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NAME OF COURSE (SUBJECT): COMPUTER SCIENCE PROGRAMME

Specific Outcome (PSO): On completion of the 03/ 04 years Degree in Computer Science students will be able to:

PSO 1 : Understand basic concepts involved in computing.

PSO 2 : Apply the knowledge in computer techniques to solve real world problems.

PSO 3 : Think of new approaches for solving problems in different domains.

PSO 4 : Follow ethics in designing software with team members.

PSO 5 : Develop research oriented skills

PSO 6 : Understand good lab practices

COURSE OUTCOME (CO):

B.SC. SEMESTER – I

Discipline Specific Course (DSC)

Title of the Course (Theory): PROBLEM SOLVING TECHNIQUES AND ALGORITHMS

CO 1 : Familiarize with fundamental concepts and computer programming.

CO 2 : Learn fundamental concepts of programming by developing and executing programs in C.

CO 3 : Focuses on the structured program.

CO 4 : Various constructs and their syntax.

Course No.1 (Practical):

Title of the Course (Practical): ALGORITHM LAB

CO 1 : Understand the basics of programming by executing the simple programming

CO 2 : Be able to design & execution of code.

CO 3 : Have practical knowledge of arrays, strings & functions

OEC-1: Title of the Course : FUNDAMENTALS OF COMPUTER CONCEPTS

CO 1 : Understanding the basic concepts Computer.

CO 2 : Paperless environment.

CO 3 : To develop word processor abilities of students.

CO 4 : To develop numerical abilities of students using electronic spread sheet.

CO 5 : To acquire practical skills related to Presentation Software

SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: FUNDAMENTALS OF DIGITAL LOGIC

CO 1 : To teach the basics involved in data representation and digital logic circuit.

CO 2 : It includes the general concept in digital logic design.

CO 3 : To make better understanding of logic used in combinational circuit design.

B.SC. SEMESTER – II

Discipline Specific Course (DSC)

Course No.2 (Practical): Title of the Course (Practical): DATA STRUCTURES LAB

CO 1 : Be able to design & implement list data structure using i. Stack & Queue ii. Linked list iii. Singly & doubly linked list

CO 2 : Design & implement searching and sorting by applying various operations.

CO 3 : Design & implement basic operation on trees.

OEC-2:

Title of the Course : FUNDAMENTALS OF COMPUTER NETWORK AND MOBILE COMMUNICATIONS

CO 1 : Understand broad range of computer networks and data communication technology.

CO 2 : Introducing basic knowledge, basic communication fundamentals.

CO 3 : Understand the network models such as OSI and TCP/IP.

CO 4 : Understand cellular and satellite networks.

B.SC. SEMESTER – III

Discipline Specific Course (DSC)

Course No.3 (Theory): TITLE OF THE COURSE: OBJECT ORIENTED PROGRAMMING USING JAVA

CO 1: Explain the object-orieted concepts using JAVA.

CO 2: Write JAVA programs using OOP concepts like Abstraction, Encapsulation, Inheritance and Polymorphism.

CO 3: Implement Classes and multithreading using JAVA.

CO 4: Demonstrate the basic principles of creating Java applications with GUI.

Discipline Specific Course (DSC)

Course No.3 (Practical): Title of the Course: JAVA LAB

CO 1: Student would be able to implement OOP's concepts using JAVA.

Open Elective Course (OEC-3) (OEC for other students)

OEC-3 : Title of the Course : Python Programming Concepts

CO 1: Explain the fundamentals of Computers.

CO 2: Explain the basic concepts of Python Programming.

CO 3: Demonstrate proficiency in the handling of loops and the creation of functions.

CO 4: Identify the methods to create and store strings.

Skill Enhancement Course (SEC)-II

Title of the Paper: ARTIFICIAL INTELLIGENCE (MODEL-2)

CO 1: Appraise the theory of Artificial intelligence and list the significance of AI.

CO 2: Discuss the various components that are involved in solving an AI problem.

CO 3: Illustrate the working of AI Algorithms in the given contrast.

CO 4: Analyze the various knowledge representation schemes, Reasoning and Learning techniques of AI.

CO 5: Apply the AI concepts to build an expert system to solve the real-world problems.

B.SC. SEMESTER – IV

Discipline Specific Course (DSC)

Course No.4 (Theory): Title of the Course: DATABASE MANAGEMENT SYSTEMS

CO 1: Explain the various database concepts and the need for database systems.

CO 2: Identify and define database objects, enforce integrity constraints on a database using DBMS.

CO 3: Demonstrate a Data model and Schemas in RDBMS.

CO 4: Identify entities and relationships and draw ER diagram for a given real-world problem.

CO 5: Convert an ER diagram to a database schema and deduce it to the desired normal form.

CO 6: Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.

CO 7: Explain the transaction processing and concurrency control techniques.

Discipline Specific Course (DSC)

Course No.3 (Practical): Title of the Course: DATABASE MANAGEMENT SYSTEMS LAB

CO: Student would be able to create a tables, execute queries and PL/SQL programs.

Open Elective Course (OEC-4)

OEC-4 : Title of the Course : ELECTRONIC COMMERCE

CO 1: Compare how internet and other information technologies support business processes.

CO2: Demonstrate an overall perspective of the importance of application of internet technologies in business administration

CO 3: Explain the basic business management concepts.

CO 4: Demonstrate the basic technical concepts relating to E-Commerce.

CO 5: Identify the security issues, threats and challenges of E-Commerce.

NAME OF COURSE (SUBJECT): GEOGRAPHY PROGRAMME

Specific Outcome (PSO): On completion of the 03/ 04 years Degree in Geography students will be able to:

PSO 1 : Enrich the knowledge of understanding the relevant terms and concept of geography including definitions.

PSO 2 : Enhanced the capability to explain the relevant principles, theories and models in geography.

PSO 3 : Conceptual clarity about the relationship between the man and environment to understand the process, factors and impact.

PSO 4 : Know the complex and interactive nature of physical and human environments and changing Process.

PSO 5 : Enhance the skills in Map Making and Cartographical Principles.

PSO 6 : Use of Geographical data to identify the trends and patterns and demonstrate through the maps of spatio-temporal changes.

PSO 7 : Demonstrate the skill of analysis of geographical information, evidences and cause and effects.

PSO 8 : Trace the trends and process of changes of physical and cultural aspects.

PSO 9 : Develop the consciousness of relevance of geography to understand and solving the contemporary environmental issues.

PSO 10: Exposer in the handling the spatial and non-spatial data through Remote Sensing and GIS.

COURSE OUTCOME (CO):

B.SC. SEMESTER – I

Discipline Specific Course (DSC)

Course No.1 (Theory): Title of the Course (Theory): PRINCIPLES OF GEOMORPHOLOGY

Course Outcome (CO): After completion of course (Theory), students will be able to:

CO 1 : To Define the Geomorphology and to explain the essential principles of it.

CO 2 : To outline the mechanism of dynamic nature of the Earth's surface and interior of the Earth. CO 3 : To illustrate and explain the forces affecting the crust of the earth and its effect on it.

CO 4 : To understand the conceptual and dynamic aspects of landform development

CO 5 : To understand the principles of geomorphology thoroughly and explain them.

Course No.1 (Practical):

Title of the Course (Practical): MORPHOLOGICAL ANALYSIS

CO 1 : To identify the different types of minerals through their characteristics.

CO 2 : To interpret the topographical maps extracted the geomorphic information.

CO 3 : To illustrate the slope analysis and prepare the Hypsometric curve and integral

CO 4 : To delineate the watershed area, stream ordering, drainage density and drainage frequency. CO 5 : Analyze the morphological analysis of any geographical space.

OEC-1:

Title of the Course: INTRODUCTION TO PHYSICAL GEOGRAPHY

CO 1 : To define the Physical Geography, the shape and size of the earth surface.

CO 2 : To identify the different types of rocks and their characteristics and agents of denudation.

CO 3 : To discuss the nature of structure and composition of Atmosphere.

CO 4 : To discuss the ocean floor and marine resources.

CO 5 : To analyse the physical geography of any geographical regions.

Subject: Geography SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: GEOGRAPHICAL STATISTICS

CO 1 : To define statistics and enable to use for analysis.

CO 2 : To handle the data collection, tabulation and sampling.

CO 3 : To enable the calculations of mean, median and mode.

CO 4 : To enable the calculations of mean, median and mode.

B.SC. SEMESTER – II

Course No.2 (Theory):

Title of the Course (Theory): PRINCIPLES OF CLIMATOLOGY

CO 1 : To define the field of climatologyand to understand the atmospheric compositionand structure.

CO 2 : To outline the mechanism and process of solar radiation transfer to earth surface and to ex- plain the temperature distribution and variation according to time and space.

CO 3 : To illustrate and explain the air pressure system, wind regulating forces and the formation of the Atmospheric Disturbance.

CO 4 : To understand and compute the air humidity as well as to explain the process of Condensation and formation of precipitation and its types.

CO 5 : To understand the principles of climatology and explain in detail.

Discipline Specific Course (DSC) Course No.-2 (Practical)

Title of the Course (Practical) : WEATHER ANALYSIS

CO 1 : To understand the structure and functions of the Indian Meteorological Department.

CO 2 : To plot the temperature data using graphical methods.

CO 3 : To handle the instruments to measure the temperature and pressure.

CO 4 : To Use the wet and dray Bulb thermometer for measuring humidity.

CO 5 : To interprete the daily weather map seasonally.

Open Elective Course (OEC-2)

Title of the Course: Basics of Natural Disasters

CO 1 : To define the natural disasters related to Lithosphere.

CO 2 : To identify the different types of atmospheric disasters and their impact.

CO 3 : To identify the different types of atmospheric disasters and their impact.

CO 4 : To define the biospheric disasters and their impact.

B.SC. SEMESTER – III

Title of the Course: DSC. T- 3.

Human Geography: 033GEO011

CO 1 To learn how human and physical components of the world interact.

CO2 To familiarized with economic processes such as globalization, trade and their impacts on economic, cultural and social activities.

CO3 To describe what geography and human geography are.

CO4 To Understand population dynamics and migration.

Title of the Course: DSC.P- 3

TECHNIQUES IN HUMAN GEOGRAPHY: 033GEO012

CO1 To learn how human, physical, and environmental components of the world interact.

CO2 To familiarized with economic processes such as globalization, trade and their impacts on economic, cultural and social activities.

CO3 To describe geography and human geography in an effective manner.

CO4 To Understand population dynamics and migration.

Title of the Course: OE 3

GEOGRAPHY OF INDIA: 003GEO051

CO1 To describe the holistic approach about the geography of India

CO2 To interpret and apply the concepts on resource distribution of India and related economic activities. CO3 To demonstrate the economic development through the connectivity of transport and communication.

SEMESTER IV

Title of the Course: DSC.T- 4

REGIONAL GEOGRAPHY OF INDIA: 034GEO011

CO1 To gets exact information regarding mechanism of monsoon and its impact. Interpret and apply the concepts on resource distribution of India and related economic activities.

CO2 To interpret and apply the concepts on resource distribution of India and related economic activities

CO3 To describe the locational characteristics of an industry.

CO4 To demonstrate the economic development through the connectivity of transport and communication

Title of the Course:

DSC.P- 4 REPRESENTATIONS OF GEOGRAPHICAL FEATURES OF INDIA: 034GEO012

CO1 To Understanding t h e holistically approach about the geography of India.

CO2 To Interpret and apply the concepts on resource distribution of India and related economic activities.

CO3 To Demonstrate the economic development through the connectivity of transport and communication CO4 To represent the data in the form of maps and diagrams.

Title of the Course: OE- 4

GEOGRAPHY OF KARNATAKA: 004GEO051

CO1 To Understand the site and situation of Karnataka.

CO2 To intellectual connect to the resources and economic activities of Karnataka

CO3 To Assess the demographic composition of Karnataka State.

RUG02E08DSE-I: REGIONAL GEOGRAPHY OF INDIA

C01: Students gain both physical and economic regional geographical knowledge about Indian subcontinent with special reference to this course is important in view of competitive examinations.

C02: This course introduces the physical and economic Resources of India, its policies

UG02E08DSE-II: GEOGRAPHY OF SETTLEMENT

C01: This course builds ideas about the evolution of settlements i.e. Rural and Urban settlements, their morphological aspects, hierarchy, issues and policies etc.

C02: Study of settlements enables the students to play an important role in settlements planning process.

PRACTICAL: BASIC STATISTICS

C01: Students learn about data collection, tabulation, analyse, interpret and present the data in an easy to understand format through statistical methods.

C02: Students gain the basic Quantitative skill like measures of central tendency and dispersion needed to ensure proper understanding of various phenomenon.

UG02E08SEC-I: REGIONAL PLANNING AND DEVELOPMENT

C01: Students learn about the principles and practice of regional planning, its issues, types, strategy. Policies for backward and tribal area development etc.

C02: This course develops a skill in the students for decision making, preparing a suitable regional plan for grass root level, national / regional levels developments.

UG02E08SEC-II: QUANTITATIVE TECHNIQUES IN GEOGRAPHY

C01: Students learn about the specific quantitative techniques used for measurement of various geographical phenomenons such as settlement pattern, rank, hierarchy, crop concentration / combination, goods flow, direction, influence, settlement functions etc.

C02: This course enables the students to be capable of measuring the Geographical phenomenon mathematically and more precisely.

SEMESTER V

RUG02F08DSE-I: ECONOMIC GEOGRAPHY OF WORLD

C01: Students gain both physical and economic regional geographical knowledge about world with special reference to this course is important in view of competitive examinations.

C02: This course introduces the physical and economic Resources of world, its policies

UG02F08DSE-II: POPULATION GEOGRAPHY

C01: Students learn about the population dynamics such as spatial pattern of distribution, density, growth trends, age, sex ratio and migration patterns etc.

C02: This course enables the students to understand the distribution and redistribution of population in spatial context and helps to make policy decision for population resource development.

SEMESTER VI

PRACTICAL: FIELD BASED PROJECT REPORT

C01: Students learn about the identification of regional problems and how to observe the fields, collect the data and its analysis presentation in the form of dissertation.

C02: This practical course gives an experience or exposure to the students to prepare project reports on various problems in a systematic scientific manner.

UG02F08SEC-I: BASICS OF REMOTE SENSING

C01: Students learn about the aerial and satellite remote sensing Techniques, principles and interpretation of imageries.

C02: This course enables the students to undertake the surveying of areas and demarcation of different regions for planning purpose.

UG02F08SEC-II: NATURAL AND MAN INDUCED HAZARDS

C01: Students learn about the factors, consequences and management of Natural Hazards as well as human induced hazards.

C02: Students gain the knowledge about disaster risk management, mitigation methods, Rescue operations, survival skills and Rehabilitation planning.

NAME OF COURSE (SUBJECT):B.SC., (BASICS/HONS) BIOTECHNOLOGY

Programme Specific Outcome (PSO): On completion of the 03/ 04 years Degree in B.Sc., (Basics/Hons) students will be able to:

PSO 1 : Understanding concepts of Biotechnology and demonstrate interdisciplinary skills acquired in cell biology, genetics, biochemistry, microbiology, and molecular biology

PSO 2 : Demonstrating the Laboratory skills in cell biology, basic and applied microbiology with an emphasis on technological aspects

PSO 3 : Competent to apply the knowledge and skills gained in the fields of Plant biotechnology, animal biotechnology and microbial technology in pharma, food, agriculture, beverages, herbal and nutraceutical industries.

PSO 4 : Critically analyze the environmental issues and apply the biotechnology knowledge gained for conserving the environment and resolving the problems.

PSO 5 : Demonstrate comprehensive innovations and skills in the fields of biomolecules, cell and organelles, molecular biology, bioprocess engineering and genetic engineering of plants, microbes, and animals with respect to applications for human welfare.

PSO 6 : Apply knowledge and skills of immunology, bioinformatics, computational modelling of proteins, drug design and simulations to test the models and aid in drug discovery.;

PSO 7 : Critically analyze, interpret data, and apply tools of bioinformatics and multi omics in various sectors of biotechnology including health and Food.

PSO 8 : Demonstrate communication skills, scientific writing, data collection and interpretation abilities in all the fields of biotechnology. Demonstrate entrepreneurship abilities, innovative thinking, planning, and setting up small-scale enterprises or CROs.

COURSE OUTCOME (CO):

B.SC. SEMESTER – I

Discipline Specific Course (DSC)

Course No.1 (Theory):

Title of the Course (Theory): FUNDAMENTALS OF BIOTECHNOLOGY

CO 1 : Understanding concepts of Biotechnology and demonstrate interdisciplinary skills acquired in cell biology, genetics, biochemistry, microbiology, and molecular biology

CO 2 : Understanding of basic structure of cell and its functions

CO 3: Understanding of basic of genetic s and it application in basic biology.

Course No.1 (Practical):

Title of the Course (Practical): FUNDAMENTALS OF BIOTECHNOLOGY

CO 1 : Learning and practicing the Laboratory skills in cell biology, basic and applied microbiology with an emphasis on technological aspects

CO 2 : Learning and practicing the concepts of Biotechnology and practical skills in interdisciplinary skills acquired in cell biology, genetics, biochemistry, microbiology, and molecular biology.

OEC-1:

Title of the Course: BIOTECHNOLOGY FOR HUMAN WELFARE

CO 1 :Understanding importance of Genetic engineering in Industry and bio-therapeutic proteins

CO 2 :Applications of molecular Genetics in Forensic science to solve criminal cases by DNA analysis

B.SC. SEMESTER – II

Subject: Biotechnology Discipline Specific Course (DSC)

Course No.2 (Theory):

Title of the Course (Theory): MICROBIOLOGICAL METHODS

CO 1 : Understanding of Microbes and their handling , culture methods, etc.,

CO 2 : Learning of various methods for identification of microbes.

CO 3 : Microbiological diseases from bacteria, fungi and virus, its pathological significance

Course No.2 (Practical):

Title of the Course (Practical): MICROBIOLOGICAL METHODS

CO 1 : Understanding of Microbes and their handling , culture methods, etc.,

CO 2 : Understand and identification of methods for microbes.

CO 3 : Analyze microbial diseases from bacteria, fungi and virus, its pathological significance

OEC-2:

Title of the Course: APPLICATIONS OF BIOTECHNOLOGY IN AGRICULTURE

CO 1 : Competent to apply the knowledge and skills gained in the fields of Plant biotechnology, in pharma, agriculture, herbal and nutraceutical industries.

CO 2 : Application of Bio based nutrient and growth promoters for agriculture yields.

B.SC. SEMESTER–III

Subject: Biotechnology Discipline Specific Course (DSCC) Course No.BIT103T

Title of the Course: BIOMOLECULES (THEORY)

CO1: Describe the structure and function of biomolecules

CO 2:Appreciate and illustrate the chemical composition of the genetic material and its multiplication

CO 3: Describe the process of gene expression in prokaryotes and eukaryotes

CO 4: Explain the concept of transposition, mutation and DNA repair mechanism

Discipline Specific Course (DSCC) Course No.-BIT1033P

Title of the Course: BIOMOLECULES (PRACTICAL)

CO1: Acquire knowledge about biomolecules, structure, and their functions

CO2: Will be able to demonstrate the skills to perform bioanalytical techniques

CO3: Apply comprehensive innovation and skills of biomolecules to biotechnology field

Open Elective Course (OEC) (OEC for other students)

Course No.: BIT103E Title of the Course: Nutrition and Health (Elective Theory)

CO1:Study the concepts of food, nutrition, diet and health

CO2:To apply the best practices of food intake and dietary requirements

CO3:Acquire knowledge about various sources of nutrients and good Cooking practices

B.SC. SEMESTER–IV

Subject: Biotechnology Discipline Specific Course (DSCC)

Title of the Course: MOLECULAR BIOLOGY (THEORY)

CO1: Study the advancements in molecular biology with latest trends

CO2: Will acquire the knowledge of structure, functional relationship of proteins and nucleic acids

CO3: Aware about the basic cellular processes such as transcription, translation, DNA replication and repair mechanisms.

Subject: Genetics Discipline Specific Course (DSCC)

Course No: BIT104P Course Name: MOLECULAR BIOLOGY (PRACTICAL)

CO 1 :Understand the techniques of nucleic acid estimation techniques

CO 2 :Perform extraction, purification of proteins and its molecular weight detection

CO 3 :Learn the process of reproduction in bacteria

CO 4 : Understand nucleic acid replication and its types

Subject: Biotechnology Open Elective Course (OEC for other students)

Course No.:BIT104E Title of the Course: INTELLECTUAL PROPERTY RIGHTS

CO 1 :Knowledge about need and scope of Intellectual property rights

CO 2 :Acquire knowledge about filing patents, process, and infringement

CO 3 :Knowledge about trademarks, industrial designs, and copyright

NAME OF COURSE (SUBJECT): BOTANY

BOTANY Programme Specific Outcome (PSO):

PSO 1: Skill development for the proper description using botanical terms, identification, naming, and classification of life forms especially plants and microbes.

