encoder

Arithmetic Circuits: Binary Addition. Binary Subtraction using 2s complement. Half and Full Adders. Half and Full Subtractors, 4 bit binary Adder/Subtractor.

Timers:IC555: block diagram and application is Astable multivibrator and Monostable multivibrator.

UNIT-IV

Introduction to Computer Organization: Input/output Devices, Data storage (idea of RAM and ROM), Computer memory, Memory organization and addressing, Memory Interfacin g,

Memory Map.

Shift registers: Serial-in-serial-out, Serial-in-Parallel-out, Parallel-in-Serial- out and Parallel- in-Parallel-out. Shift Registers (only up to 4 bits)

Counters (4 bits): Ring Counter, Asynchronous counters, Decade Counter. Synchronous Counter.

CORE –I: PAPER-XI

LAB: Credit-1

(Minimum 6 experiments are to be done)

1. To measure (a) Voltage, and (b) Time period of a periodic waveform using CRO and to test a Diode and Transistor using a Millimeter.

2. To design a switch (NOT gate) using a transistor.

3. To verify and design AND, OR, NOT and XOR gates using NAN Dgates.

4. Half Adder, Full Adder and 4-bit binary Adder.

5. Half Subtractor, Full Subtractor, Adder-Subtractor using Full AdderI.C.

6. To build Flip-Flop (RS, Clocked-RS, D-type and JK) circuits using NAND gates.

7. To design an astable multivibrator of given specifications using 555Timer.

8. To design a monostable multivibrator of given specifications using 555 Timer.

PAPER-XII **SEMESTER – V**

QUANTUM MECHANICS AND APPLICATIONS

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30h

CO-1: To understand Properties and physical interpretation of wave function and its application, knowledge in probability current density, significance of momentum space transformation and time dependent Schrödinger equation.

CO-2: To explain Time independent Schrödinger equation, Eigen value, Eigen function, generalized solution of stationary states, knowledge in wave function and discrete energy level.

CO-3: Basic knowledge in quantum mechanical operators, Eigen value and Eigen function, Uncertainty relation and Gaussian wave packet.

CO-4: Acquire the knowledge in application of Schrödinger equation in different potential barriers, concept of simple harmonic oscillator.

CO-5: Apply the acquired knowledge to solve various numerical problems .

UNIT- I

Schrodinger equation: Time dependent Schrodinger equation, Properties of Wave Function, Physical interpretation of wave function, Wave function of a free particle, Normalization, Probability current and probability current densities in three dimensions, Linearity and Superposition Principle, Wave Packet, Fourier Transform Theorem, Momentum space wave function and its significance, Representation of position vector in momentum space. Schrodinger equation in momentum space.

UNIT-II

Time Independent Schrodinger equation in 1-D, 2-D and 3-D, Hamiltonian, stationary states and energy Eigen values, expansion of an arbitrary wave function as a linear combination of energy Eigen functions, General solution of the time dependent Schrodinger equation in terms of linear combinations of stationary states. General Discussion of Bound states in an arbitrary potential: Continuity of wave function, Boundary condition and emergence of discrete energy levels.

UNIT-III

Operators: Operators, Commutator Algebra, Position, Momentum, Angular Momentum and Energy operators, Hermitian Operators, Expectation Value, Expectation values of position and momentum,

Ehrenfest Theorem, Eigenvalues and Eigenfunctions of Hermitian Operator, Energy Eigen Spectrum, Degeneracy, Orthonormality of Eigen functions, Linear Dependance, Orthogonalisation, Uncertainty

Relation- Uncertainty product, minimum uncertainty wave packet- Gaussian Wave Packet.

UNIT-IV

Application to one dimensional problem- One dimensional infinitely rigid Box- Energy Eigen values and Eigen functions, normalization, quantum dot as an example, Quantum mechanical scattering and tunneling in one dimension across a Potential Step and Rectangular Potential Barrier, Finite Square well potential, Quantum mechanics of simple Harmonic Oscillator-Energy Levels and Energy Eigen functions, ground state, zero point energy.

CORE –I: PAPER-XII

LAB: Credit-1

Use C/C++/Scilab for solving the following problems based on Quantum mechanics like (Use finite difference method, matrix method, ODE Solver method in all cases)

1. Solve the s-wave Schrodinger equation for the ground state and the first excited state ofthe Hydrogen atom:

$$\frac{d^2y}{dr^2} = A(r)\,u(r), A(r) = \frac{2m}{\hbar^2}\,[V(r) - E], V(r) = -\frac{e^2}{r}$$

Where, 'm' is the reduced mass of the electron. Obtain the energy eigenvalues and plot

the corresponding wave functions. Remember that the ground state energy of the hydrogen atom is

~ -13.6ev. Take e= 3.795 $\sqrt{(eV\text{Å})}$ **ħc= 1973** $(eV\text{Å})$ **and m=0.511 × 10^6 eV/c2.**

2. Solve the S-Wave radial Schrodinger equation for an atom:

$$\frac{d^2y}{dr^2} = A(r)\,u(r), A(r) = \frac{2m}{\hbar^2}\,[V(r) - E],$$

Where, 'm' is the reduced mass of the system (Which can be chosen to be the mass of an electron), for the screened coulomb potential: v e−r/a

Find the energy (in eV) of the ground state of the atom to an accuracy of the significant digits.

Also; plot the corresponding wave function. Take e= 3.795 (evÅ) , ħc= 1973(eVÅ) and m=0.511

× 106 eV/c2, and α =3Å, 5Å, 7Å. The ground state energy is expected to be above -12eV in all three cases.

3. Solve the S-Wave radial Schrodinger equation for a particle of mass m:

$$\frac{d^2y}{dr^2} = A(r)\,u(r), A(r) = \frac{2m}{\hbar^2}\,[V(r) - E]$$

For the anharmonic Oscillator potential: V $(\mathrm{r}) = \frac{kr^2}{2} + \frac{br^3}{3}.$

Find the ground state energy (in MeV) of the particle to an accuracy of three significant digits. Also, plot the corresponding wave function. Choose m=940MeV/C2 , k= 100MeV/fm2, b= (0, 10, 30) MeV/fm3. In these units, c = 197.3 MeV fm. [The ground state energy is expected to lie between 90 and 110 MeV for all three cases].

Solve the S-Wave radial Schrodinger equation for the vibrations of hydrogen molecule:

$$\frac{d^2y}{dr^2} = A(r)\,u(r), A(r) = \frac{2m}{\hbar^2}\,[V(r) - E]$$

Where, 'm ' is the reduced mas of the two-atom system for the Morse potential

v r = D(e−2αr − e−αr

Where r = r-r0 .

Find the lowest vibrational energy (in MeV) of the molecule to an accuracy of three significant digits. Also plot the corresponding wave functions for the choices given below:

m = 940x106 ev/c2, D = 0.755501ev, α = 1.44, r0 = 0.131349Å m = 940x106ev/c2, D = 0.755501ev, α = 1.44, r0 = 0.131349Å

Laboratory based experiments:

1. Study of Electron spin resonance- determine magnetic field as a function of the resonance frequency.

2. Study of Zeeman effect: with external magnetic field; Hyperfine splitting

3. To show the tunneling effect in tunnel diode using I-V characteristics.

4. Quantum efficiency of CCDs

PAPER-XIII **SEMESTER – V**

SOLID STATE PHYSICS

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30h)

CO-1: To understand the Concept of crystal structure and properties, X-ray Diffraction, Bragg's and Laue's condition.

CO-2: Conceptual understanding of Lattice vibration, Einstein and Debye specific heat theories of solids, knowledge in Band theory, Kroning-Penny model and Hall Effect.

CO-3: Understanding the Concept in magnetic and dielectric properties of materials.

CO-4: Basic knowledge on LASER and its generation, types. Conceptual understanding of superconductivity and its type, London's Equation, Penetration Depth and BCS theory.

CO-5: To Apply the acquired knowledge in experiments.

UNIT-I

Crystal Structure: Solids, Amorphous and Crystalline Materials, Lattice translation Vectors, Lattice with a Basis. Central and Non-Central Elements. Unit Cell, Miller Indices, Types of Lattices, Reciprocal Lattice, Brillouin zones, Diffraction of X- rays by crystals, Bragg's Law, Laue's Condition, Atomic and Geometrical Factor.

UNIT-II

Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear, Monoatomic and Diatomic Chains, Acoustical and Optical Phonons, Qualitative Description of the phonon spectrum in solids, Dulong and Petits Law, Einstein and Debye theories of specific heat of solids, *r* 3 Law.

Elementary band theory: Kroning-Penny model of band Gap, Conductor, Semiconductor (P and N type) and insulator, Conductivity of Semiconductor, mobility, Hall Effect, Measurement of conductivity (four probe method) and Hall Co- efficient.

UNIT-III

Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferro- magnetic Materials, Classical Langevins theory of dia and Paramagnetic Domains, Curies law, Weiss Theory of Ferromagnetism and Ferromagnetic Domains, Discussion of B- H Curve, Hysteresis and Energy Loss.

Dielectric Properties of Materials: Polarization Local Electrical Field at an Atom, Depolarization Field, Electric Susceptibility, Polarizability, Clausius Mosotti Equation, Classical theory of Electronic Polarizability.

UNIT-IV

Lasers: Einsteins A and B co-efficientnts, Metastable States, Spontaneous and Stimulated emissions, Optical Pumping and population Inversion, Three Level and Four Level Lasers, Ruby Laser and He-Ne Laser.

Superconductivity: ExperimentalResults, CriticalTemperature, Critical magnetic field, Meissner effect, Type-I and Type-II Superconductors, London's Equation and Penetration Depth, Isotope effect, Idea of BCS theory (No derivation).

CORE –I: PAPER-XIII

LAB: Credit-1

(Minimum 4 experiments are to be done)

1. Measurement of susceptibility of paramagnetic solution (Quinck's Tube- Method)

2. To measure the Magnetic susceptibility of Solids.

3. To measure the Dielectric Constant of a dielectric Materials with frequency

4. To determine the Hall coefficient of a semiconductor sample.

5. To draw the BH curve of Fe using solenoid and to determine the energy loss from Hysteresis

6. To measure the band gap of a given semiconductor by four-probe method.

PAPER-XIV SEMESTER – VI

ELECTROMAGNETIC THEORY

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30h

CO-1: Physical significance of Maxwell Equation and its application to free space, Lorentz and Coulomb gauge transformation, poynting theorem, concept of energy density.

CO-2: Analysis of Maxwell's equations in different media and Physical significance of relaxation time, skin depth, Electrical conductivity of ionized gases, plasma frequency.

CO-3: Basic understanding of polarization of EM wave, and different types of crystals, Phase Retardation Plates and Rotatory Polarization.

CO-4: Conceptual understanding of EMW application in bounded media, plane interface, dielectric media, Brewster's law, TIR, Evanescent wave, metallic reflection.

CO-5 :To Apply the acquired knowledge for visualize basic concept of phenomenon of light in various experiments

UNIT-I

Maxwell Equations: Maxwells equations, Displacement Current, Vector and Scalar Potentials, Gauge Transformations: Lorentz and Coulomb Gauge, Wave Equations, Plane Waves in free space and characteristics, Poynting Theorem and Poynting Vector, Electromagnetic (EM) Energy Density, Physical Concept of Electromagnetic Field Energy Density.

UNIT-II

EM Wave Propagation in Unbounded Media: Plane EM waves through vacuum and isotropic dielectric medium, transverse nature of plane EM waves, refractive index and dielectric constant, wave impedance, Propagation through conducting media, relaxation time, skin depth, Electrical conductivity of ionized gases, plasma frequency, refractive index, skin depth, application to propagation through ionosphere.

UNIT-III

Polarization of Electromagnetic Waves: Description of Linear, Circular and Elliptical Polarization, uniaxial and biaxial crystals, light propagation in uniaxial crystal, double refr action, polarization by double refraction, Nicol Prism, Ordinary and extraordinary refractive indices, Production and detection of Plane, Circularly and Elliptically polarized l ight,

Phase Retardation Plates: Quarter-Wave and Half- Wave Plates. Babinets Compensator and its Uses, Analysis of Polarized Light.

Rotatory Polarization: Optical Rotation, Biots Laws for Rotatory Polarization, Fresnels Theory of optical rotation, Calculation of angle of rotation, Experimental verification of Fresnels theory, Specific rotation, Laurents half- shade polarimeter.

UNIT IV

EM Wave in Bounded Media: Boundary conditions at a plane interface between two media, Reflection and Refraction of plane waves at plane interface between two dielectric media, Laws of Reflection and Refraction, Fresnel's Formulae for perpendicular and parallel polarization cases, Brewster'slaw, Reflection and Transmission coefficients, Total internal reflection, evanescent waves, Metallic reflection (normal Incidence)

CORE –I: PAPER-XIV

LAB: Credit-1

Minimum 4 experiments are to be done):

1. To verify the law of Malus for plane polarized light.

2. To determine the specific rotation of sugar solution using Polarimeter.

3. To analyze elliptically polarized Light by using a Babinets compensator.

4. . To determine the refractive index of liquid by total internal reflection using Wollastons air-film.

5. To determine the refractive Index of (1) glass and (2) a liquid by total internal reflection using a Gaussian eyepiece.

6. To study the polarization of light by reflection and determine the polarizing angle for air- glass interface.

7. To verify the Stefan's law of radiation and to determine Stefan's constant.

8. To determine the Boltzmann constant using V-I characteristics of PN junction diode.

PAPER-XV SEMESTER – VI

STATISTICAL MECHANICS

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30h)

CO-1: Understanding the concept of ensembles and its partition function, phase space and thermodynamic relations, MB distribution law .

CO-2: Conceptual understanding of addition of entropy, Sackur Tetrode equation, Law of equipartition of Energy and its application.

CO-3: Basic postulates and different distribution of Fermi and Dirac particles and B-E condensation.

CO-4: Basic knowledge in thermal and Black body radiation, Concept of different laws of radiation and their experimental verification.

CO-5: Apply the acquired knowledge for analyze the laws radiation and different distribution functions using computational analysis.

UNIT- I

Classical Statistics-I: Macro state and Microstate, Elementary Concept of Ensemble, Micro canonical, Canonical and Grand Canonical ensemble, Phase Space, Entropy and Thermodynamic Probability, Maxwell-Boltzmann Distribution Law, Partition Function.

UNIT- II

Classical Statistics-II : Thermodynamic Functions of an Ideal Gas, classical Entropy Expression, Gibbs Paradox, Sackur Tetrode equation, Law of equipartition of Energy (with proof)- Applications to Specific Heat and its Limitations, Thermodynamic Functions of a two energy levels system, Negative Temperature.

UNIT- III

Quantum Statistics: Identical particles, macro states and microstates, Fermions and Bosons, Bose Einstein distribution function and Fermi- Dirac distribution function. Bose- Einstein Condensation, Bose deviation from Planck's law, Effect of temperature on Fermi-Dirac distribution function, degenerate Fermi gas, Density of States Fermi energy.

UNIT-IV

Radiation: Properties of Thermal Radiation, Blackbody Radiation, Pure Temperature dependence, Kirchhoff's law, Stefan Boltzmann law: Thermodynamic proof, Radiation Pressure, Wein's Displacement law, Wien's distribution Law, Saha's Ionization Formula, Rayleigh Jeans Law, Ultra Violet catastrophe.

Planck's Law of Black body Radiation: Experimental verification, Deduction of

(1) Wien's Distribution Law, (2) Rayleigh Jean's Law, (3) Stefan Boltzmann Law, (4) Wein's Displacement Law from Planck's Law.

CORE –I: PAPER-XV

LAB: Credit-1

Use C/C++/Scilab for solving the problems based on Statistical Mechanics like

1. Plot Planck's law for Black Body radiation and compare it with Wein's.

2. Law and Raleigh-Jeans Law at high temperature (room temperature) and low temperature.

3. Plot Specific Heat of Solids by comparing (a) Dulong-Petit law, (b) Einstein distribution function, (c)Debye distribution function for high temperature (room temperature) and low temperature and compare them for these two cases

4. Plot Maxwell-Boltzmann distribution function versus temperature.

5. Plot Fermi-Dirac distribution function versus temperature.

6. Plot Bose-Einstein distribution function versus temperature.

Multi-Disciplinary Course - SEMESTER-III

Paper-II: **Introduction to Spectroscopy (Physics)**

CO- I : Basic understanding of atomic models and its spectroscopy nature

CO-2: Conceptual understanding of Spectra of Alkali elements

CO-3: Understating the basic of X-ray and its applications CO-4 : Understating molecular spectroscopy

UNIT- 1:

Vector Atomic Model: Inadequacies of Bohr and Bohr-Somerfield atomic models w.r.t. spectrum Of Hydrogen atom (fine structure of H-alpha line). Modification is due to the finite mass of the nucleus and the Deuteron spectrum. Vector atomic model (Stern-Gerlach experiment included) and physical & geometrical interpretations of various quantum numbers for single & many valence electron systems. LS & JJ couplings, spectroscopic notation for energy states, selection rules for transition of electrons and intensity rules for spectral lines. Fine structure of I-I- alpha line based on vector atomic model.

UNIT-11:

Spectra of Alkali & Alkaline Elements: Spectra of alkali elements: Screening constants for s, p, d& amp; f orbitals; sharp, principle, diffuse & amp; fundamental Series; doublet structure of spectra and fine structure of Sodium D line.' Spectra of alkaline elements: Singlet and triplet structure of spectra.

UNIT-111:

X-rays & X-Ray Spectra: Nature & production, Continuous X-ray spectrum & DuaneHunt' s law, Characteristic X-ray spectrum & Mosley's law, Fine structure of Characteristic X-ray spectrum, and X-ray absorption spectrum.

UNIT-IV:

Molecular Spectra: Discrete set of a molecule's electronic, vibrational and rotational energies. Quantization of vibrational energies, transition rules and pure vibrational spectra. Quantization of rotational energies, transition rules, pure rotational spectra and determination of inter nuclear distance. Basics of UV Visible & photoluminescence spectroscopy

Reference Books:

l. HE. White, & quot; lntroduction to Atomic Spectra & quot;, McGraw Hill, 1934 8.

2. C.N. Banwell, E.M. Mc. Cash, " Fundamentals of Molecular Spectroscopy & quot;, Mc. Graw Hill, 2017, 4e 9.

UNIT-111:

X-rays & X-Ray Spectra: Nature & production, Continuous X-ray spectrum & DuaneHunt' s law, Characteristic X-ray spectrum & Mosley's law, Fine structure of Characteristic X-ray spectrum, and X-ray absorption spectrum.

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DEPARTMENT OF CHEMISTRY
SARBATI DEVI WOMEN'S COLLEGE,RAJGANGPUR
PO,CO,PSO- NEP-2020

CORE-I PAPER-I: Atomic Structure, Periodicity of elements and Chemical Bonding

Course Objectives:

To provide the fundamental knowledge on the structure of atom, which is a necessary pre-requisite in understanding the nature of chemical bonding in compounds. Various types of periodic properties and bondings have been reviewed to strengthen students for grasping this tricky topic and effectively tackle exam questions. The basics of acid-base titrimetric analysis has been incorporated in order to develop the analytical skills of the students.

Course Outcomes:

1. Solve the conceptual questions using the knowledge gained by studying the quantum mechanical model of the atom.

2. Learn the various atomic properties of atoms and their variations in the periodic table.

3. Gain the idea of different types of bonding and their associated properties.

4. Understand the theory and applications of various acid-base titrations.

SYLLABUS

(C L P = 3 3 0; Total Hours = 15 x 3 = 45)

UNIT – I (12 Hours)

Atomic structure:

Rutherford's nuclear model of atom, Bohr's theory and the origin of hydrogen spectrum, Sommerfeld's extension of Bohr's theory, de-Broglie equation, Heisenberg's Uncertainty Principle and its significance. Postulates of wave mechanics, Derivation of Schrödinger's wave equation for hydrogen atom, significance of ψ and ψ2. Radial and angular wave functions, Radial function plots, radial probability distribution plots, angular distribution curves. Shapes of s-, p-, d- and f-orbitals, Relative energies of orbitals. Slater's rule and its limitations, Quantum numbers and their significance. Pauli's Exclusion Principle, Hund's rule of maximum spin multiplicity and Aufbau principle.

UNIT – II (10 Hours)

Periodicity of elements:

Introduction to long form periodic table, Cause of periodicity, Division of elements into s-, p-, d- and f-blocks. Atomic radius, ionic radius, covalent radius and Van der Walls radius. Periodic trends in ionic and covalent radii. Ionization energy, electron affinity, electronegativity, and their variations in the periodic table. Applications of electronegativities. Pauling's/Mulliken's scale of electronegativity, Sanderson's electron density ratio.

UNIT – III (10 Hours)

Chemical bonding-I:

Ionic bond-General characteristics, types of ions, size effects, radius ratio rule and its limitations. Packing of ions in crystals. Lattice energy, Born-Haber cycle and its application, Born-Lande equation, Madelung constant, importance of Kapustinskii equation for lattice energy. Solvation energy, Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules and consequences of polarization.

UNIT – IV (13 Hours)

Chemical bonding-II:

Covalent bond-Valence shell electron pair repulsion (VSEPR) theory, shapes of the following simple molecules and ions containing lone pairs and bond pairs of electrons: CH_4, H_2O, NH_3, PCl_3, PCl_5, SF_6, ClF_3, I_3^-, BrF_2^+, PCl_6^- , ICl_2^-, ICl_4^- , NH_4^+, $PO_4^{3-}$and SO_4^{2-}. Valence Bond theory (Heitler-London approach). Hybridization, equivalent and non-equivalent hybrid orbitals. Ionic character in covalent compounds: Dipole moment. Percentage ionic character from dipole moment and electronegativity difference, Molecular orbital diagrams of homo- & hetero-diatomic molecules (N_2, O_2, C_2, B_2, F_2, CO, NO) and their ions. Calculation of bond order. Concept of bent rule.

Calibration and use of apparatus

Preparation of solutions of different Molarity/Normality.

Estimation of oxalic acid using standard NaOH solution

Estimation of sodium carbonate using standard HCl.

Estimation of carbonate and hydroxide present together in a mixture.

Estimation of carbonate and bicarbonate present together in a mixture.

Metallic bond:

Concept of metallic bond, The free electron model, The valence bond model, The band model (molecular orbital approach), semiconductor and insulators.

Hydrogen bond:

Concept of hydrogen bond, nature of hydrogen bonding, consequences of hydrogen bonding and its importance.

Lab Work

Credit-01

(C L P = 1 0 1; Total Hours = 15 x 2 = 30)

(Laboratory periods: 30 Hours, 15 classes of 2 hours each)

List of experiments

1. Calibration and use of apparatus

2. Preparation of solutions of different Molarity/Normality.

3. Estimation of oxalic acid using standard NaOH solution

4. Estimation of sodium carbonate using standard HCl.

5. Estimation of carbonate and hydroxide present together in a mixture.

6. Estimation of carbonate and bicarbonate present together in a mixture.

Core- I (Paper-II)

Fundamental Organic Chemistry

Course Objectives:

To provide the fundamental knowledge on organic chemistry in order to comprehend other organic chemistry courses in coming semesters with greater depth. The purpose of this core paper is to review the basic concepts of electron displacement and the chemistry of aliphatic and aromatic hydrocarbons. Stereochemistry is also introduced to help to student to visualize the organic molecules and their spatial arrangement in three dimensional spaces and hands on experience on detection of organic molecules.

Course Outcomes:

1. Understanding the basic concepts of electronic displacement phenomena in organic molecules, various bond breaking processes and types of organic reactions.

2. Fundamental knowledge on symmetry and asymmetry aspect of organic molecules and their spatial arrangements in two-dimension and three-dimension with their stereochemistry.

3. Learning the synthesis, structure and stability of unsaturated hydrocarbons, understanding the concept of aromaticity and chemical reactions of unsaturated hydrocarbons and aromatic hydrocarbons.

4. Knowledge on selection of suitable solvent for purification and separation of organic compounds and detection of various elements present in it.

Syllabus
Lecture-Credit-03 (45 Hrs)

Unit–I:
Basics of Organic Chemistry (11 hrs)

Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications in dipole moment; organic acids and bases; their relative strength. Homolytic and heterolytic fission with suitable examples. Curly arrow rules; Electrophiles and Nucleophiles; Nucleophilicity and basicity; Types, shape and relative stability of carbocations, carbanions, free radicals and carbenes.
Introduction to types of organic reactions with suitable examples: Addition, Elimination, Substitution, Rearrangement and Pericyclic reactions.

Carbon-carbon sigma bonds, chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Corey-House Reactions, Free radical substitutions: Halogenation –relative reactivity and selectivity.

Unit–II:

Stereochemistry (13 hrs)

Concept of Chirality/Asymmetry, Geometrical isomerism and Optical Isomerism: Optical Activity, Specific Rotation. Determination of Relative and absolute configuration in chiral molecules using D/L, R/S, cis/trans, Syn/Anti and E/Z descriptors using C.I.P rules. Representation by Fischer Projection, Newmann and Sawhorse Projection formulae in molecules containing one and two chiral-centres. Enantiomers, Distereoisomers, meso-structures, Racemic mixture and their resolution.

Stability and Conformational analysis: types of cycloalkanes and their relative stability, Baeyer strain theory, Conformational analysis of alkanes (ethane and n-butane): Relative stability with energy diagrams. Energy diagrams of cyclohexane: Chair, Half chair, boat and twist boat forms.

Unit–III:

Chemistry of Unsaturated Hydrocarbons (13 hrs)

Carbon-Carbon Pi Bonds: Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations.

Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/AntiMarkownikoff addition), mechanism of oxymercuration-demercuration, hydroboration-oxidation, ozonolysis, syn and anti-hydroxylation (oxidation).1,2- and 1,4-addition reactions in conjugated dienes and Diels-Alder reaction; Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.

Unit–IV:

Chemistry of Aromatic Hydrocarbons (8 hrs)

Aromaticity: Hückel's rule, aromaticity in benzenoid and non-benzenoid compounds, cyclic carbocations/ carbanions and heterocyclic compounds with suitable examples.

Electrophilic aromatic substitution with mechanism: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directing effects of the functional groups.

LAB WORK- Credit-01 (15 classes of 2 hours each)

List of Experiments

Detection of extra elements (N, Cl, Br, I and S) in organic compounds by Lassaigne's test.

Functional group tests for alcohols, phenols, carbonyl and carboxylic acid groups in known organic compounds.

Separation and purification of any one component of following binary solid mixture (Benzoic acid/*p*-Toluidine; *p*-Nitrobenzoic acid/*p*-Aminobenzoic acid; *p*-Nitrotolune/*p*- Anisidine) based on the solubility in common laboratory reagents/solvents like water (cold, hot), ethanol (cold, hot), dil. HCl, dil. NaOH, dil.$NaHCO_3$ etc.

Determination of melting point and boiling point of different organic compounds

CORE-I PAPER-III

States of matter, and Ionic equilibrium

Course Objectives:

The objective of this course is to develop basic and advance concepts regarding gases and liquids. It aims to study the similarity and differences between the two states of matter and

reasons responsible for these. The objective of the practical is to develop skills for working in physical chemistry laboratory. The student will perform experiments based on the concepts learnt in Physical chemistry-I course.

Course outcomes:

- Derive mathematical expressions for different properties of gas and liquid and understand their physical significance.
- Apply the concepts of gas equations and liquids while studying other chemistry courses and understand the importance of pH in every-day life.
- Understand different lattice systems and apply working principles of XRD for understanding crystal structure by powder and single crystal method.
- Handle stalagmometer and Ostwald viscometer properly and determine the density of aqueous solutions. Data reduction, interpretation using numerical and graphical methods.

SYLLABUS
Lecture-Credit 03 (45 hours)

Unit-I: Gaseous state (13 hour)
Kinetic molecular model of a gas, Collision frequency, Collision diameter, Collision cross section, Mean free path and viscosity of gases, including their temperature and pressure dependence, Relation between mean free path and coefficient of viscosity, Maxwell distribution of molecular velocities (no derivation); average, root mean square and most probable velocities and average kinetic energy, Law of equipartition of energy, Behaviour of real gases: Deviations from ideal gas behaviour, Causes of deviation from ideal behavior, Vander Wall equation and its application, Compressibility factor Z, and its variation with pressure for different gases, Critical Phenomenon and critical constant derivation.

Unit-II: Liquid state (10 hour)
Qualitative treatment of the structure of the liquid state; physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Capillary action in relation to cohesive and adhesive forces, Explanation of cleansing action of detergents. Temperature variation of viscosity of liquids and comparison with that of gases. Qualitative discussion of structure of water.

Unit- III: Solid state (12 hour)
Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Analyses of powder diffraction patterns of NaCl, CsCl and KCl. Defects in crystals (stoichiometric and non- stoichiometric).