PSO 2: Acquisition of knowledge on the structure, life cycle, and life processes that exist among plant and microbial diversity through certain model organism studies.

PSO 3: Understanding of various interactions that exist among plants and microbes; to develop the curiosity on the dynamicity of nature.

PSO 4: Ability to explain the diversity and evolution based on the empirical evidence in morphology, anatomy, embryology, physiology, biochemistry, molecular biology, and life history.

PSO 5: Skill development for the collection, preservation, and recording of information after observation and analysis- from simple illustration to molecular database development.

PSO 6: Making aware of the scientific and technological advancements- Information and Communication, Biotechnology, and Molecular Biology for further learning and research in all branches of Botany.

PSO 7: To enable the graduates to prepare for national as well as international level competitive examinations like UGC-CSIR, UPSC, KPSC, and others.

PSO 8: To enable the students for practicing the best teaching pedagogy as a biology teacher including the latest digital modules.

PSO 9: The graduates should be knowledgeable and competent enough to appropriately deliver on aspects of global importance like climate change, SDGs, green technologies, etc at the right opportunity.

PSO 10: The graduate should be able to demonstrate sufficient proficiency in the hands-on experimental techniques for their area of specialization within biology during research and their professional career

COURSE OUTCOME (CO):

B.SC. SEMESTER – I

Discipline-Specific Course (DSC)

Course No.1 (Theory):

Title of the Course (Theory): FUNGI, MICROBIOLOGY AND PLANT PATHOLOGY

CO 1: Develop an understanding of the concept of microbial nutrition, Classify viruses based on their characteristics and structures.

CO 2: Develop a critical understanding of plant diseases and their remediation. Examine the general characteristics of bacteria and their cell reproduction/recombination.

CO 3: Increase the awareness and appreciation of human-friendly viruses, bacteria, algae, and their economic importance. Identify true fungi and demonstrate the principles and application of plant pathology in the control of plant disease.

CO 4: Demonstrate skills in laboratory, field, and glasshouse work related to mycology and plant pathology.

CO 5: Develop an understanding of microbes, fungi, and lichens and appreciate their adaptive strategies Identify the common plant diseases according to geographical locations and device control measures. Conduct experiments using skills appropriate to subdivisions.

Course No.1 (Practical):

Title of the Course (Practical): FUNGI, MICROBIOLOGY AND PLANT PATHOLOGY

CO 1: Develop an understanding of the concept of microbial nutrition, Classify viruses based on their characteristics and structures.

CO 2: Develop a critical understanding of plant diseases and their remediation. Examine the general characteristics of bacteria and their cell reproduction/recombination.

CO 3: Increase the awareness and appreciation of human-friendly viruses, bacteria, algae, and their economic importance. Identify true fungi and demonstrate the principles and application of plant pathology in the control of plant disease.

CO 4: Demonstrate skills in laboratory, field, and glasshouse work related to mycology and plant pathology.

CO 5: Develop an understanding of microbes, fungi, and lichens and appreciate their adaptive strategies Identify the common plant diseases according to geographical locations and device control measures. Conduct experiments using skills appropriate to subdivisions.

Subject: Mushroom Cultivation Open Elective Course (OEC-1)

OEC-1: Title of the Course: MUSHROOM CULTIVATION

CO 1 : Identification of various types and categories of mushrooms

CO 2 : Demonstrate various types of mushroom cultivating technologies

CO 3 : Examine various types of food technologies associated with the mushroom industry

CO 4 : Value the economic factors associated with mushroom cultivation

CO 5 : Device new methods and strategies to contribute to mushroom production

Subject: Gardening and landscaping

SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: GARDENING AND LANDSCAPING

CO 1: Apply the basic principles and components of gardening

CO 2: Conceptualize flower arrangement and bio-aesthetic planning

CO 3: Design various types of gardens according to the culture and art of bonsai

CO 4: Establish and maintain special types of gardens for outdoor and indoor landscaping

B.SC. SEMESTER – II

Discipline-Specific Course (DSC)

Course No.2 (Theory):

Title of the Course (Theory): ALGAE, BRYOPHYTES, PTERIDOPHYTES, AND GYMNOSPERMS

CO 1: Demonstrate an understanding of Algae, Bryophytes, Pteridophytes, and Gymnosperms.

CO 2: Develop a critical understanding of morphology, anatomy, and reproduction of Algae, Bryophytes, Pteridophytes, and Gymnosperms.

CO 3: Understanding of plant evolution and their transition to land habitat.

CO 4: Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of Alage, Bryophytes, Pteridophytes, Gymnosperms

CO 5: Economic importance of Alage, Bryophytes, Pteridophytes, Gymnosperms

Course No.2 (Practical):

Title of the Course (Practical): ALGAE, BRYOPHYTES, PTERIDOPHYTES, AND GYMNOSPERMS

CO 1: Demonstrate an understanding of Algae, Bryophytes, Pteridophytes, and Gymnosperms.

CO 2: Develop a critical understanding of morphology, anatomy, and reproduction of Algae, Bryophytes, Pteridophytes, and Gymnosperms.

CO 3: Understanding of plant evolution and their transition to land habitat.

CO 4: Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of Alage, Bryophytes, Pteridophytes, Gymnosperms

CO 5: Economic importance of Alage, Bryophytes, Pteridophytes, Gymnosperms

Subject: Biofertilizers Open Elective Course (OEC-2)

OEC-2: Title of the Course: BIOFERTILIZERS

CO 1: Develop their understanding of the concept of bio-fertilizer

CO 2: Identify the different forms of biofertilizers and their uses

CO 3: Compose the Green manuring and organic fertilizers

CO 4: Develop the integrated management for better crop production by using both nitrogenous and phosphate biofertilizers and vesicular-arbuscular mycorrhizal (VAM).

CO 5: Interpret and explain the components, patterns, and processes of bacteria for growth in crop production

B.SC.: SEMESTER – III

Subject: Botany Theory: Discipline Specific Core Course (DSCC)

Title of the Course and Code: DSSC 033

BOT 011: PLANT ANATOMY AND DEVELOPMENT BIOLOGY

CO 1. Observation of variations that exist in internal structure of various parts of a plant and as well as among different plant groups in support for the evolutionary concept.

CO 2. Skill development for the proper description of internal structure using botanical terms, their identification and further classification.

CO 3. Induction of the enthusiasm on internal structure of locally available plants.

CO 4. Understanding various levels of organization in a plant body with an outlook in the relationship between the structure and function through comparative studies.

CO 5. Observation and classification of the floral variations from the premises of college and house.

CO 6. Understanding the various reproductive methods sub-stages in the life cycle of plants

CO 7. Observation and classification of the embryological variations in angiosperms.

CO 8. Enthusiasm to understand evolution based on the variations in reproduction among plants.

OEC-3 (OEC for other students): 003 BOT 051

Title of the Paper: BOTANICAL GARDEN AND LANDSCAPING

CO 1:Apply the basic principles and components of gardening Conceptualize flower arrangement and bio-aesthetic planning

CO 2: Design various types of gardens according to the culture and art of bonsai

CO 3:Distinguish between formal, informal and free style gardens

CO 4:Establish and maintain special types of gardens for outdoor and indoor land scaping

B.SC.: SEMESTER – IV

Subject: Botany Discipline Specific Core Course (DSCC)

Title of the course (theory): DSSC ECOLOGY AND CONSERVATION BIOLOGY

CO 1:Energy and limiting factors. Know the concepts of productivity, measurements of productivity, food chain, food webs and trophic levels

CO 2:Understand the diversity and characters of major ecosystems – Aquatic (Marine and• Freshwater), Terrestrial and Agricultural ecosystems

CO 3:Know the Concept of biotic community with their Size and structure of biotic communityPhysiognomy, Life-forms, stratification, ecotones and concept of edge-effect.

CO 4:Understand the causes and patterns of ecological succession, concept of climax.

CO 5:Know the Concept of ecological niches, species coexistence, overlapping and niche segregation.

CO 6:Know the concept of Eutrophication, Heavy metal pollution, Ozone depletion, greenhouse effect, Global warming and its effect, Acid rains. Pesticide, particulate and nuclear radiation.

CO 7:Understand the Solid wastes. Noise Pollution. Pest population and its biological control, invasive species and their effects on native species in aquatic and terrestrial ecosystems.

CO 8:Know the Patterns of diversity in a community, Diversity measurement and indices.

CO 9:Understand the Global distribution of organisms, concept of islands, biodiversity hotspots.Methods of conservation of biodiversity.Centers for origin of cultivator plants.

CO 10:Know the population density, Natality and mortality. Life table, population growth curves, carrying capacity.

CO 11:Know the positive and negative interactions among the organisms

Open Elective Course (OEC - 4)

Paper: MEDICINAL PLANTS IN HEALTH CARE Code: OEC-004 BOT 051

CO 1:Recognize the basic medicinal plants Apply techniques of conservation and propagation of medicinal plants.

CO 2:Setup process of harvesting, drying and storage of medicinal herbs

CO 3: Propose new strategies to enhance growth of medicinal herbs considering

CO 4:thepractical issues pertinent to India

B.SC.: SEMESTER – V

PI:CELL AND MOLECULAR BIOLOGY

CO1:Understanding of Cell metabolism, chemical composition, physiochemical and functional organization of organelle

CO2:Contemporary approaches in modern cell and molecular biology.

CO3:To study the organization of cell, cell organelles and biomolecules

CO4:To gain knowledge on the activities in which the diverse macromolecules and microscopic structures inhabiting the cellular world of life are engaged.

CO5:To underst and the various metabolic processes such as respiration, photosynthesis etc. which are important for life.

CO6: To understand the process of cell division, cell replication and protein synthesis through meiosis, mitosis, transcription and translation.

CO7: To gain knowledge on the various technologies and techniques for studying molecular biology

CO8: To study the various genes and their expressions in regulating the cell

PAPER-II: ECONOMIC BOTANY AND BIOTECHNOLOGY

CO1: To get an overview of various plants those are economically important and used in dietary from day to day.

CO2: To understand the origin and distribution of economically important plants

CO3: Student will get to know the botanical terminology, parts used and uses

CO4: To get acquainted with new technologies by using plants for crop improvement

CO5: To get an understanding on various techniques and hands on training in biotechnology

PAPER-III: BIOINFORMATICS

CO1: To understand aim and scope of bioinformatics

CO2: To understand gene sequencing and its applications

CO3: To understand protein 3D structure and motifs

CO4: To create an understand evolutionary trend of any organism

CO5: To make student equipped for designing drugs and crop improvements and microbial genome applications

PAPER-IA: HERBAL TECHNOLOGY

CO1: To aim at increasing student knowledge on medicinal plants, its uses and commercial value

CO2: To understand the importance of secondary metabolites fir its medicinal value in disease resistance

CO3: To get knowledge on development of medicinal plants bank

PAPER-IB: NURSARY AND GARDENING

CO1: To equip students to develop beautiful landscaping

CO2: To understand the equipments and methodologies involved in nursery and gardning

PAPER-IIA: FLORICULTURE

CO1: To get hands of training on developing and maintenance of nurseries, gardens and landscaping of public importance places

CO2: To get commercial knowledge on floriculture

MEDICINAL BOTANY

CO1: To get knowledge of all medicinal plants used in folk medicines

CO2: To understand in situ and ex situ conservation of endemic medicinal plants

B.SC.: SEMESTER – VI

PAPER-I:GENETICS AND PLANTBREEDING

CO1.Understanding the basics of genetics and plant breeding

CO2.Ability to identify, calculate and describe crossing over, allelic generations and frequencies of recombination.

CO3.Interpret the results of mating and pollinations.

CO4.Classify Plant pollination methods

CO5.Recognition of modes of inheritance of traits/ phenotypes and Phenotype –genotype correlation.

PAPER-II: ANALYTICAL TECHNIQUES IN PLANT SCIENCES

CO1: To get understanding on all microscope used in research

CO2: To get understanding on all research instruments and methodology such as centrifugation, chromatography, spectrophotometry, autoradiography

CO3: To get Knowledge on data processing

PAPER-III: RESEARCH METHODOLOGY

CO1: To get Knowledge about research methodologies used in scientific research

CO2: To get hands on training on safety and preparation of lab chemicals

CO3: Maintaining lab records

CO4: To develop skills on scientific writing

PAPER-IA: PLANT DIVERSITY AND HUMAN WELFARE

CO1: To attain knowledge about plant diversity

CO2: To get knowledge about in situ and ex situ conservation of biodiversity

CO3: To understand the role of organizations associated with biodiversity.

CO4: To know the commercial importance of the plant utilization

PAPER-IB: ETHNOBOTANY

CO1: To get an overview of various medicinal plants those are used by ethnic groups and tribals of India

CO2: To get knowledge about methodologies used in etnobotanical studies

CO3: To understand the medicinal plants and the parts of the plant those are medicinally important

PAPER-IIA: MUSHROOM CULTURE TECHNOLOGY

CO1: To get knowledge on medicinal and nutritional values of edible mushrooms

CO2: To get hands on cultivation technology of mushrooms

Co3: To understand food preparation and storage of mushrooms

CO4: To get knowledge about marketing of mushrooms in India and abroad

PAPER-IIB: INTELLECTUAL PROPERTYRIGHTS

CO1: To understand the concept and importance of Intellectual property rights in India

CO2: To get knowledge about processes involved in patent filling, copyrights, trademarks and geographical indications

CO3: To understand the rights and plant protection acts for farmers, plant breeders and researchers

CO4: To understand the importance of novelty.

NAME OF COURSE (SUBJECT):B.SC., (BASICS/HONS) CHEMISTRY

Name of Course (Subject): Chemistry

Programme Specific Outcome (PSO): On completion of the 03/ 04 years Degree in Chemistry students will be able to:

PO 1:Demonstrate, solve and an understanding of major concepts in all the disciplines of chemistry. PO 2:Provide students with broad and balanced knowledge and understanding of key chemical concepts.

PO 3:Understand practical skills so that they can understand and assess risks and work safely and competently in the laboratory.

PO 4:To apply standard methodology to the solutions of problems in chemistry.

PO 5:Provide students with knowledge and skill towards employment or higher education in chemistry or multi-disciplinary areas involving chemistry.

PO 6:Provide students with the ability to plan and carry out experiments independently and assess the significance of outcomes.

PO 7:Develop in students the ability to adapt and apply methodology to the solution of unfamiliar types of problems.

PO 8:Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of chemical reactions.

PO 9:To prepare students effectively for professional employment or research degrees in chemical sciences.

PO 10:To cater to the demands of chemical industries of well-trained graduates.

PO 11:To build confidence in the candidate to be able to work on his own in industry and institution of higher education.

PO 12:To develop an independent and responsible work ethics.

COURSE OUTCOME (CO):

B.SC. SEMESTER – I

Subject: Chemistry Discipline Specific Course (DSC)

Course No.1 (Theory):

Title of the Course (Theory) CHEMISTRY: CHM T-1

CO 1 Describe the dual nature of radiation and matter; dual behaviour of matter and radiation, de Broglie's equations, Heisenberg uncertainty principle and their related problems. Quantum

mechanics. Derivation of Schrodinger's wave equation. Orbital shapes of s, p, d and f atomic orbitals, nodal planes. Electronic configurations of the atoms.

CO 2 Define periodicity, explain the cause of periodicity in properties, classify the elements into four categories according to their electronic configuration. Define atomic radii, ionisation energy, electron affinity and electronegativity, discuss the factors affecting atomic radii, describe the relationship of atomic radii with ionization energy and electron affinity, describe the periodicity in atomic radii, ionization energy, electron affinity and electronegativity.

CO 3 Explain bond properties, electron displacement effects (inductive effect, electrometric effect, resonance effect and Hyper conjugation effect). steric effect and their applications in explaining acidic strength of carboxylic acids, basicity of amines. Understand basic concept of organic reaction mechanism, types of organic reactions, structure, stability and reactivity of reactive intermediates.

CO 4 Describe important characteristics of configurational and conformational isomers. Practice and write conformational isomers of ethane, butane and cyclohexane. Understand the various concepts of geometrical isomerism and optical isomerism. Describe CIP rules to assign E,Z notations and R& S notations. Explain D and L configuration and threo and erythro nomenclature. Explain racemic mixture and racemisation, resolution of racemic mixture through mechanical separation, formation of diastereomers, and biochemical methods, biological significance of chirality.

CO 5 Explain the existence of different states of matter in terms of balance between intermolecular forces and thermal energy of the particles. Explain the laws governing behavior of ideal gases and real gases. Understand cooling effect of gas on adiabatic expansion. Describe the conditions required for liquefaction of gases. Realize that there is continuity in gaseous and liquid state. Explain properties of liquids in terms of intermolecular attractions.

CO 6 Understand principles of titrimetric analysis. Understand principles of different type's titrations. Titration curves for all types of acids – base titrations. Gain knowledge about balancing redox equations, titration curves, theory of redox indicators and applications.

CO 7 Understand titration curves, indicators for precipitation titrations involving silver nitrate-Volhard's and Mohr's methods and their differences. Indicators for EDTA titrations - theory of metal ion indicators. Determination of hardness of water.

Course No.1 (Practical):

Title of the Course (Practical) CHEMISTRY LAB:

CHM P -1: INORGANIC AND ORGANIC CHEMISTRY PRACTICALS

CO1: Understand and practice the calibration of glasswares (burette, pipette, volumetric flask).

CO2: Basic concepts involved in titrimetric analysis, primary standard substances, preparation of standard solutions.

CO3: Explain the principles of acid-base, redox and iodometric titrations.

CO4: Work out the stoichiometric relations based on the reactions involved in the titrimetric analysis.

CO5: Based on principles of titrimetric analysis student can perform

CO6: Describe the significance of organic quantitative analysis.

CO7: Determine the amount of phenol, aniline, amide, ester and formaldehyde in a given solution by performing blank titration and main titrations.

CO8: Determine aspirin in the tablet by hydrolysis method.

Open Elective Course (OEC-1)

OEC-1: Title of the Course CHEMISTRY: CHM

OEC-1 CHEMISTRY IN DAILY LIFE

CO1: Understand the chemical constituents in various day to day materials used by a common man like Tooth paste, Cosmetics, Soaps and detergents and Biomolecules .

CO2: Understand the chemical constituents and applications in Food additives, adulterants and contaminants, Artificial food colorants.

CO3: Understand the scientific reasons in various aspects and chemotherapy and its applications. CO4: Understand the basic constituents and applications in polymers, surface coatings, fertilizers, insecticides and pesticides, chemical explosives etc.

SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: CHM SEC-1 SOIL ANALYSIS

CO1: Acquire skills for Laboratory management and routine analysis of Soil.

CO2: Improve working ability in analytical laboratory.

CO3: Helpful for obtaining jobs in various fields.

CO4: The student can start his own business /laboratory or can associate with any kind of laboratory or associated jobs with confidence.

B.SC. SEMESTER – II

Subject: Chemistry Discipline Specific Course (DSC)

Course No.2 (Theory): Title of the Course (Theory) CHEMISTRY: CHM T-2

CO1: Explain ionic bond, Born Lande equation ,Born Haber cycle and Fajan's rules. State VSEPR theory, hybridisation and shapes of various molecules. Understand the concept of resonance and write resonating structures of NO3 - , CO3 2- and SO4 2- .

CO2: Explain MO Theory and draw the MO diagrams for homonuclear diatomic molecules and ions of 1st and 2 nd periods and heteronuclear diatomic molecules such as CO, NO and NO + . Compare MO and VB theory.

CO3: Learn preparation and reactions of alkanes, alkenes and alkynes. Clear the concept learning mechanism of Free radical mechanism of halogenations of alkanes. Understand the mechanisms of addition reactions of alkenes and alkynes.

CO4: Learn the concept of polymerization, ozonolysis in alkenes and alkynes. Learn acidity of alkynes, formation of metal acetylides and their applications. Explain cycloalkanes and their relative stability. Explain conformational analysis of cyclohexane with Karplus energy diagram. Axial and equatorial bonds. Relative stability of mono substituted cycloalkanes.

CO5: Expected to learn symmetry elements, unit cells, crystal systems. Learn Bravais lattice, types and identification of lattice planes. Explain laws of crystallography - law of constancy of interfacial angles, law of rational indices.

CO6: Miller indices. X–Ray diffraction by crystals, Bragg's law. Structures of NaCl, KCl and CsCl (qualitative treatment only). Explain defects in crystals. Learn the applications of liquid crystals. Learn the concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. 19

CO7: Understand the concept of order and molecularity of a reaction and their applications. Define half–life of a reaction. Explain methods for determination of order of a reaction by half life period and differential equation method. Understand the concept of activation energy and its calculation from Arrhenius equation. Explain theories of reaction rates: Collision theory and activated complex theory of bimolecular reactions.

CO8: Learn principles of gravimetric analysis. Learn the precipitation, mechanism of precipitation, factors influencing precipitation, co-precipitation and post-precipitation. Learn structure, specificity, conditions and applications of organic reagents. Advantages of organic reagents over inorganic reagents.