Unit-IV: Ionic equilibria (10 hour)
Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono- and diprotic acids. calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson equation and its applications. Solubility and solubility product of sparingly soluble salts and its application.

LAB WORK

Credit 01 (15 classes of 2 hours each)

List of experiments:

1.Determine the surface tension by (i) drop number (ii) drop weight method.
2.Study the variation of surface tension of detergent solutions with concentration and determination of CMC
3.Determination of viscosity of aqueous solutions of (i) polymer (ii) ethanol and (iii) sugar at room temperature.
4.Study the variation of viscosity of sucrose solution with the concentration of solute.
5.pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base.
6.Preparation of buffer solutions of different pH (i) Sodium acetate-acetic acid (ii)
7.Ammonium chloride-ammonium hydroxide
8.Determination of dissociation constant of a weak acid.
9.Determination of solubility product of PbI2 by titrimetric method.

CORE-I PAPER-IV

Chemical thermodynamics, equilibrium, and Colligative property

Course Objectives:

The learners should be able to apply principles and laws of thermodynamics to reversible and irreversible systems. In addition, they should be able to use spectroscopic data to calculate thermodynamic properties of ideal & real mixtures. In addition, understand the change in thermodynamic properties, equilibrium constants, partial molar quantities, chemical potential. Also able to identify factors affecting equilibrium constant using the principles and techniques of statistical thermodynamics.

Course outcomes:

By the end of the course, the students will be able to:

- Discuss the laws of thermodynamics and applications to natural phenomena.
- Acquire a strong foundation of partial molar properties, its variation with temp and pressure for different systems and able to apply on the thermodynamics of simple mixtures.
- Inculcate firm foundations in the fundamentals and application of chemical equilibrium, and Δ*G* derive the relationship between different equilibrium constants.
- Understand the basic concept of Solutions of non-volatile solutes, colligative properties. Calculate various thermodynamic properties (Δ*H*neutralization, Δ*H*hydration & Cv) for chemical reactions using calorimeter.
- **SYLLABUS**
- **Lecture-Credit 03 (45 hours)**

- **Unit-I: Chemical thermodynamics (10 hours)**
- Intensive and extensive variables; state and path functions; isolated, closed and open systems; zeroth law of thermodynamics. First law: Concept of heat, q, work, w, internal energy, U, and statement of **first law**; enthalpy, H, relation between heat capacities, calculations of q, w, U and H for reversible, irreversible and free expansion of gases (ideal and van der Waals) under isothermal and adiabatic conditions. Thermochemistry: Heats of reactions: standard states; enthalpy of formation of molecules and ions and enthalpy of combustion and its applications; calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data, effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions.
- **Unit-II (12 hours)**
- Carnot cycle, efficiency of heat engine, Carnot theorem; **Second Law:** Concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics; molecular and statistical interpretation of entropy. Calculation of entropy change for reversible and irreversible processes. **Third Law:** Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules. Free Energy Functions: Gibbs and Helmholtz energy; variation of S, G, A with T, V, P; Free energy change and spontaneity. Relation between Joule-Thomson coefficient and other thermodynamic parameters, inversion temperature, Gibbs-Helmholtz equation, Maxwell relations, thermodynamic equation of state.
- **Unit-III : Systems of variable composition (13 hours)**
- Partial molar quantities, dependence of thermodynamic parameters on composition; Gibbs Duhem equation, chemical potential of ideal mixtures, change in thermodynamic functions in mixing of ideal gases. **Chemical equilibrium**: Criteria of thermodynamic equilibrium, degree of advancement of reaction, chemical equilibria in ideal gases, concept of fugacity. Thermodynamic derivation of relation between Gibbs free energy of reaction and reaction quotient (vant Hoff's reaction). Equilibrium constants and their quantitative dependence on temperature, pressure and concentration. Free energy of mixing and spontaneity; thermodynamic derivation of relations between the various equilibrium constants K_p, K_c and K_x. Le Chatelier principle (quantitative treatment) and its applications.
- **Unit-IV Solutions and Colligative Properties (10 hours)**
- Dilute solutions; lowering of vapour pressure, Raoult's and Henry's Laws and their applications. Thermodynamic derivation using chemical potential to derive relations between the four colligative properties: (i) relative lowering of vapour pressure, (ii) elevation of boiling point, (iii) Depression of freezing point, (iv) osmotic pressure and amount of solute. Applications in calculating molar masses of normal, dissociated and associated solutes in solution.

LAB WORK- credit 01 (15 classes of 2 hours each)

List of experiments

1. Determination of heat capacity of a calorimeter for different volumes using change of enthalpy data of a known system (method of back calculation of heat capacity of calorimeter from known enthalpy of solution or enthalpy of neutralization).

2. Determination of heat capacity of the calorimeter and enthalpy of neutralization of hydrochloric acid with sodium hydroxide.

3. Calculation of the enthalpy of ionization of ethanoic acid.

4. Determination of heat capacity of the calorimeter and integral enthalpy (endothermic and exothermic) solution of salts.

5. Determination of basicity/proticity of a polyprotic acid by the thermochemical method in terms of the changes of temperatures observed in the graph of temperature versus time for different additions of a base. Also calculate the enthalpy of neutralization of the first step.

6. Determination of enthalpy of hydration of copper sulphate.

7. Determination of heat of solution (ΔH) of oxalic acid/benzoic acid from solubility measurement.

CORE-I PAPER-V

Acids and Bases, Metallurgy, Chemistry of main group elements

Course Objectives:

To provide the basic knowledge on general principles of acids and bases, principle of metallurgy and chemistry of s- and p-block elements. Students can learn about chronological developments of the concepts of acids and bases. It will help students to get aware of the pH scale and classify a substance as acidic, basic, or neutral based on their pH or hydrogen ion concentration. Students can achieve the knowledge regarding volumetric analysis and preparation of metal complex.

Course Outcomes:

1. Know how the various theories of acid and base, and understand the occurrence and purification of metals

2. Learn the different properties of s- and p-block elements

3. Understand the preparation and properties of inorganic polymers.

4. Achieve knowledge on how to standardize, estimate and prepare inorganic compounds/metal ions.

SYLLABUS

(C L P = 3 3 0; Total Hours = 15 x 3 = 45)

UNIT – I (10 Hours)

Acids and Bases

Different concepts of acids and bases: Arrhenius theory, Bronsted-Lowry theory, Lewis theory, The Lux-Flood definition, The Usanovich definition, acids and bases in proton solvents, Concept of conjugate acid and conjugate base, Concept of pH, Pearson's classification of Lewis acid and Lewis bases into Hard and Soft Acids and Bases (HSAB), HSAB principle, application of HSAB principle.

Principle of metallurgy

Chief modes of occurrence of metals, Ellingham diagrams for reduction of metal oxides using carbon and carbon monoxide as reducing agent, electrolytic reduction, hydrometallurgy. Methods of purification of metals: electrolytic process, parting process, Van Arkel-de Boer process, Mond's process and Zone refining.

UNIT – II (12 Hours)

Chemistry of *s*-Block Elements

General characteristics: melting point, flame colour, reducing nature, diagonal relationships and anomalous behavior of first member of each group. Reactions of alkali and alkaline earth metals with oxygen, hydrogen, nitrogen and water. Common features such as ease of formation, thermal stability and solubility of the following alkali and alkaline earth metal compounds: hydrides, oxides, peroxides, superoxides, carbonates, nitrates, and sulphates. Complex formation tendency of s-block elements; structure of the following complexes: crown ethers and cryptates of Group I; Hydride and their classifications: ionic, covalent and interstitial, EDTA complexes of calcium and magnesium. Solutions of alkali metals in liquid ammonia and their properties.

UNIT – III (13 Hours)

Chemistry of *p*-Block Elements

Electronic configuration, atomic and ionic size, metallic/non-metallic character, melting point, ionization enthalpy, electron gain enthalpy, electronegativity, catenation, allotropy of C, P, S; inert pair effect, diagonal relationship between B and Si and anomalous behavior of first member of each group. interhalogen and pseudohalogen compounds, Structure, bonding and properties (acidic/basic nature, stability, ionic/covalent nature, oxidation/reduction, hydrolysis, action of heat) of the following:

Hydrides: hydrides of Group 13 (only diborane), Group 14, Group 15, Group 16 and Group 17.

Oxides: oxides of phosphorus, sulphur and chlorine

Oxoacids: oxoacids of phosphorus and chlorine; peroxoacids of sulphur

Halides: halides of silicon and phosphorus

UNIT – IV (10 Hours)

Noble gases

Occurrence and uses, rationalization of inertness of noble gases, clathrates; preparation and properties of XeF2, XeF4 and XeF6. Molecular shapes of noble gas compounds (VSEPR theory).

Inorganic polymer

Preparation, properties, structure and uses of the following compounds: Borazine, Silicates, silicones, phosphonitrilic halides {(PNCl2)n where n = 3 and 4}, and concept of carbophosphazene.

Lab Work

(Credit-01)

(C L P = 1 0 1; Total Hours = 15 x 2 = 30)

(Laboratory periods: 30 Hours, 15 classes of 2 hours each)

List of experiments

1. Standardization of sodium thiosulphate solution by standard K2Cr2O7 solution.

2. Estimation of copper using standard sodium thiosulphate solution (Iodometrically).

3. Estimation of available chlorine in bleaching powder iodometrically.

4. Preparation of Cuprous chloride (Cu2Cl2)

5. Preparation of Manganese(III) phosphate (MnPO4.H2O)

6. Preparation of Lead chromate (PbCrO4)

Core- I (Paper-VI)

Chemistry of halogen, oxygen and sulphur containing organic compounds

Course Objectives:

To provide the knowledge on organic compounds containing halogen, alcohol, phenol, thiol, ether, thioether, aldehydes, ketones, carboxylic acids and its derivatives as functional groups. Further to know their preparation, properties and reactivity for developing the skills required for synthesizing a target molecule from a given molecule.

Course Outcomes:

1. Understanding on preparation, properties and reactions of haloalkanes, haloarenes, and organic compounds containing C,H,O and S functional groups.

2. Basic knowledge on various name reactions and their mechanisms involving substitution, addition, elimination and condensation.

3. Knowledge on functional group interconversion and synthetic applications of different organic compounds.

4. Knowledge on various functional group detection in organic compounds and preparation of derivatives of functional groups.

Syllabus

Lecture-Credit-03 (45 Hrs)

Unit-I:

Chemistry of Halogenated Hydrocarbons (10 hrs)

Alkyl halides: Methods of preparation, nucleophilic substitution reactions – SN1, SN2 and SNi mechanisms with stereochemical aspects and effect of solvent and nucleophiles. substitution vs. elimination.

Aryl halides: Preparation, including preparation from diazonium salts, nucleophilic aromatic substitution; SNAr, Benzyne mechanism.

Relative reactivity of alkyl, allyl/benzyl,vinyl and aryl halides towards nucleophilic substitution reactions.

Unit-II:

Alcohols, Phenols, Ethers and Epoxides (11 hrs)

Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, Bouvaelt-Blanc Reduction; Preparation and properties of glycols: Oxidation by periodic acid and lead tetraacetate, Pinacol-Pinacolone rearrangement;

Phenols: Preparation and properties; Acidity and factors effecting it, Ring substitution reactions, Reimer–Tiemann and Kolbe's–Schmidt Reactions, Fries and Claisen rearrangements with mechanism;

Ethers and Epoxides: Preparation and reactions with acids. Reactions of epoxides with alcohols, Ammonia derivatives and LiAlH4.

Sulphur containing compounds: Preparation and reactions of thiols and thioethers

Unit-III:

Carbonyl Compounds (12 hrs)

Structure, reactivity and preparation. Nucleophilic additions, Nucleophilic addition-elimination reactions with ammonia derivatives with mechanism; Mechanisms of Aldol and Benzoin condensation, Knoevenagel condensation, Perkin, Cannizzaro and Wittig reaction, Beckmann rearrangements, α halo-form reaction and Baeyer-Villiger oxidation, - substitution reactions, oxidations and reductions (Clemmensen,Wolff-Kishner, LiAlH4, NaBH4, MPVO.; Addition reactions of unsaturated carbonyl compounds: Michael addition.

Active methylene compounds: Keto-enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethylaceto acetate.

Unit-IV: Carboxylic Acids and Derivatives (12 hrs)

Preparation, physical properties and reactions of monocarboxylic acids: Typical reactions of dicarboxylic acids, hydroxy acids and unsaturated acids: succinic, lactic, malic, tartaric, citric, maleic and fumaric acids;

Preparation and reactions of acid chlorides, anhydrides, esters and amides; Comparative studyof nucleophilic substitution at acyl group -Mechanism of acidic and alkaline hydrolysis ofesters,Claisen condensation, Dieckmann and Reformatsky reactions,Hofmann-bromamide degradation and Curtius rearrangement.

LAB WORK- Credit-01 (15 classes of 2 hours each)

List of Experiments

1.Functional group tests for amines (*p*-, *sec*- *tert*-), nitro, amide and imide groups in known organic compounds.

2.Benzolyation of one of the following amines (aniline, o-, m-, p- toluidines and o-, m-, p-anisidine) and one of the following phenols (β-naphthol, resorcinol, p-cresol) by Schotten-Baumann reaction.

3.Bromination of any one of the following:

4.Acetanilide by conventional methods

5.Acetanilide using green approach (Bromate-bromide method)

6.Nitration of any one of the following:

7.Acetanilide/nitrobenzene by conventional method

8.Salicylic acid by green approach (using ceric ammonium nitrate).

9.Identification of unknown organic compounds containing one functional group in CHO or CHN systems and their derivative preparation.

CORE-I PAPER-VII

Phase equilibrium, Chemical dynamics, catalysis and surface chemistry

Course Objectives:

This course is offered by School of Chemistry as a core subject for the B.Sc. programme, with an

emphasis on fundamental understanding phase equilibrium and chemical kinetics. The objective of this course is to develop basic and advance concepts regarding of Surface chemistry and catalysis. It aims to study the similarity and differences between adsorption isotherms and reasons responsible for these. The objective of the practical is to develop skills for working in physical chemistry laboratory pertaining to kinetics & adsorption isotherms. The student will perform experiments based on the concepts learnt in Physical chemistry-III course.

Course Outcomes:

By the end of the course, the students will be able to:

- Establish the phase rule for one, two component systems, eutectics; and its thermodynamic derivation; fundamentals of physical transformation of pure materials.
- Interpret chemical kinetics of chemical reactions and its impact on reaction mechanism.
- Differentiate between homogenous and heterogenous catalysis & Acid Base Catalysis, differentiate between Physical adsorption, chemisorption and various adsorption isotherms.
- Determine distribution coefficients of solution mixtures, Interpret and use data generated from kinetic studies by graphical and experimental methods.

SYLLABUS
Lecture-Credit 03 (45 hours)
UNIT-I: Phase Equilibria-I (10 hr)
Concept of phases, components and degrees of freedom, derivation of Gibbs Phase Rule for nonreactive and reactive systems; Clausius-Clapeyron equation and its applications to solid-liquid, liquid-vapour and solid-vapour equilibria, phase diagram for one component systems, with applications (H_2O and sulphur system). Phase diagrams for systems of solid-liquid equilibria involving eutectic (Pb-Ag system, desilverisation of lead), congruent (ferric chloride-water) and incongruent (sodium sulphate- water) melting points.
UNIT-II: Phase Equilibria-II (13 hr)
Three component systems, water-chloroform-acetic acid system, triangular plots.

Binary solutions: Gibbs-Duhem-Margules equation, its derivation and applications tofractional distillation of binary miscible liquids (ideal and non-ideal), azeotropes, partial miscibility of liquids, CST, miscible pairs, steam distillation.

Nernst distribution law: its derivation and applications.

UNIT-III : Chemical Kinetics (12 hr)

Order and molecularity of a reaction, derivation of rate laws (Zero, first, and second order) and its differential and integrated form of rate expressions up to second order reactions, experimental methods of the determination of orders. Kinetics of complex reactions (integrated rate expressions up to first order only): (i) Opposing reactions (ii) parallel reactions (iii) consecutive reactions and their differential rate equations (steady-state approximation in reaction mechanisms) (iv) chain reactions (HBr chain reaction).

Temperature dependence of reaction rates; Arrhenius equation; activation energy. Collision theory of reaction rates, qualitative treatment of the theory of absolute reaction rates.

UNIT-IV Catalysis (10 hr)

Types of catalyst, specificity and selectivity, mechanisms of catalyzed reactions at solid surfaces; effect of particle size and efficiency of nanoparticles as catalysts. Enzyme catalysis, Michaelis- Menten mechanism, acid-base catalysis. Surface chemistry: Physical adsorption, chemisorption, adsorption isotherms (Langmuir, Freundlich and Gibb's isotherms), nature of adsorbed state.

LAB WORK- credit 01 (15 classes of 2 hours each)

List of experiments

Determination of distribution coefficients of: Iodine between water and carbon tetrachloride.

Acetic/ benzoic acid between water and cyclohexane.

Study the equilibrium of at least one of the following reactions by the distribution

Method:

- $I_2 (aq) + I^- \rightarrow I_3^- (aq)$
- $Cu^{2+}(aq) + nNH_3 \rightarrow Cu(NH_3)_n$
- Study the kinetics of the following reactions.

Integrated rate method: Acid hydrolysis of methyl acetate with hydrochloric acid.

Saponification of ethyl acetate.

Compare the strengths of HCl and H_2SO_4 by studying kinetics of hydrolysis of methyl acetate.

Verify the Freundlich and Langmuir isotherms for adsorption of acetic acid on activated charcoal.

CORE-I PAPER-VIII

Coordination Chemistry, Chemistry of d- and f-block elements, Inorganic Reaction Mechanism and electron transfer reactions

Course Objectives:

To provide the knowledge on the coordination compounds which find manifold applications in the diverse fields such as industrial catalysis, metallurgy, pharmaceutical industry, paints and pigments. Students will achieve the knowledge about the diverse kinetic aspects of the coordination compounds. They will also be familiarized with the chemistry of d- and f-block elements and get an idea about horizontal similarity in a period in addition to vertical similarity in a group. Besides, the idea of inorganic reaction mechanism and the importance of electron transfer reactions have been reviewed. Synthesis and estimation of inorganic compounds have been included to enhance the practical skill of students in this regard.

Course Outcomes:

- Understand the chemistry of coordination compounds, and d- and f-Block elements.
- Explain magnetic properties and colour of complexes on the basis of Crystal Field Theory.
- Understanding the fundamental importance of inorganic reaction mechanism and electron transfer reaction
- Achieved the knowledge of the preparation of inorganic complex, estimation by EDTA method and gravimetric method.

SYLLABUS

(C L P = 3 3 0; Total Hours = 15 x 3 = 45)

UNIT – I (13 Hours)

Coordination Chemistry

Werner's Coordination theory, IUPAC nomenclature of coordination compounds, isomerism in coordination compounds with coordination numbers 4 and 6. A brief idea about chelate effect, and labile and inert complexes. Valence bond theory and its application to complexes of coordination numbers 4 and 6. Examples of inner and outer orbital complexes. Crystal field theory and its application, measurement of Δo. Calculation of CFSE in weak and strong fields, concept of pairing energies, factors affecting the magnitude of Δo. Octahedral *vs.* tetrahedral coordination, tetragonal distortions from octahedral geometry, Jahn-Teller theorem, square planar geometry. Qualitative aspect of Ligand field theory, and MO Theory (bonding and antibonding interactions, idea about σ, σ*, π, π*, n –MO).

Synthesis of hexamine nickel(II) complex, $[Ni(NH_3)_6]Cl_2$

Synthesis of tetraamminecopper(II) sulphate, $[Cu(NH_3)_4]SO_4.H_2O$

Estimation of Ca and Mg from cement by EDTA method

Estimation of nickel (II) using dimethylglyoxime (DMG)

UNIT – II (13 Hours)

Chemistry of d- and f-Block Elements

Chemistry of transition metals: General group trends with special reference to electronic configuration, colour, variable valency, magnetic properties (no temperature dependence), catalytic properties, and ability to form complexes. Distinction among the first, second and third transition series. Chemistry of Ti, V, Cr, Mn, Fe and Co in various oxidation states (excluding their metallurgy). Some important compounds of Cr, Mn, Fe and Co and their roles as laboratory reagents; Potassium dichromate, potassium permanganate, potassium ferrocyanide, potassium ferricyanide, sodium nitroprusside and sodium cobaltinitrite. Chemistry of Lanthanides and Actinides: electronic configuration, oxidation states, colour, spectral and magnetic properties. Lanthanide contraction (causes and effects), separation of lanthanides by ion exchange method. General features of actinides, separation of Np, Pm, Am from U.

UNIT – III (11 Hours)

Inorganic Reaction Mechanism

Thermodynamic and kinetic stability, Stepwise and overall formation constants and their relationship, factors affecting stability, Substitution reactions in square planar complexes, trans-effect, theories of trans-effect (electrostatic polarization and π-bonding theory), Substitution reactions in octahedral complexes, acid hydrolysis of octahedral Co(III) complexes with reference to effect of charge, chelation, steric crowding & effects of leaving group, base hydrolysis of octahedral Co(III) complexes: Conjugate base mechanism, test of conjugate base mechanism, anation reaction.

UNIT – IV (8 Hours)

Electron transfer reaction

Redox reactions: electron tunneling hypothesis, concept of Marcus-Hush theory, atom transfer reactions, one and two electron transfer, complementary and non-complementary reactions, inner sphere and outer sphere reactions, electron transfer through extended bridges, concept of hydrated electron.

Lab Work

Credit-01

(C L P = 1 0 1; Total Hours = 15 x 2 = 30)

(Laboratory periods: 30 Hours, 15 classes of 2 hours each)

List of experiments

1.Synthesis of hexamine nickel(II) complex, $[Ni(NH_3)_6]Cl_2$

2.Synthesis of tetraamminecopper(II) sulphate, $[Cu(NH_3)_4]SO_4.H_2O$

3.Estimation of Ca and Mg from cement by EDTA method

4.Estimation of nickel (II) using dimethylglyoxime (DMG)

Core- I (Paper-IX)

Natural Products, Heterocyclic Compounds, Nitrogen containing compounds and Polynuclear Hydrocarbons

Course Objectives:

Imparting information on natural products, nitrogen based organic compounds, heterocyclic compounds and polynuclear hydrocarbons with their chemical properties and structural elucidation. Imparting hands on training in estimation and analysis of organic compounds.

Course Outcomes:

- Gaining knowledge on preparation, properties and synthetic application of nitrogen containing compounds including diazonium salts.
- Understanding on isolation and structural elucidation of natural products and heterocyclic compounds and their chemical reactions.
- Knowledge on structure and properties of fused aromatic compounds.
- Learning on various procedures of estimation of organic compounds.

SYLLABUS

Lecture-Credit-03 (45 Hrs)

Unit-I:

Nitrogen Containing Functional Groups (13 hrs)

Amines: Effect of substituent and solvent on basicity; Preparation from nitro and nitriles and properties: Gabriel phthalimide synthesis, Carbylamine reaction, Mannich reaction, Hoffmann's exhaustive methylation, Hofmann-elimination reaction; Distinction between 1°, 2° and 3° amines with Hinsberg reagent and nitrous acid.

*DiazoniumSalt*s**:** Preparation and their synthetic applications.

Unit-II:

Dyes and Polynuclear hydrocarbon derivatives (8 hrs)

Classification, colour and constitution; Mordant and Vat dyes; Chemistry of dyeing. Synthesis and applications of: *Azo dyes* – Methyl orange and Congo red (mechanism of Diazo coupling); *Triphenylmethane dyes*- Malachite Green, and crystal violet; *Phthalein dyes*– Phenolphthalein and Fluorescein. Edible dyes with example.

Preparation of Polynuclear Hydrocarbons: Reactions of naphthalene, anthracene, phenanthrene, acenaphthene, pyrene. Preparation and their structure elucidation (naphthalene) and important derivatives of naphthalene and anthracene.

Unit-III:

Heterocyclic Compounds (13 hrs)

Classification and nomenclature, Structure, aromaticity in 5-numbered and 6-membered rings containing one heteroatom, Reaction and mechanism of substitution reactions of: Furan, Pyrrole, Thiophene and Pyridine. Synthesis of Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis), Furan (Paal Knorr synthesis, Fiest-Benary Synthesis), Derivatives of Furan: Furfural and Furoic acid (preparation only) Pyridine (Hantzsch synthesis). Pyrimidine (synthesis from β-keto acid), Bicyclic Heterocyclic compound: Indole (Fischer indole synthesis and Madelung synthesis) Quinoline (Skraup synthesis, Friedlander Synthesis).

Unit-IV:

Natural Products (11 hrs)

Alkaloids

Natural occurrence, General structural features, Isolation and their physiological action. Hoffmann's exhaustive methylation, Emde's modification, Structure elucidation, synthesis and medicinal importance of Hygrine, Nicotine, Quinine and Morphine

Terpenes

Occurrence, classification, isoprenerule; Elucidation of structure and synthesis of Citral, and *α*-terpineol.

LAB WORK

Credit-01 (15 classes of 2 hours each)

List of Experiments

1) Qualitative analysis of unknown organic compounds containing bifunctional groups

2) Estimation of Phenol/ Aniline

3) Estimation of Methyl Ketone

4) Determination of percentage purity of carbonyl compound.

CORE-I PAPER-X

Conductance, electrochemistry, electrical properties of atoms and molecules

The text provides an in-depth analysis of the conductance nature of electrolytic solutions, their thermodynamics, Debye-Huckel theory, ionic strength, mean ionic activity coefficient, and the Debye-Huckel limiting law.

Explain dynamic electrochemical processes and skill development to analyse it.

Understand the dynamic electrochemical processes and skill development to analyse it.

Develop skill to solve problems on Electrochemical Cells, electrode potentials, emf & solubility product measurements, potentiometric titrations, pK and pH measurements.

Course Objectives:

This course offers in introductory knowledge of electrolytic conductance depth knowledge of electrochemical cells. Students are expected to have background knowledge in physical chemistry and mathematics up to the +2 level for this course. The objective of the practical is to develop skills for working in physical chemistry laboratory. The student will perform experiments based on the concepts learnt in Physical chemistry-IV course.

Course Outcomes:

By the end of the course, the students will be able to:

1.The text provides an in-depth analysis of the conductance nature of electrolytic solutions, their thermodynamics, Debye-Huckel theory, ionic strength, mean ionic activity coefficient, and the Debye-Huckel limiting law.

2.Explain dynamic electrochemical processes and skill development to analyse it.

3.Understand the dynamic electrochemical processes and skill development to analyse it.

4.Develop skill to solve problems on Electrochemical Cells, electrode potentials, emf & solubility product measurements, potentiometric titrations, pK and pH measurements.

SYLLABUS

Lecture-Credit 03 (45 hours)

UNIT-I : Conductance-I (10 hr)

Arrhenius theory of electrolytic dissociation. Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Molar conductivity at infinite dilution. Kohlrausch law of independent migration of ions. Debye-Hückel-Onsager equation, Wien effect, Debye-Falkenhagen effect, Walden's rules.

UNIT-II : Conductance-II (15 hr)

Ionic velocities, mobilities and their determinations, transference numbers and their relation to ionic mobilities, determination of transference numbers using Hittorf and Moving Boundary methods. Applications of conductance measurement: (i) degree of dissociation of weak electrolytes, (ii) ionic product of water (iii) solubility and solubility product of sparingly soluble salts, (iv) conductometric titrations, and (v) hydrolysis constants of salts.

UNIT-III Electrochemistry-I (10 hr)

Quantitative aspects of Faraday's laws of electrolysis, rules of oxidation/reduction of ions based on half-cell potentials, applications of electrolysis in metallurgy and industry.

Chemical cells, reversible and irreversible cells with examples. Electromotive force of a cell and its measurement, Nernst equation; Standard electrode (reduction) potential and its application

to different kinds of half-cells. Application of EMF measurements in determining free energy, enthalpy and entropy of a cell reaction, (ii) equilibrium constants, and (iii) pH values, using hydrogen, quinone-hydroquinone, glass electrodes.

UNIT-IV Electrochemistry-II (10 hr)

Concentration cells with and without transference, liquid junction potential; determination of activity coefficients and transference numbers. Qualitative discussion of potentiometric titrations (acid-base, redox, precipitation). **Electrical properties of atoms and molecules**: Basic ideas of electrostatics, Electrostatics of dielectric media. Clausius-Mosotti equation and Lorenz-Laurentz equation (no derivation), Dipole moment and molecular polarizabilities and their measurements.

LAB WORK- credit 01 (15 classes of 2 hours each)

List of experiments

I Determination of cell constant.

II Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid.