CO9: Learn about quality of surface water, ground water. Impurities in water, standards of water quality (color, pH, hardness, TDS, sulphate, fluoride, chloride) for potable, domestic, industrial and agricultural purpose. Learn Water treatment technologies – house hold water treatment, municipal water treatment, industrial treatment (primary and secondary treatment of industrial effluent),

softening of water, and disinfection of water. Determinations of DO, BOD and COD, and their significance.

Subject: Chemistry Discipline Specific Course (DSC) Course No.-2 (Practical)

Course No.2 (Practical): Title of the Course (Practical)

CHEMISTRY LAB CHM P- 2 :ANALYTICAL AND PHYSICAL CHEMISTRY PRACTICALES

CO1: Learn regarding errors, types of errors, accuracy, precision, significant figures and standard deviation. To determine the total alkalinity in antacids, Vitamin C in lemon juice/formulations. To determine free alkali present in differentsoaps/detergents. Learn analysis of DO in waste water sample.

CO2: To determine Chemical Oxygen Demand (COD) in waste water sample.

CO3: To determine temporary, permanent and total hardness of water by collecting different samples of water.

CO4: Enable to understand the applications of experiments like methods of determination of viscosity, surface tension, refractive index.

OEC-2:

Title of the Course: CHEMISTRY: CHM OEC-2 MOLECULES OF LIFE

CO1: Acquire knowledge about different types of sugars and their chemical structures. Identify different types of amino acids and determine the structure of peptides.

CO2: Explain the actions of enzymes in our body and interpret enzyme inhibition. Predict action of drugs. Depict the biological importance of oils and fats. Importance of lipids in the metabolism. Differentiate RNA and DNA and their replication. Explain production of energy in our body.

B.SC. SEMESTER – III

DSCC-5 :

Chemistry (Theory) V (Code: 033CHE011)

CO1: Explain free electron theory, physical properties of metals, distinguish between conductors, insulators, extrinsic and intrinsic semi conductors, Appreciate the importance of Hydrogen bond, applications of hydrogen bonding, van der Waals forces and factors affecting the strength and magnitude of van der Waals forces.

CO2 : Explain anomalous properties of lithium, diagonal relationship among elements preparation, uses, structure and bonding in diborane, borazine, boron nitride, carboranes, classification of silicates and their structures,

oxides and oxyacids of nitrogen, oxoacids of phosphorus, sulphur and chlorine, inter halogen compounds and xenon compounds.

CO3: Understand preparation, general mechanism and named reactions of benzene and alkyl benzenes. CO4: Describe theory of orientation, explanation on the basis of stability of sigma complex using electron withdrawing and electron donating groups.

CO5: Understand relative synthesis, mechanisms and reactivities of halogen in alkyl halides, vinyl halides, allyl halides, aryl halides and aryl-alkyl halides.

CO6: Know different methods of synthesis of primary, secondary and tertiary their reactions and mechanisms.

CO7:. Understand different thermodynamic processes, first law of thermodynamics, work done, significance of enthalpy, Joule-Thomson effect and applications Kirchhoff's equation

CO8: Derive Nernst distribution law and under different molecular states.

CO9: Acquaint with the industrial applications of Nernst distribution law.

CO10: Learn the law of chemical equllibrium, Le-Chatelier's principle, relations between Kp, Kc and Kx, ionic equilibria, hydrolysis, pH, common ion effect, solubility and solubility product.

CO11: Understand the principles and processes of metallurgy, extraction of d and f block elements and powder metallurgy.

CO12: Aware of alloys, purpose of making, composition and significance of alloys.

DSCC-6: Chemistry (Practical) - VI (Code: 033CHE012) (Practical) – VI,

CO1: Understand solubility, solubility product, common ion effect, their applications. Physico-chemical principles of separation of cations into groups in qualitative analysis of inorganic salts

CO2: Develop the skill to perform Semi-micro qualitative analysis of mixtures of two simple inorganic salts containing two anions and two cations.

CO3: Able to write the chemical reactions involved in the analysis.

CO4: Study the preparation and mechanism of reactions, recrystallization, determination of melting point and calculation of quantitative yields.

CO5: Prepare the organic compound with bromination, nitration, acetylaton, hydrolysis oxidation and reduction

OEC- 3: Industrial & Environmental Chemistry (Code: 003CHE051)

CO1: Understand minerals, ores, steps in metallurgy, extraction of metals of d & f block elements and powder metallurgy-preparation,

CO2: Appreciate purpose of making, preparation, composition and applications of alloys.

CO3: Explain manufacture of glass, ceramics, Portland cement, chemical composition of cement, setting and hardening of Portland cement, Electroplating of nickel and chromium, Primary and secondary batteries, battery components and their role.

CO4: Explain sources of energy, nuclear fusion/fission, solar energy, hydrogen and geo-thermal energy. CO5: Know air pollutants, control measures of air pollution, photochemical smog, green house effect, global warming and ozone depletion.

CO6: Aware of water pollutants and their sources, industrial effluents and their treatment, sludge disposal, water quality parameters for waste water, industrial water and domestic water, disposal of nuclear waste, nuclear disaster and its management.

B.SC. SEMESTER – IV

DSCC- 7: Chemistry (Theory) - VII (Code: 034CHE011)

CO1: Understand the general characteristics of d and f- block elements with reference to electronic configuration, colors, variable oxidation states, magnetic properties etc., separation of lanthanoids by ionexchange method and preparation of trans-uranic elements (up to Z=103).

CO2: Acquaint with general properties and types of inorganic polymers, silicones and phosphazines.

CO3: Learn Bronsted-Lowry concept, Lux-flood concept, Lewis concept and Usanvich-sandvich concept and their limitations. HSAB concept and its applications.

CO4: Gain knowledge of acidic character, comparative acid strengths of alcohols and phenols and mechanism of named reactions.

CO5: Familiar with Williamson’s ether synthesis, epoxides and Crown Ethers formation and properties

CO6: Understand the synthesis of aldehydes and ketones, their properties, named reactions mechanism. CO7: Appreciate the significance of entropy, second law of thermodynamics, change in entropy and other thermodynamic parameters with respect temperature.

CO8: Know types of adsorption isotherms, types of catalysis and their theories with examples and autocatalysis.

CO9: Know the manufacture, properties and applications of glass and cement.

CO10: Understand types, composition and manufacture of fertilizers.

CO11: Appreciate the paints and pigments formulations, composition and related properties.

CO12: Learn the types, manufacture of soaps, detergents and their cleansing actions.

DSCC-8: Chemistry (Practical) - VIII (Code: 034CHE012)

CO1: Explain regarding errors, types of errors, accuracy, precision, significant figures, standard deviation, and Use of log table

CO2: Determine the percentage of chlorine in bleaching powder, free acidity in ammonium sulphate fertilizer, phosphoric acid in super phosphate fertilizer, calcium in CAN fertilizer/dolomite ore by complexometric method, copper in brass by iodometric method/ calcium in cement by oxalate method. CO3: Understand the effect of acid strength on hydrolysis of methyl acetate using HCl and H2SO4 , for the pseudo first order reaction.

CO4: Determine the change in enthalpy of solution and ionization.

CO5: Learn the concepts of degree of dissociation, adsorption and distribution law.

OEC – 4 : Analytical Chemistry (004CHE051).

CO1: Understand the principle, classification of volumetric analysis, different methods of expression of concentration term, titration curves of all type of acid-base titrations.

CO2: Understand the theory, titration curves, indicators of precipitation and complexometric titration. CO3: Acquaint with steps involved in gravimetric analysis and advantages of organic reagents over inorganic reagents.

CO4: Learn the Composition of soil and the determination of pH of soil samples. Estimation o f Calcium a n d Magnesium in the soil.

CO3: Identify pure and contaminated water, water sampling & water purification methods and water quality measurements.

CO4: Understand the principle, techniques and applications of chromatography, paper chromatography, Gas chromatography and High Performance Liquid Chromatography.

CO5 : Learn the ion-exchange chromatography. Resins, types with examples, mechanism of cation and anion exchange processes and applications of ion-exchange chromatography in softening of hard water, separation of lanthanides and industrial applications.

CO6: Know the solvent extraction method, its types and factors affecting the solvent extraction.

CO7: Make out the nutritional value of food, food processing, food preservation and adulteration.

B.SC. SEMESTER–V

Chemistry: Paper -I (CHT:P-I E)

CO1: Explain Crystal field effect in octahedral and tetrahedral symmetry for weak and strong fields. Factors affecting the magnitude of D. Spectrochemical series. Comparison of CFSE for Oh and Td complexes, Tetragonal distortion of octahedral geometry. Jahn-Teller distortion, Square planar coordination.

CO2: Understand Metal carbonyls: Types, nomenclature, preparation, and properties. 18 electron rule, Structure of mononuclear and binuclear carbonyls using VBT, Preparation and structure of methyl lithium, Zeiss salt and ferrocene and industrial applications of organometallic compounds.

CO3: Understand instrumental technique, methodology and applications of Flame Emission Spectroscopy, Atomic Absorption Spectroscopy, Thermal methods of analysis, Separation techniques.

CO4: Learn the structure and constitution of Carbohydrates, Ring Size determination and properties, Structures of disaccharides and polysaccharides and biological importance.

CO5: Study the classification of amino acids, stereochemistry of amino acids. Zwitterion and explanation to isoelectric point, Synthesis of amino acids and diptides, biological importance, primary, secondary structure of proteins (α-helical, β-sheet).

CO6: Study of mechanism, factor affecting and specificity of enzymatic action, components and structure of nucleic acids, structure of DNA and RNA and its biological roles.

CO7: Explain the spectral distribution of block body radiation, Plank's radiation law, Photoelectric effect, Compton effect.

CO8: Describing Schrödinger's wave equation, wave functions, Eigen function and Eigen values, normalization and orthogonality

CO9: Interpretation of equations of motion, elementary wave motion and operators. Derive expression of Solutions of Schrödinger equations of a free particle, particle in a box.

CO10: Explain the dimensions, degeneracy, reflection and penetration of a particle in a one dimensional box of semi-infinite barrier, a particle in a box of finite walls.

Chemistry: Paper -II (CHT:P-II E)

CO1: Explain Crystal field effect in octahedral and tetrahedral symmetry for weak and strong fields. Factors affecting the magnitude of D. Spectrochemical series. Comparison of CFSE for Oh and Td complexes, Tetragonal distortion of octahedral geometry. Jahn-Teller distortion, Square planar coordination.

CO2: Understand Metal carbonyls: Types, nomenclature, preparation, and properties. 18 electron rule, Structure of mononuclear and binuclear carbonyls using VBT, Preparation and structure of methyl lithium, Zeiss salt and ferrocene and industrial applications of organometallic compounds.

CO3: Explain manufacture and types of glass, ceramics, Portland cement, chemical composition of cement, setting and hardening of Portland cement,

CO4: Explain types and manufacture of fertilizers and alloys, composition of alloys.

CO5: Learn to develop and demonstrate knowledge pertaining to the background and development of Green Chemistry, Learn about green chemistry and its necessity, choice of solvents, atom economy, and sustainable raw materials, about the examples of green reactions and future trends in green reaction.

CO6: Explain the spectral distribution of block body radiation, Plank's radiation law, Photoelectric effect, Compton effect.

CO7: Describing Schrödinger's wave equation, wave functions, Eigen function and Eigen values, normalization and orthogonality

CO8: Interpretation of equations of motion, elementary wave motion and operators.

CO9: Derive expression of Solutions of Schrödinger equations of a free particle, in a box.

CO10: Explain the dimensions, degeneracy, reflection and penetration of a particle in a one dimensional box of semi-infinite barrier, a particle in a box of finite walls.

CHEMISTRY LAB: CHPr: E

CO1: Understanding the techniques of gravimetric determination of Ba as $BaSO_4$, Al as Al_2O_3 and Fe as Fe_2O_3 and complex preparation.

CO2: Understand to apply the knowledge of conductivity, emf, absorbance and critical solution temperature to performing the experiments.

CO3: Acquire skills for handling analytical instruments like potentiometer, conductometer, pH meter & colorimeter.

B.Sc. Semester - VI CHEMISTRY:

Paper-I (CHT: P-I F)

CO1: Understand the Ellingham diagrams for reduction of metal oxides using carbon as reducing agent and different types of metallurgy.

CO2: Apply the knowledge & skills for extraction, purification and uses of metals.

CO3: Understand the Inorganic polymers and their comparision with organic polymers and applications.

CO4: Acquiring knowledge about Role of metal ions present in biological systems with special reference to Na+, K+ and Mg2+ ions: Na/K pump; Role of Mg2+ ions in energy production and chlorophyll.

CO5: Explain the Electromagnetic radiations, electronic transitions, λ_{max} & ε_{max}, chromophore, auxochrome, bathochromic and hypsochromic shifts.

CO6: Apply the knowledge of electronic spectroscopy and Woodward rules for calculating λ_{max} of conjugated dienes- alicyclic homo nuclear and hetero nuclear. cis – trans isomerism, α, β – unsaturated compounds, aldehydes, ketones, carboxylic acids and esters.CO5:

CO7: Understanding the basic principle & theory of Molecular Spectroscopy and their applications for structural elucidations.

CO8: Learnt about the laws of photochemistry, photochemical reactions and dark reactions, photophysical process, photosensitisation and quantum yield.

CO9: Understanding about Role of photochemical reactions in biochemical processes, photo stationary states, chemiluminescence, Fluorescence and phosphorescence.

CO10: Acquire the knowledge about Reversible, Parallel, Consecutive and Chain reactions. Derivations of rate constant for first order parallel, reversible and consecutive reactions. Reaction kinetics of thermal and photochemical Hydrogen – Bromine Reactions.

B.Sc. Semester - VI CHEMISTRY:

Paper-II (CHT:P-II F)

CO1: Understanding Air Pollution, Major regions of atmosphere. Chemical and photochemical reactions in atmosphere. Air pollutants: types, sources, particle size and chemical nature; Photochemical smog: its constituents and photochemistry.

CO2: Reasoning about the Effects of air pollution on living organisms and vegetation. Greenhouse effect and Global warming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and Halogens.

CO3: Understanding about Sources and nature of water pollutants, Techniques for measuring water pollution, Impacts of water pollution on hydrological and ecosystems. Water purification methods.

CO4: Explain the Electromagnetic radiations, electronic transitions, λ_{max} & ε_{max}, chromophore, auxochrome, bathochromic and hypsochromic shifts.

CO5: Apply the knowledge of electronic spectroscopy and Woodward rules for calculating λ_{max} of conjugated dienes- alicyclic homo nuclear and hetero nuclear. cis – trans isomerism, α, β – unsaturated compounds, aldehydes, ketones, carboxylic acids and esters.CO5:

CO6: Understanding the basic principle & theory of Molecular Spectroscopy and their applications for structural elucidations.

CO7: Learnt about different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of Polymers.

CO8: Determine the crystalline melting point and degree of crystallinity. Understanding Morphology of crystalline polymers and Factors affecting crystalline melting point. Nature and structure of polymers-Structure Property relationships.

CO9: Applying the knowledge about determination of molecular weight of polymers (Mn, Mw, etc) by end group analysis, viscometry, light scattering and osmotic pressure methods. Molecular weight distribution and its significance. Polydispersity index.

CO10: Understanding the Physical, thermal, Flow & Mechanical Properties of different properties of polymers. Explain about Micelles

SEMESTER VI

CHEMISTRY LAB: CHPr-F

SET – I: PHYSICAL EXPERIMENTS

CO1: Understand to apply the knowledge of conductivity, emf, for the determination of dissociation constant, solubility & solubility product of sparingly soluble salts. Determinationof pH of the solution and use of Abbe's refractometer for determination of RI.

CO2: Acquire skills for handling analytical instruments like potentiometer, conductometer, pH meter & Abbe's refractometer.

CO3: Understanding about the extraction & calculation of metals from their respective ores. Determination of saponification value of oil or fat & Iodine number.

Name of Course (Subject): Computer Applications Programme

Specific Outcome (PSO): On completion of the 03/ 04 years Degree in BCA students will be able to:

PSO 1 : To provide young men and women with required knowledge and necessary skills to get rewarding careers into the changing world of information technology.

PSO 2 : To provide a foundation of computing principles and business practices for effectively using/managing information systems and enterprise software.

PSO 3 : To specialize in legacy applications, system software or mobile application.

PSO 4 : Think of new approaches for solving problem in different domains.

PSO 5 : To caters the needs of managing the business application.

PSO 6 : Be in a position to develop industrial applications.

COURSE OUTCOME (CO):

BCA SEMESTER – I

Course No.1 (Theory): Title of the Course (Theory) : Introduction to Algorithms

Course Outcome (CO): After completion of course (Theory), students will be able to:

CO 1 : Familiarize with fundamental concepts and computer programming.

CO 2 : Learn fundamental concepts of programming by developing and executing programs in C. CO 3 : Focuses on the structured program.

CO 4 : Various constructs and their syntax.

Subject: Computer Applications Discipline Specific Course (DSC)

Course No.1 (Practical): Title of the Course (Practical) : Algorithm Lab

CO 1 : Understand the basics of programming by executing the simple programming

CO 2 : Be able to design & execution of code.

CO 3 : Have practical knowledge of arrays, strings & functions

Course No.2 (Theory): Title of the Course (Theory) : Introduction to Linux

CO1 : Be familiar with fundamentals of Linux operating system.

CO2 : To learn the concepts of files and file organization.

CO3 : To learn the mechanisms involved in ownership of files and file attributes

CO4 : To gain the knowledge on vi editor and regular expressions

CO 5 : To know the techniques of shell programming.

Course No.2 (Practical): Title of the Course (Practical): Linux Lab

CO 1 : Use basics of fundamental ability which are required again & again on daily basis to work on modern operating system.

CO 2 : Write useful shell scripts, which enhance the usefulness of computers

CO 3 : Understand basics of various OS related concept like files, directories, Kernel etc.,

Open Elective Course (OEC-1)

OEC-1: Title of the Course : STATSTICAL DATA ANALYSIS USING SPSS

CO 1 : To develop data handling ability of students.

CO 2 : To develop diagrammatic representation of the data.

CO 3 : To create awareness of descriptive statistics.

CO 4 : To acquire practical skills related to regression analysis.

SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: FUNDAMENTALS OF DIGITAL LOGIC

CO 1 : To teach the basics involved in data representation and digital logic circuit.

CO 2 : It includes the general concept in digital logic design.

CO 3 : To make better understanding of logic used in combinational circuit design.

BCA SEMESTER – II

Subject: Computer Applications Discipline Specific Course (DSC)

Course No.3 (Theory): Title of the Course (Theory) : DATA STRUCTURES

CO 1 : To impart the basic concepts of data structures and algorithms.

CO 2 : To familiar with data structural algorithms such as sorting & searching, stack & queue, linked list and trees.

CO 3 : To be familiar with some graph algorithms such as binary tree representation of tree and operations on trees.

CO 4 : To understand the basic concepts of tree traversal.

CO 5 : How to use basic data structure for program implementation.

Course No.3 (Practical):

Title of the Course (Practical) : Data Structure Lab

CO 1 : Be able to design & implement list data structure using

i. Stack & Queue

ii. ii. Linked list

iii. iii. Singly & doubly linked list

CO 2 : Design & implement searching and sorting by applying various operations. CO 3 : Design & implement basic operation on trees.

Course No.4 (Theory): Title of the Course (Theory) : DISCRETE MATHEMATICAL STRUCTURE

CO 1 : Define basic concepts of preposition logic and proofs.

CO 2 : Define sets, sequences, sum and summation.

CO 3 : Solve problems using counting techniques.

CO 4 : Solve problems using advance counting technique.

CO 5 : Introduction to induction & recursion and writing algorithms using recursion.

CO 6 : Studying the properties of relations.

CO 7 : Describe the origin of graph theory, illustrate different types of graphs. CO 8 : Categorize trees.

Course No.4 (Practical): Title of the Course (Practical) : DMS Lab

CO 1 : Design & implement quantification & arithmetic series.

CO 2 : Design & implement of sets by applying various operations.

CO 3 : Implement the recursion operation on Factorial, Fibonacci series, tower of Honai, Binary search & Merge sort.

Open Elective Course (OEC-2)

OEC-2: Title of the Course : INTRODUCTION TO FINANCIAL ACCOUNTING USING TALLY

CO 1 : To develop accounting ability of students.

CO 2 : To teach the basics involved in creating book of account, ledgers, voucher system.

CO 3 : To make better understanding of bank reconciliation statement and trail balance.

CO 4 : To explore the basics of stock groups.

CO 5 : To study the preparation of final accounts of trading, loss account and balance sheet.

CO 6 : To make the better understanding of provisions of companies act.

BCA SEMESTER –III

Course No.3 (Theory): Database Management Systems (DBMS) Course Code: 053BCA011

CO 1: Explain the various database concepts and the need for database systems. CO 2: Identify and define database objects, enforce integrity constraints on a database using DBMS.

CO 3: Demonstrate a Data model and Schemas in RDBMS.

CO 4: Identify entities and relationships and draw ER diagram for a given real-world problem.

CO 5: Convert an ER diagram to a database schema and deduce it to the desired normal form.

CO 6: Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.

CO 7: Explain the transaction processing and concurrency control techniques.

Course No.3 (Practical): Database Management Systems (DBMS)

Lab Course Code: 053BCA012

CO: Student would be able to create a table, execute queries and PL/SQL programs.

Course No.3 (Theory): Object Oriented Programming using JAVA

Course Code: 053BCA013

CO 1: Explain the object-oriented concepts using JAVA.

CO 2: Write JAVA programs using OOP concepts like Abstraction, Encapsulation,

CO 3: Inheritance and Polymorphism.

CO 4: Implement Classes and multithreading using JAVA.

CO 5: Demonstrate the basic principles of creating Java applications with GUI.

OEC-3: Title of the Course: Python Programming Concepts

Course Code: 003BCA051

CO 1: Explain the fundamentals of Computers.

CO 2: Explain the basic concepts of Python Programming.

CO 3: Demonstrate proficiency in the handling of loops and the creation of functions.

CO 4: Identify the methods to create and store strings.

SEC-2: Title of the Course: Open Source Tools

Course Code: 053BCA061

CO 1: Recognize the benefits and features of Open Source Technology and to interpret, contrast and compare open source products among themselves

CO 2: Use appropriate open source tools based on the nature of the problem

CO 3: Write code and compile different open-source software.

BCA SEMESTER –IV

Course No.4 (Theory): Python Programming Course Code: 054BCA011

CO 1: Explain the basic concepts of Python Programming.

CO 2: Demonstrate proficiency in the handling of loops and creation of functions. CO 3: Identify the methods to create and manipulate lists, tuples and dictionaries.

CO 4: Discover the commonly used operations involving file handling.

CO 5: Interpret the concepts of Object-Oriented Programming as used in Python. CO 6: Develop the emerging applications of relevant fields using Python.

Course No.4 (Theory): Computer Multimedia and Animation

Subject Code: 054BCA013

CO 1: Write a well-designed, interactive Web site with respect to current standards and practices.

CO 2: Demonstrate in-depth knowledge of an industry-standard multimedia development tool and its associated scripting language.

CO 3: Determine the appropriate use of interactive versus standalone Web applications.

Course No.4 (Practical): Computer Multimedia and Animation Subject Code: 054BCA014

CO 1: Students will learn HTML/DHTML, CSS, SVG, Canvas and JavaScript programming codes.

OEC-4: Title of the Course: ELECTRONIC COMMERCE Subject Code: 004BCA051

CO 1: Compare how internet and other information technologies support business processes.

CO 2: Demonstrate an overall perspective of the importance of application of internet technologies in business administration

CO 3: Explain the basic business management concepts.

CO 4: Demonstrate the basic technical concepts relating to E-Commerce.

CO 5: Identify the security issues, threats and challenges of E-Commerce.

Name of Course (Subject): Industrial Fish and Fisheries (IFF)

Programme Specific Outcome (PSO):

PSO 1 : to understand fishes and shell fishes of India

PSO 2 : To understand the anatomy of fishes

PSO 3 : To under stand the construction of aquarium and maintenance

PSO 4 : To under stand the byproducts of fishes

PSO 5 : To understand hatchery management and seed production

PSO 6 : to understand mariculture and freshwater fish culture

PSO 7 ; to understand fish biochemistry, biotechnology and microbiology

PSO 8 : to understand fish preservation methods 4

PSO 9 : to understand fish feed preparation method

PSO 10 : to understand the fisheries resource of India

COURSE OUTCOME (CO):

B.SC. SEMESTER – I

Course No.1 (Theory): Title of the Course (Theory): Introduction to Fisheries Science

CO 1 : Understand the difference between teleost and elasmobranchs

CO 2 : Understand anatomy of fish

CO 3 : Understand different feeding habit of fish

CO 4 : Understand different reproductive behavior of fish

CO 5 : Understand overall fish and their body anatomy

Course No.1 (Practical): Title of the Course (Practical Industrial Fish and Fisheries (IFF)

CO 1 : Understand morphometry of fish

CO 2 : Study of different fin fishes of India

CO 3 : Study of different fin fishes of India

CO 4 : Anatomy of fish to understand organ arrangement

CO 5 : Mounting of fish organs

OEC-1: Title of the Course:- Introduction to fisheries Science:

CO 1 : to understand the different fin and shell fishes

CO 2 : to understand external character of fishes

CO 3 : to understand biochemical value of fish

CO 4 : to understand different fishery byproduct

CO 5 : to understand different ornamental fishes

Subject: INDUSTRIAL FISH AND FISHERIES SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: INDUSTRIAL FISH AND FISHERIES

CO 1 : to understand different uses of fishes and their products

CO 2 : to understand different preparation of fishery products

CO 3 : to understand uses of fish byproducts

CO 4 : to understand uses of sea weed and their uses

CO 5 : to understand fish handling methods

B.SC. SEMESTER – II

Subject: Industrial Fish and Fisheries (IFF) Discipline Specific Course (DSC)

Course No.1 (Theory): Title of the Course (Theory): Ornamental Fisheries and Entrepreneurship:

CO 1 : To understand different ornamental fishes

CO 2 : To understand ornamental fish breeding techniques

CO 3 : to understand how to construction of aquarium

CO 4 : To understand maintenance of aquarium

CO 5 : To understand Ornamental Fisheries and Entrepreneurship

Course No.1 (Practical): Title of the Course (Practical Industrial Fish and Fisheries (IFF)

CO 1 : To understand different ornamental fishes

CO 2 : To understand different marine ornamental fishes

CO 3 : to understand how to construction of aquarium

CO 4 : To understand maintenance of aquarium

CO 5 : To understand different disease diagnose of aquarium fishes

OEC-1: Title of the Course:- Introduction to fisheries Science:

CO 1 : to understand different inland fishery source

CO 2 : to understand different Coldwater fishes

CO 3 : to understand different lake and estuarine fishes

CO 4 : to understand different capture fishes

CO 5 : to understand riverine fisheries

B.SC. SEMESTER –III

Course No.1 (Theory):

Title of the Course (Theory):Capture Fisheries and Inland Fisheries033IFF011

CO 1 :Knowledge regarding capture fisheries resource of world with statistics.

CO 2 :Students get information of Inland fisheries resource India.

CO 3 :Lake and estuarine fisheries resource of India.

CO 4 :Student will get complete information marine pelagic fisheries resources of India.

CO 5 :Information regarding demersal fisheries resource of Indian sub-continent.

CO 6 : Students will get complete capture and inland fisheries resource of India and world.

Course No.1 (Practical):

Title of the Course (Practical):Industrial fish and fisheries033IFF012

CO 1 :Student will get information about different gear of freshwater and marine fisheries sector.

CO 2 : Information about different indigenous craft used for fish catching.

CO 3 : To know working principle of different gear used in India and world.

CO 4 : Student will know the length and weight relationship of fish species for assessing stock in natural water body.

CO 5 :To know the length and frequency date in particular fish species for new fish add to same group that infer that stock assessment.

CO 6 : Study trip will give information regarding fish landing Centre and Fisheries Institute and different beach observation.

OEC-1: Title of the Course: Principles and Practice of Aquaculture003IFF051

CO 2 : Breeding of air breeding fish, prawn and cold-water fishes and its culture.

CO 3 : To know the different fish culture system used in India and world.

CO 4 : To know the present status of Aquaculture in India and World.

CO 5 : To know fish pond preparation and culture of different freshwater fishes.

B.SC SEMESTER IV

Course No.4 (Theory):

Title of the Course (Theory): FISHERIES TECHNOLOGY AND FISHERIES EXTENSION034IFF011

CO 1 : Principles of fish preservation and different methods for fish preservation.

CO 2 : To know different fish by-products preparation and its uses.

CO 3 : Sea weed commercial uses and pearl production in India.

CO 4 : Fish catching methods and use of different gear used in India.

CO 5 : Fisheries cooperative society and fisheries extension in India.

Course No.4 (Practical):

Title of the Course (Practical): Industrial fish and fisheries034IFF012

CO 1 : Student will know different fish by-products and their production and its economic importance.

CO 2 :To know the preparation of chitosan and its commercial importance.

CO 3 : To know the preparation of fish liver oil and fish body oil and its commercial importance.

CO 4 : Student will know the preparation of fish feed formulation and preparation methods.

CO 5 : Study tour will help the student get the knowledge of fish processing industry, plants and other fish feed industry.

CO 6 : Overall, the student will get knowledge of fish by-products its production and commercial importance.

OEC-4:

Title of the Course:Mariculture and Fish Pathology004IFF051

CO 1 :Student will get information of marine and brackish water fisheries resource of India.

CO 2 :To know the Hatchery production of prawn seeds, nursery rearing and management.

CO 3 :Student will know Different brackish water fish and shell fishes breeding, seed production and pond rearing.

CO 4 :To know the different fish breeding, seed production and rearing with hatchery production.

CO 5 :To know the different type of disease occurring for the fishes and other aquatic animals and their diagnostic methods.

BSc V SEMESTER

Course No.1 (Theory):Paper-I

CO1: Define, comprehend, scope and significance of aquaculture

CO2: Examine the types and practices of Aquaculture systems

CO3:Describe the food, feeding, growth, digestion, and respiration in fishes CO4:Culture practice of freshwater prawn and breeding practices

CO5:Culture of other fishes like air breathing fish and cold-water fishes

Paper-II

CO1: To understand the techniques involved in aquaculture practices.

CO 2:To get a detailed information about marine aquaculture and hatchery management.

CO3:To provide a basic idea about the importance of disease in fishes. CO4: To give basic idea for fish histology for better diagnostic in fish disease CO5: To get detailed information mariculture of shell fishes

BSc VI SEMESTER

Course No.1 (Theory):Paper-I

CO 1: Student will get knowledge in basic genetical principles in field of fishery

CO 2: To know different technic involved in fish breeding

CO 3: To gain knowledge molecular application fish breeding and aquaculture

CO 4: student will get knowledge regarding environmental biology related fisheries aspect

CO 5: To gain the knowledge in field of pollution free environment for fishery production

Paper-II

CO 1: Students will get knowledge in the field of application of biotechnology in fisheries

CO 2: To gain knowledge biochemical assessment of fisheries products

CO 3: To gain knowledge in microbial deterioration fishery product and prevention methods

CO 4: To know the biochemical composition of fish from study of fish bio-chemistry

CO 5: To gain knowledge in the field of microbiological application in fisheries

Name of Course (Subject): ZOOLOGY

Programme Specific Outcome (PSO):

PS0 1:The structure and functions of animal cell, cell organelles, cell- cell interactions, process of reproduction leading to new organisms.

PS0 2:The principles of inheritance, Mendel‘s laws and the deviations. Inheritance of chromosomal aberrations in humans by pedigree analysis in families.

PS0 3.Acquaint the knowledge about basic procedure and methodology of integrated animal rearing.Students can start their own business i.e. self employments.

PS0 4.To get employment in different sectors of Applied Zoology.

PSO 2:1. In depth understanding of structure of biomolecules like proteins, lipids and carbohydrates.

2. The thermodynamics of enzyme catalyzed reactions.

3.To know various physiological processes of animals.

Programme Outcome (PO)

After the completion of 03/ 04 years Degree in Zoology, students will be able to:

PO 1: Students gain knowledge and skill in the fundamentals of animal sciences, understands the complex interactions among various living organisms

PO 2: Analyze complex interactions among the various animals of different phyla, their distribution and their relationship with the environment

PO 3: Apply the knowledge of internal structure of cell, its functions in control of various metabolic functions of organisms

PO 4: Understands the complex evolutionary processes and behaviour of animals

PO 5: Correlates the physiological processes of animals and relationship of organ systems 4

PO 6: Understanding of environmental conservation processes and its importance, pollution control and biodiversity and protection of endangered species

PO 7: Gain knowledge of agro based small scale industries like sericulture, fish farming, butterfly farming and vermicompost production

PO 8: Understands about various concepts of genetics and its importance in human health

PO 9: Apply the knowledge and understanding of Zoology to one’s own life and work

PO 10: Develops empathy and love towards the animals

PO 11: Candidates find opportunities in government departments, environmental agencies, universities, colleges, biotechnological, pharmaceutical, environmental/ecological fields

PO 12: There are numerous career opportunities for candidates completing their B.Sc, M.Sc and Ph.D. in Zoology in public and private sectors

Programme Specific Outcomes (PSO) PSO III:

PSO 1: Understanding of the processes of central dogma viz. transcription, translation etc. underlying survival and propagation of life at molecular level

PSO 2: Understanding how genes are ultimately expressed as proteins, which are responsible for the structure and function of all the organisms

PSO 3: Learn how four sequences (3 letter codons) generate the transcripts of life and determine the phenotypes of organisms

PSO 4: Understand the basics of various instruments like microscopes and bioinstruments used in biological studies and their applications

PSO 5: They are able to understand the use of biological instrumentation and proper laboratory techniques PSO 6: The students will be acquiring basic experimental skills in various techniques in the fields of molecular biology

PSO 7:To learn various techniques used in biology like histochemistry and immunotechniques 5

PSO IV:

PSO 1: To understand the principles of genetic engineering and its applications

PSO 2: To understand the basics of immunology and various mechanisms involved in immunity and their response

PSO 3: Acquired skills in diagnostic testing, haematology, staining procedures used in clinical and research laboratories, will provide them opportunity to work in diagnostic or research laboratory.

PSO 4: Acquired practical skills in biostatistics, bioinformatics can be used to pursue career as a scientist in drug development industry in India or abroad.

PSO 5: To know various type of biostatistical and bioinformatics techniques

PSO 6: Students gain skills in basics of computers, operating systems, overview of programming languages, internet services, sequencing techniques

PSO 7: Attained knowledge of data collection, tabulation and presentation of data and measures of central tendency, probability and Chi-square test.

PSO 8: Know the applications of internet and statistical bioinformatics in research

COURSE OUTCOME (CO):

B.SC. SEMESTER – I

Subject: ZOOLOGY Discipline Specific Course (DSC)

Course No.1 (Theory): Title of the Course (Theory): Cytology, Genetics and Infectious Diseases

CO 1 :The structure and function of the cell organelles.

CO 2 : The chromatin structure and its location.

CO 3 :The basic principle of life, how a cell divides leading to the growth of an Organism and also reproduces to form a new organisms.

CO 4: How a cell communicates with its neighboring cells.

CO 5: The principles of inheritance, Mendel‘s laws and the deviations.

CO 6: How environment plays an important role by interacting with genetic factors.

CO 7: Detect chromosomal aberrations in humans and study of pedigree analysis.

Course No.1 (Practical):

Title of the Course (Practical): Cytology, Genetics and Infectious Diseases

CO 1:To use simple and compound microscopes.

CO 2:To prepare stained slides to observe the cell organelles.

CO 3:To be familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.

CO 4:The chromosomal aberrations by preparing karyotypes.

CO 5;How chromosomal aberrations are inherited in humans by pedigree analysis in families. The antigen-antibody reaction.

OEC-1:

Title of the Course: Economic Zoology

CO 1: Gain knowledge about silkworms rearing and their products.

CO 2 :Gain knowledge in Bee keeping equipment and apiary management.

CO 3: Acquaint knowledge on dairy animal management, the breeds and diseases of cattle and learn the testing of egg and milk quality.

CO 4:Acquaint knowledge about the culture techniques of fish and poultry.

CO 5:Acquaint the knowledge about basic procedure and methodology of vermiculture.

CO 6:Learn various concepts of lac cultivation.

CO 7:Students can start their own business i.e. self-employments.

CO 8:Get employment in different applied sectors

SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper : VERMICULTURE

CO 1 :Understands the importance of earthworms in maintaining soil quality.

CO 2:Learns that the vermicomposting is an effective organic solid waste management method.

CO 3:Gets acquainted with the importance of earthworms in agro-based economic activity.

CO 4:Vermi composting leads to organic farming and healthy food production.

CO 5:Vermi composting may be taken up as a small scale industry by the farmers and unemployed youth.

CO 6:Get jobs in teaching institutions or vermiculture units as technicians.

CO 7:Learn the concept of vermicomposting as bio fertilizers thus student can become an entrepreneur after completion of the course.

CO 8:Best opportunity for self-employment and lifelong learning with farmers.

B.SC. SEMESTER – II

Subject: ZOOLOGY Discipline Specific Course (DSC)

Course No.2 (Theory):

Title of the Course (Theory) : Biochemistry and Physiology

CO 1:To develop a deep understanding of structure of biomolecules like proteins, lipids and carbohydrates.

CO 2:How simple molecules together form complex macromolecules.

CO 3:To understand the thermodynamics of enzyme catalyzed reactions.

CO 4:Mechanisms of energy production at cellular and molecular levels.

CO 5:To understand various functional components of an organism.

CO 6:To explore the complex network of these functional components.

CO 7:To comprehend the regulatory mechanisms for maintenance of function in the body

Course No.2 (Practical):

Title of the Course (Practical) : Biochemistry and Physiology

CO 1:At the end of the course the student should be able to understand Basic structure of biomolecules through model making.

CO 2:Develop the skills to identify different types of blood cells.

CO 3:Enhance basic laboratory skill like keen observation, analysis and discussion. Learn the functional attributes of biomolecules in animal body.

CO 4:Know uniqueness of enzymes in animal body and their importance through enzyme kinetics.

OEC-2: Title of the Course: Parasitology

CO 1:Know the stages of the life cycles of the parasites and infective stages.

CO 2:Develop ecological model to know population dynamics of parasite, establishment of parasite population in host body, adaptive radiations and methods adopted by parasite to combat with the host immune system.

CO 3:Develop skills and realize significance of diagnosis of parasitic infection and treatment.

CO 4;Understand about diseases caused by Protozoa, Helminthes, Nematodes and Arthropods at molecular level.

CO 5:Develop their future career in medical sciences and related administrative services.

B.SC. SEMESTER – III

DSCC-5: Molecular Biology, Bioinstrumentation and Techniques in Biology (Theory) - V

CO1: Acquire better understanding and comprehensive knowledge regarding most of the essential aspects of molecular biology subject, which in turn will provide a fantastic opportunity to develop professional skill related to the field of molecular biology.

CO2: The course will mainly focus on the study of principal molecular events of cell incorporating DNA Replication, Transcription and Translation in prokaryotic as well as eukaryotic organisms.

CO3: Acquiring knowledge on instrumentation and techniques in biology

B.Sc. Semester – III DSCC-6: Molecular Biology, Bioinstrumentation and Techniques in Biology (Practical) - VI (Code: 033ZOO012) Course Outcomes (CO): After completion of this Course (Practical) - VI, students will be able to:

CO 1: To understand the principle of qualitative and quantitative analysis of nucleic acids (DNA and RNA) CO 2: Understand the basic principles and applications of bioinstruments and biotechniques

CO 3: Understand the basic principles of microscopy, working of different types of microscopes

CO 4: Understand the principle of measuring the concentrations of macromolecules in solutions by colorimeter and spectrophotometer

CO 5: Learn about some of the commonly used separation techniques like centrifugation, chromatography CO 6: To know about measurement of cells types through micrometry and also to get knowledge about virtual labs

OEC- 3: Endocrinology (Code: 003ZOO051)

CO 1: Differentiate among endocrine, paracrine and autocrine systems.

CO 2: Describe the different classes and chemical structures of hormones.

CO 3: Identify the glands, organs, tissues and cells that synthesize and secrete hormones, hormone precursors and associated compounds.

CO 4: Identify and discuss the integration of the endocrine system in general with focus on specific interactions.

CO 5: Explain the consequences of under- and overproduction of hormones.

B.SC. SEMESTER – IV

DSCC- 7: Gene Technology, Immunology and Computational Biology (Theory) - VII (Code: 034ZOO011)

CO1: Acquaint knowledge on versatile tools and techniques employed in genetic engineering and recombinant DNA technology.

CO2: An understanding on application of genetic engineering techniques in basic and applied experimental biology.

CO3: To acquire a fundamental working knowledge of the basic principles of immunology.

CO4: To understand how these principles, apply to the process of immune function. CO5: Use, and interpret results of, the principal methods of statistical inference and design; helpsto communicate the results of statistical analyses accurately and effectively; helps in usage of appropriate tool of statistical software.

DSCC-8: Gene Technology, Immunology and Computational Biology (Practical) – VIII (Code: 034ZOO012)

CO 1: Understand the principles of genetic engineering with hands on experiments in detection of diseases CO 2: Get introduced to DNA testing and utility of genetic engineering in forensic sciences.

CO 3: Understand the basics of immunology and its applications in clinical research.

CO 4: Study on immune system and its components

CO 5: Apply knowledge and awareness of the basic principles and concepts of biology, computers science and mathematics existing software's effectively to extract information from large data bases to use this in computer modeling

CO 6: Use bioinformatics tools to find out evolutionary/ phylogenetic relationship of organisms using gene /protein sequences

CO 7: Understand and can apply biostatistics and bioinformatics tools in research.