Perform the following conductometric titrations: Strong acid vs. strong base

Weak acid vs. strong base

Strong acid vs. weak base

I Perform the following potentiometric titrations:

i Strong acid vs. strong base

ii Weak acid vs. strong base

iii Dibasic acid vs. strong base

Core- I (Paper-XI)

Organic Spectroscopy

Course Objectives:

To provide knowledge on the principles of different advanced spectroscopic methods such as UV-Visible, FTIR, NMR and Mass-spectrometry and to develop analytical aptitude for interpretation of structure of the organic compounds by applying these spectroscopic methods. Imparting practical knowledge on UV-visible spectroscopy and colour of compounds.

Course Outcomes:

1. Gaining knowledge on principle of UV-visible and Infrared Spectroscopic techniques.
2. Gaining knowledge on principle of NMR Spectroscopic techniques.
3. Gaining knowledge on principle of Mass Spectrometry techniques.
4. Understanding and interpretation of different spectra of organic molecules.

SYLLABUS

Lecture-Credit-03 (45 Hrs)

Unit-I:

UV-Visible Spectroscopy (11 hrs)

Types of electronic transitions, λmax, Lambert-Beer's law and its limitations, Chromophores and Auxochromes, Bathochromic and Hypsochromic shifts, Intensity of absorption; Instrumentation (brief idea only), Application of Woodward rules for calculation of λmax for the following systems: α, β- unsaturated carbonyl compounds, acids and esters; Conjugated dienes, distinction between cis and trans isomers.

Unit-II:

FTIR Spectroscopy (9 hrs)

Fundamental and non-fundamental molecular vibrations; IR absorption positions of O and N containing functional groups; Effect of H-bonding, conjugation, resonance and ring size on IR absorptions; Fingerprint region and its significance; application in simple functional group analysis.

Unit-III:

NMR Spectroscopy (15 hrs)

NMR Spectroscopy: Basic principles of Proton Magnetic Resonance, chemical shift and factors influencing it; Equivalent and non-equivalent protons, Spin-spin coupling and coupling constant; Anisotropic effects in alkene, alkyne, aldehydes and aromatics; Interpretation of NMR spectra of simple organic compounds. 13C NMR spectroscopy, chemical shift values and interpretation of NMR spectra. preliminary idea on NMR of 15N, 19F, 31P nuclei.

Unit-IV:

Mass Spectrometry (10 hrs)

Introduction, Basic principle, Fragmentation pattern, instrumentation, Determination of molecular formulae, molecular ions, Parent peak, Base peak, isotopic peak and metastable ion peak. Use of molecular fragmentation, McLafferty rearrangement, Mass spectra of some classes of compounds (hydrocarbons, alcohols, phenols, ketones, aldehydes, acids and esters)

Problems involving identification of organic compounds using UV, IR, NMR and Mass spectroscopy.

LAB WORK

Credit-01 (15 classes of 2 hours each)

List of Experiments

1) Determine the λmax value and predict the effect of auxochrome and conjugation on λmax for the following molecules e.g. salicylic acid, benzoic acid and *p*-amino benzoic acid, cinnamic

acid, nitrophenols and nitrobenzene (in neutral, acidic and alkaline medium) by using UV-visible Spectrophotometer.

2) Identification of labelled peaks in the 1H NMR spectra of the known organic compounds and to explain their δ-values and splitting pattern on a supplied NMR spectra.

3) Identification of labelled peaks in the IR spectrum of a compound and to explain the relative frequencies of the absorptions (C-H, O-H, N-H, C-O,C-N, C-X, C=C, C=O, N=O, C≡C, C≡N) of a supplied spectra.

CORE-I PAPER-XII

Basic quantum chemistry, Molecular & electronic spectroscopy, and photochemistry

Course Objectives:
This course is offered by School of Chemistry as a core subject for the B.Sc. programme, with an emphasis on fundamental understanding of Quantum chemistry, molecular spectroscopy, and photochemistry. Students are expected to have background knowledge in mathematics up to the +2 level for this course. The objective of the practical is to develop skills for working in physical chemistry laboratory. The student will perform experiments based on the concepts learnt in Physical chemistry-V course.

Course outcomes:
By the end of the course, the students will be able to:
1. Understand the postulates of quantum mechanics. Construct the Schrödinger wave equations for 1-D box, 3-D box, Rigid rotor, and SHO and able to interpret the solution of Schrödinger equation.
2. Understand LCAO-MO compare with VBT of H2 molecule. Apply the fundamentals of Quantum mechanics to interpret molecular spectroscopy.
3. Calculate quantum yield of photochemical reactions.
4. Interpret the data obtained from graphical methods of Lambert-Beer's law experiments and corelate with UV-Vis spectroscopy.

SYLLABUS
Lecture-Credit 03 (45 hours)
UNIT-I: Quantum Chemistry-I (10 hr)
Quantum mechanical operators, Postulates of quantum mechanics, Schrödinger equation and its application to particle in one-dimensional box (complete solution) - quantization of energy levels, zero-point energy, normalization of wave functions, probability distribution functions, nodal properties. Extension to three-dimensional boxes.
Qualitative treatment of simple harmonic oscillator model of vibrational motion: Setting up of Schrödinger equation and discussion of solution and wave functions. Vibrational energy of diatomic molecules and zero-point energy.
Rigid rotator model of rotation of diatomic molecule: Schrödinger equation, transformation to spherical polar coordinates. Derivation of rotational energy expression of diatomic molecule.
UNIT-II Chemical Bonding (15 hr)
Chemical bonding: Covalent bonding, valence bond and molecular orbital approaches, LCAO- MO treatment of H_2^+. Bonding and antibonding orbitals. Qualitative extension to H_2. Comparison of LCAO-MO and VB

treatments of H_2 (only wave functions, detailed solution not required) and their limitations. Localized and non-localized molecular orbitals treatment of triatomic (BeH_2, H_2O) molecules.
UNIT-III: Molecular Spectroscopy-I (10 hr)

Interaction of electromagnetic radiation with molecules and various types of spectra; Born-Oppenheimer approximation.
Rotation spectroscopy: Selection rules, intensities of spectral lines, determination of bond lengths of diatomic molecules, isotopic substitution.
Vibrational spectroscopy: Classical equation of vibration, computation of force constant, amplitude of diatomic molecular vibrations, anharmonicity, Morse potential, dissociation energies, fundamental frequencies, overtones, hot bands, degrees of freedom for polyatomic molecules, modes of vibration. Vibration-rotation spectroscopy: diatomic vibrating rotator, P, Q, R branches.

UNIT-IV: Molecular Spectroscopy-II (10 hr)

Raman spectroscopy: Qualitative treatment of Rotational Raman effect; Effect of nuclear spin, Vibrational Raman spectra, Stokes and anti-Stokes lines; their intensity difference, rule of mutual exclusion. ***Electronic spectroscopy:*** Franck-Condon principle, electronic transitions, singlet and triplet states, fluorescence and phosphorescence, dissociation and predissociation.

Photochemistry Laws of photochemistry, quantum yield, actinometry, examples of low and high quantum yields, photochemical equilibrium and the differential rate of photochemical reactions, photosensitised reactions, quenching, chemiluminescence.

LAB WORK

Credit 01 (15 classes of 2 hours each)

List of experiments

- Study of absorption spectra (visible range) of KMnO4 and determine the λmax value. Calculate the energies of the transitions in kJ mol-1, cm-1, and eV.
- Verify Lambert-Beer's law and determine the concentration of CuSO4/KMnO4/K2Cr2O7 in a solution of unknown concentration.
- Determine the dissociation constant of an indicator (phenolphthalein).
- Determine the concentration of HCl against 0.1 N Na OH spectrophotometrically.
- To find the strength of given ferric ammonium sulfate solution of (0.05 M) by using EDTA spectrophotometrically.
- To find out the strength of CuSO4 solution by titrating with EDTA spectrophotometrically.
- To determine the concentration of Cu(II) and Fe(III) solution photometrically by titrating with EDTA.

CORE-I PAPER-XIII

Chemistry of Organometallic Compounds

Course Objectives

To provide the basic knowledge and cutting-edge developments in the field of organometallic chemistry. This includes the classification of organometallic compounds, the concept of hapticity and the 18-electron rule governing the stability of a wide variety of organometallic species. Specific organometallic compounds are studied in detail to understand the basic concepts. It familiarizes the versatility of phosphine/NHC ligands as well as metathesis reactions. It provides much fundamentals about the qualitative inorganic analysis having multiple radical mixtures.

Course Outcomes:

- Understand the basic concepts of organometallic compounds pertaining to their synthesis, structure and bonding
- Understand the mechanistic phenomena of organometallic based catalytic reactions
- Get knowledge on the versatility of phosphine/NHC ligands, and industrially important metathesis reactions.
- Understand and explain the basic principles of qualitative inorganic analysis

SYLLABUS
(C L P = 3 3 0; Total Hours = 15 x 3 = 45)

UNIT – I (12 Hours)

Organometallic Compounds-I

Definition of organometallic compound, classifications, nature of metal-carbon bond, nomenclature, the 18-electron rule, Concept of hapticity of organic ligands. Metal carbonyls: electron counting of metal carbonyls of 3d series. General methods of preparation (direct combination, reductive carbonylation, thermal and photochemical decomposition) of mono and binuclear metal carbonyls of 3d series. Structures of mononuclear and binuclear carbonyls of Cr, Mn, Fe, Co and Ni using VBT. π-acceptor behaviour of CO (MO diagram of CO to be discussed), synergic effect and use of IR data to explain extent of back bonding. Zeise's salt: preparation and structure, evidence of synergic effect and comparison of synergic effect with that in carbonyls.

UNIT – II (11 Hours)

Organometallic Compounds-II

Metal Alkyls: Important structural features of methyl lithium (tetramer) and trialkyl aluminium (dimer), concept of multicentre bonding in these compounds. Role of triethyl aluminium in the polymerisation of ethene and propylene (Ziegler – Natta Catalyst). Ferrocene: preparation and reactions (acetylation, alkylation, metallation, Mannich condensation, nitration, halogenation, silylation, borylation, sulphonation), structure and aromaticity, comparison of aromaticity and reactivity with that of benzene. Fluxional molecules. Concept of coordinative unsaturation, oxidative addition, reductive elimination, insertion reaction, migratory insertion, intramolecular hydrogen transfer reaction, agostic interaction.

UNIT – III (12 Hours)

Organometallic Catalysis

General idea of catalysis, turnover number (TON), turnover frequency (TOF), hydrogenation of alkenes using Wilkinson's catalyst, Tolman catalytic loop, hydroformylation of alkenes (using cobalt catalyst), enantioselective hydrofomylation, wacker process, mosanto acetic acid synthesis, cativa process, hydrosilylation reactions, reduction of carbon monoxide by hydrogen (Fischer-Tropsch reaction). Concept of Pd-catalyzed cross-coupling reactions.

UNIT – IV (10 Hours)

Neutral Spectator Ligands and Metathesis Reactions

Steric and electronic structure of phosphine ligands, basicity of phosphine, monodentate and multidentate phosphines, cone angle, bite angle, N-heterocyclic carbenes (NHC), synthesis of NHC, alkene metathesis, mechanism of alkene metathesis, classification of metathesis reactions, significance of metathesis reactions.

Lab Work

(C L P = 1 0 1; Total Hours = 15 x 2 = 30)

(Laboratory periods: 30 Hours, 15 classes of 2 hours each)

Experiment

1. Qualitative analysis of mixtures containing 4 radicals (2 anions and 2 cations). Emphasis should be given to the understanding of the chemistry of different reactions. The following radicals are suggested:

CO_3^{2-}, NO_2^-, S^{2-}, SO_3^{2-}, F^-, Cl^-, Br^-, I^-, NO_3^-, PO_4^{3-}, NH_4^+, K^+, Pb^{2+}, Cu^{2+}, Cd^{2+}, Bi^{3+}, Sn^{2+}, Sb^{3+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Zn^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+}.

Mixtures may contain one insoluble component ($BaSO_4$, $SrSO_4$, $PbSO_4$, CaF_2 or Al_2O_3) or

combination of interfering anions e.g., CO_3^{2-} and SO_3^{2-}; NO_2^- and NO_3^-; Cl^-, Br^-, I^-; $Br^-$and I^-; NO_3^-, Br^-, I^-.

Core- I (Paper-XIV)

Chemistry of Biomolecules

Course Objectives:

The objective of this course is to familiarize the student with biomolecules such as carbohydrates, amino acids, proteins, peptides, lipids and enzymes. The student will comprehend the structure, nomenclature, and properties of various biomolecules and their functions in biological systems. It will also help the learners to build the concept of metabolism by studying the chemistry and energetics of biomolecules in biochemical reactions.

Course Outcomes

- Imparting knowledge on various biomolecules with their detailed classification, structure, nomenclature and functions.
- Understanding the chemistry and energetics of food to energy conversion in biological systems.
- Gaining knowledge on type of enzymes and their roles in metabolism of biomolecules in various biochemical reactions.
- Practically determine saponification value and iodine number of fat and oil and determine the reducing and non-reducing sugars by Benedict's reagent.

Syllabus

Lecture-Credit-03 (45 Hrs)

Unit-I:

Carbohydrate (13 hrs)

Occurrence, classification (mono-, di- and poly- saccharides), chemical structure, constitution and absolute configuration of glucose and fructose, epimers and anomers relationships, mutarotation, determination of ring size of glucose and fructose, Haworth projections and Fischer projection conformational structures, interconversions of aldoses and ketoses. Chemical properties of monosaccharides and Killiani-Fischer synthesis and Ruff degradation; Synthesis of Disaccharides –(Sucrose, Lactose and maltose) by condensation reactions.

Unit-II:

Amino Acids, Peptides, Proteins and Nucleic acids (11 hrs)

Amino acids: Classification, Synthesis, ionic properties and reactions. Zwitterions, pKa values, isoelectric point and electrophoresis.

Peptides: Classification, Determination of their primary structures-end group analysis, methods of peptide synthesis. Synthesis of peptides using N-protecting, C-protecting and C-activating groups- Solid-phase synthesis.

Proteins: Structure of proteins, protein denaturation and renaturation.

Nucleic Acids: Components of nucleic acids, Nucleosides and nucleotides; Structure, synthesis and reactions of: Adenine, Guanine, Cytosine, Uracil and Thymine; Structure of polynucleotides.

Unit-III:

Lipids (12 hrs)

Introduction to oils and fats, common fatty acids present in oils and fats, role of lipids in our body, structure and classification, importance of omega-3 and omega-6 fatty acids and their sources. Physical and chemical properties of oils and fats, acid value, saponification value, iodine value, smoke point, flash point, fire point, and specific gravity. Chemical reactions of oil and fat, rancidity, conversion of oil to fat through hydrogenation, Baudouin test, Halphens test, Hexabromide test.

Unit-IV:

Enzymes (9 hrs)

Introduction to enzyme nomenclature, classification and characteristics. Salient features of active site of enzymes. Enzyme-substrate formation theory. Mechanism of enzyme action, factors affecting enzyme action, coenzymes and cofactors and their role in biological reactions, specificity of enzyme action, enzyme inhibitors and their importance, phenomenon of inhibition (competitive, uncompetitive and non-competitive including allosteric inhibition).

LAB WORK

Credit-01 (15 classes of 2 hours each)

List of Experiments

(1) Determination of Saponification value of supplied oil.

(2) Determination of Iodine value of supplied oil.

(3) Qualitative analysis of carbohydrate: aldoses and ketoses, reducing and non-reducing sugars.

(4) Quantitative estimation of sugars:

a) Estimation glucose by titration with Fehling's solution.

b) Estimation glucose and sucrose in a given mixture.

(5) Estimation of glycine by Sorenson's formalin method.

(6) Study of the titration curve of glycine

CORE-I, PAPER-XV

Solid and porous materials, and magnetochemistry and power cells

Course Objectives:

To provide the basic understanding about the solid and porous materials with their diverse applications. Students will learn fundamentals of magnetochemistry and molecular magnetism which will be helpful for their competitive examinations. Course is designed to develop a comprehensive technological understanding in different power cells.

Course Outcomes:

1. Learn about the different materials, including theory and methods for the development of new materials with desired properties.

2. Know how pores can influence the properties of materials

3. Demonstrate an increased knowledge and understanding of magnetochemistry with critical thought and achieve the ability to analyze magnetochemical studies and data

4. Explain the principles that underlie the ability of various power cells and develop new idea of constructing power cells

SYLLABUS

(C L P = 4 4 0; Total Hours = 15 x 4 = 60)

UNIT – I (20 Hours)

Inorganic Solid Materials

Silicate industry:

Glass: Glassy state and its properties, classification (silicate and nonsilicate glasses), Manufacture and processing of glass, composite armoured properties of the following types of glasses: soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, colored glass, photosensitive glass.

Ceramics: Manufacture and types of ceramics, high technology ceramics and their applications, superconducting and semiconducting oxides, fullerenes, carbon nanotubes and carbon fibers.

Cement: Classification of cement, ingredients and their role, manufacture of the cement, and their setting process and quick setting cements.

UNIT – II (15 Hours)

Crystal Engineering and Principle of Designing Porous Materials

Inorganic crystal engineering and design principle of metal-organic frameworks and organic-inorganic hybrids. Principles of ICE in the design of porous materials, their understanding and characterizations using X-ray diffraction and thermal methods. Surface characterization and surface behavior of such porous materials with special reference to the gas/solvent vapors sorption. Some special applications of such materials like gas storage, gas/solvent separation, etc. Understanding of the structure-property relationship for the design of functional molecular material or molecular devices- philosophy and the terminologies**.**

UNIT – III (15 Hours)

Magnetochemistry

Magnetic Substances: Terminology related with magnetic properties, Classification, Cooperative Magnetism, Ferromagnetic substances and related aspects, Application of hard and soft ferromagnetic substances. Para-, ferro- and antiferro-magnetism: Temperature dependence of magnetic susceptibility, Curie‘s Law and Curie-Weiss Law, Pathways of ferro- and antiferromagnetism, magnetic properties of an electron, paramagnetism and thermal energy, Spin-orbit Coupling, Magnetic properties of compounds of d- and f-block elements: concentrated and dilute systems, Magnetically frustrated systems, single molecule magnet (SMM), single ion magnet (SIM), single chain magnet (SCM).

UNIT – IV (10 Hours)

Power cells

Primary and secondary batteries, Battery components and their role, characteristics of battery, working principles of following batteries: Pb-battery, Li-battery, solid state electrolyte battery, fuel cell, solar cell, polymer cell.

Multi-Disciplinary Course - SEMESTER-I

Paper-I: Environmental Chemistry (Chemistry)

Course Objectives:

The objectives of a course in environmental chemistry typically aim to provide students with a deep understanding of the chemical processes occurring in the environment and their impacts on ecosystems, human health, and the planet as a whole with a comprehensive understanding of the components and processes of environmental systems, including the atmosphere, hydrosphere, lithosphere, and biosphere, and their interactions. Investigation of the chemical composition of environmental compartments, including the atmosphere (air pollutants), hydrosphere (water pollutants), and lithosphere (soil pollutants), and the sources, fate, and transport of pollutants in these compartments. To examine the chemical properties and toxicological effects of environmental pollutants on ecosystems and human health, including acute and chronic toxicity, bioaccumulation, bio magnification, and risk assessment.

Course outcomes:

• Gain a comprehensive understanding of the chemical processes occurring in the environment, including the sources, fate, and transport of pollutants

• Develop analytical skills in environmental chemistry, and apply a range of analytical techniques for the detection, and characterization of environmental pollutants.

• Aware of global environmental issues and challenges such as climate change, pollution, biodiversity loss, and resource depletion.

• Apply the principles of environmental chemistry for mitigating environmental pollution, promoting environmental conservation, and contributing to the development of environmentally friendly technologies and policies.

UNIT I

Environment Introduction, Composition of atmosphere, vertical temperature, heat budget of the earth atmospheric system, vertical stability atmosphere, Biogeochemical Cycles of C, N, P, S and O. Bio distribution of elements. Hydrosphere Chemical composition of water bodies- takes, streams, rivers and wet lands etc. Hydrological cycle. Aquatic pollution-inorganic, organic, pesticide agricultural, industrial and sewage, detergents, oil spills and oil pollutants. Water quality parameters- dissolved oxygen, biochemical oxygen demand, solids, metals, content of chloride, sulphate, phosphate, nitrate and mocro-organisms. Water quality standards, Analytical methods for measuring BOD, DO, COD, F, oils, metals (As, Cd, Cr, Hg, Pb, Se etc) residual chloride and chlorine demand. Purification and treatment of water.

UNIT II

Soils composition, micro and macro nutrients, pollution-fertilizers, pesticides, plastics and metals, waste treatment Atmosphere Chemical composition of atmosphere-particles, ions and radicals and their formation. Chemical and photochemical reactions in atmosphere, smog formation, oxides of N, C, S, O and their effect, pollution by chemicals, petroleum, minerals,

chlorofluorohydrocarbons. Greenhouse effect, acid rain, air pollution controls and their chemistry. Analytical methods for measuring air pollutants. Continuous monitoring instruments.

UNIT III

Industrial Pollution Cement, Sugar, distillery, drug, paper and pulp, thermal power plants, nuclear power plants, metallurgy. Polymers, drugs etc. Radionuclide analysis. Disposal of wastes and their management.

UNIT IV

Environmental Toxicology, Chemical solutions to environmental problems, biodegradability, principles of decomposition.

DEPARTMENT OF MATHEMATICS
SARBATI DEVI WOMEN'S COLLEGE,RAJGANGPUR
PO,CO,PSO- NEP-2020

COURSE STRUCTURE FOR UNDER GRADUATE MATHEMATICS

(As per NEP guideline provided by Department of Higher Education, Government of Odisha)

DETAILED SYLLABUS OF THE CORE COURSES

CALCULUS & ANALYTIC GEOMETRY

Objective: The main emphasis of this course is to equip the student with necessary analytic and technical skills to handle problems of mathematical nature as well as practical problems. More precisely, main target of this course is to explore the different tools for higher order derivatives to plot the various curves and to solve the problems associated with differentiation and integration of vector functions.

Learning Outcomes: After completing the course the student will be able to

CO1: trace a curve and find asymptotes.

CO2: calculate integrals of typical type using reduction formulae, etc.

CO3: calculate arc length, surface of revolution and know about conics

CO4: calculate triple products, gradient divergence, curl, etc.

UNIT-I

Hyperbolic functions, higher order derivatives, Leibnitz rule and its applications to problems of the type $e^{ax+b}\sin x$, $e^{ax+b}\cos x$, $(ax+b)^n\sin x$, $(ax+b)^n\cos x$, concavity and inflection points, asymptotes, curve tracing in Cartesian coordinates, tracing in polar coordinates of standard curves, L'Hospital rule, application in business, economics and life sciences.

UNIT-II

Riemann integration as a limit of sum, integration by parts, reduction formulae, derivations and illustrations of reduction formulae of the type $\int \sin^n x\,dx, \int \cos^n x\,dx, \int \tan^n x\,dx, \int \sec^n x\,dx$, $\int (\log x)^n dx, \int \sin^n x \cos^n x\,dx$, definite integral, integration by substitution.

UNIT-III

Volumes by slicing, disks and washers methods, volumes by cylindrical shells, parametric equations, parameterizing a curve, arc length, arc length of parametric curves, area of surface of revolution, techniques of sketching conics, reflection properties of conics, rotation of axes and second degree equations, classification into conics using the discriminant, polar equations of conics.

UNIT-IV

Triple product, introduction to vector functions, operations with vector-valued functions, limits and continuity of vector functions, differentiation, partial differentiation, div, curl and integration of vector functions, tangent and normal components of acceleration.

INTRODUCTION TO ALGEBRA & NUMBER THEORY

Objectives: To present a systematic introduction to number theory and a basic course on algebra.

Learning Outcomes: After completing the course the student will be able to

CO1: understand the equivalence relations and concept of group with different examples.

CO2: understand the properties of cyclic groups, rings, and integral domain.

CO3: know divisibility and division algorithm and find *gcd* using Euclidean Algorithm.

CO4: solve linear Diophantine equations, find least common multiples, solve linear congruence applying the Chinese remainder theorem.

UNIT -I

Integers and equivalence relations**,** properties of integers, modular arithmetic, mathematical inductions, equivalence relations, Introduction to groups**,** symmetries of a square, the dihedral groups, definitions and examples of groups, elementary properties of groups, subgroups, examples of subgroups.

UNIT-II

Cyclic groups, properties of cyclic groups, classification of subgroups of cyclic groups, definitions and examples of normal subgroups, Introduction to rings, definition and examples of rings, properties of rings, subrings, definition and examples of integral domain and fields.

UNIT-III

Divisibility**,** division algorithms, prime and composite numbers, Fibonacci and Lucas numbers, Fermat numbers, greatest common divisor, Euclidean algorithm.

UNIT-IV

Fundamental theorem of arithmetic, least common multiple, linear Diophantine equations, congruence, linear congruence, Chinese remainder theorem, Wilson's theorem, Fermat little theorem, Euler's theorem.

REAL ANALYSIS-I

Objective: The objective of the course is to introduce the basics of real number system and the properties of sequence and series of real numbers. The ideas of completeness, least upper bound property, denseness, limit, continuity and uniform continuity will also be introduced. This is one of the core courses essential to start doing mathematics.

Learning Outcomes: On successful completion of this course, students will be able to

CO1: learn basics of real number system and test countability of a set.

CO2: know on sequence of real numbers and their basic properties.

CO3: test convergence of an infinite series.

CO4: find limit and continuity of functions and test uniform continuity of functions.

UNIT-I

Finite and infinite sets, countable and uncountable sets, examples, algebraic and order Properties of R, uncountability of R, completeness property of **R,** applications of the supermom property, Intervals, nested interval property, denseness of rationals in R.

UNIT-II

Sequence and their limits, limit theorems, monotone sequences, monotone Convergence theorem, subsequences, divergence criteria, monotone subsequence theorem, Bolzano Weierstrass theorem for sequences, Cauchy sequence, Cauchy's convergence criterion.

UNIT-III

Infinite series, convergence and divergence of infinite series, Cauchy criterion, Tests for convergence: comparison test, limit comparison test, ratio test, Cauchy's nth root test, Raabe's test, integral test, alternating series, Leibniz test, absolute and conditional convergence.

UNIT-V

Limits of functions, limit theorems, some extensions of limit concept, continuous functions and their combinations, continuous functions on intervals, boundedness theorem, maximum minimum theorem, intermediate value theorem, uniform continuity, examples, uniform continuity theorem.

ALGEBRA-I

Objectives: To present a systematic and rigorous study on algebraic structures like groups, rings and some important results with their applications. After pursuing this course, one can opt for advanced topics in groups, rings and their applications to

problems in physics, computer science and engineering.

Learning Outcomes: After completing this course, students will able to

CO1: understand permutation groups with some results and application in Rubik's cube.

CO2: understand the concept of homomorphisms, isomorphisms, normal subgroups and factor groups.

CO3: explore more properties of rings and ideals rigorously.

CO4: get introduced to the concept of reducibility and irreducibility of polynomials and concept of unique factorization domain.

Unit -I

Permutation groups, definition and notations, cyclic notation, properties of permutations, isomorphisms, definition and examples, Cayley's theorem, properties of isomorphisms, automorphisms, cosets, properties of cosets, Lagrange's theorem and consequences, an application of cosets to permutation groups, an application of cosets to Rubik's cube.

Unit-II

External direct products, definition and examples, properties of external direct products, the group of units modulo n as an external direct product, applications, normal subgroups, factor groups, application of factor groups, internal direct products, group homomorphisms, definition and examples, properties of homomorphisms, the first isomorphism theorem.

Unit-III

Characteristic of a ring, ideals, factor rings, prime ideals and maximal ideals, ring homomorphisms, definition and examples, the field of quotients, polynomial rings, notations and terminology, division algorithm and consequences.

Unit-IV

Factorization of polynomials, reducibility test, irreducibility test, unique factorization in Z[x], divisibility in integral domains, irreducible, primes, unique factorization domain, Euclidean domain.

PROBABILITY

Objective: The objective of the course is to make the student understand basics of probability which is of use in everyday life.

Learning Outcomes: After completing the course the student will be able to

CO1: learn the basics of probability and random variables with axioms of probability.

CO2: know the discrete and continuous distributions and learn how to calculate mean, variance and moments of them.

CO3: learn on limit theorems with their applications and know about the conditional expectations.

CO4: learn on Markov chains and their applications.

UNIT-I

Sample space and events, probability axioms, probability defined on events, conditional probabilities, Independent events, Bayes formula, real random variables, discrete and continuous random variables, probability distribution function, probability mass/density functions, mathematical expectation, and properties, variance and standard deviation.

UNIT-II

Discrete distributions: uniform, binomial, Poisson, geometric, negative binomial, continuous distributions: uniform, normal, exponential, their expectations and variance, moments, moment generating function, characteristic function and computation of these for the

distributions, joint distribution function and its properties, joint probability density functions, marginal and conditional distributions, independent random variables.