B.Sc, SEMESTER V

PAPER 5.2 :ETHOLOGY AND APPLIED ZOOLOGY

CO 1:Animal behavior: Ethology and applied zoology are concerned with the study of animal behavior, including its evolution, development, and ecological significance.

CO 2:By studying these subjects, students can gain a deeper understanding of how animals interact with each other and their environment.

CO 3:Ethology and applied zoology are foundational subjects for many careers in animal-related fields, such as veterinary medicine, wildlife conservation, animal behavior research, and animal training.

CO 4:A strong background in these subjects can prepare students for a wide range of careers in the animal industry, including animal welfare and management. students can have a significant positive impact on students' understanding of animal behavior, animal welfare, and conservation.

B.Sc, SEMESTER V ETHOLOGY AND APPLIED ZOOLOGY

PRACTICAL 5.2

CO 1:Students gain practical knowledge and hands on training of these topics

CO 2:This study also help to develop their own income generating activity and become self employed

B.Sc, SEMESTER VI

PAPER 6.1 : ECOLOGY, ZOOGEOGRAPHY AND WILD LIFE BIOLOGY

CO 1:Ecology, zoo geography, and wildlife biology involve the study of ecological principles, such as species interactions, population dynamics, and ecosystem processes.

CO 2:By studying these subjects, students can gain a deeper understanding of the complex interactions between living organisms and their environment.

CO 3:Ecology, zoo geography, and wildlife biology are foundational subjects for many careers in wildlife-related fields, such as wildlife conservation, wildlife management, and ecological research.

CO 4:A strong background in these subjects can prepare students for a wide range of careers in the wildlife industry, including wildlife biology, wildlife management, and conservation biologist.

PRACTICAL 6.1

ECOLOGY, ZOOGEOGRAPHY AND WILD LIFE BIOLOGY

CO 1:studying ecology, zoo geography, and wildlife biology as practicals can provide students with valuable hands-on experience, technical skills, and problem-solving abilities.

CO 2:It can also prepare students for a wide range of careers in wildlife-related fields and help them develop teamwork and communication skills that are essential for working in these professions.

PAPER 6.2 : GENETICS, BIOTECHNOLOGY AND NANO TECHNOLOGY

CO 1:Genetics, biotechnology, and nanotechnology involve the study of fundamental biological processes at the molecular level.

CO 2:Understanding of fundamental biological processes: These involves the study of fundamental biological processes at the molecular level. By studying genetics, students can gain a deeper understanding of DNA, gene expression, and genetic variation.

CO 3:By studying these subjects, students can gain a deeper understanding of DNA, protein synthesis, and gene expression and Inheritance of characters

CO 4:Students may learn to think critically about the implications of genetic variations or develop strategies for creating and testing new biotech products that can be applied in various areas of life, including medical research, disease diagnosis, and genetic counseling

CO 5:And also applications of biotechnology and nanotechnology for the benefit of mankind, biodiversity, disease diagnosis, cure of the diseases and agriculture

GENETICS, BIOTECHNOLOGY AND NANO TECHNOLOGY

PRACTICAL 6.2

CO 1:Students gain the hands on experience and skill Which is essential in careers in biotech and medical fields:

CO 2:Genetics, biotechnology, and nanotechnology are foundational subjects for many careers in biotech and medical fields, such as genetic counseling, biotech research, and medical laboratory technology.

CO 3:A strong background in these subjects can prepare students for a wide range of careers in the biotech and medical industries.

CO 4:Overall, studying genetics, biotechnology, and nanotechnology can have a significant positive impact on students' understanding of fundamental biological processes, medical research, and biotech innovation.

CO 5:students may learn to critically evaluate scientific literature, design experiments, and solve complex problems related to genetic diseases.

CO 6:Student have scope in careers in healthcare and research: Genetics , Biotechnology open many careers in healthcare and research, such as genetic counseling, medical genetics, and genomic research and research industries.

Name of Course (Subject): GEOLOGY

Programme Specific Outcome (PSO):

PSO 1 : The study of this paper strengthens student's knowledge with respect to understanding the essentials of the dynamics of earth.

PSO 2 : The students will understand the origin and age of our Solar system and planets including earth.

PSO 3 : The students will able to learn the dynamic nature of the Earth processes. They will learn about the geodynamics of the lithosphere, concept of ocean floor spreading, continental drift and plate tectonics.

PSO 4 : The course designed for the students of understand geomorphological features of developed during glaciations, circulation of groundwater and oceans and coastal land forms.

PSO 5 : To determine possible causes of formation of structures and forces responsible for it. This course also helps to know the relation of structure with tectonics.

PSO 6 : Learn how to read geological features occurred by different endogenic process.

PSO 7 : Collaborative learning is encouraged during the field training programmes and educational tours

PSO 8 : Overall development of an ethical sense and increasing awareness in terms of gender sensitization, cleanliness, environmental protection etc.

PSO 9 : Inculcation of value-orientation in students through the promotion of a sensitive attitude towards one's surrounding and culture

PSO 10 : Assists students in competitive examination (JAM etc.)

B.SC. SEMESTER – I

Subject: GEOLOGY Discipline Specific Course (DSC)

Course No.1 (Theory): Title of the Course (Theory): EARTH SYSTEMS SCIENCES

CO 1 : Understand the significance of various branches of Geology, the concept of rock cycle; describe characteristics of earth and its origin in relation to the Solar System.

CO 2 : Describe internal structure and composition of the earth.

CO 3 : Explain basic concepts of plate-tectonics, ideas of plate boundaries, plate movements and associated geological features.

CO 4 : Describe weathering processes and types. Stages of river by Devi's concepts

CO 5 : Describe volcanic activity, types of volcanoes, volcanic products and earthquakes, types, causes, effects; elastic rebound theory, seismic waves, scale of measures.

Course No.1 (Practical):

Title of the Course (Practical): INTERPRETATION OF TOPOSHEETS AND SOIL PROFILING

CO 1 : Understanding of topographical maps.

CO 2 : Explain what is meant by map interpretation and what procedure is followed for its interpretation. CO 3 :Describe the commonly used scales for mapping our country used by the Survey of India

CO 4 : Describe contours. Marginal information in Topographical sheets using the Survey of India toposheets

CO 5 : Understanding the Preparation of LU/LC maps.

CO 6 : Describe physiographic models and also using lens stereoscope and mirror stereoscope.

OEC-1: Title of the Course: Basics of Earth System Sciences Course Outcome (CO):

CO 1 : A basic understanding of the Earth as an holistic system;

CO 2 : Knowledge of the main components of the Earth system and their interactions;

CO 3 : An appreciation of the implications of human interaction with the Earth system for sustainable management of the planet; and Acquired skills in inquiry-based learning.

Subject: GEOLOGY SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: GEO-ENVIRONMENTAL STUDIES

CO 1 : Understanding of Earth environmental segments. Atmosphere (structure and composition), hydrosphere- hydrological cycle.

CO 2 Describe Environmental Hazards: 1) Natural-Brief, 2) Manmade – Brief.

CO 3 Understanding of Identification of rocks and minerals in the field and collection of samples.

B.SC. SEMESTER – II

Course No.2 (Theory):

Title of the Course (Theory): BASICS OF CRYSTALLOGRAPHY, MINERALOGY AND PETROLOGY

CO 1 : Identify face, form, Axis, symmetry and laws of crystallography.

CO 2 : What is crystallography notation? Describe different symmetry class and morphological forms present in particular symmetry class.

CO 3 : Define mineral and describe physical/chemical properties and optical properties of given mineral.

CO 4 : Describe physical and optical properties of given mineral group.

CO 5 : Explain parts and functions of petrological microscope

CO 6 : Describe physical properties of magma generation in crust and mantle. Add a note on metamorphism and metamorphic rocks.

Course No.2 (Practical):

Title of the Course (Practical): CRYSTALLOGRAPHY, MINERALOGY AND PETROLOGY

CO 1 As minerals are the basic building blocks of Earth materials, this course is designed to give a fundamental understanding of their classification, structure, and properties.

CO 2 The student will learn the basic principles of crystal chemistry and how this is related to the external form, chemical composition, and physical properties of minerals.

CO 3 Identification, classification and interpretation of the occurrence of rock-forming minerals will be addressed.

OEC-2: Title of the Course: INDUSTRIAL MINERALS

CO 1 Distinguish industrial rocks and minerals among other geological commodities.

CO 2 Classify and explain the uses of different industrial minerals and rocks

CO 3 Understand the specifications of industries as regards physical and chemical properties of industrial minerals and rocks.

CO 4 Carry out efficient exploration of industrial minerals.

CO 5 Describe Properties, occurrences and distribution of the minerals/rocks in India, with special reference to Karnataka.

B.SC. SEMESTER – III

Course Title: Principles of Stratigraphy & Palaeontology

CO-1: Understand and describe the basic principles of Stratigraphy and breaks in stratigraphic successions and their significance.

CO 2: Understand and explain the elements of stratigraphic classification, Geological Time Scale, Stratigraphic correlation and define typical terms related to stratigraphic studies

CO 3: Understand and describe the physiographic and geological divisions of India and acquire knowledge about cratons and mobile belts.

CO 4: Understand and describe the Early Precambrian and Late Precambrian formations of India with emphasis on lithology, classification, age, structure, post- tectonic intrusives, and organic remainsand economic resources.

CO 5: Understand and describe the important Palaeozoic, Mesozoic and Cenozoic formations of India with reference to their distribution, lithology, classification, fossils and age.

CO 6: Understand and describe the stratigraphy of Karnataka and explain the characteristics of the Precambrian terrain of Karnataka.

CO 7: Understand and explain significance of palaeontology, the conditions and methods of fossilization, classification and nomenclature of fossils and the basic principles of Taxonomy, Systematics and Binomial nomenclature.

CO 8: Understand and explain the morphology, classification, geological history and stratigraphic importance of Phylum Protozoa, Phylum Coelenterata – Class Anthozoa, Phylum Brachiopoda, Phylum Mollusca – Classes Pelecypoda, Gastropoda, Cephalopoda.

CO 9: Understand and describe the morphology, classification, geological history and stratigraphic importance of Phylum Arthropoda – Class Trilobita, Phylum Echinodermata – Class Echinoidea and Phylum Hemichordata – Class Graptolithina.

CO 10: Understand the basic ideas of Micropalaeontology and describe the characteristics of important plant fossils, morphology, distribution and significance of Gondwana flora.

OPEN ELECTIVE SUBJECT (OEC) THEORY PAPER- OEC-3

CO 1: Understand the morphological features of ocean floor with reference to Indian Ocean and describe the distribution various parameters in sea water and explain eustatic sea level changes.

CO 2: Understand and describe the oceanographic expeditions, ocean floor drilling programmes and ocean floor mapping and understand and explain marine pollution.

CO 3: Understand and describe the types of coasts and coastal geomorphological features and processes; explain tides and law of the sea.

CO 4: Understand and describe the different type of marine sediments and their distribution; explain the mineral resources of ocean floor including coal and petroleum.

B.SC. SEMESTER – IV

Course Title: Structural Geology and Hydrogeology

CO-1. Describe various structural forms of rocks.

CO-2. Describe concept of brittle and ductile deformation.

CO-3. Describe primary and secondary structural forms.

CO-4. Give classification and describe various types of folds and their recognition criteria.

CO-5. Describe faults on the basis of geometrical pattern.

CO-6. Give classification of joints and describe joints of tectonic origin.

CO-7. Describe fault and mention its types.

CO-8. Give an account of linear and planar structures and describe secondary foliations.

Course Outcome: Hydrogeology

CO-1. Discuss hydrological cycle and its importance.

CO-2. What is precipitation? Discuss its different types.

CO-3. Explain vertical distribution of water in the crust with diagram.

CO-4. Discuss porosity, permeability, specific yield and specific retention.

CO-5. What is aquifer? Describe their various types.

CO-6. Describe Darcy's Law.

CO-7. Describe physical and chemical characteristics of groundwater.

CO-8. Explain water harvesting and watershed management.

CO-9. Give in detail about natural and artificial recharge of groundwater.

OPEN ELECTIVE COURSE- (OEC-04)

Course outcomes: After completion of the course the student will be able to;

CO-1: The challenges and opportunities posed by the climate change, resource demands and conflicts, and natural disasters (due to man-made structures as well as natural climate change) point to the importance of studying transdisciplinary nature of the earth processes and their implications to our society.

CO-2:This interdisciplinary nature of Earth Science draws a special attention from the students with other branches of science.

CO-3:From this interdisciplinary optional course on Earth and Social Science, students gain an understanding of natural processes and the impact the distribution and use of natural resources such as water, fossil fuels, and critical minerals for economic growth.

CO-4:It also facilitates the understanding natural hazards such as climate change, landslides, tsunami induced coastal erosions, thermal disturbances in sea water & sea food, and earthquakes.

Name of Course (Subject): PHYSICS

Programme Specific Outcome (PSO):

PSO 1 :culminate in depth knowledge of almost all basic branches of physics such as mechanics, properties of matter, relativity, electricity and magnetism, wave motion, optics, thermal physics, electronics, classical mechanics, quantum mechanics, spectroscopy, nuclear physics, condensed matter physics and also advanced areas like Nanoscience, energy science, astrophysics, instrumentation.

PSO 2 :communicate effectively physics concepts with examples related to day to day life. Acquire ability of recognizing and distinguishing various aspects of physics found in real life.

PSO 3 : learn, perform and design experiments in the laboratory to demonstrate the concepts principles, laws of physics, theories learnt in the class rooms.

PSO 4 : acquire ability of critical thinking and logical reasoning in physics problems and their solutions. Develop ability to analyze physics problem including simple to thought provoking problems and apply the acquired knowledge to solve.

PSO 5 : appreciate the importance of physics subjects and its application for pursuing interdisciplinary and multidisciplinary higher education and research in these areas.

PSO 6 : understand the vast scope of physics as theoretical and experimental science with application in finding solution of problems in nature spanning from smallest dimension 10-15 m to highest dimension 1026 m in space, covering energy ranges from 10-10 eV to 1025 eV.

PSO 7 : think independently and develop algorithm and program using programming techniques for solving real world physics problems.

PSO 8 : develop ability of working independently and to make in-depth study of various notions of physics. PSO 9 develop ability to apply the knowledge and skill acquired through experiments of physics in laboratories to solve real life problems.

PSO 10: Pursue advanced studies and research in varied areas of physical science.

COURSE OUTCOME (CO):

B.SC. SEMESTER – I

Subject: PHYSICS Discipline Specific Course (DSC)

Course No.1 (Theory): Title of the Course (Theory): Mechanics and Properties of Matter

CO 1 : Analyze data, (graphical and analytical), through estimation of errors and their sources in experimental determination of physical quantities. Also able to fit experimental data to straight line graph and calculate standard deviation, standard error and probable error.

CO 2 : Distinguish inertial, non-inertial and rotational frames of reference. Also able understand and distinguish real, fictitious and Coriolis force and its importance in real life. .

CO 3 : Distinguish Galilean, Lorentz transformation and their applications .Understand special theory of relativity by studying variation of length, mass and time with relativistic velocity

CO 4 : Analyze collision problems through laboratory and center of mass frame of reference, also able to relate these two frames. .

CO 5 : Understand concept of moment of inertia of regular/irregular bodies and its variation with axes through distribution of mass

CO 6 : Find Young's modulus, rigidity modulus and their importance in understanding materials and applications.

CO 7 : Understand concept of surface tension and viscosity of liquids and their experimental determination. CO 8 Understand importance of surface tension and viscosity of liquids/fluids in real life situation (everyday life).

B.Sc. Semester – II

Subject: PHYSICS Discipline Specific Course (DSC)

Course No.2 (Theory): Title of the Course (Theory): ELECTRICITY and MAGNETISM

CO2: determine dielectric constant of solid/liquid materials by experiments in laboratory.

CO3: apply the resonant circuits in the field of communication and signal oscillator building

CO4: apply concepts of AC and DC bridges to determine values of resistance, capacitance of capacitor and self- inductance of coil.

CO5:.understand how to produce magnetic field from electric current. Understand magnetic field produced by current in toroid and solenoid.

CO6: distinguish Seeback and Peltier effect and their applications to real life. Also able to distinguish different type of thermocouples as temperature sensors.

CO7: explain Maxwell's equations to articulate the relationship between varying electric and magnetic field. Also able to explain electromagnetic waves and their characteristics.

B.Sc. Semester – III

DSCC-5 : Physics (Theory) V (Code: 033PHY011)

Course No.5 (Theory): Title of the Course (Theory): Wave Motion and Optics

CO1 understand types of waves by their characteristics.

CO2 formulate a wave equation and obtain the expression for different parameters associated with waves. Explain and give an analytical treatment of the superposition of waves under different conditions, such as, equal or different frequencies.

CO3 analyse the formation of standing waves in the case of stretched string.

CO4 calculate velocity of sound at different conditions. Describe resonance in general and Helmholtz resonators in particular.

CO5 explain basics of laws of reflection and refraction.

CO6 describe different types of aberrations, cardinal points of optical instruments.

CO7 demonstrate interference of light due to division of wavefront and amplitude by Fresnel's biprism and Newton's rings experimental setup. Measurement of wavelength of light using experiments like Michelson interferometer.

CO8 explain diffraction due to different objects like single slit, two slits, diffraction of grating, oblique incidence, circular aperture and give the theory and experimental setup for the same.

CO9 explain the polarization of light and obtain how the polarization occurs due to quarter wave plates, half wave plates, and through the optical activity of a medium.

DSCC-6: Physics (Practical) - VI Code: 033PHY012

Title of the Course (Practical): Wave Motion and Optics

CO1 determine velocity of sound in different medium (solid/fluid).

CO2 observe different Lissajous figures when two SHM are acting Perpendicular to each other with different frequencies and able to calculate unknown frequency of a component.

CO3 set up a spectrometer experiment for the measurement of wavelength, dispersive power of a prism etc.

CO4 explain the calculation of specific rotation of a sugar solution by using half shade polarimeter.

CO5 calculate cardinal points of optical systems using goniometer and turn table experimental setup.

CO6 demonstrate interference of light due to division of wave front and amplitude in case of Fresnel's biprism/Lloyd mirror and Newton's rings experimental arrangements.

CO7 explain diffraction grating and hence calculation of resolving power.

CO8 measure wavelength of monochromatic light using Michelson interferometer. diffraction due to single slit and double slit experiments.

CO9 measure the wavelength of laser light using single/double slit experiment.

OEC- 3: Sports Science (Code: 003PHY051)

CO1 use different types of units in day today life.

CO2 explain various fundamental terms like mass, weight, velocity, speed, force, etc.

CO3 apply the knowledge of projectile motion in the field of sports like Javelin, Disc and Hammer throw. CO4 describe and apply conservation laws, centre of mass of a system, angular

momentum, Archimedes principle, Buoyancy and freefall under gravity in various events of sports.

CO5 realise and aware about importance of nutritious food.

CO6 incorporate good life style by practicing walking, jogging, running and exercise.

B.SC. SEMESTER – IV

DSCC-7: Physics (Theory): VII (Code: 034PHY011)

Title of the Course (Theory): Thermal Physics and Electronics

CO1. apply the laws of thermodynamics and analyze the thermal system and compare the efficiency and working of steam, Otto and Diesel engine.

CO2. analyze the temperature entropy-diagram with physical significance.

CO3. study the Maxwell's thermodynamical relations with different applications.

CO4. analyze the significance of thermodynamic potentials and develop the relation between thermodynamical potential with their variables.

CO5. distinguish the current and voltage source and construct the power supply with different filter circuits and its importance in real life.

CO6. use the concept of semiconductor to describe BJT, FET etc and explain their functions and applications.

CO7. describe the construction of IC-555 and its use in the astable multivibrator to generate rectangular waveform.

CO8. explain the functioning of op-Amp and use them as the building blocks of applications. use of logic gates with different theorems of Boolean algebra followed by logics circuits.

DSCC-8: Physics (Practical) - VIII Code : 034PHY012

Title of the Course (Practical): Thermal Physics and Electronics

CO1 determine the thermal conductivity of bad conductor by Lee's and Charlton method. Compare the result with theoretical value.

CO2 determine of thermal conductivity of conductor like copper using different methods such as Searle's, Angstrom methods.

CO3 verification of Clausius- Clapeyron equation experimentally Determine the specific heat ratio for air using Clement and Desormes apparatus.

CO4 learn how to apply Thevenin's and Norton's theorem to given network. Also they will learn basics of voltage/current power supply.

CO5 study in depth about transistor/JFET by performing many experiments using them

CO6 learn about very popular versatile device such as Operational amplifier and its applications

CO7 learn how to implement logic function using IC-7400/any other IC's

OEC- 4: Medical Physics (Code: 004PHY051)

CO1 understand human body anatomy and its physiological properties of the circulatory system, digestive system, respiratory system endocrine system and nervous system.

CO2 understand physics behind. medical equipment's such as X-rays, CT and MRI and sonography.

CO3 apply the principle of radiation physics, learn more about nuclear radiation detectors and how these radiation principles are used in radiation therapy.

CO4 know real time applications of this course by visiting diagnostic canters. Etc.

OEC- 4: Medical Physics (Code: 004PHY051)

CO1:Understand constrains, identify and apply different types of constrains in classical mechanical problem.

CO 2:Able to know and calculate degrees of freedom in space point and configuration space.

CO 3:Describe displacement and virtual work

CO 4:Apply general coordinates D Alembert's Principle Lagrange's Equation

CO5:Identify the limitation of classical mechanics and rectify these by application of quantum mechanics

CO 6:By understanding Compton scattering, expression for Compton shift, de Broglie hypothesis, Davision and Germer's experiments need for quantum mechanics is realized and problem in classical mechanics are rectified with application of quantum mechanics

CO 7:Illustarion with examples of Gamma ray microscope and diffraction of electrone at single slit

CO 8:Usage of the quantum mechanical concepts to set the Schrodinger's equation for wave motion

CO 9:Able to interprate wave function and hence able to calculate Eigen function and Eigen values using Schrodinger's equation

CO 10:Application of wave equation to calculate the energy in three dimension, Linear Harmonic Oscillator.

CO 11:Able to analyze the concept of zero point energy

CO 12:Distinguish different statistical particles and different statistical

CO 13:Maxwell-bolzmann, Bose –Einstein and Fermi-Dirac statistics are explained

CO 14:Describe degenerate Fermi Gas

B.SC. SEMESTER – V

paper II Physics

Molecular Spectra, Laser, Relativity and Electronics

CO1: Describe electronic, vibration and rotational motion of a molecule

CO 2:Explain energy distribution in the electromagnetic spectrum

CO 3:Analyze features of band spectra and distinguish between band spectra and atomic spectra

CO 4:Explain diatomic molecule as rigid rotator and non rigid rotator

CO 5:Explain rotational energy levels. Explain rotational spectrum

CO 6:Describe moment of inertia and inter nuclear distances from the pure rotational spectrum

CO 7:Explain Einstein's theory of spontaneous emission, stimulated emission and distinguish between individuals

CO 8:Describe laser action

CO 9:Explain He-Ne Lasers, Diode laser

CO 10:Explain Application of lasers

CO 11:Explain Rayleigh's and Raman Scattering

CO 12:Elaborate Raman effect and Raman spectrum, understanding Raman effect using quantum theory

CO 13:Application of Raman effect ,Laser Raman spectroscopy, Surface Enhance Raman Spectroscopy

CO 14:Understand and explain the significance of negative results of Michelson-Morley Experiment

List the Postulates of special theory of relativity

B.SC. SEMESTER – VI

Solid State Physics, Nuclear Physics and Nanoscience

CO 1: Understand Lattice, Lattice translation vectors, basis of crystal structure.

CO 2: Able to know Bravais lattices, Seven crystal system and calculate Miller indices and draw the crystal plane for the same

CO 3: Able to obtain expression for interplanar distance

CO 4: Explain NaCl and CsCl structure

CO 5: Able to solve crystal structure problem

CO 6: explain X-Ray spectrum able to differentiate line spectrum and continuos spectrum

CO 7: Able to derive Bragg's law

CO 8: Able to solve Bragg's law problem

CO 9: Describe specific heat of solids experimental facts

CO 10: Explain the classical theory of specific heat of solids

CO 11: Explain Einstein's and Debye's theory of specific heat of solids

CO 12: Explain Classical free electron model

CO 13:Able to derive the expression for electrical and thermal conductivity

Paper II Physics

Astrophysics, Computational Physics, Electronics and Communication

CO 1:Able to explain units of stellar distance (light year and parsec)

CO 2:Ability to explain luminosities of stars, apparent and absolute magnitudes

CO 3:Able to give example to luminosities of stars, apparent and absolute magnitudes

CO 4:Explain Stellar spectra able to plot H-R diagram

CO 5:Able to binary stars, stellar masses, stellar temperature

CO 6:Able to explain equation of stellar structure, linear density model for stars

CO 7:Able to explain formation and evolution of stars

CO 8:Describe end stage of stars-white dwarfs, neutron stars and black holes

CO 9:Explain different types of telescope and their characteristics

CO 10:Explain briefly C programming

CO 11:Explain and Identify C constants, variables, and data types

CO 12:Able to write expression with syntax using operators

Name of Course (Subject):ELECTRONICS

Programme Specific Outcome (PSO):

PSO 1: Provide students with learning experiences that provide broad knowledge and understanding of key concepts of Electronics and equip students with advanced scientific / technological capabilities for analysing and tackling then issues and problems in the field od Electronics.

PSO 2:Develop ability in students to apply knowledge and skills they have acquired to solve specific theoretical and applied problems in Electronics

PSO3: Develop abilities in students to design and develop innovative solutions for the benefit of society. PSO4: Provide students with skills that enable them to get employment in industries or pursue higher studies or research assignments or turn as enterpreneurs.

B.SC. SEMESTER – I

COURSE OUTCOME (CO):

Subject: ELECTRONICS Discipline Specific Course (DSC)

Course No.1 (Theory): Title of the Course (Theory) ELECTRONIC DEVICES AND CIRCUITS

CO1: Ability to apply knowledge of logical thinking and basic science for solving Electronic related issues. CO2:. Ability to perform Electronic experiments , as well as to analyse and interpret data.

CO3. Ability to design and manage electronic system or processes that conform to a given specification within ethical and economic constraints.

CO4:. Ability to identify, formulate, solve and analyse the problems in various sub-disciplines of Electronics. CO5: Ability to use modern tools / techniques

Course No.1 (Practical):

Title of the Course (Practical): ELECTRONIC DEVICES AND CIRCUITS

CO1. Study and analyze basic networks using network theoremsin a systematic manner.

CO2. Build simple electronic circuits used in various applications.

CO3. Describe the behaviour of basic semiconductor devices

CO4. Reproduce the VI characteristics of diode/BJT devices

CO5. Describe the frequency response of BJT amplifiers.

CO6. Explain the behaviour, characteristics and applications of Varactor diode, Schottky diode, Tunnel diode, LED, LCD and solar cells.

CO7. Apply standard device models to explain/calculate critical internal parameters of semiconductor devices.

CO8. Understand and represent numbers in powers of base and converting one from the other, carry out simple arithmetic operations.

CO9. Understand the basic knowledge of Digital system building blocks, effectively can construct simple digital designs with the knowledge of Boolean algebra.

B.SC. SEMESTER – II

Subject: ELECTRONICS Discipline Specific Course (DSC)

Course No.2 (Theory): Title of the Course (Theory) :ANALOG AND DIGITAL ELECTRONICS

CO1. Reproduce the VI characteristics of various MOSFET devices,

CO2. Apply standard device models to explain/calculate critical internal parameters of semiconductor devices.

CO3. Explain the behavior and characteristics of power devices such as UJT, SCR, Diac, Triac etc.

CO4. Perform experiments for studying the behavior of semiconductor devices.

CO5. Calculate various device parameter values from their VI characteristics.

CO6. Interpret the experimental data for better understanding the device behaviour.

CO7. Understand basic logic gates, concepts of Boolean algebra and techniques to reduce/simplify Boolean expressions

CO8. Analyze combinatorial and sequential circuits

B.SC. SEMESTER – III

DSCC-5: Electronics (Theory) V (Code: 033ELE011)

Title of the Course (Theory): Digital Design using Verilog and Programming in C

CO 1: Understand Verilog as hardware description language which is used to model electronic systems.

CO 2: Understand basics of system Verilog and development of digital design using Verilog.

CO 3: Understand the basics of simulation and synthesis tools.

CO 4:Understand basics of HDL, its syntax, data flow modeling and practical examples.

CO 5:Build a strong foundation in programming and logical thinking.

CO 6:Develop C-Programs.

CO 7:Control the sequence of the program using control statements and looping.

CO 8:Implement arrays and strings in the program.

OEC – 3: Electronics (003ELE051) Title of the Course: Basics of Communication Methods

CO 1: Understand the introduction of antennas, their principle of operation and their types.

CO 2: Understand ionosphere, and different types of wave propagation.

CO 3: Have knowledge about various modulation and demodulation techniques.

CO 4: Understand block diagram of communication system.

CO 5: Learn the communication satellite mechanics, block diagram of satellite communication system and applications of satellites.

CO 6: Familiar with Optical Fiber Communication System, principle, types of OFC and applications.

B.SC. SEMESTER – IV

DSCC- 7: Electronics (Theory) - VII (Code: 034ELE011)

Title of the Course (Theory) : Electronic Communication – I

CO 1. Know the basic concept of Analog Communication.

CO 2. Understand the principle with which Analog Communication works.

CO 3. Know the Various modulation techniques involved in radio communication before the transmission.

CO 4. Understand the various blocks involved in radio transmitter.

CO 5. Know different detection process involved in receiver to detect the original signal and able to design “AM” and “FM” detectors.

CO 6. Familiar with “AM” and “FM” super heterodyne receiver.

CO 7. Understand the basic concept of Pulse Modulation, Carrier Modulation for digital transmission and able to construct simple pulse modulation.

Title of the Course (Theory) : Electronic Communication – II

CO 1. Compute modulation index for various analog modulation schemes like AM and FM.

CO 2. Evaluate the performance of analog and digital modulation - demodulation techniques.

CO 3. Analyse various analog continuous wave modulation and demodulation techniques like AM and FM.

CO 4. Construct and analyse AF amplifier, AM transmitter and receiver circuits.

CO 5. Implement analog pulse modulation and demodulation methods like PPM and PWM.

CO 6. Implement digital pulse modulation and demodulation methods like ASK, FSK and PSK

OEC-4: Basic Instrumentation (Code: 004ELE051)

CO 1: Understand the fundamental concepts and principles of instrumentation.

CO 2: Learn principle of operation, working of different instruments like Voltmeter, Ammeter, Ohmmeter, Multimeter and AC Millivoltmeter.

CO 3: Learn the functioning, specification, and applications of signal analyzing Instruments like cathode ray oscilloscope.

CO 4: Work in industry with good skill.

CO 5: Measure various parameters using proper instruments without errors.

CO 6: Understand the importance of electronic instrumentation and measurements,

Name of Course (Subject): Mathematics

Programme Specific Outcome (PSO):

PSO 1 : Culminate in-depth knowledge of Algebra, Calculus, Geometry, differential equations and several other branches of mathematics and also in other allied subjects.

PSO 2 : To communicate various mathematical concepts effectively using examples and their geometrical visualization which can be used for modeling and solving of real life problems.

PSO 3 : Acquire ability of critical thinking and logical reasoning and capability of recognizing and distinguishing the various aspects of real life problems.

PSO 4 : Develop an ability to analyze the problems, identify and define appropriate computing requirements for its solutions.

PSO 5 : Develop the capability of inquiring about appropriate questions relating to the Mathematical concepts in different areas of Mathematics.

PSO 6 : Use appropriate softwares to solve system of algebraic equation and differential equations.

PSO 7 : Develop an ability of working independently and to make an in-depth study of various notions of Mathematics.

PSO 8 : Develop an ability to identify unethical behavior such as fabrication, falsification or misinterpretation of data and adopting objectives, unbiased and truthful actions in all aspects of life in general and Mathematical studies in particular.

PSO 9 : Think independently and develop algorithms and computational skills for solving real word problems.

PSO 10 : Peruse advanced studies and research in Mathematical sciences.

COURSE OUTCOME (CO):

B.SC SEMESTER I

Course No.1 (Theory):

Title of the Course (Theory): Algebra - I and Calculus - I

CO 1: Learn to solve the system of homogeneous and non homogeneous linear equations in m variables by using concept of rank of matrix, finding eigenvalues and eigenvectors.

CO 2: Sketch curves in Cartesian, polar and pedal equations.

CO 3: Learn geometrical representation and problem solving on MVT and Rolls theorems.

CO 4: Get familiar with the techniques of integration and differentiation of function with real variables.

CO 5: Identify and apply the intermediate value theorems and L'Hospital rule and Trace the curves.

Course No.1 (Practical):

Title of the Course (Practical): Practicals on Algebra - I and Calculus – I

CO 1: Learn Free and Open Source Software (FOSS) tools for computer programming

CO 2: Solve problem on algebra and calculus using FOSS softwares.

CO 3: Acquire knowledge of applications of algebra and calculus through FOSS.

OEC-1: Title of the Course: Business Mathematics-I

CO 1: Apply sets, relations, functions in business.

CO 2: Use permutations and combinations.

CO 3: Use matrices in commercial field.

CO 4: Apply trigonometric function in real world.

SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: Scilab

CO 1: Understand the Scilab and apply commands in Scilab

CO 2: Use looping in Scilab

CO 3: Build Scilab functions

CO 4: Plot graphs

CO 5: Develop skills to write programme in Scilab

B.SC. SEMESTER – II

Subject: Mathematics Discipline Specific Course (DSC)

Course No.2 (Theory):

Title of the Course (Theory): Algebra - II and Calculus - II

CO 1: Recognize the countable set and groups.

CO 2: Link the fundamental concepts of groups and symmetries of geometrical objects.

CO 3: Explain the significance of the notions of Cosets, normal subgroups and factor groups.

CO 4: Finding the extreme values of functions.

CO 5: Evaluate multiple integration.

Course No.2 (Practical):

Title of the Course (Practical): Practicals on Algebra -II and Calculus - II

CO 1: Learn Free and Open Source Software (FOSS) tools for computer programming

CO 2: Solve problem on algebra and calculus using FOSS softwares.

CO 3: Acquire knowledge of applications of algebra and calculus through FOSS.

OEC-2:

Title of the Course: Business Mathematics-II

CO 1: Integrate concept in business concept with functioning of global trade.

CO 2: Understand the commercial arithmetic.

CO 3: Apply decision-support tools to business decision making.

CO 4: Apply knowledge of business concepts and functions in an integrated manner.

B.SC.SEMESTER–III

Title of the Course (Theory): Discipline Specific Course(DSC)

DSCC-5 :Ordinary Differential Equations and Real Analysis–I(033MAT011)

CO1:Solve first-ordernon-lineardifferentialequationsandlineardifferentialequations.

CO2:To model problems in nature using Ordinary Differential Equations.

CO3:Formulate differential equations for various mathematical models

CO 4: Apply these techniques to solve and analyze various mathematical models.

CO 5:Understandthefundamental properties of the real numbers that lead todefine sequenceandseries intheformaldevelopmentofrealanalysis

CO 6:Learnthe concept ofConvergenceandDivergenceofasequence.

CO 7:Able to handle and understand limits and their use in sequences, series, differentiation, and integration.

CO 8:Apply the ratio, root, alternating series, and limit comparison tests for convergence andabsolute convergenceofaninfiniteseries.

Title of the Course(Practical):

DSCC-6: Practicals on Ordinary Differential Equations and Real Analysis–I (033MAT012)

CO 1:Freeand Open Source software (FOSS)tools or computer programming.

CO 2:Solvingexact differentialequations

CO 3: Plotting orthogonaltrajectories

CO 4: Finding complementaryfunctionsandparticularintegraloflinearandhomogeneous differentialequations.

CO 5:Acquireknowledgeofapplicationsofrealanalysisanddifferentialequations.

CO 6:Verificationofconvergence/divergenceofdifferenttypesofseries

Open Elective Course (OEC-3)

OEC-3 003MAT051 Title of the Course: Quantitative Mathematics

CO1: Understandnumbersystemandfundamentaloperations

CO2: Understand theconcept oflinearquadraticandsimultaneous equationsand theirapplicationsinreal-lifeproblems.

CO3:Understandandsolvetheproblemsbasedon Age.

CO4:SolveSpeedandDistancerelatedproblems.

B.SC.SEMESTER–IV

Title of the Course(Theory):: Discipline Specific Course(DSCC)

DSCC-7:Partial Differential Equations and Integral Transforms(034MAT011)

CO1: Solve the Partial Differential Equations of the first order and second order.

CO2: Formulate, classify and transform partial differential equations into canonical form.

CO3: Solve linear and non-linear partial differential equations using various methods; and apply these methods to solving some physical problems.

CO4: Able to take more courses on wave equation, heat equation, and Laplace equation.

CO5: Solve PDE by Laplace Transforms and Fourier Transforms.

Title of the Course (Practical)

DSCC-8:PracticalsonPartial Differential Equations and Integral Transforms(034MAT012)

CO1:Learn Free and Open Source software(FOSS) tools or computer programming.

CO2: Solve problemson Partial Differential Equations and Integral Forms.

CO3:To find Laplace transformof various functions.

CO 4:To find the Fourier Transform of periodic functions

CO 5:To solve partial differential equations by using Integral transforms.

OEC-4: 004MAT051:

Title of the Course: Mathematical Finance

CO1:Understandhowto computeprofitandloss,discount,andBanker'sdiscount.

CO2: Understand the concept of Linear equations and inequalities and their use in the Solvingthe Linear Programming Problems.

CO3: Formulation of Transportation Problem and its application in the routing problem Integratethe conceptinbusinessconceptwiththe functioningofglobaltrade.

CO4: Understandcommercialarithmetic.

CO5: Applydecision-supporttoolstobusinessdecision-making.

CO6:Applyknowledgeofbusinessconceptsandfunctionsinanintegratedmanner.

Name of Course (Subject): STATISTICS

Programme Specific Outcome (PSO)

PSO 1 : To Acquire knowledge of different topics of Statistics and ability to apply to relevant areas, scientific problems and basic analysis of data and interpretation.

PSO 2 : To provide a foundation of Statistics principles and business practices for effectively using Data Science Techniques and enterprise software/packages.

PSO 3 : Be able to use modern scientific, engineering and IT tools or techniques such as use of Excel and R tools for solving statistical problems related to the domain of interest.

PSO 4 : To specialize in Statistical Methods, Data Science, Machine Learning and its applications

PSO 5 : Be able to work effectively as an individual/ team member so as to build a multidisciplinary team. PSO 6 : To cater the needs of managing the business application

PSO 7 ; Be in a position to develop industrial applications

PSO 8 : Shall abide by the norms of professional ethics in respective disciplines

PSO 9 : Be able to communicate effectively with the stakeholders and give and receive clear instructions. PSO 10 : Remains curious and enthusiastic in learning advanced knowledge in the respective discipline.

COURSE OUTCOME (CO):

B.SC. SEMESTER – I

Subject: STATISTICS Discipline Specific Course (DSC)

Course No.1 (Theory): Title of the Course (Theory) : DESCRIPTIVE STATISTICS

CO 1 Knowledge of introductory Statistics and its scope and importance in various areas such as Medical, Engineering, Agricultural, Social Sciences, etc.

CO 2 Knowledge of various types of data, their organization and evaluation of summary measures such as measures of central tendency, dispersion, etc.

CO 3 Knowledge of correlation and regression analysis, regression diagnostics, partial and multiple correlations.

CO 4 Knowledge of types of data reflecting independence or association between two or more attributes

Course No.1 (Practical):

Title of the Course (Practical): Practicals (based on Descriptive Statistics)

: CO 1 Practical knowledge of handling various types of data, their organization and evaluation of summary measures such as measures of central tendency, dispersion, etc.

CO 2 Practical knowledge of carrying out correlation and regression analysis, regression diagnostics, partial and multiple correlations.

CO 3 Computing knowledge of types of data reflecting independence or association between two or more attributes. List of the Experiments for 5

OEC-1: Title of the Course: STATISTICAL METHODS

CO 1 : Acquire knowledge of statistical methods.

CO 2 : Identify types of data and visualization, analysis and interpretation.

CO 3 : Know about elementary probability and probability models.

CO 4 : Employ suitable test procedures for given data set.

SKILL ENHANCEMENT COURSE (SEC)-I Title of Paper: DATA ANALYSIS WITH SPSS – I

CO 1Frame and formulate management decision problems.

CO 2Understand the basic concepts underlying quantitative analysis.

CO 3Use sound judgment in the applications of quantitative methods to management decisions.

Course No.2 (Theory):

Title of the Course (Theory): PROBABILITY AND DISTRIBUTIONS

CO 1 Ability to distinguish between random and non-random experiments

CO 2 Knowledge to conceptualise the probabilities of events including frequentist and axiomatic approach. Simultaneously they will learn the notion of conditional probability including the concept of Bayes' Theorem

CO 3 Knowledge related to concept of discrete and continuous random variables and their probability distributions including expectation and moments

CO 4 Knowledge of important discrete and continuous distributions such as Binomial, Poisson, normal distributions.

CO 5 Knowledge on R-programming in the descriptive statistics and probability models.

CO 6 Students will be able to write and execute R-code for basics of probability and statistics.

B.SC. SEMESTER – II

Subject: STATISTICS Discipline Specific Course (DSC)

Course No.2 (Practical):

Title of the Course (Practical): PRACTICALS (based on Probability and Distributions)

CO 1 Practical knowledge of computing the probabilities, conditional probability including the concept of Bayes' Theorem

CO 2 Knowledge of computing discrete and continuous probability distributions such as Binomial, Poisson, normal distributions including expectation and moments.