UNIT-III

Limit theorems: Markov inequality, Chebyshev's inequality, statement and interpretation of (weak) law of large numbers and strong law of large numbers, application to problems, conditional probability and conditional expectation, discrete case, continuous case, applications, expectation of function of two random variables, conditional expectations, bivariate normal distribution, correlation coefficient, joint moment generating function and calculation of covariance, linear regression for two variables.

UNIT-IV

Central limit theorem for independent and identically distributed random variables with finite variance, Markov chains, Chapman-Kolmogorov equations, classification of states, Gambler Ruin problem.

DIFFERENTIAL EQUATIONS-I

Objective: Differential Equations introduced by Leibnitz in 1676 models almost all Physical, Biological, Chemical systems in nature. The objective of this course is to familiarize the students to various methods of solving differential equations, partial differential equations and to have a qualitative applications through models. The students have to solve problems to understand the methods.

Learning Outcomes: After completing the course the student will be able to

CO1: get the idea to solve first order linear ordinary differential equations of different types those are arising in physical problems.

CO2: get the idea to solve second order linear ordinary differential equations of different types those are arising in physical problems.

CO3: get basic ideas of first order partial differential equations, its formulation in two, three variables and variable separable method for identify the solutions.

CO4: get idea to solve various mathematical models of ODEs and PDEs which may be helpful for simulation process.

UNIT-I

Differential equations and mathematical models, general, particular, explicit, implicit and singular solutions of a differential equation, exact differential equations and integrating factors, separable equations and equations reducible to this form, linear equations and Bernoulli’s equation, compartmental model, population model for single species.

UNIT-II

General solution of homogeneous equation of second order, principle of superposition, Wronskian, its properties and applications, method of undetermined coefficients, method of variation of parameters, linear homogeneous and non-homogeneous equations of higher order with constant coefficients, Euler’s equations.

UNIT-III

Partial Differential Equations - Basic concepts and definitions, origin of first order PDEs, Classification of first order PDEs, Pfaffian differential forms and equations, solution of Pfaffian differential equations in three variables, Cauchy's problem for first order PDEs, linear equations of first order, integral surfaces passing through a given curve, Cauchy's method of characteristics, compatible systems, method of separation of variables for solving first order and second order partial differential equations.

UNIT-IV (PRACTICAL)

The students will implement the following problems in the computer Lab using *Matlab / Mathematica / Maple* etc.

1. Plotting of second order solution family of differential equations.

2. Plotting of third order solution family of differential equations.

3. Population growth model (exponential case only).

4. Population decay model (exponential case only).

5. Solution of Cauchy problem for first order PDEs.

6. Finding the characteristics for the first order PDEs.

7. Plot the integral surfaces of a given first order PDE with initial data.

LINEAR ALGEBRA

Objective: The objective of this course is to acquaint students with matrix operations, solution of system of equations, vector spaces and linear transformations. In addition, the student will learn about eigenvalues, diagonalization, canonical forms, etc., which has many applications in almost all areas of science and engineering.

Learning Outcomes: After completing the course the student will be able to

CO1: determine basis and the dimension of a finite-dimensional vector space, know the relation between rank and nullity of a linear transformation.

CO2: the relation between matrix and linear transformation.

CO3: to find solution of system of linear equations, compute eigenvalues, eigenvectors of a matrix and linear transformation.

CO4: about orthogonality of vectors and application of it to different form of matrix, introduced to different operators.

UNIT-I

Vector spaces, subspaces, span of a set, more about subspaces, linear dependence, independence, product and quotient space, dimension and basis, linear transformations, range and kernel of a linear map, rank and nullity of linear map.

UNIT-II

Inverse of linear transformation, consequences of rank – nullity theorem, the space L(U, V), composition of linear maps, matrix associated with linear map, linear map associated with matrix, rank and nullity of a matrix, determinant minors and rank of a matrix, transpose of a matrix and special type of matrices, elementary row operations

UNIT-III

System of linear equations, matrix inversion, application of determinant to linear equations, eigenvalues and eigenvectors, similarity of matrices, invariant subspaces, minimal polynomial (eigenvalues and the minimal polynomial), upper triangular matrices, diagonalizable operators (diagonal matrices, conditions for diagonalizability).

UNIT-IV

Inner product space: inner products and norms, orthonormal bases, orthogonal complements, self-adjoint and normal operators, spectral theorems, isometries, unitary operators, characteristic polynomial, Cayley – Hamilton theorem, Jordan form, trace, quadratic form, application to reduction of quadrics.

REAL ANALYSIS-II

Objective: As a second course in real analysis, the objective is to learn on the concept of differentiation, Riemann Integration and their applications. The series of functions and the improper integrals have also been introduced.

Learning Outcomes: After completing the course the student will be able to

CO1: learn working out problems on derivatives of function and their applications.

CO2: learn about Riemann Integration and their properties including Improper Integrals.

CO3: learn on pointwise and uniform convergence of power series.

CO4: learn to calculate value of improper integrals.

UNIT-I

Differentiability of a function at a point and in an interval, Caratheodory's theorem, algebra of differentiable functions, relative extrema, interior extremum theorem. Rolle's theorem, Mean value theorems, Cauchy's mean value theorem, Lagrange mean value theorem, intermediate value property of derivatives, Darboux's theorem, applications of mean value theorem, Taylor's theorem and applications.

UNIT-II

Riemann integration: partitions, conditions of integrability, definition of Riemann integral properties of the Riemann integral, Riemann integral as limit of a sum, mean value theorem for integrals, integration by parts, Fundamental theorems of calculus, Taylor theorem with remainder.

UNIT-III

Pointwise and uniform convergence of sequence of functions, Cauchy criterion for uniform convergence and Weierstrass M-test, uniform convergence and continuity, term by term

integration and differentiation of a series, power series, Abel's theorem, Weierstrass approximation theorem, Taylor series

Unit IV

Improper integrals, integration of unbounded functions with finite limits of integration, comparison tests of convergence, infinite range of integration, integrand as product of functions convergent at infinity, absolutely convergent integral,tests of convergence, convergence of Beta and Gamma functions, applications.

COMPLEX ANALYSIS-I

Objectives: The objective of the course is to introduce the theories for functions of a complex variable. The concepts of analyticity and complex integration and its applications are discussed in detail. This course is prerequisite to many other advance analysis courses such as advanced complex analysis, geometric functions, theory, potential theory, theory of entire and meromorphic functions, etc.

Learning Outcomes: After completing the course the student will be able to

CO1: understand the geometric aspects of complex numbers system, convergence of series of complex numbers.

CO2: understand the significance of complex differentiability, analyticity and construction of analytic functions from 20

given harmonic functions.

CO3: relate the notion of line integral, Cauchy fundamental theorems on integrals and its applications.

CO4: classify the nature of singularities, properties of zeros and poles and be able to know the applications of residue theorem.

UNIT- I

Basic properties of complex number and, Stereographic projection, power series, absolute convergence, uniform convergence, Cauchy-Hadamard formula for the radius of convergence, circle of convergence, exponential, logarithmic, sine and cosine functions for complex numbers.

UNIT-II

Continuity and differentiability of a complex valued function, analytic function, necessary and sufficient conditions for analytic functions, Cauchy-Riemann equations (Cartesian and polar form), harmonic and conjugate harmonic functions, construction of analytic function (Milne-Thomson's method).

UNIT-III

Line integral, path independence, complex integration, Green's theorem, anti-derivative theorem, Cauchy-Goursat theorem, Cauchy integral formula, Cauchy's inequality, derivative of

analytic function and its generalizations, Liouville's theorem, Morera's theorem, Taylor's and Laurent's theorem, expansion of analytical function in Taylor and Laurent series.

UNIT-IV

Zeroes of an analytic function, singularities of complex functions and its classifications, residues, Cauchy's residue theorem, residue at infinity, residues at poles and its examples, maximum modulus theorem.

ALGEBRA-II

Objectives: To present a systematic study on finite abelian groups, Sylow's theorems and Modules.

Learning Outcomes: After completing the course the student will be able to

CO1: know on finite abelian groups, the class equation and Sylow's theorems.

CO2: know on applications of Sylow's theorems and test the simplicity of groups.

CO3: learn on group action, composition series, nilpotent groups and solvable groups.

CO4: solve problems in modules and related results.

UNIT -I

Fundamental theorem of finite abelian groups, isomorphism classes of abelian groups, proof of the fundamental theorem, Sylow's theorems, conjugacy classes, the class equation, Sylow's first theorem, Cauchy theorem, Sylow's second and third theorems.

UNIT-II

Application of Sylow's theorem, finite simple groups, non-simplicity tests, the simplicity of alternating group $A5$, free groups,classification of groups of order up to 15, characterization of dihedral groups.

UNIT-III

Group actions and permutation representations, composition series and holder programs, nilpotent groups, solvable groups.

UNIT-IV

Introduction to modules, definition and examples, direct sum, free modules, quotient modules, homomorphisms, simple modules, modules over PIDs.

REAL ANALYSIS-III

Objective: After a first course in real analysis in undergraduate program, the ideas of uniform continuity, uniform convergence and approximation by polynomials are crucial in analysis. In addition to the functions of bounded variation and their integrators, the student has to learn differentiating functions from Rn to Rm.. The techniques of integration of a function with respect to another function and the basic ideas of finding a Fourier series are also included.

Learning Outcomes: After completing the course the student will be able to

CO1: find the Fourier series of a function.

CO2: calculate Riemann Stieltjes integrals and know whether a function is of bounded variation or not.

CO3: learn how to define derivatives on Rn including the existence of partial derivatives, inverse function theorem and implicit function theorem.

CO4: learn about metric spaces and their topological properties.

UNIT-I

Basic concepts of Fourier series, Fourier series of even and odd functions, half range series, Fourier series on other intervals, orthogonal systems of functions, theorem on best approximation, properties of Fourier coefficients, Riesz-Fisher theorem, Riemann-Lebesgue lemma, Dirichlet integral, Integral representation for the partial sum of a Fourier series**,** convergence of Fourier series.

UNIT-II

Function of bounded variation, examples, total variation, function of bounded variation expressed as difference of increasing functions, rectifiable paths, Riemann-Stieltjes integrals, properties and techniques, necessary and sufficient condition for existence of the integral, mean value theorem for Riemann-Stieltjes integrals, reduction to Riemann integrals.

UNIT-III

Differentiation in Rn, partial derivatives, directional derivatives, sufficient condition for differentiability, chain rule, , mean value theorem, Jacobians, contraction mapping principle, inverse function theorem, implicit function theorem, rank theorem, differentiation of integrals, Taylor theorem in many variables.

UNIT-IV

Metric spaces, definitions and examples, open and closed sets, interior and exterior points, convergence and completeness, continuity and uniform continuity, compactness, connectedness.

DIFFERENTIAL EQUATIONS-II

Objective: The objective of this course is to understand basic methods for solving nonlinear first order ordinary differential equations and existence of solutions along with some special type of second order ordinary differential equations of mathematical physics. Also, students will be exposed to second order partial differential equations arising in thermal physics and thermodynamics.

Learning Outcomes: After completing the course the student will be able to

CO1: understand first order nonlinear ordinary differential equations and existence of solutions

CO2: learn the methods to find solutions of second order linear ordinary differential equations with constant coefficients and variable coefficients.

CO3: the different methods for solving first and second order partial differential equations and can take more courses on wave equation, heat equation, diffusion equation, gas dynamics, nonlinear evolution equations etc. All these courses are important in engineering and industrial applications for solving boundary value problems.

CO4: get idea to solve various mathematical models of ODE and PDE which may be helpful for simulation process.

UNIT-I

Existence and Uniqueness of Solutions: Lipschitz condition, Gronwall type inequality, successive approximations, Picard's theorem, non-uniqueness of solutions, continuation and dependence on initial conditions, existence of solutions in the large.

UNIT-II

Solution of second order ODE with constant coefficients, power series solutions of ordinary and singular points, and special functions of Legendre's differential equations, Bessel's differential equations and their properties.

UNIT-III

Charpit's method, special types of first order PDE, Jacobi's method, Linear second order PDE, canonical forms of second order PDE and characteristics curves, one dimensional wave equation, its origin and elementary solutions, vibration of an infinite string, vibration of a semi finite string, vibration of a string of finite length, existence of unique solution.

UNIT-IV (PRACTICAL)

Laboratory work for the following problems using *MATLAB / Mathematica / Maple* etc.

1) Plot the Fourier series of the following functions:

i. $f(x)$=$x2$,x∈[−1,1]

ii. $f(x)$={1, 0<x<π −1,−π<x<0

iii. $f(x)$=$sinsin\ x$, 0<x<π2

2) Solution of wave equation $\partial 2u\partial t2-c2\partial 2u\partial x2$=0 for the following associated conditions:

(i) $u(x,0)$=$\varphi(x)$,$ut(x,0)$=$\sigma(x)$,x∈R,t>0

(ii) $u(x,0)$=$\varphi(x)$,$ut(x,0)$=$\sigma(x)$,$u(0,t)$=0 x∈(0,∞),t>0

(iii) $u(x,0)$=$\varphi(x)$,$ut(x,0)$=$\sigma(x)$,$ux(0,t)$=0 x∈(0,∞),t>0

(iv) $u(x,0)$=$\varphi(x)$,$ut(x,0)$=$\sigma(x)$,$u(0,t)$=0,$u(l,t)$=0,0<x<l,t>0

3) Solution of one dimensional heat equation $\partial u\partial t-k\partial 2u\partial x2$=0 for the following conditions

(i) $u(x,0)$=$\varphi(x)$,$u(0,t)$=a,$u(l,t)$=b,0<x<l,t>0 23

(ii) $u(x,0)=\varphi(x), x\in R, 0<t<T$

(iii) $u(x,0)=\varphi(x), u(0,t)=a, x\in(0,\infty), t\geq 0$.

NUMERICAL ANALYSIS & SCIENTIFIC COMPUTING

Objectives: The objective of this course is to acquaint the students with a wide range of numerical methods to solve algebraic and transcendental equations, linear system of equations, interpolation and curve fitting problems, numerical integration, initial and boundary value problems, etc. Develop adequate skills to apply those methods in real world problems.

Learning Outcomes: After completing the course the student will be able to

CO1: understand the errors in computation, find the roots of algebraic and transcendental equations, familiarize with convergence, advantages and limitations of those numerical techniques, learn to apply Gauss–Jacobi, Gauss–Seidel methods to solve system of linear equations.

CO2: get aware of using interpolation techniques to solve polynomials.

CO3: learn numerical differentiation and integrations by using different techniques.

CO4: understand the techniques to find approximate solutions of ODE and PDE.

UNIT-I

Errors in approximation, absolute, relative and percentage errors, round-off error, solution of algebraic and transcendental equations: bisection method, Regula-Falsi method, secant method, method of iteration, Newton Raphson method, order of convergence, systems of simultaneous equations: Gauss elimination method, Gauss Jordon method, LU decomposition method, Iterative methods: Jacobi method and Gauss-Seidel method.

UNIT-II

Finite differences, interpolation techniques for equal intervals-Newton forward and backward, Gauss forward, Gauss backward, interpolation, interpolation with unequal intervals-Newton's divided difference method, Lagrange method, Hermite interpolation,

Numerical differentiation using Newton forward and backward formulae, numerical integration using Newton-Cotes formulas, trapezoidal rule, Simpson rules, Gauss-Legendre, Gauss-Chebyshev formulas.

UNIT-III

Solution of ordinary differential equations: Taylor series method, Picard's method, Euler method, Euler modified method, Runge–Kutta methods.

UNIT-IV (PRACTICAL)

Practical / Lab work to be perform in Computer Lab:

Use of computer algebra system (CAS) software: Python/ Sage Math / Mathematica/ MATLAB/ Maple/ Maxima/ Scilab/ R or any other (open source) software etc., for developing at least the following numerical programs:

1. Bisection method, Newton-Raphson method and Secant method.

2. LU decomposition method.

3. Gauss–Jacobi method and Gauss–Seidel method.

4. Lagrange interpolation and Newton interpolation.

5. Trapezoidal rule and Simpson's rules.

6. Taylor series method, Picard's method, Euler method, Euler modified method and Runge–Kutta Methods.

MULTIVARIABLE CALCULUS

Objectives: The primary objective of this course is to introduce students, the extension of the studies of single variable differential and integral calculus to functions of two or more independent variables with the geometry and visualization of curves and surfaces. To aware the students about the techniques multiple integrations and higher order derivatives.

Learning Outcomes: After completing the course the student will be able to

CO1: learn the concept of limit, continuity and differentiations of functions of more than one.

CO2: understand the maximization and minimization of multivariable functions with the given constraints on variables.

CO3: learn about inter-relationship amongst the line integral, double, and triple integral formulations.

CO4: familiarize with the Green's, Stokes' and Gauss divergence theorems and their applications.

UNIT-I

Functions of several variables, limit and continuity of functions of two variables: partial differentiation, total differentiability, sufficient condition for differentiability, chain rule for one and two independent parameters, directional derivatives, the gradient, maximal and normal property of the gradient, tangent planes.

UNIT-II

Extrema of functions of two variables, method of Lagrange multipliers, constrained optimization problems, double integration over rectangular region, double integration over non rectangular region, double integrals in polar co-ordinates.

UNIT-III

Triple integrals, triple integral over a parallelepiped and solid regions, volume by triple integrals, cylindrical and spherical co- ordinates, change of variables in double integrals and triple integrals.

UNIT-IV

Definition of vector field, divergence and curl, line integrals, applications of line integrals: mass and work, fundamental theorem for line integrals, conservative vector fields, independence of path, Green's theorem, surface integrals, integrals over parametrically defined surfaces. Stokes' theorem, the divergence theorem.

DIFFERENTIAL GEOMETRY

Objective: The objective of this course is to explore geometry of curves and surfaces in R2 and R3 with their intrinsic properties and curvatures.

Learning Outcomes: After completing the course the student will be able to

CO1: understand the notion of plane curves, space curves, curvature, torsion and the existence of space curves.

CO2: learn the theory of sur faces and learn to calculate first fundamental forms.

CO3: learns on geodesics on a surface and learns to calculate curvatures.

CO4: Learns calculating second fundamental forms, curvatures and discovers minimal surfaces.

UNIT-I

Theory of Space Curves: space curves, arc length, tangent, normal and binormal, osculating plane, curvature, torsion, Serret-Frenet formulae, contact between curves and surfaces, osculating circles and spheres, involute and evolutes, existence of space curves, Helices.

UNIT-II

Theory of surfaces: parametric curves on surfaces, surfaces of revolution, helicoids, metric, direction coefficients. First Fundamental forms.

UNIT-III

Geodesics, canonical geodesic equations, nature of geodesics on a surface of revolution, normal property of geodesics, Torsion of a geodesic: geodesic curvature, Gauss-Bonnet theorem, Gaussian curvature, surfaces of constant curvature.

UNIT-IV

Second Fundamental forms, principal curvatures, lines of curvature, Rodrigue’s formula, conjugate and asymptotic lines. Developables, developable associated with space curves and curves on surfaces, minimal surfaces. Fundamental Theory of surfaces.

Multi-Disciplinary Course

SEMESTER-III

Paper-I: Programming C++ (Mathematics/Computer Science)

Course Objective:

The objective of the course is to learn the basics about C++ programming language such as variables, data types, arrays, pointers, functions and classes etc. On successful completion this course, students will acquire a good understanding about the concept of object-oriented programming using C++ and be able to write and read basic C++ code.

Learning Outcome: On the completion of this course, students will be able to

• Learn to understand different types of data by C++ language.

• Learn different symbols used in the programming language representing the text variables and constants.

• Learn to develop various operators, loops and nested control statements.

• Learn to generate functions, local and global variables, 1D and 2D array in C++ programe.

UNIT-I

Introduction to structured programming: data types- simple data types, floating data types, character data types, string data types, arithmetic operators and operator's precedence.

UNIT-II

Variables and constant declarations, expressions, input using the extraction operator >>and cin, output using the insertion operator << and cout, preprocessor directives, increment (++) and decrement (--) operations.

UNIT-III

Creating a C++ program, input output, relational operators, logical operators and logical expressions, if and if-else statement, switch and break statements, for, while and do-while loops, continue statement, nested control statement.

UNIT-IV Functions, value returning functions, value versus reference parameters, local and global variables, one dimensional array, two dimensional array, pointer data and pointer variables.

DEPARTMENT OF BOTANY
SARBATI DEVI WOMEN'S COLLEGE,RAJGANGPUR
PO,CO,PSO- NEP-2020

BOTANY (MAJOR)

SEMESTER-I

PAPER-I **MICROBIOLOGY AND PHYCOLOGY**

Course Objectives:

- To introduce the diverse group of microorganisms and their habitat relationship.
- To learn the discovery, nature and multiplication of virus particles.
- To know the characteristics, growth and physiology of bacteria and their role in agriculture, health and industry.
- To learn the general characteristics and ecological distribution of bacteria, algae and Cyanobacteria and their immense importance to the mankind.
- To have knowledge about the habitats, distribution and diversity of algae in the soil, freshwater and marine environments.

Course Outcomes

- The students learn about the diverse nature of microbes and their interaction with other organisms.
- The students certainly get the opportunities to learn the basics of the nature and impact of viruses.
- The students shall be able to understand the potential of various microbes and the approaches to use them for human welfare.
- The students would be able to identify the important microbes including bacteria, Cyanobacteria, and algae available in local environments and understand their beneficial roles.
- The students shall learn about the immense potential the algal resources and understand the methods of cultivation and use of algae.

Unit-I:

Learning Outcome: The learners are able to identify diverse group of microorganisms,

general features of viruses and their economic importance**.**

- The microbial world, microbial nutrition, growth and metabolism.
- Viruses**:** Discovery, nature, physicochemical and biological characteristics; classification (Baltimore), general structure with special reference to viroids and prions; replication (a general account), DNA virus (T-phage), lytic and lysogenic cycle; RNA virus (TMV). Economic importance of viruses. Vaccine production, role in research, medicine and diagnostics. Viral plant diseases- symptoms, effect and control

Unit–II:

Learning Outcome: The students understand the growth, physiology and economic

importance of bacteria and Cyanobacteria.

- Bacteria**: -** Discovery, general characteristics, types- Archaebacteria, Eubacteria, Mycoplasma and Spheroplasts, Cell structure, inclusions, nutrition, reproductionvegetative, asexual and recombination(conjugation ,transformation and transduction). Economic importance of bacteria with reference to their role in agriculture, medicine and industry.
- Cyanobacteria**:-** Ecology, occurrence, cell structure, heterocyst, reproduction, economic importance; role in biotechnology. Morphology and life-cycle of *Nostoc*. General characteristics of prochlorophyceae, Evolutionary significance of Prochloron.

Unit–III:

Learning Outcome: The students able to grasp the general characteristics, ecological distribution and economic importance of algae and Chlorophyta.

- **Algae:-** General characteristics; Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigments, reserve food (of only groups represented in the syllabus), flagella; methods of reproduction. Classification; criteria, system of Fritsch, and evolutionary classification of Lee (only up to groups); Role of algae in the environment, agriculture, biotechnology and industry.
- **Chlorophyta:-** General characteristics, occurrence, range of thallus organization, cell structure and reproduction. Morphology and life-cycles of *Chlamydomonas*, *Volvox*, *Oedogonium* and *Coleochaete*.

Unit-IV:

Learning Outcome: The students will able to understand the general characteristics, ecological distribution and economic importance of algae and Cyanobacteria.

- **Charophyta:-**General characteristics; occurrence , morphology, cell structure and life-cycle of *Chara*; evolutionary significance.
- **Xanthophyta:-**General characteristics; occurrence, morphology and life cycle of *Vaucheria*.
- **Phaeophyta:-**Characteristics, occurrence, cell structure and reproduction. Morphology and life-cycles of *Ectocarpus* and *Fucus*.
- **Rhodophyta:-**General characteristics, occurrence, cell structure and reproduction. Morphology and life-cycle of *Polysiphonia*.

Practical:

1. Electron micrographs/Models of viruses–T-Phage and TMV, Line drawings/Photographs of Lytic and Lysogenic Cycle.

2. Types of Bacteria to be observed from temporary/permanent slides/photographs.

3. Examination of bacteria from bacterial culture by Gram ‘staining method.

4. Electron micrographs of bacteria, binary fission, endospore, conjugation, root Nodule (live materials and photographs).

5. Bacterial growth measurement by turbidometry.

6. Hemocytometry

7. Colony counting using colony counter

8. Phycology: - Study of vegetative and reproductive structures of *Nostoc*, *Chlamydomonas* (electron micrographs), Volvox*, Oedogonium, Coleochaete, Chara, Vaucheria, Ectocarpus, Fucus* and *Polysiphonia, Procholoron*, Diatoms through, temporary preparations and permanent slides

PAPER-II ANALYTICAL TECHNIQUES IN PLANT SCIENCES

Course Objective

- To learn the principles and operations of microscopes of various complexity and their application in biological studies.
- To learn the techniques of centrifugation for separation of biological samples.
- To learn the methods of radioisotopes measurement in and their importance in study of biological materials and processes.
- To understand and the principles and applications of spectrophotometry and to understand the basic structural design of a standard instrument.
- To learn about various chromatographic techniques in separation of plant extracts.
- To acquaint the students with the advanced methods for characterization of biomolecules.

Course Outcomes:

- Proper understanding of the microscopy and knowledge to analyze plant samples using electron microscopy and flow Cytometer.
- Separation of biomolecules and cell organelle and appropriate application of the knowledge of centrifugation for the same.
- Basic knowledge on the use of radioisotopes for analysis of biological samples.
- Extraction and qualitative and quantitative analysis of extracts as well as the assay mixtures using spectrophotometer.
- Skillful application of chromatographic techniques for separation of amino acids, pigments and biomolecules.
- Proper method for characterizing protein and nucleic acids and skill on handling electrophoresis equipment for preparation of gels.

Unit-I:

Learning Outcomes: Students will able to acquire knowledge about principles of microscopy and their types.

Imaging and related techniques: Principles of microscopy; Light microscopy; Fluorescence microscopy; Flow cytometry (FACS); Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

Unit-II:

Learning Outcomes: Students will learn about the principles of centrifugation in biomolecule separation and importance of radiography in biological research

Cell fractionation: Centrifugation: Differential and density gradient centrifugation, Sucrose density gradient, CsCl2 gradient, analytical centrifugation, ultracentrifugation.

Radioisotopes: Use in biological research, auto-radiography, pulse chase experiment.

Unit-III:

Learning Outcomes: Students will learn about the components and working principle of different types of Spectrophotometer

Spectroscopy: Principles, Components and working mechanism of UV-Visible and Infra- Red spectroscopy, Fluorescence spectroscopy, Chlorophyll *a* fluorescence, Flame photometer, Bomb Calorimeter and Atomic Absorption Spectrophotometer.

Unit-IV:

Learning Outcomes: Students will learn about the separation methods for biomolecules using chromatography and electrophoresis instruments.

- **Chromatography:** Principle of chromatography, paper chromatography, column chromatography, TLC, HPLC, Ion-exchange chromatography, Molecular sieve chromatography, Affinity chromatography.
- **Characterization of proteins and nucleic acids:** Electrophoresis: AGE, PAGE, SDSPAGE.

Mass spectrometry; X-ray diffraction, X-ray crystallography.

Practicals:

1. Study of different microscopic techniques observation through simple and compound microscope
2. Study of PCR using demonstration.

3. To separate pigments by paper chromatography.

4. To separate phytochemicals by thin layer chromatography.

5. Qualitative analysis of total Carbohydrates, Proteins &Lipids.

6. Demonstration of SEM/Electrophoresis/ Chromatography.

7. Measuring OD using spectroscopy.

8. Beer Lombard's law and its validation

SEMESTER-II

PAPER-III **CELL BIOLOGY**

Course Objectives:

- To understand the basic components of prokaryotic and eukaryotic cells and the role of various macromolecules in the cells.
- Understand how the formation of cytoskeleton.
- To have an understanding on nucleic acids as the genetic material;
- To learn the basic mechanism of replication of nucleic acids.
- Understand how cells undergo mitosis & meiosis.

Course Outcomes

- Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
- Students will understand the components of cell wall & cytoskeleton
- Students will understand how these cellular components are used to generate and utilize energy in cells.
- Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or physiological changes.
- Students will understand the cellular components underlying mitotic and meiotic cell division.

Unit-I:

Learning Outcomes: Students will understand the orgin, growth and basic components of cell, cell wall & cytoskeleton.

- **The Cell**: Cell as a unit of structure and function; Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic theory).Unique features of plant cells
- **Plasmodesmata**: Structure, role in movement of molecules & macromolecules, comparison with gap junctions.
- **Plant Cell wall**: Chemistry , structure and function.

- **Cytoskeleton**: The concept, structure and roles of microtubules, microfilaments and intermediary filament.

Unit–II:

Learning Outcomes: Students will recognize composition of Plasma Membrane and origin, structure, function of cell organelles.