CO 3 Practical knowledge of using R-programming in computing the descriptive statistics and probability models.

OEC-2: Title of the Course BUSINESS STATISTICS

CO 1 Acquire knowledge of statistical methods.

CO 2 Identify types of data and visualization, analysis and interpretation.

CO 3 Know about elementary probability and probability models.

CO 4 Employ suitable test procedures for given data set

B.SC. SEMESTER – III

Subject: STATISTICS Discipline Specific Course (DSC)

Course No.3 (Theory): Title of the Course (Theory) : 033STA011: Calculus and Probability Distributions

CO 1 Judge continuity of a function, find integrations and solve problems of differentiability.

CO 2 Solve problems of various analytical environments using different distributions and their properties. CO 3 Find sampling distributions of functions of random variables and explore their applications.

Course No.03 (Practical): Title of the Course (Practical): 033STA012:

Practicals (based on DSCC-5: Calculus and Probability Distributions)

CO 1 Practical knowledge of handling various types of R-functions for calculus and probability distributions. CO 2 Practical knowledge of carrying out numerical analysis.

CO 3 The knowledge of simulating random observations from various probability distributions using R.

OEC-3: 003STA051:

Title of the Course: POPULATION STUDIES

CO 1 : Study the concepts of Vital Statistics, sources of data, different measures of Fertility, Mortality and migration.

CO 2 : Understand the Growth rates- GRR and NRR and their interpretations.

B.SC. SEMESTER – IV

Subject: STATISTICS Discipline Specific Course (DSC)

Course No.4 (Theory): 034STA011:

Title of the Course (Theory): STATISTICAL INFERENCE-I

CO 1 Carryout statistical analysis by identifying families of distributions and the use of order statistics.

CO 2 To find estimators using different methods of estimation and compare estimators.

CO 3 To carryout statistical inference using different tests of hypotheses under different scenarios.

Course No.4 (Practical): 034STA012:

Title of the Course (Practical): Practicals (Based On DSCC-7: Statistical Inference-I)

CO 1 Practical knowledge of computing the estimates and test statistics using R.

CO 2 Practical knowledge of carrying out statistical inference with different tests of hypotheses.

CO 3 Practical knowledge on carrying out MP and UMP tests using R.

Subject: STATISTICS Open Elective Course (OEC-4): 004STA051

OEC-4: 004STA051: Title of the Course: Basics of Operations Research

CO1- Generate mathematical models of business environment.

CO2-Analyze the business situations.

CO3-Use different solution procedures through OR models.

Name of Course (Subject): Criminology and Forensic Science

Programme Specific Outcome (PSO):

PSO 1 : Demonstrates a systematic or coherent understanding of the fundamental concepts, principles and processes underlying the academic field of Criminology and Forensic Science.

PSO 2 : learn its application in different subfields (law, Policing, Investigation Techniques, Investigation of Scene of Crime, Penology, Human Rights, Victimology, Criminal Psychology, Security Management and in others allied fields), and its linkages with related disciplinary areas/subjects.

PSO 3 : procedural knowledge that creates different types of professionals in the field of Criminology and Forensic Science related fields such as teaching, research and development, private investigations, security industry, victim assistance, nongovernmental organizations, juvenile justice system, correctional system, policing, and crime analyst.

PSO 4 : skills related to specialization areas within Criminology and Forensic Science as well as within subfields of Criminology and Forensic Science (policing, investigative techniques, crime scene management, penology, victimology, criminal psychology, security management), and other related fields of study, including broader interdisciplinary subfields (forensic science, human rights, gender studies, sociology and law)

PSO 5 : Apply appropriate methodologies in order to conduct analysis and detect patterns of crime and victimization and apply relevant knowledge and skills to seek solutions to problems that emerge from the subfields of Criminology and Forensic Science as well as from broader interdisciplinary subfields relating to Criminology and Forensic Science.

PSO 6 : Use techniques relevant to academia and industry, generic skills and global competencies.

PSO 7 : learn knowledge and skills that enable students to undertake further studies in the field of Criminology and Forensic Science, its related field, and work in the government and non-government sectors.

PSO 8 : Undertake hands-on field work and practical activities that develop problem- solving abilities required for successful career in research and development.

PSO 9 : Field work on policy-making, teaching, security management, private investigation, disaster management, non-governmental organizations, victim assistance programmes, correctional institutions, after-care programs, criminal justice administration, etc.

PSO 10: Recognize and appreciate the importance of Criminology and Forensic Science, its application in an academic, social, legal, industrial, economic and environmental context.

COURSE OUTCOME (CO):

B.A / B.SC SEMESTER – I

Course No.1 (Theory): Discipline Specific Course (DSC)

Title of the Course (Theory):- Fundamentals of Criminology

CO 1 : Understand the concept of crime and historical perspective

CO 2 : A systematic disciplinary knowledge of the fundamental concepts, analytical reasoning, principles and processes.

CO 3 : Apply appropriate methodologies in order to conduct analytical skills and detect patterns of crime and victimization.

CO 4 : Apply moral and ethical awareness/reasoning

CO 5 : identify the patterns of crime and its preventions

Course No.1 (Practical):

Title of the Course (Practical): Crime NEWS analysis

CO 1 : to identify the crime news

CO 2 : practice to collection of crime news clipping

CO 3 : to understand different types of crime through experiments

CO 4 : to understand crimes of different place

CO 5 : to capable analyze the crimes

OEC-1:

Title of the Course: Police Organization in India

CO 1 : Understand the concept and purpose of Police Organization in India , the developmental process over the years according to the needs of the society.

CO 2 : Develop the knowledge regarding the historical development of police system, organization, and structure of police.

CO 3 : Explain the different Police Units at the Central and State level

CO 4 : Become aware about the different Auxiliary Units and their functions

CO 5 : Understand the police functioning

SKILL ENHANCEMENT COURSE (SEC)-I Title of Paper: Digital Skill for Crime Data Analysis

CO 1 : Understand the importance of specific digital skills required for crime data analysis

CO 2 : Encourage to develop the necessary digital skills to become crime data analyst

CO 3 : Explain the importance of communication, analytical skills and writing skills

CO 4 : Explain the pre-requisite qualities of able crime data analysts.

CO 5 : Equip the students to attend the challenges of digital life

B.A / B.SC SEMESTER – II

Subject: Criminology and Forensic Science Discipline Specific Course (DSC)

Course No.2 (Theory): Title of the Course (Theory): Criminalistics

CO 1 : Understand the definition, scope and basic principles of Criminalistics, exhibit the various tools and techniques utilized in the application of the subject.

CO 2 : Explain the significance of evidence, types and classification of physical evidences such as blood, fibre, paint, firearms, fingerprints, etc.

CO 3 : Examine the forensic documents, tools and techniques employed, types of forgeries, types of handwriting and its characteristics, etc.

CO 4 : Explain the basic principles and stages involved in crime scene reconstruction.

CO 5 : Describe the scope and importance of medical evidence such as oral and documentary, etc.

Course No.2 (Practical):

Title of the Course (Practical) : Scene of Crime Investigation

CO 1 : Understand the importance of scene of crime

CO 2 : Analyze the difficulties in evidence collection

CO 3 : Understand the value of physical evidences

CO 4 : Understand the methods and types of scene of crime

CO 5 : Explore different methods of Scene of Crime Investigation

OEC-2:

Title of the Course: Social Problems and Crime

CO 1 : Understand the different social problems in India, their causes, which leads to crimes, criminality and social disorder.

CO 2 : Explain the various forms of women and child related issues, crimes and their related laws.

CO 3 : Understand about alcoholism and drugs leads to social disorganization and crimes

CO 4 : Explain about the corruption and terrorism and their impact on society with related laws

CO 5 : Understand the effect of drug abuse on society

B.A / B.SC. SEMESTER – III

Subject: Criminology and Forensic Science Discipline Specific Course (DSC)

Course No. 05 : Title of the Course (Theory):- Police Science and Criminal Investigation:

CO 1 : Understand the concept and purpose of Police Science and its importance in crime prevention, investigation and maintaining social order peacefully. o

CO 2 : Develop the knowledge regarding the Police Administration, Enforcement of Laws ofthe nation, Maintaining the Law and Order. o

CO 3 : Understanding the various challenges faced by police in their day to day policing. O

CO 4 : Become aware about the different types of crime scenes, investigations and theirrelated legal procedures.

Course No.06:

Title of the Course (Practical): Police Science Code: 033FSC012

CO 1: Understand the importance of Scene of Crime o

CO 2: Understand the different methodologies used in different scene of crimes o

CO 3: Understand the need and types of crime scene documentation o

CO 4: Aware the importance of physical evidences and need for handling, packing and preservation

OEC-03: Title of the Course: Crime Scene Investigation

Code: 003FSC051 for both B.Sc. and B.A.

CO 1: Understand the methods of securing, searching and documenting crime scenes. o

CO 2: Capable to do the art of collecting, packaging and preserving different types of physical andtrace evidence at crime scenes. o

CO 3: Describe the legal importance of chain of custody. o

CO 4: Understand the tools and techniques for analysis of different types of crime scene evidence.

B.A / B.SC. SEMESTER – IV

Subject: Criminology and Forensic Science Discipline Specific Course (DSC)

Course No.07: Title of the Course (Theory): Correctional Administration Code: 034FSC011

CO 1: Understand about the meaning, concept and scope of penology and CorrectionalAdministration. o
CO 2: Explain the theories and types of punishments in the past and present in India and abroad. O

CO 3: Describing the prison as institution of correction, its types and the legal provisions o

CO 4: Understanding the concepts of non-institutional treatments of prisoners.

Course No.08:

Title of the Course (Practical): Correctional Institution Visits Code: 033FSC012 for B.Sc. and 013FSC012

CO 2: Prisoners facilities and Problems o

CO 3: Understand the functions of Juvenile Rehabilitation centers o

CO 4: Understand the powers and functions of JJB and CWC

OEC-04:

Title of the Course: Child Protection Laws Code: 004FSC051 for both B.Sc. and B.A.

CO 1:Understand the legal and constitutional definition of child and issues and problems of theirdevelopment stage. o

CO 2: Describe the role of various social institutions in the child protection and its importance. O

CO 3: Understanding the powers and functions of Juvenile Justice Board and Child WelfareCommittees mentioned under Juvenile Justice Board. o

CO 4: Explain the crime against children and related laws and guidelines.

Name of Course (Subject): Genetics

PSO 1 : To instill in students an enthusiasm for classical genetics, an appreciation of its application in different contexts, and to involve them in an intellectually stimulating and satisfying experience of learning and studying.

PSO 2 : To provide students with broad and balanced knowledge and understanding of key concepts of cell biology and cytogenetics. Students will be technically sound with respect to the practical aspects of the subject and make them employable.

PSO 3 : To develop in students a range of practical skills in molecular biology so that they can understand and assess risks of handling microorganisms and work safely with pathogenic and transformed microbes competently in the laboratory.

PSO 4 : To develop in students the ability to apply standard methodology to the solution of problems in Microbial Genetics.

PSO 5 : To provide students with knowledge and skill towards employment or higher education in Genetics or multi-disciplinary areas involving computational biology and bio informatics.

PSO 6 : - To provide students with the ability to plan and carry out experiments independently and assess the significance of outcomes. Skills developed by the students in Genetic engineering or r-DNA technology make them employable.

PSO 7 : To develop in students the ability to adapt and apply methodology to the solution of unfamiliar types of problems.

PSO 8 : To instill critical awareness of advances at the forefront of human genetics and cancer biology.

PSO 9 : To prepare students effectively for professional employment or research degrees in Genetics.

PSO 10: To build confidence in the candidate to be able to work independently in Industries, Higher education and research Institutes with responsibility and work ethics.

COURSE OUTCOME (CO):

B.SC. SEMESTER – I

Course No.1: Title of the Course (Theory): Cytogenetics

Course Outcome (CO): After completion of course (Theory), students will be able to:

CO 1 : Understand the structure and function of all the cell organelles.

CO 2 : Understand mechanism of cell division and insight in to cell cycle regulation

CO 3 : Understand chromosome number and abnormalities

Course No.-1 (Practical) Title of the Course (Practical): Cytogenetics

CO 1 : Learn preparation of chemicals and reagents used for cytogenetics analysis

CO 2 : Carryout hands-on techniques in cytogenetics

CO 3 : Prepare and analyse the karyotype of plants and assess the evolutionary significance.

Open Elective Course (OEC-1) (OEC for other students)

OEC-1: Title of the Course: Introduction to Cell Biology

CO 1 : Use microscopes to study the events inside cell

CO 2 : Understand functioning of cell organelles

CO 3 : Have insight chromosome abnormalities and its implication in human health

SKILL ENHANCEMENT COURSE (SEC)-I

Title of Course: Cytogenetic Techniques

CO 1 : Hands on experience of preparation of chemicals and reagents used for cytogenetics analysis

CO 2 : Knowledge of techniques in cytogenetics

CO 3 : Proficiency of carrying out cytogenetic techniques independently.

B.SC. SEMESTER – II

Subject: Genetics Discipline Specific Course (DSC)

Course: No.2: Title of the Course: Transmission Genetics (Theory)

CO 1 : Learn historical overview genetics and laws Inheritance.

CO 2 : Understand Mendel's principles and deviations.

CO 3 : Gene interactions and their outcome through gene mapping

Course No.-2: Transmission Genetics (Practical)

CO 1 : Handle Drosophila and carryout Genetic experiments

CO 2 : Understand Mendel's principles experimentally.

CO 3 : Gene interactions and their outcome through gene mapping.

Open Elective Course (OEC-2) (OEC for other students)

OEC-2: Title of the Course: Basic Genetics

CO 1 : Mendelian genetics and inheritance of characteristics

CO 2 : Sex determination in plants animals and humans

CO 3 : Extranuclear inheritance

B.SC. SEMESTER–III

Subject: Genetics Discipline Specific Course (DSCC)

Course No.GEN103T Title of the Course: Biomolecules and Molecular Genetics(Theory)

CO1: Describe the structure and function of biomolecules

CO 2:Appreciate and illustrate the chemical composition of the genetic material and its multiplication

CO 3:Describe the process of gene expression in prokaryotes and eukaryotes

CO 4:Explain the concept of transposition, mutation and DNA repair mechanism

Title of the Course: Biomolecules and Molecular Genetics(Practical)

CO1: Understand the working principle and handling of instruments. Biology

CO2: Perform the isolation of DNA from various sources.

CO3: Characterize the eye pigments in Drosophila using paper chromatography.

CO4: Demonstrate the effects of mutation and appraise the applications of molecular markers.

Open Elective Course (OEC) (OEC for other students)

Course No.: GEN103E Title of the Course: Eugenics, Euphenics and Society (Elective Theory)

CO1:explain the basic concepts of eugenics and assisted reproductive technology

CO2:appraise the concept of preimplantation and prenatal diagnosis

CO3:interpret the importance of genetic counselling

CO4 :appraise the concept of gene therapy and its significance

B.SC.SEMESTER–IV

Subject: Genetics Discipline Specific Course (DSCC)

CourseNo.: GEN104T Title of the Course: Human Genetics and Genetic Counselling (Theory)

CO1:Learn pattern on human disease inheritance

CO2:understand pedigree and risk calculation

CO3:assist in genetic counselling

Course Name: Human Genetics and Genetic Counselling (Practical)

CO 1 : Collectpatient data

CO 2 : construct and analyze pedigree

CO 3 : calculate risk and probability of geneticdiseases

B.SC.SEMESTER–IV

Subject: Genetics Open Elective Course (OEC for other students)

Course No.: GEN104E Title of the Course: Human Genetic Disorders

CO 1 : Mendelian genetics and inheritance of characteristics

CO 2 : Genotype phenotype correlation

CO 3 : Extranuclear inheritance

Name of Course (Subject): Microbiology

Programme Specific Outcome (PSO): On completion of the 03/ 04 years Degree in Microbiology students will be able to:

PSO 1: Gain Knowledge and understanding of concepts of microbiology and its application in pharma, food, agriculture, beverages, nutraceutical industries. Knowledge on history, general characters and classification of Microorganisms, Understanding the microbiological techniques, cultivation and detection of microorganisms. Comprehend evolutionary importance and economic significance of microorganisms and microbiology. Understand the distribution, morphology and physiology of microorganisms and demonstrate the skills in aseptic handling of microbes including isolation, identification and maintenance.

PSO 2: To develop understanding about Biochemistry, enzymes, microbial metabolism, growth and bioenergetics. Students will become efficient in managerial skills, able to employ analytical reasoning, problems solving and interpretation and documentation of laboratory experiments at a level suitable to succeed at an entry-level position in Microbiology.

PSO 3: Competent to apply the knowledge gained for conserving the environment and resolving the environmental related issues.

PSO 4: Learning and practicing professional skills in handling microbes and contaminants in laboratories and production sectors.

PSO 5: Exploring the microbial world and analyzing the specific benefits and challenges.

PSO 6: Applying the knowledge acquired to undertake studies and identify specific remedial measures for the challenges in health, agriculture, and food sectors.

PSO 7: Thorough knowledge and application of good laboratory and good manufacturing practices in microbial quality control.

PSO 8: Understanding biochemical and physiological aspects of microbes and developing broader perspective to identify innovative solutions for present and future challenges posed by microbes.

PSO 9: Understanding and application of microbial principles in forensic and working, knowledge about clinical microbiology. Enhance and demonstrate analytical skills and apply basic computational and statistical techniques in the field of microbiology.

PSO 10: Demonstrate the ability to identify ethical issues related to recombinant DNA technology, GMOs, intellectual property rights, bio-safety and biohazards. Demonstrate the ability to identify key questions in microbiological research, optimize research methods, and analyze outcomes by adopting scientific methods, thereby improving the employability.

COURSE OUTCOME (CO):

B.SC. SEMESTER – I

Subject: Microbiology Discipline Specific Course (DSC)

CO 1 : At the end of the course the student will have broad and balanced knowledge of Microbiology, history, general characters and classification of Microorganisms, Viz-Bacteria, Fungi, algae, protozoa and virus,

CO 2 : Understanding the microbiological techniques, cultivation and detection of microorganisms.

CO 3 : Comprehend evolutionary importance and economic significance of microorganisms and microbiology.

CO 4 : Learning and practicing professional skills in handling microbes. Thorough knowledge and application of good laboratory and good manufacturing practices in microbial quality control..

Course No.1 (Practical): Title of the Course (Practical):

PAPER MB DSC-1P – General Microbiology (4 hrs/week)

CO 1: Learning and practicing professional skills in handling microbes.

CO 2: Thorough knowledge and application of good laboratory and good manufacturing practices in microbial quality control.

CO 3: To develop in students a range of practical skills so that they can understand and assess risks and work safely

OEC-1: Title of the Course

OE 1T MBL Human Microbial Diseases

CO 1 : Knowledge and understanding of the disease causing microorganisms.

CO 2 : Learning and practicing professional skills in handling microbes and diagnosing disease.

CO 3 : Thorough knowledge and application of good laboratory and good manufacturing practices in microbial quality and disease control

SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: SEC 1T, MBL Microbial Analytical Techniques and quality control

CO 1 : Learning and practicing professional skills in handling microbes.

CO 2 : Thorough knowledge and application of good laboratory and good manufacturing practices in microbial quality control..

CO 3 : To develop in students a range of practical skills so that they can understand and assess risks and work safely

CO 4 To provide students with industrial problem based knowledge and skill towards employment or higher education in Biotechnology or multi-disciplinary areas involving different branches of sciences

B.SC. SEMESTER – II

Subject: Microbiology Discipline Specific Course (DSC)

Course No.2 (Theory): Title of the Course (Theory): Microbiology

CO 1 : Develop thorough knowledge and understanding of concepts of Biochemistry, enzymes, microbial metabolism, growth, bioenergetics and physiology ...

CO 2 : Students will become efficient in managerial skills,

CO 3 able to employ analytical reasoning, problems solving, interpretation and documentation of laboratory experiments at a level suitable to succeed at an entry- level position in Microbiology

Course No.2 (Practical): Title of the Course (Practical): PRACTICAL II PAPER DSC-2P

Microbial Biochemistry and Enzymology

CO 1 Develop thorough knowledge and understanding of concepts of Biochemistry, enzymes, microbial metabolism, growth, bioenergetics and physiology ...

CO 2 : Students will become efficient in managerial skills,

CO 3 : able to employ analytical reasoning, problems solving, interpretation and documentation of laboratory experiments at a level suitable to succeed at an entry- level position in Microbiology

OEC-2: Title of the Course OE-2T MBL Food borne microbial infections

CO 1 : Thorough knowledge and understanding of concepts of Food microbiology, principles of food preservation and spoilage of foods

CO 2 : Dairy Microbiological techniques and its application in different microbiological industries.