- **Plasma Membrane**: Overview of membrane structure and function; fluid mosaic model; Chemical composition of membranes; Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis.
- **Cell organelles**: Endoplasmic Reticulum, Golgi apparatus, Lysosomes & Plant Vacuole.

Unit-III:

Learning Outcomes: Students will realize the importance of photosynthesis and cellular respiration

- **Cell organelles**: Chloroplast, Mitochondria and Peroxisomes: Structural organization & Function.
- Biogenesis & semiautonomous nature of mitochondria and chloroplast.
- **Nucleus** :Structure-nuclear envelope, nuclear pore complex , nuclear lamina & Function.

Unit-IV:

Learning Outcomes: Students will understand the cellular units (DNA&RNA) underlying mitotic and meiotic cell division

- **Nucleolus:** Structure and function of nucleolus, Chromatin organization, its packaging role of nuclear matrix in chromosome organization and function, matrix binding proteins.
- **Nucleic acids**: Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids; Structure of A, B, Z types of DNA; Types of RNA
- **Cell division**: Eukaryotic cell cycle, different stages of mitosis and meiosis. Cell cycle, Regulation of cell cycle.

Practical:

1. Study of plant cell structure with the help of epidermal peel mount of Onion/*Rhoeo discolor*

2. Demonstration of the phenomenon of protoplasmic streaming in *Hydrilla* leaf.

3. Counting the cells per unit volume with the help of hemocytometer.(Yeast/pollen grains).

4. Study the phenomenon of plasmolysis and deplasmolysis.

5. Study of different stages of mitosis and meiosis using acetocarmine and acetoorcine method from Onion root tip and bud respectively.

6. To find out the mitotic index.

PAPER-IV MYCOLOGY AND PHYTOPATHOLOGY

Course Objectives

- To learn classification and diversity of fungi and their nutritional requirements.
- To learn the lifecycle and ecology of some important genera of fungi and their pathogenicity.
- To understand the beneficial fungal interactions.
- To learn about edible fungi and their role in human nutrition.
- To learn the beneficial application of fungi in agriculture and medicine.
- To know the phyto-pathological processes and the method of their prevention and control.

Course Outcomes

- Have an idea on the vast fungal diversity in nature and method of their identification and culture.
- Know the life cycle of commonly occurring fungal genera and the disease caused by them.
- Have knowledge on the types of fungal associations and their importance.
- Have knowledge and skill on the application of fungi and fungal biomolecules in human welfare.
- Have skill to understand the host-parasite relationship and its role in establishment of viral, fungal and bacterial diseases in plants.
- Understand the causes and conditions for commonly occurring plant diseases and the methods of their control.

Unit-I:

Learning Outcomes: To introduce the students with the classification and diversity of fungi and their nutritional requirements**.**

- **Introduction to true fungi**: Definition, General characteristics; Affinities with plants and animals; Thallus organization; Cell wall composition; Nutrition; Classification; spore of fungi.

- **Zygomycota**: General characteristics; Ecology; Thallus organization; Life cycle with reference to *Rhizopus*.
- **Ascomycota**: General characteristics (asexual and sexual fruiting bodies); Ecology; Life cycle, Heterokaryosis and parasexuality; life cycle and classification with reference to *Saccharomyces, Aspergillus*, *Penicillium,* and *Neurospora*.
- **Basidiomycota**: General characteristics; Ecology and Classification; Lifecycle of *Puccinia* and *Agaricus*.

Unit-II:

Learning Outcomes :To introduce the students with the general characteristics, classification of allied fungi and the beneficial symbiotic associations

- **Allied Fungi:** General characteristics; Status of Slime molds, Classification; Occurrence; Types of plasmodia; Types of fruiting bodies.
- **Oomycota:** General characteristic; Ecology; Life cycle and classification with reference to *Phytophthora, and Albugo*.
- **Symbiotic associations**: Lichen – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction. Economic importance of Lichens, Mycorrhiza-Ectomycorrhiza, Endomycorrhiza and their significance.

Unit-III:

Learning Outcomes: To introduce the students with the role of fungi in food industries, agriculture and medicine.

Applied Mycology: Role of fungi in biotechnology & research, Mushroom cultivation, Application of fungi in food industry (Flavor & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Secondary metabolites (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical mycology.

Unit-IV:

Learning Outcomes: To introduce the students with the phytopathological processes and method for prevention and control of plant diseases.

- **Phytopathology:** Terms and concepts; General symptoms; Geographical distribution of diseases; etiology; symptomology; Host- Pathogen relationships; disease cycle and

environmental relation; prevention and control of plant diseases, and role of quarantine.

- **Bacterial diseases** – Citrus canker and angular leaf spot disease of Cotton. Viral diseases – Tobacco Mosaic, Vein Clearing. Fungal diseases – Early blight of potato, Loose and covered smut.

Practical:

1. Introduction to the world of fungi (Unicellular, coenocytic /septate mycelium, ascocarps & basidiocarps).
2. *Rhizopus:* study of asexual stage from temporary mounts and sexual structures through permanent slides.
3. *Aspergillus, Penicillium and Saccharomyces*: study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs.
4. *Puccnia*: Study of different stages from temporary mounts and permanent slides.
5. *Agaricus*: Specimens of button stage and full-grown mushroom; sectioning of gills of Agaricus, and fairy rings are to be shown.
6. *Albugo*: Study of symptoms of plants infected with *Albugo*; asexual phase study through section/ temporary mounts and sexual structures through permanent slides.
7. Phytopathology: Herbarium specimens of bacterial diseases; Citrus Canker; Viral Diseases: Mosaic disease of ladies 'finger, papaya, cucurbits, moong, black gram, Fungal diseases: Blast of rice, Tikka disease of ground nut, powdery mildew of locally available plants and White rust of crucifers.

SEMESTER-III

PAPER-V **ARCHEGONIATE**

Course Objectives

- To know the principles, hypotheses and process of adaptation of plants to land habitat.
- To learn about the origin classification, and characteristics of bryophytes through some representative genera.

- To learn about the origin and distribution of vascular plants and stages of evolution of conducting tissues.
- To study the morphology, and characteristics of Pteridophytes through some representative genera.
- To learn the characteristics, classification and importance of the gymnosperms.
- To have a general knowledge on the fossils and fossilization processes.

Course Outcomes:

- Able to understand the mechanism of the evolution of the higher plants and their adaptation to land habit.
- Knowledge on the diversity of archegoniates and their and their pattern of habitat specific distribution.
- Knowledge on the characteristics of bryophytes and skill to differentiate the genera on the basis of their morphology and anatomy.
- Ability to identify the members of pteridophytes and knowledge on their characteristic features.
- Understand the unique features and distribution of gymnosperms.
- Capacity to analyze various types of fossils on the basis of their characters.

Unit-I:

Leaning Outcomes: The students will gain knowledge on the basic characteristics of Archegoniates.

- **Introduction**: Unifying features of archegoniates; Transition to land habit; Alternation of generations. General characteristics; Origin of land plants and Adaptations to land habit.
- **Bryophytes**: Origin and Classification; Range of thallus organization .Classification (up to family).Structure, Reproduction and evolutionary trends in *Riccia*, *Marchantia*, *Anthoceros* and *Funaria* (developmental stages not included). Ecological and economic importance of bryophytes.

Unit-II:

Leaning Outcomes: The learners shall acquire an understanding on the origin, evolution and structural uniqueness of pteridophytes.

Pteridophytes: General characteristics, classification. Classification (up to family), morphology, anatomy and reproduction of *Psilotum*, *Selaginella*, *Equisetum, Pteris* and

Marsilea. Apogamy, and apospory, heterospory and seed habit, telome theory, stellar evolution and economic importance.

Unit-III:

Leaning Outcomes: The learners shall have the skill to identify and evaluate the importance of gymnosperms in a habitat

Gymnosperms: General characteristics, classification (up to family), morphology, anatomy and reproduction of *Cycas*, *Pinus, Ginkgo* and *Gnetum*. (Developmental details not to be included). Ecological and economic importance.

Unit-IV:

Leaning Outcomes: The students will have knowledge to identify and analyze a fossil specimen.

Palaeobotany: Geological time scale, fossils and fossilization process. Morphology, anatomy and affinities of *Rhynia, Calamites, Lepidodendron, Lyginopteris, Cycadeoidea and Williamsonnia*.

Practical:

1. Morphology, anatomy and reproductive structures of *Riccia, Marchantia, Anthoceros, Funaria*.
2. *Psilotum*-Study of specimen, transverse section of synangium (permanent slide).
3. *Selaginella*- Morphology, whole mount of leaf with ligule, transverse section of stem, whole mount of strobilus, whole mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus (permanent slide).
4. *Equisetum*-Morphology, transverse section of internode, longitudinal section of strobilus, transverse section of strobilus, whole mount of sporangiophore, whole mount of spores (wet and dry) (temporary slide), transverse section of rhizome (permanent slide).
5. Study of temporary preparations and permanent slides of *Marsilea*.
6. *Pteris*- Morphology, transverse section of rachis, vertical section of sporophyll, whole mount of sporangium, whole mount of spores (temporary slides), transverse section of rhizome, whole mount of prothallus with sex organs and young sporophyte (permanent slide).

7. *Cycas*- Morphology (coralloid roots, bulbil, leaf), whole mount of microsporophyll and megaspore, T.S root, leaflet, rachis

8. *Pinus*- Morphology (long and dwarf shoots, whole mount of dwarf shoot, male and female cones), T.S. Needle, stem, L.S. male cone, whole mount of microsporophyll, whole mount of Microspores (temporary slides), L.S. of female cone.

9. *Gnetum*- Morphology (stem, male & female cones), transverse section of stem, vertical section of ovule (permanent slide).

10. Study of some fossil slides /photographs as per theory.

PAPER-VI ANATOMY OF ANGIOSPERMS & ECONOMIC BOTANY

Course Objectives

- To explain the tissues and tissue systems in plants.
- To explain the organization of shoot and root apices.
- To educate the students on the activity of meristems for primary and secondary growth of plants
- To explain about various types of woods in plants and their developmental pattern.
- To give a comprehensive idea about economic botany and its importance in human welfare.
- To provide knowledge on general account, cultivation, propagation and uses of common crops.

Course Outcomes:

- The ability to examine the internal anatomy of plant systems and organs.
- Develop a critical understanding of the evolution of the concept of organization of shoot and root apex.
- Evaluate the adaptive and protective morphological systems of plants.
- Be able to know the origin and evolution of crops and the importance of wild relatives in crop improvement.
- Develop a basic knowledge on germplasm and the basics for their conservation.
- Have an understanding of plants as a source of food, beverages, spices, and materials and its application in human welfare.

Unit-I:

Learning Outcomes: Students will learn about the plant tissues and their anatomical structures. They will also learn about adaptive modifications in plants to adjust at different environments**.**

- **Introduction and scope of Plant Anatomy**: Applications in systematics, forensics and

pharmacognosy.

- **Tissues**: Classification of tissues; Simple and complex tissues (no phylogeny); cytodifferentiation

of tracheary elements and sieve elements; Pits and plasmodesmata; Cell wall ingrowths and transfer cells, adcrustation and incrustation, Ergastic

substances.

- **Adaptive and Protective Systems**: Epidermal tissue system, cuticle, epicuticular

waxes, trichomes (uni-and multicellular, glandular and non-glandular: two examples

of each), stomata (classification); Anatomical adaptations of xerophytes and

hydrophytes.

Unit-II:

Learning Outcomes: Students will learn about the leaf anatomical components. They will

also learn about the organization of root and shoot system in plant.

- **Leaf:** Anatomy of dicot and monocot leaf, Kranz anatomy.
- **Stem:** Organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus

theory, continuing meristematic residue, cyto-histological zonation); Types of

vascular bundles; Anatomy of dicot and monocot stem. Vascular Cambium:

Structure, function and seasonal activity of cambium; secondary growth in stem

(normal and anomalous). Root Stem transition.

- **Root:** Organization of root apex (Apical cell theory, Histogen theory, Korper-Kappe

theory); Quiescent center; Root cap; Anatomy of dicot and monocot root;

Endodermis, exodermis and origin of lateral root. Secondary growth in roots.

Unit-III:

Learning Outcomes: Students will learn about the plant domestication and cultivation of

important crop plants.

- **Origin of Cultivated Plants**: Concept of Centers of Origin, their importance with

reference to Vavilov's work. Examples of major plant introductions; Crop

domestication and loss of genetic diversity; evolution of new crops/varieties,

importance of germplasm diversity.

- **Cereals:** Cultivation and brief account of Wheat, Rice and millets.
- **Legumes:** General account, importance to man and ecosystem.
- **Sugars & Starches**: Morphology, cultivation and processing of sugarcane, products

and by-products of sugarcane industry. Potato – morphology, cultivation, propagation & uses.

Unit–IV:

Learning Outcomes: Students will learn about the important timber, spice, oils and fats and drug yielding plants.

- **Timber plants**: General account with special reference to teak and pine. Fibers: Classification based on the origin of fibers, Cotton and Jute (morphology, extraction and uses).
- **Spices:** Listing of important spices, their family and part used, economic importance with special reference to fennel, saffron, clove and black pepper Beverages: Tea, Coffee (morphology, processing & uses).
- **Oils & Fats**: General description, classification, extraction, their uses and health implications groundnut, coconut, linseed and *Brassica* (Botanical name, family &uses)
- **Drug-yielding plants**: Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis

Practical:

1. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular.
2. Root: monocot, dicot, secondary growth.
3. Stem: monocot, dicot-primary and secondary growth (normal and anomalous); periderm; lenticels.
4. Leaf: isobilateral, dorsiventral, C4 leaves (Kranz anatomy).
5. Ecological anatomy.
6. Cereals: Rice (habit sketch, study of paddy and grain, starch grains).
7. Legumes: Soya bean/moong bean/black gram, Groundnut, (habit, fruit, seed structure, micro-chemical tests).
8. Spice and Beverages: clove, black pepper, Tea (plant specimen, tea leaves), Coffee (plant specimen, beans).
9. Fiber-yielding plants: Cotton (specimen, whole mount of seed to show lint and

fuzz; whole mount of fiber and test for cellulose), Jute (specimen, transverse section of stem, test for lignin on transverse section of stem and fiber).

PAPER-VII GENETICS

Course Objective

- To know general organization, possible function and frequency of genes and nongene DNA sequences in a typical eukaryotic genome.
- Practical methodology for applying Mendelian laws (heavily reliant on problem solving).
- Extensions of Mendelian genetics, including different forms of allelic relationships.
- To know different types of mutations, affect genes and the corresponding MRNAs and proteins.
- Inheritance of linked genes, including recombination mapping, and the physical basis of these rules (chromosomal behaviour during meiosis)

Course Outcomes:

- Learn the basic principles of inheritance at the molecular, cellular and organismal levels.
- Understand the mechanism of inheritance and its relationship with the expression of morphological traits.
- Understand the relationships between molecule/cell level phenomena("modern" genetics) and organism-level patterns of heredity ("classical"genetics)
- Know about the variations by polyploidy, chromosomal aberration and gene mutations.
- Test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations

Unit-I:

Learning Outcomes: To acquire the basic principles of inheritance at the molecular, cellular and organismal levels

- **Mendelian genetics and its extension Mendelism**: History; Principles of inheritance; Chromosome theory of inheritance; Autosomes and sex chromosomes; Incomplete dominance and co dominance; Multiple alleles, Lethal alleles, Interaction of genes, Pleiotropy, Recessive and Dominant traits, Polygenic inheritance.

- **Extrachromosomal Inheritance**: Chloroplast mutation: Variegation in Four o'clock plant; Mitochondrial mutations in yeast; cytoplasmic male sterility; Maternal effects shell coiling in snail; Infective heredity- Kappa particles in Paramecium.

Unit-II:

Learning Outcomes: Relationships between modern genetics and classical genetics.

- **Linkage, crossing over and chromosome mapping**: Linkage and crossing over-Cytological basis of crossing over; Recombination frequency, two factor and three factor crosses; Interference and coincidence; Numerical based on gene mapping; Sex Linkage.

Unit-III:

Learning Outcomes: To develop mutants using different mutagens.

- Variation in chromosome number and structure: Deletion, Duplication, Inversion, Translocation, Position effect, Euploidy and Aneuploidy
- Gene mutations: Types of mutations; Molecular basis of Mutations; Mutagens - physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); Detection of mutations: CIB method. Role of Transposons in mutation. DNA repair mechanisms.

Unit-IV:

Learning Outcomes: Applying this knowledge in a variety of problem-solving situations of genetics

- The structure of gene: Classical vs. molecular concepts of gene; Cis-Trans complementation test for functional allelism; Structure of Phage T4, rII Locus.
- Population and Evolutionary Genetics: Gene pool, Allele frequencies, Genotype frequencies, Hardy-Weinberg Law, role of natural selection, mutation, genetic drift. Genetic variation and Speciation

Practical:

1. Analysis of allelic and genotypic frequencies.
2. Mendel's laws through seed ratios. Laboratory exercises in probability and chisquare analysis.
3. Chromosome mapping using testcross data.

4. Pedigree analysis for dominant and recessive autosomal and sex-linked traits.

5. Incomplete dominance and gene interaction through seed ratios(9:7,9:6:1,13:3, 15:1,

12:3:1, 9:3:4).

6. Blood Typing: ABO groups& Rh factor.

7. Chromosome anomaly: Translocation Ring, Laggards and Inversion Bridge, break etc.

(through photographs).

SEMESTER-IV

PAPER-**VIII** **BASIC MOLECULAR BIOLOGY**

Course Objectives

- To understand the Historical perspective of DNA and DNA as the carrier of genetic

information.

- To learn the Organization and structure of DNA and RNA in pro-and eukaryotes.
- To understand the structure and function organellar and nuclear genomes.
- To understand the General principles of replication and the relationship with genetic code.
- To study about Processing and modification of RNA in prokaryotes and eukaryotes for translation.

Course Outcomes:

On completion of the course the students shall

- Be able to describe Organization and structure and replication of DNA and RNA.
- Have theoretical and practical knowledge the prokaryotic and eukaryotic nucleic acids.
- Have a clear understanding on the structure and function of organellar genome.
- Understand the processes of bidirectional, semi-conservative and semi discontinuous mode of replication and the importance of the genetic code.
- Have ability to understand the mechanism of translation in prokaryotes and eukaryotes.

Unit-I:

Learning Outcomes: Students will gain knowledge about historical perspective and

experimental proof of nucleic acids as genetic material.

Nucleic acids: Carriers of genetic information: Historical perspective; DNA as the carrier of

genetic information (Griffith's, Hershey & Chase, Avery, McLeod; McCarty), Types of genetic

material, denaturation and renaturation, cot curves. Organization of DNA and structure of RNAProkaryotes,

Viruses, Eukaryotes, Fraenkel-Conrat's experiment. Organelle DNA - mitochondria

and chloroplast DNA. The Nucleosome – Chromatinstructure - Euchromatin, Heterochromatin-Constitutive and Facultative heterochromatin.

Unit-II:

Learning Outcomes: This is to gain knowledge about general principles and mechanism of replication of DNA and RNA processing

The replication of DNA: Chemistry of DNA synthesis (Kornberg's discovery); General principles–bidirectional, semi-conservative and semi-discontinuous replication, RNA priming; Various models of DNA replication, including rolling circle, θ (theta) mode of replication, replication of linear ds-DNA, replication of the 5' end of linear chromosome;

EnzymesinvolvedinDNAreplication.Centraldogmaandgeneticcode:Keyexperiments

Establishing-The Central Dogma (Adaptor hypothesis and discovery of mRNA template), Genetic

code (deciphering & salient features).

Unit-III:

Learning Outcomes: This is to learn the Mechanism of Transcription and transcriptional regulation in Prokaryotes and Eukaryotes

- Mechanism of Transcription: Transcription in prokaryotes and eukaryotes
- Regulation of transcription in prokaryotes and eukaryotes: Principles of transcriptional
- Regulation; Prokaryotes: Operon concept- Regulation of lactose metabolism and tryptophan synthesis in E. coli. Eukaryotes: transcription factors, heat shock proteins, steroids and peptide hormones; Gene silencing.
- Processing and modification of RNA: Split genes-concept of introns and exons, removal of introns, spliceosome machinery, splicing pathways, group I & group II intron splicing, alternative splicing eukaryotic mRNA processing (5' cap, 3' poly A tail); Ribozymes, exon shuffling; RNA editing and mRNA transport.

Unit-IV:

Learning Outcomes: Students will gain knowledge on Mechanism of Translation and Translation regulation in Prokaryotes and Eukaryotes**.**

Translation (Prokaryotes and eukaryotes): Ribosome structure and assembly; Charging of tRNA, aminoacyl tRNA synthetases; Various steps in protein synthesis, proteins involved in initiation, elongation and termination of polypeptides; Fidelity of translation; Inhibitors of protein synthesis; post-translational modifications of proteins.

Practical:

1. Preparation of LB medium and raising E.coli.

2. Isolation of genomic DNA from suitable plant material.

3. RNA estimation by orcinol method.

4. DNA estimation by diphenylamine reagent/UV Spectrophotometry.

5. Photographs establishing nucleic acid as genetic material (Messelson and Stahl's,

Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments)

6. Study of Barr body from buccal smear preparation.

PAPER-IX PLANT ECOLOGY AND PHYTOGEOGRAPHY

Course objectives

- To learn the interaction of biotic components with non-living components of an ecosystem.
- To introduce to various natural ecosystems and how the interaction among different biotic and abiotic factors influencing the stability and diversity of an ecosystem.
- To study the physical, biological and chemical characteristics of factors influencing population.
- To know the experimental approach to determine the physical, chemical and organic matters of soil.
- To introduce the students to the characteristics and dynamism of population ecology.

Course Outcomes:

- Have ability to understand the ecological functioning of ecosystems and would certainly help students to maintain the local ecosystems.
- Have information on species' geographical range and how the size and life history influenced By the various components of ecosystems.
- An understanding of the factors that influence patterns of abundance and distribution in populations.
- Have knowledge on the process of soil formation and approaches to study the nature of soils.
- Have skill to evaluate the dynamics of change of population characteristics.

Unit-I:

Learning Outcomes: The students learn the concept of ecology and inter-relationships

between the living world and its environment.

- Introduction and Concept of ecology, Autoecology, Synecology, System ecology:

Levels of organization. Inter-relationships between the living world and the

environment, the components of environment, concept of hydrosphere and

lithosphere and dynamism, homeostasis.

- Light, temperature, wind and fire. Variations; adaptations of plants to their variation.

Unit-II:

Learning Outcomes: The students get idea on the formation, composition and profile of soil and

state of water in environment.

Soil: Formation; Composition; Physical; Chemical and Biological components; Soil profile; Role of

climate in soil development.

Water: Importance: States of water in the environment; Atmospheric moisture; Precipitation

types (rain, fog, snow, hail, dew); Hydrological Cycle

Unit-III:

Learning Outcomes: The students grasp about the dynamics of population ecology and

plant communities.

- Biotic interactions and Population ecology: Characteristics and Dynamics.
- Plant communities: Concept of ecological amplitude; Habitat and niche; Characters: analytical and synthetic; Ecotone and edge effect; Dynamics: succession – processes, types; climax concepts.

Unit-IV:

Learning Outcome: The students know about the ecosystem process and phytogeography of India.

- Ecosystems: Structure; Processes; Trophic organization; Food chains and Food webs; Ecological pyramids.
- Functional aspects of ecosystem: Principles and models of energy flow; Production and productivity; Ecological efficiencies; Biogeochemical cycles; Cycling of Carbon, Nitrogen and Phosphorus.
- Phytogeography: Principles; Continental drift; Theory of tolerance; Endemism
- Phytogeographical division of India; Vegetation of Odisha.

Practical:

1. Determination of pH of various soil and water samples (pH meter, universal

indicator/Lovibond comparator and pH paper)

2. Analysis for carbonates, chlorides, nitrates, sulphates, organic matter and based efficiency

from two soil samples by rapid field tests.

3. Determination of dissolved oxygen of water samples from polluted and unpolluted sources.

4. Study of morphological adaptations of hydrophytes, xerophytes, halophytes (two each).

5. Determination of minimal quadrate size for the study of herbaceous vegetation in the

college campus, by species area curve method (species to be listed).

6. Quantitative analysis of herbaceous vegetation for frequency, density and abundance in the college campus.

7. Field visit to familiarize students with ecology of different sites.

PAPER-X PLANT SYSTEMATICS

Course Objectives

- A comprehensive presentation of the rules, regulations and codes of governing principles of the International Code of Nomenclature of Algae, Fungi and Plants (ICN)
- To provide knowledge on basic concepts of plant nomenclature and the tools used for naming the taxa.
- To impart knowledge on the traditional and advanced systems of classification of lower and higher plants.
- To acquaint the students with the modern approaches for developing systematic relationships in the plant kingdom.
- To enlighten the students about the phylogeny and the methods for building phylogeny among taxa of various angiosperms.
- To educate the students on the specific taxonomic characteristics of some angiosperm families and the method to make morphological studies of plant materials.

Course Outcomes:

- Knowledge on various levels of taxonomic hierarchy and the relationships among various hierarchical levels with respect to their similarities and variations of characters.
- The skill to use various taxonomic literature, Flora and herbaria, keys of both physical and digital types for plant identification and floristic studies.
- Critical thinking on the ancient, traditional and modern classification systems and evaluation of their applicability in taxonomic placement of taxa.
- Knowledge on the evolution of the concepts in classifying plants and weighing the potential of various tools.
- Ability to build the phylogeny among various taxa of different levels of hierarchy and

identifying the apomorphy and plesiomorphy.

- Critical observations of the morphology of plant materials for taxonomic description

and identification to the family, genus and species level.

Unit I:

Learning Outcome: The students shall gain knowledge on the importance of specimens, herbaria and flora for study of plant taxonomy**.**

Plant identification, Classification, Nomenclature; Biosystematics. Identification: Field inventory;

Functions of Herbarium; Important herbaria and botanical gardens of the world And India; Virtual herbarium; E-flora; Documentation: Flora, Monographs, Journals; Keys: Single

access and Multi-access

Unit-II:

Learning Outcome: The learners shall have basic understanding on the application of rules of ICN for plant identification and nomenclature.

- Taxonomic hierarchy: Concept of taxa (family, genus, species); Categories and

taxonomic hierarchy; Species concept (taxonomic, biological, evolutionary).

- Botanical nomenclature: Principles and rules (ICN); Ranks and names; Typification,

author citation, valid publication, rejection of names, principle of priority and its limitations; Names of hybrids.

Unit-III:

Learning Outcome: The students shall be able to classify plant as per the correct taxonomic hierarchy.

- Systematics- an interdisciplinary science: Evidence from palynology, cytology,

phytochemistry and molecular data.

- Systems of classification: Major contributions of Theophrastus, Bauhin, Tournefort,

Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist; Classification systems of Bentham and Hooker (up to series) and Hutchinson (up to series); Brief reference of Angiosperm Phylogeny Group (APG III) classification.

Unit-IV:

Learning Outcome: The student shall have the skill to apply modern taxonomic tools in plant taxonomy.

- Phylogeny of Angiosperms: Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, paraphyly, polyphyly and clades). Origin& evolution of angiosperms; co- evolution of angiosperms and animals; methods of illustrating evolutionary relationship (phylogenetic tree, cladogram).
- Families of Angiosperms: Descriptive studies of *Magnoliaceae, Rosaceae, Rubiacae, Poaceae, Orchidaceae, Musaceae, Acanthaceae, Apocynaceae, Asclepiadaceae, Lamiaceae*.

Practical:

1. Study of vegetative and floral characters of available materials of the families included in theory syllabus (Description, V.S. flower, section of ovary, floral diagram/s, floral formula and systematic position according to Bentham &Hooker's system of classification).
2. Field visit, plant collection and herbarium preparation and submission. Mounting of properly dried and pressed specimen of at least fifteen wild plants with herbarium label (to be submitted in the record book)

SEMESTER-V

PAPER-XI REPRODUCTIVE BIOLOGY OF ANGIOSPERMS

Course Objectives

- To give a comprehensive idea about economic botany and its importance inhuman welfare.
- To know the origin, introduction, domestication and evolution of new crops/varieties of crop plants.
- To create awareness about importance of germplasm diversity.
- To provide knowledge on general account, cultivation, propagation and uses of common crops and processing of the materials.
- To know the extraction and uses of different oils as well as essential oils.

Course Outcomes:

- Have an understanding on the fundamental concepts of Economic Botany.
- Develop a basic knowledge on the evolution of crops/varieties.
- be aware about the importance of germplasm diversity and learn the methods for their conservation.
- Increase appreciation of diversity of plants and plant products used in everyday life of human and the methods for their enhanced production.
- Have an understanding of plants as a source of food, beverages, spices, and materials.

Unit-I:

Learning Outcome: Learn about structure and function of anther and pollen as well as their abnormalities

- **Introduction**: History and scope.
- **Anther**: Anther wall: Structure and functions, micro-sporogenesis, callose deposition and its significance.
- **Pollen biology**: Micro-gametogenesis; Pollen wall structure, MGU (male germ unit) structure, NPC system; Palynology and scope (a brief account); Pollen wall proteins; Pollen viability, storage and germination; Abnormal features: Pseudomonads, polyads, massulae, pollinia.

Unit-II:

Learning Outcome: Learn about the structure and function of ovule and embryo sac.

Ovule: Structure; Types; Special structures–endothelium, obturator, aril, caruncle and hypostase; Female gametophyte– mega-sporogenesis and mega-gametogenesis; Types and ultra structure of different mature embryo sacs(Details of *Polygonum* type),Developmental pattern of mono-, bi- and tetrasporic embryo sacs.

Unit-III:

Learning Outcome: Develop knowledge about process of pollination, fertilization and selfincompatibility.

- **Pollination and fertilization**: Pollination types and significance; adaptations; structure of stigma and style; path of pollen tube in pistil; double fertilization.
- **Self-incompatibility**: Basic concepts; Methods to overcome self- incompatibility: mixed pollination, bud pollination, stub pollination; Intra ovarian and *in vitro* pollination; Modification of stigma surface.

Unit-IV:

Learning Outcome: Students will be aware of the details of endosperm, embryo, seed, polyembryony and apomixes**.**

- **Endosperm:** development, structure and functions
- **Embryo:** Types of embryogeny; General pattern of development of dicot and monocot embryo; Suspensor: structure and functions; Embryo- endosperm relationship; Nutrition of embryo; Embryo development in *Paeonia*.
- **Seed:** Structure, importance and dispersal mechanisms

Polyembryonyandapomixes:Introduction;Classification;Causesandapplications

Practical:

1. Anther: Wall and its ontogeny; Tapetum (amoeboid and glandular); MMC, spore tetrads, uninucleate, bicelled and dehisced anther stages through slides/micrographs, male germ unit (MGU) through photographs and schematic representation.

2. Pollen grains: Fresh and acetolyzed showing ornamentation and aperture, psuedomonads, polyads, pollinia (slides/photographs, fresh material),ultra structure of pollen wall (micrograph); Pollen viability: Tetrazolium test, Germination: Calculation of percentage germination in different media using hanging drop method.

3. Ovule: Types-anatropous, orthotropous, amphitropous/ campylotropous, circinotropous, unitegmic, bitegmic; Tenuinucellate and crassinucellate; Special structures: Endothelium, obturator, hypostase, caruncle and aril (permanent slides/specimens/photographs). Female gametophyte through permanent slides/ photographs: Types, ultrastructure of mature egg apparatus.

4. Embryogenesis: Study of development of dicot embryo through permanent slides/photographs; dissection of developing seeds for embryos at various developmental stages; Study of suspensor through electron micrographs.

5. Tracing the path of pollen tube.

6. Study of haustorial endosperm.

PAPER- XII **BASIC PLANT PHYSIOLOGY**

Course Objectives

- About the mechanism and physiological activities in plants.
- On nutrient uptake and translocation to different plant parts.
- On the nature and physiological roles of various plant hormones on plant growth and development.
- On the physiological requirements for plant morphogenesis and flowering
- On the role of light responsive pigments in plant morphogenesis.

Course Outcomes

- The governing principles behind various physiological processes in plants.
- About various uptake and transport mechanisms (water and solutes) in plants and the factors governing these processes.
- The role of various plant hormones, signaling compounds ,and stress responses.
- The skills to manipulate the plant hormones in plants for desired morphological and physiological responses.
- Theclimaticandphysiologicalrequirementsformolecularsignalingofplantsfor growth, differentiation, maturity.

Unit-I:

Learning Outcome: The learners shall have the knowledge on importance of water for basic physiological processes of plants.

- Structure and properties of water; Ph and buffers; cellular buffering systems; Cell water Potential and its components, plasmolysis and imbibition, soil water potential.
- Water absorption by roots, aquaporins, path way of water movement, symplast, apoplast, trans-membrane pathways.
- Ascent of sap–cohesion-tension theory. root pressure; water movement to leaves.
- Transpiration: Processes; mechanism of stomatal movement; factors affecting transpiration; guttation.
- Translocation in the phloem: experimental evidence in support of phloem as the site of sugar translocation. Pressure–flow model; phloem loading and unloading; source–sink relationship.

Unit-II:

Learning Outcome: The students shall know about the nutrient uptakes and hormonal regulation of plant growth and metabolism**.**

- Mineral nutrition: essential and beneficial elements, macro and micronutrients,

mineral deficiency symptoms, chelating agents.

- Nutrient Uptake: Transport of ions across cell membrane, passive absorption,

electrochemical gradient, facilitated diffusion, active absorption, role of ATP, carrier

systems, proton ATPase pump and ion flux, uniport, co-transport, Symport and

antiport.

- Plant growth regulators: Auxin: Biosynthesis, transport, distribution and function
- Gibberellins: Biosynthesis ,transport, distribution and function
- Cytokinin : Biosynthesis, transport, distribution and function
- Abscisic acid: Biosynthesis, transport, distribution and function
- Ethylene: Biosynthesis, transport, distribution and function

Unit-III:

Learning Outcome: The students shall know about photosynthesis and storage of

metabolites by plants.

- Photosynthesis: General concept; photosynthetic apparatus; photosynthetic

pigments

and photo systems; Red drop and Emerson's enhancement effect.

- Primary photochemical reactions: photon, exciton and electron transfer.
- Non-cyclic electron flow: role of tyrosine and phaeophytin, quinine cycle, oxygen

Evolving complex and water splitting. Cyclic electron flow: process and function: role of

ferredoxin-quinone reductase

- C3, C4 and CAM pathways of carbon fixation.
- Photorespiration
- Synthesis and Catabolism of Sucrose and Starch.

Unit-IV:

Learning Outcome: The learners shall have the skill to understand the photo morphogenesis.

- Physiology of flowering: Photoperiodism, flowering stimulus, floral meristems,

external and internal factors of flower evocation; florigen concept; ABC model of

floral organ identity; chemical signals for floral evocation.

- Seed dormancy: causes, effects, breaking of seed dormancy.
- Senescence: Types and causes, biochemical basis
- Phytochrome: Discovery, chemical nature, role of phytochrome in photomorphogenesis, low energy responses (LER) and high irradiance responses (HIR), mode of action.

Practical:

- Determination of osmotic potential of plant cell sap by plasmolytic method.
- Determination of water potential of given tissue (potato tuber) by weight method.
- Study of the effect of wind velocity and light on the rate of transpiration in excised twig/leaf.
- Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of a mesophyte and xerophyte.
- To calculate the area of an open stoma and percentage of leaf area open through stomata in a mesophyte and xerophyte (both surfaces).
- To study the phenomenon of seed germination (effect of light).
- To study the induction of amylase activity in germinating barley grains.
- To demonstrate suction due to transpiration.
- Measurement of relation between transpiration and transpiring surface
- Measurement of cuticular resistance to transpiration.
- Measurement of primary photochemical reactions by fluorescence.

PAPER-XIII BASIC PLANT BIOTECHNOLOGY

Course Objectives:

- To have a basic idea on principles and methods of Plant Tissue culture and in vitro tissue differentiation.
- To study about Somatic embryogenesis; Embryo culture and embryo rescue
- To have theoretical and practical knowledge on Protoplast isolation, fusion, culture and Selection of hybrid cells for regeneration of hybrid plants.
- To study about Recombinant DNA technology and its application.
- To study various techniques of gene transfer and its application in plant improvement.

Course Outcomes

- Have knowledge the about methods of Plant Tissue culture and its application.
- Be able to describe the Somatic embryogenesis; Embryo culture and embryo rescue
- Have skill to isolate plant Protoplast and differentiate the normal and hybrid protoplasts.
- Have knowledge the Gene Construct; construction of genomic and cDNA libraries , screening DNA libraries
- Gain knowledge on methods for developing transgenic plants and application of transgenics for human welfare.

Unit-I:

Learning Outcome: Understanding of the various process of tissue culture mediated plant regeneration protocols.

Plant Tissue Culture: Historical perspective; Aseptic tissue culture techniques; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones). Totipotency; Micropropagation (using nodal explant); Organogenesis (Callus mediated and direct adventitious); Somatic Embryogenesis; Protoplast isolation, culture and fusion, plant acclimatization.

Unit-II:

Learning Outcome: Gain knowledge about the fundamental aspects of recombinant DNA technology.

Recombinant DNA technology-I: Restriction Endonucleases (History, Types I-IV, biological role and application); Restriction Mapping (Linear and Circular); Cloning Vectors: Prokaryotic (pUC 18 and pUC19, pBR322, Ti plasmid, BAC); Lambda phage, M13 phagemid, Cosmid, Shuttle vector; Eukaryotic Vectors (YAC and briefly PAC, MAC, HAC). Gene Cloning (Recombinant DNA, Bacterial transformation and selection of Recombinant clones, PCR mediated gene cloning).

Unit-III:

Learning Outcome: Gain knowledge about the recombinant DNA technology, gene transfer technology and production of transgenic plants**.**

Recombinant DNA technology-II: Gene Construct; construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by genetic selection; complementation, colony hybridization; Probes-oligonucleotide, heterologous, Methods of gene transfer- *Agrobacterium*-mediated, Direct gene transfer by Polyethylene Glycol (PEG) Electroporation, Microinjection, Micro projectile bombardment; Selection of transgenics– selectable marker and reporter genes (Kanamycin, Luciferase, GUS, GFP).

Unit-IV:

Learning Outcome: Have knowledge on chloroplast transformation and biosafety concerns of GM crops.

Chloroplast Engineering: Chloroplast genome, chloroplast transformation: rationale, methods used for generation of transplastomic plants, vectors for chloroplast transformation, transplastomics without antibiotic resistant gene, applications of chloroplast transformation. Biosafety concerns of genetically modified (GM) crops.

Practical:

1. Tissue Culture: laboratory setup(drawing component wise)
2. Demonstration of instruments for Plant tissue culture like Autoclave, Laminar air flow cabinet, and Hot air oven.
3. Demonstration of sterilization techniques for glassware.
4. Preparation of tissue culture (MS) medium.
5. Demonstration of surface sterilization techniques.
6. Demonstration of aseptic inoculation of nodal or leaf explants of any available plant species.
7. Isolation of plasmid DNA.
8. Gel electrophoresis and visualization(demonstration/photography)

SEMESTER-VI

PAPER-XIV BASIC PLANT METABOLISM

Course Objectives:

- To learn the anabolic and catabolic cellular processes and their regulations.
- To understand the mechanism of signal transduction in plants and the major signaling pathways.
- To learn the photochemical and biochemical mechanisms for photosynthetic carbon fixation.
- To learn the mechanism of carbon oxidation and ATP synthesis.
- To understand the pathways of synthesis and oxidation and of lipids and fatty acids.
- To understand the role of enzymes and enzyme action.

Course Outcomes:

- The students shall be able to explain the importance of biochemical pathways and regulatory pathways.
- The students can explain the role of enzymes in metabolic activities.

- The students shall have ability to differentiate various carbon metabolic pathways.
- The students shall have proper level of knowledge on carbon oxidation and energy synthesis

.

- The students can explain the processes of lipid metabolism and its importance in

the germinating seeds.

- The students shall be able to understand and explain the amino acid metabolic pathways.

Unit–I:

Learning Outcomes: Students will learn about the cellular metabolism and understand

metabolic pathways and regulation of glycolysis, TCA cycle, ATP synthesis

- Concept of metabolism: Introduction, anabolic and catabolic pathways.
- Glycolysis and its regulation, Fate of pyruvate, oxidative pentose phosphate

pathway, oxidative decarboxylation of pyruvate; regulation of PDH, NADH shuttle.

- TCA cycle, amphibolic role, anaplerotic reactions, regulation of the TCA cycle,
- Mechanism of ATP synthesis, substrate level phosphorylation, chemiosmotic mechanism (oxidative and photo-phosphorylation), ATP synthase enzyme.
- Boyers conformational model, Racker's experiment, Jaggendorf's experiment
- Role of uncouplers in ATP synthesis and their application.

Unit-II:

Learning Outcomes: Students will learn about fatty acid synthesis, break down and their

regulation in plants**.**

- Fatty acid biosynthesis: Synthesis, and breakdown of triglycerides and their importance.
- Fatty acid Breakdown: β-oxidation, α oxidation, glyoxylate cycle
- Regulation of fatty acid metabolism. Gluconeogenesis and its role in mobilization of lipids during seed germination

Unit-III:

Learning Outcomes: The learner will understand the amino acid biosynthesis, degradation

along with their regulation in plants.

- Amino acid biosynthesis and degradation in plants and its importance (proteasomal

pathway) Synthesis of amino acid of alpha-ketoglutarate family, 3-phosphoglycerate

precursor family, oxalo-acetate and pyruvate family, PEP erythrose-4-phosphate

precursor family, Ribose-5-phosphate precursor family.

- Feedback control of amino acid biosynthesis: sequential, concerted and cumulative

feedback control.

Unit-IV:

Learning Outcomes: Students will learn about the enzymes and their classification, kinetics, inhibition and regulation.

- Enzymes: General properties, nomenclature and classification,
- Energetics of enzyme reactions, free energy change, forward and reverse reactions.
- Michaelis-Menten kinetics of enzyme reactions and its significance, Reciprocal plot, Brigg's-Halden modification, determination of Vmax and Km
- Enzyme inhibition: competitive, non-competitive inhibition, determination of Ki,
- Role of regulatory enzymes: allosteric, covalent modulation

Practical:

1. Detection of organic acids: citric, tartaric, oxalic and malic from laboratory samples.

2. Detection and quantification of protein from plant samples samples following Bradford method using spectrophotometer/colorimeter.

3. Detection/Estimation of the nature of carbohydrate – glucose, fructose, sucrose and starch from laboratory samples.

4. Detection of Ca, Mg, Fe, S from plant ash sample.

5. Estimation of amino-nitrogen by formol titration method(glycine)

6. Estimation of titratable acidity from lemon.

PAPER-XV NATURAL RESOURCE MANAGEMENT

Course Objectives:

- To introduce the types of natural resources and the concept of sustainable development.
- To understand the status of biological diversity and their management.
- To know the contemporary tools such as EIA and GIS for assessment and conservation of natural resources.
- To know about the non-conventional energy resources and their application.
- To learn the concept of resource accounting for better natural resource management

Course Outcomes:

- Be able to understand importance of each component of natural resources and try to

use the available resources judiciously.

- Know about different biological conventions and treaties emphasizing the conservation of biological diversities.
- Clearly understand the importance of sustainable use of natural resources and procedures for their assessment.
- Have skill to use renewable energy sources for the betterment of the human civilization and actively participate in popularization of the methods of energy and resource conservation.
- Know the national and international efforts for management and accounting of natural resources.

Unit-I:

Learning Outcome: The learners shall gain knowledge about the importance of natural resources.

- **Natural resources:** Definition and types.
- **Sustainable utilization**: Concept, approaches (economic, ecological and sociocultural).
- **Land:** Utilization (agricultural, horticultural, silvicultural); Soild degradation and management.
- **Water:** Freshwater (rivers, lakes, groundwater, water harvesting technology, rainwater storage and utilization.

Unit-II:

Learning Outcome: The students shall be able to know the processes for maintaining sustainability.

- **Biological Resources**: Biodiversity-definition and types; Significance; Threats; Management strategies; Bioprospecting; IPR; CBD; National Biodiversity Action Plan).
- **Forests**: Definition, Cover and its significance (with special reference to India); Major and minor forest products; Depletion; Management.

Unit-III:

Learning Outcome: The students shall have skills to use modern tools for effective resource assessment and utilization.

- **Energy**: Renewable and non-renewable sources of energy-solar, wind, tidal, geothermal and bioenergy resources.

- **Contemporary practices in resource management**: EIA, GIS, Participatory Resource Appraisal, Ecological Footprint with emphasis on carbon foot print

Unit-IV:

Learning Outcome: The learners shall gain accounting skills for management and conservation of natural resources.

 Resource Accounting; Waste management. National and international efforts in resource management and conservation

Practicals

1. Estimation of solid waste generated by a domestic system (biodegradable and nonbiodegradable)

and its impact on land degradation.

2. Collections of data on forest cover of specific area.

3. Measurement of dominance of woody species by DBH (diameter at breast height)

method.

4. Calculation and analysis of ecological footprint.

5. Ecological modeling.

6. Estimation of soil moisture content and soil texture.

7. Estimation of soil porosity

8. Estimation of soil water-holding capacity.

9. Estimation of soil organic matter and soil carbon

Paper-II: Gardening& Vermicomposting (Botany)

Course Objectives:

• To introduce the students with the concept and importance of horticulture.

• To introduce the students with the methods for plant propagation.

• To introduce the students with the scope and importance of vermicomposting. **Course Outcomes:**

• Students would understand the scope and importance of the horticulture.

• Students would get the skill to propagate the plants through asexual methods.

• Students would understand the importance and use of vermicomposting for horticulture.

Unit-I: Introduction to horticulture, importance of horticulture crops, Principle of cop production technology, essential plant nutrients and their deficiency symptoms, organic and inorganic manures, water management in horticulture crops

***LO: The students will know about the concept and importance of horticulture*.**

Unit-II:

Types of plant propagation, root curing and tubers, grafting, leaf cutting, runners and offsets, rooting media, rooting hormone, types of nursery bed, irrigation & *protection* ***LO*: The students will be able to know how to do the plant propagation.**

Unit-III: Vermiculture: Definition, scope and importance; vermicomposting using garden waste; use of vermicomposting in garden

***LO: The students will be able to know and how to use the vermicomposting*.**

Practicals:

1. Identification and description of salient features of ornamental plants

2. Study of asexual propagation methods (grafting, cutting, layering)

3. Study of techniques for rooting

4. Study of irrigation techniques (drip irrigation)

5. Study of preparation of nursery bed.

Multi-Disciplinary Course - SEMESTER-III

Paper-IX: Herbarium Preparation (Botany)

Objectives:

• To introduce the basics of herbaria and herbarium specimens.

• To educate on the methods for preparation and handling of specimens and materials.

• To know the methods of collection, processing and storage of herbarium specimens.

• To learn about the range of application of herbaria in plant taxonomy.

Course Outcomes:

• The students shall have a basic knowledge on the herbaria and herbarium specimens.

• The students shall get the opportunities to learn the basics specimen processing and proper storage for use.

• The students shall be able to understand the range of application of the herbatia and herbarium specimens.

• The students would be able to learn the application of modern tools for information collection, storage and sharing.

Unit-I: LO: The learners shall gain knowledge on the importance of herbarium in plant taxonomy.

• Herbaria: Introduction, history and objectives; Types of herbaria; role of herbaria in teaching, and research; important herbaria of India and the world.

• Herbarium specimen - types and diversity- loose seeds, dried and bulky fruits, algae, fungi, wood sections, pollen, microscope slides, silica-stored materials, DNA extractions, and fluid-preserved flowers or fruits; use of specimens. Plant collections and maintenance of live specimen.

Unit-II: LO: The learners shall gain knowledge and skills on the preparation and processing of herbarium specimens.

Herbarium methodology: Collection, field notes; Processing of specimen-poisoning, pressing, drying, mounting, stitching, identification and arrangement. Methods to address specimen diversity - Algae, fungi, and bryophytes; methods of their collection, processing and preservation.

Unit-III: LO: The students shall be able to understand the long-term storage, and use of specimen as well as on the procedure for data and knowledge sharing in the field.

Maintenance and curing of specimen, materials and illustrations-moisture management, heating, chemical treatments, fumigation. Handling of Specimen; library and special collections; exchange of specimens. Use of computer, databases and webs - Local and global databases; Herbaria for outreach activities - services, education, plant identification and conservation.

Practical:

1. Field survey and collection of plant materials

2. Methods of pressing and drying

3. Drying of materials by using chemicals- alcohol, glycerol, formaldehyde, FAA

4. Preservation of materials-moist and dried

5. Mounting, labelling and cataloguing of herbarium specimen
6. Use of computers for herbarium cataloguing and management
7. Seed collection and storage

DEPARTMENT OF ZOOLOGY
SARBATI DEVI WOMEN'S COLLEGE,RAJGANGPUR
PO,CO,PSO- NEP-2020

SEMESTER I

PAPER I

Invertebrates: Protista to Echinodermata

(4Credit, Theory-45h and Practical – 30h)

Programme Outcome:

- Understand the general characteristics o f non-chordate groups of organisms.
- Acquire knowledge regarding classification of the taxa with examples.
- Develop an understanding of important phenomena associated with each taxon.
- Acquire skills in identifying representative species of groups studied.
- Illustrate phylogenic distribution of lower groups of Non-chordates.
- Understand elaboration of coelomic evolution and metamerism on Coelomates with their classification up to their class and excretion system in Annelidans.
- Recognize insect vision, respiration and metamorphosis in Arthropoda with reference to Termites and in evolutionary significance of Onychophora with general characteristics.
- Obtain an over view of the general features, respiration, Gastropodan evolution, mechanism of torsion, and significance of larval life stages.
- Acquire knowledge on general characters and classification of Echinoderms and their affinities with Chordates.

Course Outcome:

- Utilize information to understand the differences of the groups studied.
- Develop skills in examining diversity of the taxa.
- Develops skills in elaborating the general features and evolutionary significance of the coelomate from Annelida to Echinoderms.
- Impactful visual understanding and enables the students to correlate the evolutionary significance of each organism on the phylogenetic tree.
- Study on various general features and characteristics of body symmetry and arrangement with various vision types, excretory systems and developmental stage give a strong fundamental understanding on the subject on Coelomates.

Learning Outcome

- Systematically understand the diverse group of organisms from Protista to

Cnidaria and Ctenophora

- Systematically understand the diverse group of organisms that make up

Phyla Platyhelminthes and Nemathelminthes.

- Understand the diverse organisms that make up Phyla from Annelida,

Arthropoda and Onychophora.

- Understand the diverse organisms that make up Phyla from Mollusca

and Echinodermata and significant processes associated.

Unit 1: Protista to Cnidaria and Minor Phylum Ctenophora

General characteristics and Classification up to classes. Locomotion, Nutrition and Reproduction in Protista, Life cycle and pathogenicity of Plasmodium vivax, Canal system and spicules in sponges, Metagenesis in Obelia, Polymorphism in Cnidaria, Corals and coral reefs, Evolutionary significance of Ctenophora.

Unit 2: Platyhelminthes and Nemathelminthes

General characteristics and Classification up to classes. Life cycle and pathogenicity of Fasciola hepatica and Taenia solium, Life cycle, and pathogenicity of Ascaris lumbricoides and Wuchereria bancrofti. Parasitic adaptations in helminthes

Unit 3: Annelida, Arthropoda and Onychophora

General characteristics and Classification up to classes. Evolution of coelom and metamerism. Excretion in Annelida, Vision and Respiration in Arthropoda. Metamorphosis in Insects. Social life in bees and termites. Onychophora: General characteristics and Evolutionary significance.

Unit 4: Mollusca and Echinodermata

General characteristics and Classification up to classes. Respiration in Mollusca. Torsion and detorsion in Gastropoda. Evolutionary significance of trochophore larva. Water-vascular system in Echinoderms, Larval forms in Echinodermata

Invertebrates: Protista to Echinodermata

Practical

1. Study of whole mount of Euglena, Amoeba and Paramecium, Binary fission and Conjugation in Paramecium.
2. Study of Sycon (T.S. and L.S.), Hyalonema, Euplectella, Spongilla, Spicules and Spongin fibers.
3. Study of Cnidarians Obelia, Physalia, Millepora, Aurelia, Tubipora, Corallium, Alcyonium, Gorgonia, Metridium, Pennatula, Fungia, Meandrina, Madrepora., Ctenophore.
4. Study of Life cycle stages of Fasciola hepatica, Taenia solium and Ascaris lumbricoides (Slides/micro-photographs).

5. Study of Annelids - Aphrodite, Nereis, Heteronereis, Sabella, Serpula, Chaetopterus, Pheretima, Hirudinaria.

6. Study of Arthropods – Crab, Limulus, Palamnaeus, Palaemon, Daphnia, Balanus, Sacculina, Eupagurus, Scolopendra, Julus, Bombyx mori, Periplaneta americana, termites, honey bees and Peripatus

7. Study of Molluscs and Echinodermata- Chiton, Dentalium, Pila, Doris, Helix, Unio, Ostrea, Pinctada, Sepia,Octopus, Nautilu.

Echinodermata - Pentaceros/Asterias, Ophiura, Clypeaster, Echinus, Cucumaria and Antedon

8. Study of digestive system, nephridia of earthworm (Virtual), T.S. through pharynx, gizzard, and typhlosolar region of earthworm, Mounting of mouth parts and dissection of digestive system and nervous system (Virtual) of Periplaneta americana.

9. To submit a Project Report on any related topic.

PAPER II

Diversity of Chordates: Protochordates to Mammalia

(4Credit, Theory-45h and Practical – 30h)

Programme Outcome:

- The students learn about the salient features, diversity and distribution of all Chordates.
- To know the evolution of aquatic, amphibious and terrestrial vertebrates.
- To understand the importance of distribution of vertebrates in different realms.

Course Outcome

- ❖ Understanding the origin, larval forms, distribution and adaptation of different vertebrates.
- ❖ Accumulating the knowledge and understanding on the classification, affinities and comparative anatomy of different vertebrates and their evolutionary significance.
- ❖ Learning the mechanism of flight and aquatic adaptations in birds and mammals.
- ❖ Obtaining knowledge pertaining to the distribution of animals particularly vertebrate in different realms.

Learning Outcome:

- Gain understanding of Protochordates and origin of Chordates. ·
- Knowledge regarding characteristics and classification of Agnatha, Pisces, Amphibia, and evolution of tetrapoda.
- Understanding characteristics and classification of Reptiles and Aves and their connecting links.
- Comprehend characteristics and organization of mammals, in addition to their distribution in zoogeographical realms.

Unit 1: Protochordates and Origin of Chordates

General characteristics and outline classification Chordata (Protochordata: Hemichordata, Urochordata and Cephalochordata). Study of larval forms in protochordates; Retrogressive metamorphosis in Urochordat; Dipleurula concept and the Echinoderm theory of origin of chordates.

Unit 2: Agnatha, Pisces & Amphibia

General characteristics and classification up to order. Migration, Parental care in fishes, Accessory respiratory organs in Pisces, Evolutionary significance of Dipnoi.

Amphibia: Origin of Tetrapoda (Evolution of terrestrial ectotherms); Parental care.

Unit 3: Reptilia & Aves

General characteristics and classification up to order. Affinities of Sphenodon; Poison apparatus and Biting mechanism in snakes. Archaeopteryx- a connecting link; Flight adaptations and Migration in birds.

Unit 4: Mammals & Zoogeography

General characters and classification up to order; Affinities of Prototheria; Adaptive radiation with reference to locomotory appendages. Zoogeographical realms, Theories pertaining to distribution of animals, Plate tectonic and Continental drift theory, distribution of vertebrates in different realms.

PRACTICAL

1. Protochordata: Balanoglossus, Herdmania, Branchiostoma, Urochordata, Sections of Balanoglossus through proboscis and branchio-genital regions, Sections of Amphioxus through pharyngeal, intestinal and caudal regions. Permanent slides of Herdmania spicules, Doliolum, Salpa

2. Agnatha: Petromyzon and Myxine.

3. Fishes: Scoliodon, Sphyrna, Pristis, Torpedo, Chimaera, Mystus, Heteropneustes, Labeo, Exocoetus, Echeneis, Anguilla, Hippocampus, Tetrodon/ Diodon, Anabas, Flat fish.

4. Amphibia: Ichthyophis/Ureotyphlus, Necturus, Bufo, Hyla, Alytes, Salamander.

5. Reptilia: Chelone, Trionyx, Hemidactylus, Varanus, Uromastix, Chamaeleon, Ophiosaurus, Draco, Bungarus, Vipera, Naja, Hydrophis, Zamenis, Crocodylus. Key for Identification of poisonous and non-poisonous snakes

6. Aves: Study of six common birds from different orders. Types of beaks and claws. Study of feathers.

7. Mammalia: Sorex, Bat (Insectivorous and Frugivorous), Funambulus, Loris, Herpestes, Erinaceous.

8. Power point presentation on study of any two examples representing two different classes.. Submission of report on local species.

SEMESTER II

PAPER III Microbiology

(4Credit, Theory-45h and Practical – 30h)

Programme Outcome:

- Knowledge of microbial diversity and classification.
- To understand microbial culture, growth and reproduction.
- To understand the importance of viral pathogenicity, nature of viral transmission.
- To comprehend the importance of Anti-viral drugs and vaccines.

Course Outcome:

- Obtaining knowledge pertaining to future scopes and modern trends of microbiology.
- Understanding the experimental approaches to explore the origin of microbes.
- Uunderstanding the morphology, classification and significance of host-vector relationship.
- Learning the mechanism of action of microbial toxins and pathogenicity.
- Obtaining knowledge on pathogenic manifestation of Oncoviruses & HIV.

Learning Outcome:

・ Finding the historical background and modern experimental approaches to understand the origin and development of microbiology. ・

・ Analysing the general features, classification and pathogenicity of Archea and Eubacteria. ・

・ Deducing knowledge on role of microbes in agriculture and healthcare sector. ・

・ Interpreting the mechanism of antibacterial and anti-viral their mode of action, and importance of vaccines. ・

Unit-1

History and development of microbiology: Biogenesis and abiogenesis, Contribution of Francesco Redi, Lazzaro Spallanzani, John Needham, Louis Pasteur, John Tyndall, Joseph Lister, Robert Koch (germ theory), Edward Jenner and Alexander Fleming`s experiments on discovery of Penicillin, Modern trends and future scope of Microbiology.

Unit-2

Microbial systems of classification: General features of Bergey's manual for classification of microbes, Whittakar’ s five kingdom concept, Carl Woese's 3 domain classification, Lynn Margulis theory of endosymbiotic theory. General features of Archaea: Structure, Nutrition.and Reproduction.

General features, pathogenicity of Mycoplasma, Rickettsia and Spirochaetes.

Unit-3

Isolation, culture and maintenance of microorganisms: Microbial growth, continuous culture (chemostat), Factors influencing growth of microbes, Role of microbes in agriculture and healthcare industry. Reproduction of Eubacteria, Genetic recombination in bacteria (Transformation, Conjugation and Transduction).

Unit-4

Virion and viroids: General characteristics and classification of viruses, morphology, nature of viral transmission. Bacteriophage replication, Oncoviruses & HIV: structure, transmission, pathogenicity and replication. Microbial toxins: types, mode of actions and pathogenicity (Exo and Endo-toxin). Antibiotics and their mode of action, Anti-virals and vaccine.

PRACTICAL

1. Study on aseptic techniques in microbiology: various methods of sterilization process.

2. Preparation and formulation of microbial media and methods of inoculation.

3. Methods of isolation of bacteria: spread plate, streak plate, pour plate, serial dilution.

4. Sampling and quantification of microorganisms in air, water and soil.

5. Morphological identification of microorganisms from various habitats through simple staining, differential staining, acid fast staining, spore staining.

6. Methods of microscopic measurements, micrometer (ocular and stage), haemocytometer.

7. Preparation of bacterial growth curve.

PAPER -IV

Cell Biology

(4Credit, Theory-45h and Practical – 30h)

Programme Outcome:

・ Introducing prokaryotic and eukaryotic cells and their features, ultrastructure of plasma membrane and mechanism of transport of molecules across plasma membrane. ・

・ To know the structure, function and properties of endomembrane & cytoskeletal network system and cell organelles. ・

・ To understand the importance of mitochondria in aerobes, the role of mitochondrial electron transport chain, oxidative phosphorylation & mechanism of ATP synthesis. ・

・ To study the structure and packaging of chromosome in nucleus, behaviour of chromosome during cell division, cell cycle and its regulation. ・

Course Outcome:

・ Understanding the difference between prokaryotic and eukaryotic cells and the mechanism of transportation across their membrane system. ・

・ Understanding the role of cytoskeleton in maintaining structural frame work, cell motility and cell organelles. ・

・ Deciphering the role of mitochondria in cellular respiration and energy production. ・

・ Obtaining knowledge on structure and function of nucleus, cell division and regulation of cell cycle. ・

Learning Outcome

Understanding Cell junctions and mechanism of transportation across membrane.

• Obtaining knowledge on structural and functional aspect of cytoskeleton and endomembrane system. •

• Obtaining knowledge on nucleus, nucleosome and cell division and cell cycle regulation. •

• Knowledge about mitochondrial respiratory chain, chemi-osmotic hypothesis and functions of peroxisome. •

Unit 1: Overview of cells and plasma membrane

Prokaryotic and Eukaryotic cells, Virus, Viroids, Mycoplasma, Prions, Various models of plasma membrane structure. Transport across membranes: Active and Passive transport, Facilitated transport. Cell junctions: Tight junctions, Desmosomes, Gap junctions.

Unit 2: Cytoskeleton & Endomembrane System

Structure and Functions: Microtubules, Microfilaments and Intermediate filaments; Structure and Functions: Endoplasmic Reticulum, Golgi apparatus, Lysosomes.

Unit 3: Mitochondria and Peroxisomes

Mitochondria: Structure, Semi-autonomous nature, Endosymbiotic hypothesis; Mitochondrial Respiratory Chain, Chemi-osmotic hypothesis. Peroxisomes.

Unit 4: Nucleus, Cell Division and Cell signalling

Structure of Nucleus: Nuclear envelope, Nuclear pore complex, Nucleolus; Chromatin: Euchromatin and Heterochromatin and packaging (nucleosome); Mitosis, Meiosis, Cell cycle and its regulation; GPCR and Role of second messenger (cAMP).

PRACTICAL

1. Understanding of simple and compound microscopes.
2. To study different cell types such as buccal epithelial cells, striated muscle cells using Methylene blue/any suitable stain (virtual/ slide/slaughtered tissue).
3. Preparation of temporary stained squash of onion root tip to study various stages of mitosis.

4. Study of various stages of meiosis in grasshopper testis
5. Preparation of permanent slide to show the presence of Barr body in human female blood cells/cheek cells.
6. Preparation of permanent slide to demonstrate:

i. DNA by Feulgen reaction

ii. DNA and RNA by MGP

iii. Mucopolysaccharides by PAS reaction

iv. Proteins by Mercuric bromophenol blue/Fast Green

7. Demonstration of osmosis (RBC/ Egg etc.).

SEMESTER-III

PAPER V Principles of Ecology

(4Credit, Theory-45h and Practical – 30h)

Programme Outcome:

- Understand the concept of an ecosystem, its attributes, factors and functioning.
- Learn about population attributes, growth patterns, strategies; regulation and interactions.
- To appraise learners regarding various community characteristics.
- Comprehend biological data, learn graphical representation of data, sampling techniques, grasp basic statistics.
- Acquire skills on plotting survivorship curves, quadrate method of determining population density, diversity indices, techniques of preservation and mounting of plankton, determination of ecological parameters.

Course Outcome:

- Utilize information to understand interrelations and working of an ecosystem.
- Demonstrate the ability to comprehend data, plot graphs, present data and apply basic statistics.

Learning Outcome:

- Understand food chain dynamics and energy flow patterns.
- Gain knowledge about population dynamics.
- Understand community stratification and succession.
- Gain knowledge about representation of data, data processing and analysis.

Unit 1: Ecosystem and Applied Ecology

Ecology: Autecology and synecology, Types of ecosystems with one example in detail, Food

chain: Detritus and grazing food chains, Linear and Y-shaped food chains, Food web, Energy flow through the ecosystem, Ecological pyramids Nutrient and biogeochemical cycle with one example of Nitrogen cycle. Laws of limiting factors, Study of physical factors- (Light, temperature).

Unit 2: Population

Attributes of population: Density, natality, mortality, life tables, fecundity tables, survivorship curves, age ratio, sex ratio, dispersal and dispersion Exponential and logistic growth, equation and patterns, r and K strategies. Population regulation - density- dependent and independent factors, Population interactions, Gause' s Principle with laboratory and field examples.

Unit 3: Community

Community characteristics: species richness, dominance, diversity, abundance,vertical stratification, Ecotone and edge effect; Ecological succession with one example. Theories pertaining to climax community.

Unit – 4: Biometry

Biological data, graphical representation of data (frequency polygon and histogram), sampling techniques, measures of central tendency (Mean, median and mode), Measures of dispersion (range, quartile deviation, mean deviation and standard deviation), Hypothesis and hypothesis testing (Chi-square test, t- test).

PRACTICAL

1. Study of life tables and plotting of survivorship curves of different types from the hypothetical/real data provided.
2. Determination of population density in a natural/hypothetical community by quadrate method and calculation of Shannon-Weiner diversity index for the same community.
3. Study of an aquatic ecosystem: Phytoplankton and zooplankton collection, preservation and mounting, Measurement of temperature, turbidity/penetration of light, determination of pH, Dissolved Oxygen content (Winkler' s method), BOD, COD, Free CO_2, Hardness, TDS.
4. Report on a visit to National Park/Biodiversity Park/Wild life sanctuary.

5. Chi-square analysis using seeds/beads/Drosophila.

6. Problems on standard deviation.

7. Graphical representation of data (Frequency polygon and Histogram).

PAPER-VI

Physiology: Controlling and Coordinating systems

(4Credit, Theory-45h and Practical – 30h)

Programme Outcome:

- Develop an understanding of tissues and tissue systems with clarity on types and functions of each.
- Acquire knowledge on the muscle and nervous system.
- Obtain information about various receptors, their functioning and understand the mechanism of action.

Course Outcome:

- Acquire skills in differentiating tissues based on their structure and functions.
- Gain insights on the controlling and coordinating systems of the body.

Learning Outcome:

- Gain knowledge about tissue composition and function.
- Understand muscle types and mechanism of action.
- Understand functioning of different type of receptors.
- Acquire knowledge on osmoregulation and thermoregulation.

Unit 1: Tissues & Tissue system

Structure, location, classification and functions of epithelial tissue, connective tissue, muscular tissue and nervous tissue. Structure and types of bones and cartilages, Ossification, bone growth and resorption.

Unit 2: Muscle & Nervous System

Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction. Introduction to CNS, PNS and ANS. Structure of neuron, Types of neurons, Action potential and its propagation, Synapse and synaptic transmission, Neuromuscular junction; Reflex action.

Unit 3: Physiology of Special senses

Sensory Neurons-types; Physiology and pathway- hearing and balance, Olfaction, Gustation and Vision. Interoception – Nociceptors, Baroreceptors, Chemoreceptors, Thermoreceptors, Osmoreceptors, Cutaneous Receptors.

Unit 4: Homeostasis

Homeostasis and body fluids, Sources of body water and loss, Control of homeostasis, Homeostatic imbalances. Osmoregulation in fish, thermoregulation in Poikilotherms, homeotherms and heterotherms.

Practical

Physiology: Controlling and Coordinating systems

1. Demonstration of the unconditioned reflex action (Deep tendon reflex such as knee jerk reflex).
2. Study of permanent slides- Squamous epithelium, Striated muscle fibres, nerve cells and others relevant to the theory.
3. Microtomy: Preparation of permanent slides.
4. Models of mammalian tissues (Any five) /photographs.
5. Effect of salt concentration on cells.

PAPER VII

Fundamentals of Biochemistry

(4Credit, Theory-45h and Practical – 30h)

Programme Outcome:

- To gain understanding of fundamentals of biochemistry and biological macromolecules.
- To understand structure, classification, properties and significance of biomolecules.
- Acquire knowledge on nomenclature, classification and mechanism of enzyme action, regulation and its kinetics.

Course Outcome:

- To understand the structure and biological importance of protein, carbohydrates,

lipids, nucleic acids and enzymes.

- Providing knowledge on types of amino acids and its polymeric form.
- Learning the structure and pairing of nucleotides, denaturation and denaturation kinetics of DNA.
- Obtaining knowledge on enzymes and isoenzymes, specificity, inhibition, derivation of Michaelis-Menten equation.

Learning Outcome:

- Gaining knowledge on different classes of biological macromolecules such as carbohydrates, lipids and nucleic acids.
- Understanding the structure of proteins and its monomers.
- Learning the structure of nucleic acids, denaturation and renaturation kinetics of DNA.
- Interpret the activities of enzymes and isoenzymes.

Unit 1: Carbohydrates & Lipids

Structure and Biological importance: Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates; Structure and Significance: Physiologically important saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Glycolipids, Steroids.

Unit 2: Proteins

Amino acids: Structure, Classification and General properties of α -amino acids; Physiological importance of essential and non-essential α -amino acids.

Proteins: Bonds stabilizing protein structure; Levels of organization in proteins; Renaturation, Denaturation; Introduction to simple and conjugate proteins

Immunoglobulins: Basic Structure, Classes and Function, Antigenic Determinants.

Unit 3: Nucleic Acids

Structure: Purines and pyrimidines, Nucleosides, Nucleotides, Nucleic acids. Cot Curves, Base pairing, Denaturation and Renaturation of DNA, Types of DNA and RNA, Complementarity of DNA, Hypo and Hyperchromaticity of DNA.

Unit 4: Enzymes

Nomenclature and classification, Cofactors, Specificity of enzyme action, Isozymes, Mechanism of enzyme action, Enzyme kinetics, Factors affecting rate of enzyme-catalyzed reactions, Derivation of Michaelis-Menten equation, Concept of Km and Vmax, Lineweaver-

Burk plot, Multi-substrate reactions, Enzyme inhibition, Allosteric enzymes and their kinetics, Regulation of enzyme action.

Fundamentals of Biochemistry

Practical:

1. Qualitative tests of functional groups in carbohydrates, proteins and lipids.
2. Paper chromatography of amino acids.
3. Action of salivary amylase under optimum conditions.
4. Effect of pH, temperature and inhibitors on the action of salivary amylase/Urease/acid or alkaline phosphatase
5. Demonstration of proteins separation by SDS-PAGE.

SEMESTER-IV

PAPER VIII **Endocrinology & Reproductive Biology**

(4Credit, Theory-45h and Practical – 30h)

Programme Outcome:

• Insights on the history of endocrinology, study endocrine glands, hormones, control and regulation •

• Acquire knowledge on the various facets of the reproductive system and their endocrine aspects. •

Course Outcome:

• Essential clarity on endocrine gland structures, hormones, functions and their regulation. •

• Scientific knowledge base on reproductive health and endocrine control. •

Learning Outcome:

• Acquire information on the history of endocrinology, endocrine glands, and hormones. •

• Gain an understanding of the Hypothalamo-hypophysial axis and regulation of hormone action. •

• Understand the endocrine aspects of reproductive system. •

• Recognize different aspects of reproductive health and Assisted Reproductive Technology. •

Unit 1: Introduction to Endocrinology

A brief history of endocrinology, Types of endocrine glands (Pituitary, Pineal, Thyroid, Parathyroid, Adrenal, Pancreas), their histology, hormones, functions and disorders; General characteristics of Hormones, Classification, Hormone receptors, Mechanism of hormone action (steroidal and non-steroidal hormones) and tansduction .

Unit 2: Hypothalamo-hypophysial Axis and Regulation of Hormone Action

Structure of hypothalamus, Hypothalamic nuclei, Neurosecretions, Neurohormones and their functions, Hypothalamo-hypophysial portal system, Hypothalamic-pituitary-gonadal axis, Hormone action at cellular and molecular level, Genetic control of hormone action. Regulation-Feedback mechanisms.

Unit 3: Reproductive System-endocrine aspects

Testis: Histology; Spermatogenesis: kinetics and hormonal regulation; Androgen synthesis and metabolism; Epididymal function and sperm maturation; Sperm transportation in male tract; Ovary: Histology, folliculogenesis, ovulation, corpus luteum formation and regression; Steroidogenesis and secretion of ovarian hormones; Reproductive cycles and their regulation, Ovum transport in the fallopian tubes; Sperm transport in the female tract, fertilization, prevention of polyspermy; Hormonal control-implantation and gestation, foeto-maternal relationship; Parturition and Lactation.

Unit 4: Reproductive Health

Infertility in male and female: causes, diagnosis and management; Assisted Reproductive Technology: sex selection, sperm banks, frozen embryos, in vitro fertilization, ET, EFT, IUT, ZIFT, GIFT, ICSI, PROST; Modern contraceptive technologies; Demographic terminology used in family planning.

Endocrinology & Reproductive Biology

Practical:

1. Dissect and display of Endocrine glands in laboratory bred rat*.
2. Study of the permanent slides of all the endocrine glands.
3. Study and identification of endocrine disorders through images.

4. Compensatory ovarian/ adrenal hypertrophy in vivo bioassay in laboratory bred rat*.

5. Demonstration of Castration/ ovariectomy in laboratory bred rat*.

6. Estimation of plasma level of any hormone using ELISA.

7. Designing of primers of any hormone.

8. Examination of vaginal smear from live animals and examination of Human vaginal exfoliate cytology.

9. Surgical techniques: principles of surgery in endocrinology. Ovarectomy, hysterectomy, castration and vasectomy in rats. (*Subject to UGC guidelines)

10. Sperm count and sperm motility in rat.

11. Study of modern contraceptive devices.

12. Report on endocrine disorders in human.

13. Paper chromatographic separation of hormones.

14. Hypophysectomy in fish (Tilapia/catfish/ locally available fish)

PAPER IX

Comparative Anatomy of Vertebrates

(4Credit, Theory-45h and Practical – 30h)

Programme Outcome:

・ Understand anatomical significance of organ system in vertebrates. ・

・ Comprehend structure, function and various derivatives of Integumentary, Skeletal, digestive, respiratory, circulatory, urinogenital and nervous system. ・

Course Outcome:

・ Learner gains detailed overview of the anatomical resemblance amongst vertebrates hierarchies. ・

・ Acquires knowledge on cellular development of organ systems in the vertebrates and linear progression of cellular derivatives during organogenesis. ・

・ Understand the process of linear and vertical cellular evolutionary processes. ・

Learning Outcome:

・ Acquire knowledge of the integument, and skeleton systems. ・

・ Gain knowledge on the Gastro intestinal canal, associated glands, and respiration

system. ·

· Obtain knowledge of the Circulatory and Urinogenital systems and their evolution. ·

· Comparative study of mammalian nervous system & sense organs. ·

Unit 1: Integumentary & Skeletal System

Structure, functions and derivatives of integument (Scale, claw, nail, hair, feather and dentition). Axial and appendicular skeleton, Jaw suspensorium, Visceral arches.

Unit 2: Digestive & Respiratory System

Alimentary canal and associated glands; Respiration through Skin, gills, lungs and air sacs; Accessory respiratory organs.

Unit 3: Circulatory and Urinogenital system

General plan of circulation, evolution of heart and aortic arches; Succession of kidney, Evolution of urinogenital ducts, Types of mammalian uteri.

Unit 4: Nervous System & Sense Organs

Comparative account of brain; Nervous system, Spinal cord, Cranial nerves in mammals. Classification of receptors: Brief account of visual and auditory receptors in man. Chemo and mechano-receptors.

Practical

1. Study of placoid, cycloid and ctenoid scales through permanent slides/photographs
2. Disarticulated skeleton of Frog, Varanus, Fowl, Rabbit.
3. Carapace and plastron of turtle /tortoise (Photographs, charts etc).
4. Mammalian skulls: One herbivorous and one carnivorous animal.
5. Study of structure of any two organs (heart, lung, kidney, eye and ear) through ICT tools.
6. Project r e p o r t s u b m i s s i o n on I n t e g u m e n t a r y d e r i v a t i v e s .

PAPER X

Physiology: Life Sustaining Systems

(4Credit, Theory-45h and Practical – 30h)

Programme Outcome:

・ Knowledge of critical physiological processes. ・

・ Understand anatomical attributes of Digestive, Respiratory, Renal and Cardiovascular system. ・

・ Learn and develop an understanding of vital life-sustaining physiological processes. ・

Course Outcome:

・ Appraise the significance of anatomical structures and physiological events. ・

・ Apply information to understand the functioning of organisms. ・

・ Demonstrate the ability to appreciate the occurrence of physiological actions. ・

・ Understand interrelationships of life processes. ・

・ Acquire practical skills in identifying different organs, and perform laboratory work based on theoretical applications ・

Learning Outcome:

・ Acquire knowledge on digestion, respiration, renal and heart physiology. ・

・ Understand the composition of blood grouping, functions and Blood clotting. ・

Unit 1: Physiology of Digestion

Structural organization and functions of gastrointestinal tract and associated glands; Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; Hormonal control of secretion of enzymes in Gastrointestinal tract.

Unit 2: Physiology of Respiration

Histology of trachea and lung; Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in blood; Respiratory pigments, Dissociation curves and the factors influencing it; Carbon monoxide poisoning; Control of respiration.

Unit 3: Renal Physiology

Structure of kidney and its functional unit, Mechanism of urine formation, Regulation of water balance, Regulation of acid-base balance, Homeostatic regulation of tubular reabsorption and secretion.

Unit 4: Blood and Physiology of Heart

Haemopoiesis, Components of blood and their functions; Structure and functions of haemoglobin, Blood clotting system, Blood groups: Rh factor, ABO and MN.
Structure of mammalian heart, Coronary circulation, Origin and conduction of cardiac impulses Cardiac cycle; Cardiac output and its regulation, Frank-Starling Law of the heart, nervous and chemical regulation of heart rate. Electrocardiogram, Blood pressure.

Practical:

1. Determination of ABO Blood group.
2. Enumeration of red blood cells and white blood cells using haemocytometer.
3. Preparation of blood smear for differential count.
4. Estimation of haemoglobin using Sahli' shaemoglobinometer.
5. Preparation of haemin and haemochromogen crystals.
6. Recording of blood pressure using a sphygmomanometer.
7. Examination of sections of mammalian slides: oesophagus, stomach, duodenum, ileum, rectum liver, trachea, lung, kidney.

SEMESTER -V

PAPER XI **Biochemistry of Metabolic Processes**

(4Credit, Theory-45h and Practical – 30h)

Programme Outcome

- Understanding of catabolism, anabolism and regulatory mechanism of intermediary metabolism.
- To learn the processes of carbohydrate, lipid and protein metabolism.
- To obtain knowledge on redox regulation and electron transport system.

Course Outcome:

- Gain overall knowledge and understanding on metabolic pathways and shuttle systems.
- Gain knowledge on carbohydrate metabolism related processes.

・ Understanding of β -oxidation and catabolism of amino acids.・

・ Understanding on mitochondrial respiratory chain and oxidative phosphorylation.・

Learning Outcome:

・ Gain knowledge on the compartmentalization of metabolic pathways.・

・ Understand role of intermediate and carbohydrate regulatory metabolism.・

・ Gain knowledge on β and omega oxidation of saturated fatty acids.・

・ Understand the role of mitochondria in energy production during electron transport.・

Unit 1: Overview of Metabolism

Catabolism vs Anabolism, Stages of catabolism, Compartmentalization of metabolic pathways, Shuttle systems and membrane transporters; ATP as "Energy Currency of cell"; coupled reactions; Use of reducing equivalents and cofactors; Intermediary metabolism and regulatory mechanisms.

Unit 2: Carbohydrate Metabolism

Sequence of reactions and regulation of glycolysis, Citric acid cycle, Phosphate pentose pathway, Gluconeogenesis, Glycogenolysis and Glycogenesis.

Unit 3: Lipid and protein Metabolism

B -oxidation and omega -oxidation of saturated fatty acids with even and odd number of carbon atoms; Biosynthesis of palmitic acid; Ketogenesis

Catabolism of amino acids: Transamination, Deamination, Urea cycle; Fate of C-skeleton of Glucogenic and Ketogenic amino acids.

Unit 4: Oxidative Phosphorylation

Redox systems; Review of mitochondrial respiratory chain, Inhibitors and un-couplers of Electron Transport System.

Practical

1. Estimation of total protein in given solutions
2. Measurement of SGOT and SGPT activity.
3. Determination of GSH level in serum/tissue.
4. Measurement of GST activity.
5. To study the enzymatic activity of Trypsin/ Lipase.
6. To perform the Acid and Alkaline phosphatase assay from serum/ tissue.

7. Dry Lab (Virtual): To trace the labelled C atoms of Acetyl-CoA till they evolve as CO_2 in the TCA cycle.

PAPER XII

Principles of Genetics

(4Credit, Theory-45h and Practical – 30h)

Programme Outcome:

• Obtain knowledge on the basic principles of genetics. •

• To provide knowledge on the mechanism of sex determination and extrachromosomal inheritance. •

• To learn the process of DNA recombination, transposons and transposable elements. •

Course Outcome:

• Acquire knowledge on the fundamentals of Mendelian and non-Mendelian genetics, chromosomal mapping and interaction of genes. •

• Providing the knowledge and understanding on linkage, crossing over, sex determination and role of extra-chromosomal inheritance. •

• Obtaining knowledge on chromosomal aberration, cause and consequences of mutations. •

Learning Outcome:

• Understand principles of Mendelian genetics. •

• Discern types of gene mutations and chromosomal aberrations with detection methods.. •

• Gain an understanding of mechanisms of sex determination and extra chromosomal inheritance. •

• Understand the process of recombination and transposable genetic elements.

Unit 1: Mendelian Genetics, Linkage, Crossing Over and Chromosomal Mapping

Principles of inheritance, Incomplete dominance and co-dominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Sex-linked, sex-influenced and sex-limited characters inheritance. Polygenic inheritance with suitable examples; simple numerical based on it. Linkage and crossing over, Cytological basis of crossing over, Molecular mechanisms of

crossing over including models of recombination, Recombination frequency as a measure of linkage intensity, Two factor and three factor crosses, Interference and coincidence, Somatic cell hybridization.

Unit 2: Mutations

Types of gene mutations (Classification), Types of chromosomal aberrations (Classification, figures and with one suitable example of each), Molecular basis of mutations in relation to UV light and chemical mutagens; Detection of mutations: CLB and sex- linked visible attached X method.

Unit 3: Sex Determination & Extra-chromosomal Inheritance

Chromosomal mechanisms of sex determination in Drosophila and Man; Criteria for extrachromosomal

inheritance, Antibiotic resistance in Chlamydomonas, Mitochondrial mutations

in Saccharomyces, Cytoplasmic inheritance in Paramecium.

Unit 4: Recombination in Bacteria and Viruses & Transposable Genetic Elements

Conjugation, Transformation, Transduction, Complementation test in Bacteriophage.

Transposons in bacteria, Ac-Ds elements in maize and P elements in Drosophila, Transposons in human.

Practical

1. Study of Mendelian laws and gene interactions.
2. Linkage maps based on data from conjugation, transformation and transduction.
3. Linkage maps based on data from Drosophila crosses.
4. Study of human karyotype (normal and abnormal).
5. Pedigree analysis of some human inherited traits.
6. Experiments on epistatic interactions including test cross and back cross.
7. Experiments on probability and Chi-square test.
8. Study on sex linked inheritance in Drosophila.

PAPER- XIII

Molecular Biology

Programme Outcome:

・ Detailed information on DNA structure, different forms, their properties and types of RNA.・

・ Understanding mechanism of DNA replication and repair in prokaryotes and eukaryotes.・

・ Gain knowledge on mechanism of transcription and translation in prokaryotic and eukaryotic cells.・

・ Acquire knowledge on post transcriptional modifications of RNA.・

Course Outcome:

・ Gain knowledge on details of Watson-Crick Model of DNA, RNA types .・

・ Understand the process of DNA replication, transcription, translation and their regulatory mechanisms.

・ Gain knowledge on genetic code & regulatory machinery.・

・ Understand gene expression and role of RNA interference elements.・

Learning Outcome:

・ Gain knowledge on the fundamentals of double helical structure of DNA, denaturation and renaturation kinetics DNA, mechanism of replication and repair of DNA.・

・ Acquire knowledge on process of transcription, translation and post-processing regulatory mechanisms.・

・ Obtain knowledge on splicing mechanism, RNA editing, Processing of rRNA and tRNA.・

・ Understand operon concept and regulation.・

Unit 1: Nucleic Acids, DNA Replication & Repair

Salient features of DNA: Watson and Crick model of DNA, DNA denaturation and renaturation kinetics, Cot curves, C-value paradox, Salient features of RNA

DNA Replication in prokaryotes and eukaryotes: Semi-conservative, bidirectional and semidiscontinuous

replication, Replication of circular and linear ds-DNA and RNA priming,

replication of telomeres.

DNA repair mechanism: Base and nucleotide excision repair in bacteria, Mismatch repair, SOS repair.

Unit 2: Transcription & Translation

Transcription: RNA polymerase and transcription Unit, mechanism of transcription in prokaryotes and eukaryotes, synthesis of rRNA and mRNA, transcription factors and regulation of transcription.

Translation: Genetic code, Degeneracy of the genetic code and Wobble Hypothesis, Process of protein synthesis in prokaryotes: Ribosome structure and assembly in prokaryotes, Fidelity of protein synthesis, Aminoacyl tRNA synthetase and charging of tRNA; Proteins involved in initiation, elongation and termination of polypeptide chain; Inhibitors of protein synthesis; Difference between prokaryotic and eukaryotic translation.

Unit 3: Post Transcriptional Modifications and Processing of Eukaryotic RNA

Structure of globin mRNA; Split genes: concept of introns and exons, splicing mechanism, alternative splicing, exon shuffling, and RNA editing, Processing of rRNA and tRNA.

Unit 4: Gene Regulation &Regulatory RNAs

Transcription regulation in prokaryotes: Principles of transcriptional regulation with examples from Lac-operon and Trp-operon; Transcription regulation in eukaryotes: Activators, repressors, enhancers, silencer elements; Gene silencing, RNA interference, miRNA, si-RNA.

PRACTICAL

Molecular Biology

1. Study of Polytene chromosomes from Chironomous / Drosophila larvae.
2. Preparation of liquid culture medium (LB) and raise culture of E.coli..
3. Estimation of the growth kinetics of E. coli by turbidity method.
4. Preparation of solid culture medium (LB) and growth of E. coli by spreading and streaking.
5. Quantitative estimation of calf thymus DNA using colorimeter (Diphenylamine reagent) or spectrophotometer (A 260 nm measurement).
6. Quantitative estimation of RNA using Orcinol reaction.
7. Study and interpretation of electron micrographs/photograph showing (a) DNA replication, (b) Transcription and (c) Split genes.

SEMESTER-VI

PAPER XIV **Developmental Biology**

(4Credit, Theory-45h and Practical – 30h)

Programme Outcome:

 Understand the phases of development, changes, regulation and the concepts of ageing and teratogenesis.

 Gain knowledge on In- Vitro fertilization and amniocentesis.

Course Outcome:

 Understand the basic concepts of gametogenesis, fertilization and embryogenesis.

 Gain knowledge on interferences in developmental biology.

Learning Outcome:

 Apprise the historical perspectives of Developmental Biology with the basic concepts.

 Understanding of the phases and changes associated with early, late and postembryonic Development

Unit 1: Introduction to Developmental Biology, Gametogenesis & Fertilization

Historical perspective and basic concepts: Phases of development, Cell-Cell interaction, Pattern formation, Differentiation and growth, Differential gene expression, Cytoplasmic determinants and asymmetric cell division. Gametogenesis, Spermatogenesis, Oogenesis; Types of eggs, Egg membranes; Fertilization (External and Internal): Changes in gametes, Blocks to polyspermy.

Unit 2: Early Embryonic Development

Cleavage: Planes and patterns of cleavage, Types of Blastula, Fate maps (including Techniques); Early development of frog and chick up to gastrulation; Embryonic inductionand organizers.

Unit 3: Late Embryonic Development

Fate of Germ Layers; Extra-embryonic membranes in birds; Implantation of embryo in humans, Placenta (Structure, types and functions of placenta).

Unit 4: Post Embryonic Development & Interferences in Developmental Biology

Metamorphosis: Changes, hormonal regulations in amphibians and insects; Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each); Ageing: Concepts and Theories. Teratogenesis: Teratogenic agents and their effects on embryonic development; In vitro fertilization, Stem cell (ESC), Amniocentesis.

Developmental Biology

Practical:

1. Study of whole mounts and sections of developmental stages of frog through permanent slides: Cleavage stages, blastula, gastrula, neurula, tail-bud stage, tadpole (external and internal gill stages).
2. Study of whole mounts of developmental stages of chick through permanent slides: Primitive streak (13 and 18 hours), 21, 24, 28, 33, 36, 48, 72, and 96 hours of incubation (Hamilton and Hamburger stages).
3. Study of the developmental stages and life cycle of Drosophila from stock culture.
4. Study of different sections of placenta (photomicropgraph/slides).
5. Project report on Drosophila culture/chick embryo development.
6. Study of developmental stages by raising chick embryo in the laboratory.
7. Estimation of calcium in egg shell.
8. Estimation of carbohydrates and proteins in egg.

PAPER -XV

Taxonomy and Evolutionary Biology

(4Credit, Theory-45h and Practical – 30h)

Programme Outcome:

- Familiarize learners with concepts of Taxonomy.
- Gain overview of the beginning of life and evolutionary theories.
- Understand various physical forces or stress pressures during evolution.
- Gain knowledge on correlates of epigenetic changes in the cellular footprints of animals and genetic lineages exerted through various physical forces.
- Comprehend the origin of evolution in Hominides with reference to Primates, validate evidence of human origin by molecular and phylogenetic sequence analysis.

Course Outcome:

・ Understand concepts of taxonomy. Obtain knowledge of life initiation and its evolution through the chronological landscape.

・ Know the evolutionary relationship of organisms with response to various physical forces leading to adaptive evolution.

・ Strengthen student’ s analytical approach to evolutionary relationships.

Learning Outcome:

・ Acquisition of knowledge on concepts of taxonomy and species.

・ Acquaint learners with theories of evolution, evidences, and the process of changes over time.

・ Gain knowledge on construction and interpretation of phylogenetic tree in relation to evolution.

Unit 1: Concepts of Taxonomy

Importance & Applications of biosystematics; taxonomic characters, Hierarchy categories; biological classification; Taxonomic procedures: collections, preservation, curetting, identification, Keys; International Code of Zoological Nomenclature (ICZN): operative principles, important rules; Zoological nomenclature; Chemo and sero taxonomy, Cytotaxonomy, Numerical taxonomy, and DNA barcoding. Taxonomic publications: Kinds, Major features of manuscript for publication.

Unit 2: Theories, Evidences of Evolution and Extinction

Life’ s Beginnings: Chemogeny, RNA world, Biogeny, Evolution of eukaryotes. Historical review of evolutionary concept: Lamarckism, Darwinism, Neo-Darwinism. Evidences of Evolution: Fossil record (types of fossils, transitional forms, geological time scale, evolution of horse), Sources of variations: Heritable variations and their role in evolution. Extinctions, Back ground and mass extinctions (causes and effects), detailed example of K-T extinction.

Unit 3: Process of Evolutionary changes

Population genetics: Hardy-Weinberg Law (statement and derivation of equation, application of law to human Population); Evolutionary forces upsetting H-W equilibrium; Natural selection (concept of fitness, selection coefficient, derivation of one

unit of selection for a dominant allele, genetic load, mechanism of working, types of selection, density-dependent selection, heterozygous superiority, kin selection, adaptive resemblances, sexual selection). Genetic Drift (mechanism, founder's effect, bottleneck phenomenon); Role of Migration and Mutation in changing allele frequencies.

Unit 4: Products of evolution, Species concept, Origin and Evolution of man

Micro evolutionary changes (inter-population variations, clines, races, Species concept, Isolating mechanisms, modes of speciation-allopatric, sympatric, Parapatric. Adaptive radiation/ macroevolution (exemplified by Galapagos finches). Origin and evolution of man, Unique hominin characteristics contrasted with primate characteristics, primate phylogeny from Dryopithecus leading to Homo sapiens, molecular analysis of human origin. Phylogenetic trees, multiple sequence alignment, construction and interpretation of phylogenetic trees.

Multi-Disciplinary Course - SEMESTER-II

Paper-II: Apiculture (Zoology)

• Provide knowledge on economic aspects of livestock management.

• Make available information on lucrative facets of animal rearing and goods obtained.

• To familiarize with apiculture features

Course Outcomes

• Foundation through skilled learning for entrepreneurship.

• Acquire skills in developing economically viable ventures using bees.

• To know the basic concepts of beekeeping.

• Discern bee species, understand culture techniques, honey harvesting, and the identification and management of diseases and pests.

• Students will be equipped with practical knowledge that can be immediately applied in the field or even used to start their own beekeeping enterprise

Learning Outcomes

• Gain knowledge of the Biology of Bees, their identification, and social structure.

• Acquire skills in rearing bees and honey extraction.

• Identify pests of bees and their control and eradication.

• Skilled learning for entrepreneurship.

Unit 1:

Biology of Bees: Apis and Non-Apis Bee species and their identification. General Morphology of Apis Honey Bees. Social Organization of Bee Colony.

Unit 2:

Rearing of Bees: Artificial Bee rearing (Apiary), Beehives – Newton and Langstroth box, Bee Pasturage,

Selection of Bee Species for Apiculture, Modern Bee Keeping Equipment, Methods of Extraction of Honey (Indigenous and Modern).

Unit 3:

Diseases and Enemies: Bee Diseases and Enemies, Control and Preventive measures

Unit 4:

Bee Economy and Entrepreneurship: Products of Apiculture Industry and their uses- Honey, Bees Wax, Propolis, Pollen. Bee Keeping Industry – Recent Efforts, Modern Methods in employing artificial Beehives for cross pollination in horticultural gardens.

SARBATI DEVI WOMEN'S COLLEGE, RAJGANGPUR

Skill-Enhancement Course SEMESTER-II
Paper-I:
Personality Development

Description of the Course: This course aims at enhancing personal and professional skills, focusing on areas like communication, self-awarenesSs, leadership, and interpersonal skills, ultimately fostering self-confidence and positive self-image after overcoming shortcomings and limitations contributing to the overall well-being and success.

Course Objectives:

l. To familiarize students with the concept of personality development and its significance in personal and professional life.
2. To enable students to identify and maximize their potentials for a holistic development.
3. To enable the students to apply the personality development insights for professional and personal growth.
Course Outcomes:

On completion of the course, the student will be able to
CO l : Manage interpersonal relationships to promote personal and professional growth.
CO 2: develop and improve communication skills.
CO 3: build a wholesome personality to achieve all round development.

Syllabus: Unit I: Introduction to Personality Development

A. Personality - Meaning, definition, significance and traits of personality; Impact of heredity and environment, Impact of Literature on building Personality

B. Development of Personality — Self-awareness, SWOT analysis, Interpersonal relationships (Freedom, Responsibility and Commitment), Social skills, Etiquettes and manners, effective use of social media and e-gadgets, mental health (overall wellbeing)

Unit II: Personality Development and Professional Growth

A. Attitude — Concept, Significance, factors affecting attitudes, positive and negative attitude

B. Leadership and motivation - Concept, Significance, Internal and external motives, the importance of self-motivation, team management, goal setting (SMART Goals)

Unit III: Skills of Personality Development

A. **I. Soft Skills** — Introduction, Meaning, Time management, stress management, critical thinking, decision making and problem solving, ethical behavior
II. Communication Skills Introduction, Meaning, Purpose of communication, Process of communication, Key elements of communication, Characteristics of effective communication, Verbal communication and Non-verbal communication, body language, Barriers to communication, overcoming barriers, Communication with Family, Friends and colleagues (Improving one's sense of humor, loving, supporting and caring for others, accepting and tolerating differences)

B. **Practical Skills for Personality Development** Listening and Speaking (Phonetics) Application for jobs, E-mail, Resume (CV) writing Note making Seminar Presentation Group Discussion Knowledge of Basic grammar

Paper-II:

Election Studies and Public Opinion

Course Objectives:

• To identifv the scope of Flection Studies as a sub-discipline of Political Science.

• To understand the concept of public opinion and the channels through which they are formulated.

Course Outcomes:

• To Identify the importance of election studies.

• To Evaluate the forums through which public opinion is formulated.

UNIT I: Meaning. significance and Characteristics of Public Opinion: Role in Democracy Conditions necessary for formation of public opinion. Agencies of Public Opinion: Political Parties. Associations, Media, Public Platforms and Civil Society.

UNIT II: Meaning of Electoral Studies, Representation of People's Act 195 1, constituency and the dynamics of political parties in electoral politics.

UNIT III: Composition and Powers of Election Commission in India, State Election Commission, Media and election Election Model Code of Conduct.

UNIT IV: Opinion Polls- exit polls. their impact on electoral result and analysis of electoral data and understand the electoral behaviour.

SEMESTER-V

Paper-V: Quantitative and Logical Thinking

Course Objectives

1. To select and apply appropriate methods to solve real world problems;

2. To interpret quantitative model and understand a variety of methods of communicating them;

3. To improve decision making skills, problem solving skills and setting goals.

Course Outcomes

After completion of the course, learners will be able to

CO1: To apply appropriate methods to solve real world problems,

CO2: To understand various methods to solve the difficulties and communicating thereafter, CO3: To draw conclusion and / or make decisions based on analysis and critique of quantitative information using proportional reasoning.

Unit –I:

Whole numbers, Integers, Rational and irrational numbers, Fractions, Square roots and Cube roots, Surds and Indices, Problems on Numbers, Divisibility; Steps of Long Division Method for Finding Square Roots.

Unit –II:

Basic concepts, Different formulae of Percentage, Profit and Loss, Discount, Simple interest, Ratio and Proportion, Mixture, Time and Work, Pipes and Cisterns, Basic concepts of Time, Distance and Speed; relationship among them **Unit –III:**

Concept of Angles, Different Polygons like triangles, rectangle, square, right-angled triangle, Pythagorean Theorem, Perimeter and Area of Triangles, Rectangles, Circles.

Unit-IV:

Analogy basing on kinds of relationships, Simple Analogy; Pattern and Series of Numbers, Letters,

Figures. Coding-Decoding of Numbers, Letters, Symbols (Figures), Blood Relations. Logical Statements –

Two premise argument, more than two premise argument using connectives; Venn Diagrams, Mirror

Images, Problems on Cubes and Dices.

Skill-Enhancement Course

SEMESTER-VI

Paper-I: Life Skill Education

Course Outcomes (COs):

On completion of this course, the learners will be able to:

COI: Identify career opportunities in consideration of their own potential and aspirations.

C02: Gain self-competency and confidence.

C03: Participate in simulated interview.

C04: Analyse the role of digital literacy in professional life.

C05: Develop interpersonal skills and adopt good leadership behaviour for self-empowerment and the empowerment of others.

C06: Demonstrate a set of practical skills such as time management, self-management, conflicts management, team leadership etc.

C07: Understand the importance of values in individual, social circles, career path and national life.

Course Contents

CO: Familiar with the concept ofLife Skills.

Unit I: Introduction to Life Skills Education.

• Concept, need and objectives of life skills education.

• Recommendations of WHO and UNICEF over the years.

• Four Pillars of Education - Learning to Know, Learning to Do, Learning to Be, Learning to Live Together.

Unit 11: Social Skills

CO: Communicate efficiently and develop good interpersonal skills. CO: Use social digital platforms efficiently.

• Communication skill-types of communication, barriers to communication, strategies for effective communication.

• Interpersonal skills-determinants, maintaining and sustaining a relationship, conflict resolution.

• Digital literacy and social media-digital ethics and cyber security.

Unit Ill: Life Skills for Self-Management and Career Planning

CO: Develop awareness about one 's own self and plan a career accordingly.

Self-awareness-self-concept, self-esteem, time management and empathy.

• Emotional intelligence, social intelligence and spiritual intelligence.

• Choosing a career-sources of career information, preparation of resume, interview facing and group discussion.

Unit IV: Universal Human Values

CO: Understand the importance of values and develop values for life. Truth, love, compassion and non-violence.

• Constitutional values- justice and human rights.

• Understanding happiness and prosperity correctly- a critical appraisal of the current scenario.
Sample Questions

What is meant by Life skills? (l Mark)

• Mention any two life skills as laid down by WHO. (2 Marks, Within 50 words) 44171M

• Define Communication. Discuss strategies for effective communication. (5 Marks, Within 300 words)

• Critically reflect on Four Pillars of Education. (8 Marks, Within 500 to 800 words).

Mode of Course Transaction: Seminar, Team Teaching, Dialogue, Peer-Teaching, Collaborative and Cooperative Learning, Field Trip, Concept Mapping, Self-Learning.

Activities

Each student will be required to prepare and submit a report on any one of the following:

• Prepare a report on the implications of any two pillars of education in developing life skills education in India.

• Examine the opportunities and challenges in application of life skills education and write a report.

Conduct a semi structured interview on parents exploring the challenges of parenting and life skills needed for effective parenting. Compare the gender difference of parenting.

• Conduct Case study on life history of great personalities who contributed towards universal values.

SARBATI DEVI WOMEN'S COLLEGE, RAJGANGPUR

VALUE ADDED COURSES SEMESTER -I
ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT

FULL MARK-100 3CH

Unit 1: Multidisciplinary nature of environmental studies (12 Period)
Definition, scope and importance, Need for public awareness
Environmental Pollution
Definition • Cause, effects and control measures of: -
a) Air pollution
b) Water pollution
c) Soil pollution
d) Marine pollution
e) Noise pollution
f) Radiation pollution

Unit 2: Natural Resources: (12 Period)
Renewable and non-renewable resources:
Natural resources and associated problems.
a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d) Food resources: World food problems, changes caused by agriculture and Overgrazing, effects of modern agriculture, fertilizer-pesticide problems, waterlogging, salinity, case studies.
e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.

Biodiversity: -
Introduction-Definition; Biogeographically classification of India India as a mega diversity nation. Hot sports of biodiversity, Threats to biodiversity. Endangered and endemic species of India. Conservation of biodiversity. In Situ and Ex-so conservation of biodiversity

Unit-3: Disaster Management (12 Period)
1. **Disaster Management:** Types of disasters (natural and Man-made) and their causes and effect)
2. **Vulnerability Assessment and Risk analysis:** Vulnerability to various disasters (Flood, Cyclone, Earthquake, Heat waves, Desertification and Lighting)
3. **Institutional Framework:** Institutional arrangements for disaster management (National Disaster Management Authority (NDMA), State Disaster Management Authority (SDMA), Disaster Management Act, 2005, District Disaster Management Authority (DDMA), National Disaster Response Force(NDRF) and Odisha Disaster Rapid Action Force(ODRAF)
4. Preparedness measures: Disaster Management cycle, Early Warning System, Pre-Disaster and Post-Disaster Preparedness, strengthening of SDMA and DDMA, Community Preparedness for flood cyclone, heat waves, fire safety, lightening and snake biting. Stakeholders participation, Corporate Social Responsibility (CSR)
5. Survival Skills: Survival skills adopted during and after disaster (Flood, Fire, Earthquake, Cyclone and Lightening), Disaster Management Act-2005, Compensation and Insurance

Unit 4: Social Issues and the Environment **(9Period)**

A. a) Environmental Ethics: Issues and possible solutions.
b) Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies
c) Environment Protection Act
d) Air (Preservation Control of Pollution) Act
e) Water (Preservation Control of Pollution) Act
f) Wildlife Protection Act
g) Forest Conservation Act
h) Solid waste management Cause, effect and Control Measure of Urban and Industrial waste (Role of each individual in the conservation of Natural resources and prevention of pollution)

B. **Human Population and the Environment**
Population Ecology: Individuals, species, population, community Human population growth, population control method Urbanisation and its effect on society

Unit 5: Field work **(15 Periods of 30 hrs)**

- Visit to an area to document environmental assets: river/forest/flora/fauna, etc.
- Visit to a local polluted site- Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems-pond, river, Delhi Ridge ,etc.

SEMESTER-III
ETHICS AND VALUES

Credit point: 3 **Total Hours: 45**

COURSE OUTCOME

- Development of a good human being and a responsible citizen
- Developing a sense of right and wrong leading to ethically correct behavior
- Inculcating a positive attitude and healthy work culture
- To equip the students to prepare themselves national and state level civil service and other competitive examination.

COURSE CONTENTS UNIT-I-
ETHICS AND HUMAN INTERFACE **[5 Hours]**

Learning Outcome-

⁾ Understand the basic concept of ethics and its relevance in life

- Ethics and Human Interface: Essence, Determinants and consequence of ethics and human action.
- Dimensions of Ethics in private and public relationship
- Human Values: Tolerance, Compassion, Rationality, Objectivity, Scientific Attitude Integrity, Respecting conscience and Empathy etc.
- Mahatma Gandhi and Ethical Practices: Non-Violence, Truth, Non-hatred and love for all, concern for the poorest, objective Nationalism and Education for man making. Relation between Ends and Means.

Subject Teacher: Philosophy/Political Science or Any other Teacher.

UNIT-II- ETHICS AND MAJOR RELIGIONS AND CIVILIZATIONS **[7 hours]**
Learning Outcome-

⁾ Be familiar with ethical principles and values promoted by major religious traditions and civilization

- Hinduism- Dharma and Mokhya (out of 4 goals of life Dharma, Artha, Kama and Mokhya), Concept of Purusartha, Nisakama Karma(work without attachment to results), Concept of Basudev Kutumba and Peace (Whole world including all animals, plants, inanimate beings and human form one world)
- Ten Commandments: (Christianity and Judaism Tradition)
- Islamic Ethics: Justice, Goodness, Kindness, Forgiveness, Honesty, Purity and Piety
- Egyptian- Justice, Honesty, Fairness, Mercy, Kindness and Generosity
- Mesopotian-Non-indulgence in lying, stealing, defrauding, maliciousness, adultery, coveting possession of others, unworthy ambition, misdemeanors and injurious teaching.
- Buddhism-Arya Astangika Marg: Right View, Thought, Speed, Action, Livelihood, Efforts, Attention and Concentration.
- Jainism-Right faith, knowledge and conduct(Triralna)
- Chinese-Confucianism- Respect for Autonomy, Beneficence, non-maleficence and justice. Taoism: No killing, No stealing, No sexual misconduct, No false Speech and No taking of intoxicants.

Subject Teacher: History/Philosophy/Political Science or Any other Teacher.

UNIT-III- CONSTITUTIONAL VALUES, GOOD CITIZENSHIP, PATRIOTISM AND VOLUNTEERISM [10 Hours]

Learning Outcome

⎫ Students Learns about constitutional values of India, Civic Sense and good Citizenship (both National and International) Patriotism and need for Volunteerism

- Salient Values of Indian Constitution: Sovereign, Socialist, Secular, Democratic, Republic, Justice, Liberty, Equality and Fraternity
- Patriotic values and ingredients of National Building, Examples of great Patriots, Rani Laxmi Bai, Bhagat Singh, Mangal Pandey, Birsa Munda, Laxman Naik, Subhas Chandra Bose and Khudiram Bose.
- Law abiding citizenship
- Concept of Global citizenship in contemporary world
- Volunteerism- concept and facts of Volunteerism, building a better society through Volunteerism, Blood Donation, Social work, Helping the Aged, Promotion of Green Practices and Environment protection.

Subject Teacher: Philosophy/Political Science /History/ or Any other Teacher.

UNIT-IV- WORK ETHICS [6 hours]

Learning Outcome-

⎫ Understand the concept of work ethics, ethics in work place and ethical practices to be adopted by various professionals

- The concept of professionalism.
- Professional ethics at work place
- Core values needed for all professionals. Reliability, Dedication, Discipline, Productivity, Co-operation, Integrity, Responsibility, Efficiency, Professionalism, Honesty, Purity and Time Management, Accountability, Respect Diversity, Gender Sensitivity, Respect for others, Cleanliness, Rational Thinking, Scientific Attitude, Clarity in Thinking. Diligence, cleanliness and Environment Consciousness.
- Codes of conduct for Students (both in College and Hostels), Teachers, Business professional, Doctors, Lawyers, Scientist, Accountants, IT professionals and Journalist.
- Practical ethics in day to day life

Subject Teacher: Commerce/Philosophy/Education/History/ or Any other Teacher.

UNIT-V-ETHICS AND SCIENCE AND TECHNOLOGY [7 Hours]

Learning Outcome-

⎫ Understand how Science is related to ethics and values has ethical implications.

- Ethics of Science and Technology. Are science and Technology ethically neutral? Are Science and Technology Value Free?
- Ethics of scientific Research, Innovation and Technology
- Ethics of Social Media, Modern Gadgets
- AI and Ethics

Subject Teacher: Philosophy or Any Science Teacher

UNIT-VI- ETHICS AND VULNERABLE SECTIONS OF SOCIETY [10 hours]

Learning Outcome-

⎫ Understand how various vulnerable sections of our society are treated unequally and what needs to be done to address their inequality

⎫ Understand dimensions of substance abuse

1. **Women and family**-Gendered practices in the family, marriages (dowry, child marriage, women's consent).
   Women and work- women's work at home and at work place, pay gap, gendered roles, harassment at work place and working women and role conflict.
   Women and Society- Gender sensitive language, property right, marriagedivorce/Separation and women's right; violence against women

2. Issues Relating to Children: Nutrition and health, Child Exploitation: Child labour ,trafficking, sexual exploitation

3. Issues Relating to Elderly Persons: Abuse of Elders, Financial insecurity, Loneliness and Social insecurity, Health Care Issues, Needs for a happy and Dignified Ageing

4. Issues Relating to persons with disability: Rights of PWD, affirmative action, prevention of discrimination, providing equal opportunity, various scheme for empowering PWD and social justice for PWD.

5. Issues Relating to Third Gender: Understanding LGBTQ, Social justice for them, Removal of discrimination, Affirmative action and Acceptance of diversity of gender

Subject Teacher: Sociology/political Science /Anthropology or Any Science Teacher

SEMESTER-V

UNDERSTANDING ODISHA

Credit point: 3 **Full mark -100** **Total Hours: 45**

COURSE OUTCOME

• To familiarize the students with Odisha, its history, linguistic heritage, religion, culture, literature, geographic features, tribes and their culture, dance and music and contemporary features.

• To enable the students to develop an informed perspective about their land, people, their past and present and the challenge they face.

• To enable the students to face competitive examinations for jobs under Govt. of Odisha

COURSE CONTENTS

Unit- I ODISHA'S PHYSICAL AND HUMAN GEOGRAPHY [9 hours]

Learning Outcome:

• Familiar with the physiography, drainage, climate and forests in Odisha

• Physiography, Drainage systems, Climate, natural vegetation

• Major Industries and Minerals in Odisha : Iron Ore, Coal, Bauxite and Chromite

• Steel and Aluminum industries

• Growth and distribution of population

Unit- II AN OUTLINE OF POLITICAL HISTORY OF ODISHA [9 hours]

• Learning Outcome : To enable the students to familiarize themselves with the chronology of Political History , formation of Odisha in modern days and freedom movement

• Ashoka and Kharavela

• An outline of Dynastic History of Odisha: Bhaumkaras, Somavamsies, Gangas and Gagapatis

• Odisha under Mughals and Marathas

• Movement for Separate Province of Odisha and freedom struggles Odisha

UNIT- III AN INTRODUCTION TO ODISHA'S CULTURE AND HERITAGE [9 hours]

Learning Outcome :

• Understand Essence of Odisha's Culture, Art, Architecture, Dance , Music, Religion, and Literature

• Temple Architecture in Odisha

• History of Odia Literature from ancient period to independence including Bhakti Literature, Development of Odia Script

• Dance and Music : Odissi, Gotipua, Chhau, and Folk

• Religion in Odisha: Shaivism, Vaishnavism and Neo-Vaishnavism(Chaitanya),Shakti cult, Jagannath Culture, Islam and Christianity in Odisha

• Odisha Cuisine

• Major Festival of Odisha

UNIT- IV TRIBES OF ODISHA [9 hours]

Learning Outcome: Odisha has a large concentration of Tribal Population; students would develop an understanding of their culture, and develop an appreciation at their ways of life.

• Essentials of 62 Tribes of Odisha: Major Tribes and PVTs, festivals, beliefs, art and craft

UNIT- V CONTEMPORARY ODISHA **[9 hours]**

Learning Outcome: To be cognizant of contemporary Odisha

- Districts of Odisha – An Outline
- Education – Primary, Secondary, Higher education including Technical.
- Tourism in Odisha including Eco-tourism
- Industry, Agriculture, Public Health, Service Sector (including IT)

SEMESTSER-VI

CREATIVE WRITING

Credit point: 3 **Full mark -100** **Total Hours: 45**

Course Objective:

The course aims to provide students with the foundational skills, techniques, and creative processes necessary for expressing themselves effectively through various forms of media writing. Through a combination of theoretical study, practical exercises, and workshop-style feedback sessions, students will explore the craft of creative writing across genres such as fiction, and creative nonfiction. This course also aims to foster creativity, critical thinking, and self-expression while equipping students with the tools and confidence to pursue further writing endeavours.

Unit I Basics of creative writing, Principles of good writing, Various formats of writing, differentiate between journalistic and creative writing, Characteristics of media writings, Drafting and revising.

Unit II Various formats of news writing, writing features, writing articles, writing editorials, columns, middle, letter to editor, writing film reviews, Writing book reviews.

Unit III Basics of radio writing, Radio talks, radio features, Basic of television writing, Writing for fictional and non-fictional programme.

Unit IV Writing for web: characteristics of web writing, technical writing, blogs, online journalism, restrictions on publications, ethics and responsibility, Practical writing exercises-anecdotes, news story, features, captions, headlines, copywriting, reviews, press release.

List of Practical's:

1. Writing feature articles exploring human interest stories, profiles, or in-depth analyses on specific topics.
2. Writing editorial expressing personal viewpoints on current events or any social issues.
3. Writing columns on specialized topics or areas of expertise.
4. Composing letters to the editor addressing community concerns or responding to published articles.
5. Writing film reviews and book reviews analysing plot, character development, themes, and overall impact.
6. Crafting radio scripts for various formats such as radio talks, interviews, radio features.
7. Developing scripts for Television News Programs.
8. Writing content for websites, blogs, and online publications.