CO 3 : They will be well aware of the food borne outbreaks and handle them accordingly

B.SC. SEMESTER–III

Subject: Microbiology Discipline Specific Course (DSCC) Course No.MCB103T

Title of the Course: Microbial Diversity (Theory)

CO1: Knowledge about microbes and their diversity

CO 2: Study, characters, classification and economic importance of ProEukaryotic and Eukaryotic microbes CO 3: Knowledge about viruses and their diversity

Title of the Course: Microbial Diversity (Practical)

CO1: Isolate microbes from different sources

CO 2:phenotypethe microbes by staining and microscopic observation

CO 3:Micrometry for scoring microbial cell dimensions

Open Elective Course (OEC)

CO1:Demonstrate entrepreneurial skills

CO2:Acquire knowledge industrial entrepreneurship

CO3:Acquire knowledge about Healthcare Entrepreneurship

B.SC.SEMESTER–IV

Subject: Microbiology Discipline Specific Course (DSCC) CourseNo.: MCB104T

Title of the Course: Microbial Enzymology and Metabolism (Theory)

CO1: Differentiating concepts of chemoheterotrophic metabolism and chemolithotrophic metabolism. CO2: Describing the enzyme kinetics, enzyme activity and regulation

CO3: Differentiating concepts of aerobic and anaerobic respiration and how these are manifested in the form of different metabolic pathways in microorganisms

Discipline Specific Course (DSCC) Course No: MCB104P Course Name: (Practical)

CO 1 : To perform biochemical estimations

CO 2 : Understand the process of fermentation for alcohol production CO 3 : analyze effect of various factors on enzyme reactions

Open Elective Course (OEC for other students)

Course No.:MCB104E Title of the Course: Human Microbiome

CO 1 : Articulate a deeper understanding on biological complexities of human micro biome.

CO 2 : Understand broader goals of biological anthropology

CO3: Compare and contrast the microbiome of different human body sites and impact human health promotion

B.SC.SEMESTER–V

CO 1:To learn about Contribution and discoveries of scientist in the field of Microbiology with general characters and classification of Microorganisms.

CO 2:Comprehend evolutionary and economic importance of microorganisms.

CO 3:Good knowledge and application of GLP and GMP in quality control. Develop best practical skills and safety rules in students.

CO 4:Knowledge and understanding of the disease causing microorganisms. To provide students with industrial problem based knowledge and skill towards employment or higher education in Biotechnology or multi-disciplinary areas involving different branches of sciences.

B.SC.SEMESTER–VI

CO 1:Develop thorough knowledge and understanding of concepts of Biochemistry, enzymes, microbial metabolism, growth, bioenergetics and physiology.

CO 2:Thorough knowledge and understanding of concepts of Food microbiology, principles of food preservation and spoilage of foods as well as Dairy.

CO 3:Students could study molecular basis of life and its applications in genetic engineering with biotechnology programmes and regulations. And study of isolation of microbes from environment by air samplers, testing portability of water by MPN and demonstration of sewage treatment plants by visiting treatment plants created awareness in students about conserving environment.

CO 4:Students study applications of microorganisms in soil fertility, biogeochemical cycle, plant-microbe interactions, it's their production in PGPR, bio-inoculants, bio- fertilizer.

B.SC.SEMESTER–VI

CO 1:Students learn microbial diseases of agriculture crops and their control measures.

CO 2:Students can learn screening of industrially important microbes in fermentation, upstream and downstream processing and through production in minerals and petroleum. Students learn immunology and their techniques.

CO 3:Students learn epidemiology, pathogenicity, prophylaxis, treatment and control of all microbial diseases in human.

POST GRADUATION

COURSE OUTCOME (CO):

DEPARTMENT OF CHEMISTRY

M.Sc. Semester – I

After completion of course , students will be able to:

NAME OF COURSE (SUBJECT): InorganicChemistry-I

CO 1:Properties of ionic compounds.

CO 2:Relationship between radius ratio and structure of ionic compounds.

CO 3:Structure and bonding in covalent inorganic compounds, based on various bonding theories viz.VSEPR,VBTandMOT.

CO 4:Band theory and its use in classification of materials such as conductors,insulatorsandsemiconductors.

CO 5:Basics of organometallic chemistry,viz.18and16electronrules.

CO 6:Synthesis, structure, bonding and reactions of representative organometallics.

CO 7: Bonding theories in coordination compounds viz. MOT

CO 8: Basics of electronic spectra and magnetism.

CO 9: Stability of metal complexes, with reference to nature of metal and ligand.

CO 10: Theories of acids and bases.

CO 11: Basics of solid-state chemistry, crystallographic methods, crystal defects, and band theory.

NAME OF COURSE (SUBJECT): Lab Course in Inorganic Chemistry

CO 1: Students would learn to separate and determine the metal ions using gravimetric and volumetric methods such as Fe(II) + Ni(II) Fe(II) + Cu(II) Zn(II) + Cu(II) Zn(II) + Ni(II)

CO 2: Students are also exposed to synthetic methodologies of the preparation of coordination compounds.

NAME OF COURSE (SUBJECT): Inorganic Chemistry – II

CO 1: Synthesis, properties, and structures of compounds of non-transition elements such as B, Si, P, N, S, Halogens, and Noble gases.

CO 2: Structure and Properties of interhalogen compounds, oxyacids.

CO 3: Synthesis, structure, and bonding in transition metal organometallic compounds.

CO 4: Classification of molecules on the basis of point groups.

CO 5: Applications of group theory in chemical bonding and spectroscopy (IR and Raman).

NAME OF COURSE (SUBJECT): Lab Course in Inorganic Chemistry

CO 1: Students would learn semi-micro qualitative analysis of salt mixtures, containing three cations and two anions viz. W, Pb, Cu, Cd, Mo, As, Fe, Cr, Ti, Zr, Ce, V, Ni, Zn, Co, Ca, Sr, Ba, Mg, K, Na, Li and halides, nitrate, sulphate, phosphate, oxalate, borate, acetate.

NAME OF COURSE (SUBJECT): Applied Inorganic Chemistry

CO 1: Separation techniques such as ion exchange and solvent extraction. CO 2: The principles and classification of chromatographic methods such as paper, thin layer, column, and liquid chromatography. CO 3: Analysis of data using different techniques, thermal methods of analysis. CO 4: The essential role of trace metals in biological processes. CO 5: The transport and storage of dioxygen in Heme proteins. CO 6: The structure and functions of Hemoglobin, Myoglobin, Hemocyanin, etc. CO 7: The structure and functions of metalloproteins in electron transport processes. CO 8: The principles of transition metal coordination complexes in understanding functions of biological systems. CO 9: The role of metals in medicines.

NAME OF COURSE (SUBJECT): Advanced Coordination & Bioinorganic Chemistry

CO 1: To interpret the electronic spectra and magnetic properties of coordination compounds. In detail about the reaction mechanism of inorganic metal complexes and to understand the substitution reaction mechanism along with the involvement of reactive intermediates. Also, to understand their structure and reactivity through various inorganic reactions. This course gives an idea about the way in which a reaction proceeds and its kinetics, especially for inorganic substitution reactions.

CO 2: The essential role of trace metals in biological processes.

CO 3: The transport and storage of dioxygen in Heme proteins.

CO 4: The structure and functions of Hemoglobin, Myoglobin, Hemocyanin, etc.

CO 5: The structure and functions of metalloproteins in electron transport processes.

CO 6: The principles of transition metal coordination complexes in understanding functions of biological systems.

CO 7: The role of metals in medicines.

NAME OF COURSE (SUBJECT): Molecular Spectroscopy

CO 1: Apply IR, NMR, UV-Vis, EPR, NQR, and Mossbauer spectroscopy techniques in solving the structures of organic and inorganic compounds.
CO 2: Interpret the spectroscopic data of unknown compounds.
CO 3: Use these techniques in their future research work.
CO 4: Solve the spectroscopic problems in NET/SET/GATE exams.

NAME OF COURSE (SUBJECT): Selected Topics in Inorganic Chemistry

CO 1: Synthesis, structure, and bonding in metal carbonyl clusters.
CO 2: Structure and bonding in metal halide clusters.
CO 3: Preparation, structure, and bonding of metal nitrosyls.
CO 4: Chemistry of dinitrogen and dioxygen complexes.
CO 5: Analysis of pesticides and insecticides.
CO 6: Analysis of fuel and fertilizers.
CO 7: Chemistry of lanthanoids and actinoids.
CO 8: Fluorescence, phosphorescence, and photochemistry of transition metal complexes.

NAME OF COURSE (SUBJECT): Lab Course in Inorganic Chemistry

CO 1: Students are exposed to different synthetic methodologies of coordination compounds.
CO 2: Students are made to understand the characterization of prepared complexes by various analytical methods viz. elemental analysis, metal percentage determination, chloride and sulfate determination, etc.
CO 3: Student would learn to establish the composition of coordination compounds.
CO 4: Students are trained to scan, IR, NMR, UV-Vis spectra of prepared compounds and to interpret the observed spectra.

NAME OF COURSE (SUBJECT): Lab Course in Inorganic Chemistry

CO 1: Students are exposed to use the instruments such as colorimeter, potentiometer, conductometer for the determination of metal ions/halides.
CO 2: Students would learn to determine the composition of coordination complexes by colorimetry.

NAME OF COURSE (SUBJECT): Lab Course in Inorganic Chemistry

CO 1: Students are exposed to the analysis of food and drugs by analyzing:

- Iodine in common salt.
- Calcium in milk powder.
- Vitamin C in tablets.
- Iron in tablets.
- Aspirin content in tablets.

NAME OF COURSE (SUBJECT): Instrumental Methods of Analysis

CO 1: Atomic absorption and emission spectroscopy.

CO 2: Molecular luminescence spectroscopy.
CO 3: Electrophoresis and gel filtration.
CO 4: Coulometry and amperometry.
CO 5: Ion-selective electrodes.
CO 6: Thermal methods of analysis.
CO 7: Polarography, voltammetry, and stripping analysis.
CO 8: Light scattering methods.

NAME OF COURSE (SUBJECT): Material, Nuclear, and Environmental Chemistry

CO 1: Nuclear reactions and use of nuclear energy in generating electricity.
CO 2: Safety measures to be adopted in handling radioactive materials.
CO 3: Composition of atmosphere.
CO 4: Various types of pollutants related to soil, water, and air.
CO 5: Use of chemistry in the betterment of society.
CO 6: Nanomaterials and electron microscopes.
CO 7: Synthetic methods for nanomaterials and carbon nanotubes.
CO 8: Principles & types of LED, LCD.
CO 9: The advantages and disadvantages of LED and LCD.
CO 10: Properties of glass, ceramics, and clay products.

NAME OF COURSE (SUBJECT): Organometallic and Solid State Chemistry

CO 1: Metal ions as catalysts and their importance in synthetic procedures.
CO 2: Catalysts in industrial applications such as Wacker's process, Hydroformylation, Monsanto acetic acid synthesis, Water gas shift reaction, Fischer-Tropsch synthesis, Alkene polymerization, etc.
CO 3: Structures of solids.
CO 4: Optical properties of solids and their applications.
CO 5: Magnetic properties of solids and their applications.
CO 6: Phenomenon of superconductivity and its applications.
CO 7: Alloys and phase diagrams.

NAME OF COURSE (SUBJECT): Project Work

CO 1: Project work is carried out by the students under the guidance of teachers in the department. A topic of research is chosen by the students, in consultation with their respective mentors.
CO 2: Students gather a complete knowledge in carrying out the research, which would help them in their higher studies (such as Ph.D. program) and in industrial career.
CO 3: Students may get a publication on successful completion of his/her project work.

NAME OF COURSE (SUBJECT): Lab Course in Inorganic Chemistry

CO 1: Cyclic voltammetric method.
CO 2: Determination of fluoride content and acidity of water.
CO 3: Ion exchange methods for purification of water.
CO 4: Importance of TG-DTA in analysis of compounds.

CO 5: Analysis of baking soda.
CO 6: Determination of iron in food samples.

NAME OF COURSE (SUBJECT): Lab Course in Inorganic Chemistry

CO 1: Colour, pH, and temperature.
CO 2: Dissolved oxygen, COD, BOD, and oxidizing power.
CO 3: Chloride and sulfate ions.
CO 4: Calcium, magnesium ions.
CO 5: Temporary and permanent hardness.
CO 6: Analysis of heavy metals in wastewater and seawater.
CO 7: Acid content in soft drinks.
CO 8: Preparation and characterization of nanoparticles.
CO 9: Analysis of glass and ceramics.

NAME OF COURSE (SUBJECT): Lab Course in Inorganic Chemistry

CO 1: Determination of total acidity in beverages.
CO 2: Analysis of antacids.
CO 3: Analysis of tablets.
CO 4: Analysis of milk powder.
CO 5: Analysis of cement.
CO 6: Analysis of urine.

NAME OF COURSE (SUBJECT): Organic Chemistry - I

CO 1: The localized chemical bonding helps the students to understand the hybridization, bond distance, bond angles, bond energies, etc., to the modern ideas in chemical technology.
CO 2: The study of reaction mechanism imparts the internal energy changes in reaction as well as nature of the intermediate in the organic reactions.
CO 3: In the study of organic reactions, the exploration of stereochemistry and conformational analysis gives the ideas of structure of organic molecules and their enantiomers, diastereomers, epimers, etc., to the student to get the depth knowledge about the organic molecules.
CO 4: To study the internal energetic electrons in the aromatic compounds that give the ideas regarding the nature of organic reactions to the modern temples called as industry to understand by the students.
CO 5: To overall view the studies of concepts in organic chemistry reveals that the most exciting organic reactions and their products called organic molecules are exploited in various industries to explore the knowledge to the students.

NAME OF COURSE (SUBJECT): Lab Course in Organic Chemistry - I

CO 1: The theoretical study of the organic reactions is proved by the synthesis of targeted organic molecules for further application in various industries.
CO 2: The students shall understand the imaginary organic reactions through the synthetic study of internal mechanistic transformations of one organic molecule to another organic molecule.

NAME OF COURSE (SUBJECT): Organic Chemistry - II

CO 1: The students will be able to understand the aliphatic and aromatic electrophilic substitutions and nucleophilic reaction mechanism. This gives insight into the organic reactions.

CO 2: Advanced stereochemistry course makes the students to differentiate the prochiral and achiral molecules, enantiomers, homotopic and diastereotopic ligands.

CO 3: This course also helps the students to classify and understand the reactions of mono and disaccharides.

CO 4: The students are made aware of classification and reactions of five-membered heterocycles.

NAME OF COURSE (SUBJECT): Lab Course Organic Chemistry

CO 1: The students understand the quantitative estimation of acid, amide, ester, and glucose.

CO 2: Students will understand how the molecular weight is determined by the base hydrochloride method.

CO 3: The chemical transformation of organic compounds to the products by the preparation of derivatives thus trains the students about synthetic organic chemistry.

NAME OF COURSE (SUBJECT): Organic Spectroscopy

CO 1: The students will be able to understand the structure of organic molecules after studying the theoretical and experimental study of spectroscopic techniques.

NAME OF COURSE (SUBJECT): Chemistry of Natural Products

CO 1: The students understand the important steroidal hormones and their structures, synthesis, stereochemistry, and spectral features.

CO 2: The students will be aware of natural alkaloids and terpenes which are being exploited in pharmaceutical industry and perfumery industry along with photochemical synthesis of some important narcotic alkaloids.

CO 3: In the ongoing teaching, the students are enabled to make more focus on Natural fatty acids and Prostaglandins which are having remarkable applications in various oleochemical and pharmaceutical industry.

CO 4: This course also helps the students to understand the biomolecules such as nucleosides, nucleotides, and peptides with amino acid sequences.

NAME OF COURSE (SUBJECT): Lab Course in Organic Chemistry

CO 1: The binary mixture analysis helps the students to understand the nature, physical properties, and functional group of the unknown organic compounds.

CO 2: This course also helps the students to know about separation and purification techniques.

NAME OF COURSE (SUBJECT): **Lab Course in Inorganic Chemistry**

CO 1: The chemical transformations of organic compounds to the other products by preparation of derivatives which will train the students in the synthetic organic chemistry.

CO 2: The students get the training in chromatographic techniques, particularly in TLC and column chromatography.

NAME OF COURSE (SUBJECT): **Lab Course in Inorganic Chemistry**

CO 1: The students will learn the extraction methods for natural products and isolation methods.

CO 2: Students will learn how to assign the structure of natural products by spectroscopic methods.

NAME OF COURSE (SUBJECT): **Organic Synthesis**

CO 1: The students were able to understand the retrosynthetic analysis to get at a target and helps to make them for the research work.

CO 2: The study of newer reagents and reactions makes the students to recent development in the synthesis of most potential biomolecules.

CO 3: Studies on oxidations and reductions enable the students to differentiate the methods involved in the organic synthesis.

NAME OF COURSE (SUBJECT): PHOTOCHEMISTRY AND PERICYCLICREACTIONS

CO 1: The students are able to understand the classifications and features of pericyclic reactions and are being useful in research work.

CO 2: Students understand the molecular rearrangements, mechanistic patterns, etc.

CO 3: The biochemical mechanism is useful for students to study the bio-chemical reactions associated with enzymes and vitamins.

NAME OF COURSE (SUBJECT): **Heterocyclic and Medicinal Chemistry**

CO 1: The students are made aware of the classification, nomenclature, and reactions of three, four, and seven-membered heterocycles.

CO 2: The students are able to understand transformations, photochemistry, and rearrangements of heterocycles.

CO 3: This course also helps the student to study modern theories of drug actions and SAR studies and chemotherapy.

NAME OF COURSE (SUBJECT): PROJECT WORK

Research Methodology Course

In this course, students are exposed to extensive literature survey which will help them to understand the given research problem.

CO 1: The students will be exposed to the spectroscopic methods which will help them to synthesize the previously unknown molecules.

CO 2: The outcome of research work is being published in the international journals of repute, which makes students inspire in the future research field.

NAME OF COURSE (SUBJECT): **Lab Course in Organic Chemistry**

CO 1: The Ternary mixtures analysis helps the students to study the nature, physical properties, and functional group of the unknown organic compounds.

CO 2: This course also helps the students to know about separation and purification techniques.

NAME OF COURSE (SUBJECT): **Lab Course in Inorganic Chemistry**

CO 1: The chemical transformations of organic compounds to the other products by preparation of derivatives which has trained the students in the synthetic organic chemistry.

CO 2: Further, students are being exposed to prove the structure of organic molecules by spectroscopic methods.

NAME OF COURSE (SUBJECT): **Physical Chemistry**

CO 1: This course helps students a better understanding to describing and predict the behaviour of matter at atomic and molecular level.
CO 2: At the end of this course, the students will learn the kinetics and mechanism of reactions take place and also the significance of activation parameters.
CO 3: In this course, the students will learn the energy of activation and entropy of a chemical reaction.
CO 4: This course provides the fundamentals of polymers, their synthesis, and degradation.

NAME OF COURSE (SUBJECT): **Lab Course in Physical Chemistry**
CO 1: This course is designed in such a way that it provides a bridge to the students and attempts to make a link between their undergraduate experiments to master level.
CO 2: The aim is to make students gain familiarity with a variety of physicochemical measurement techniques of some basic physical chemistry experiments like spectrometry, conductometry, potentiometry, law, etc.
CO 3: Also familiarize the students with general information and chemical mathematics, calibration of glassware's, concentration measures of solutions and treatment of experimental data.

PHYSICAL CHEMISTRY-II

NAME OF COURSE (SUBJECT): **Molecular Spectroscopy, Electronic Spectroscopy, Thermodynamics, Reaction Kinetics, and Introduction to Polymers**
CO 1: This course demonstrates the development of physical science.
CO 2: This course describes the arrangement of atoms and molecules in crystalline solids and also exhibits how crystalline solids show strong diffraction pattern when exposed to X-rays, neutrons, and electrons.
CO 3: This course helps to understand the solvent and ionic strength effects on kinetics of solutions and also about the Stopped-Flow technique.
CO 4: This course helps in understanding the basics of redox reactions at the surface of the electrode and also helpful in understanding the electric double layer at inter-phase region between the electrode and electrolyte.

NAME OF COURSE (SUBJECT): **Lab Course in Physical Chemistry**
CO 1: It consists of several experiments that use different techniques to explore fundamental concepts of solubility of a solute, cryoscopic determination of the degree of dissociation of a given strong electrolyte, spectrophotometry, conductance, potentiometry, viscometry, etc.
CO 2: This course also helps the students to learn the thermal behavior of crystalline and amorphous polymers and also synthesis and kinetics of polymerization.

NAME OF COURSE (SUBJECT): **Quantum Mechanics, Diffraction & Group Theory**
CO 1: This course covers the application and solution of the Schrödinger equation in spherical polar coordinates and Schrödinger's equation for atoms of many electron systems.
CO 2: Elemental analysis by emission spectroscopy.
CO 3: This course explains the locations of atoms and molecules in crystalline solids and also exhibits how crystalline solids show strong diffraction pattern when exposed to X-rays, neutrons, and electrons.
CO 4: Group theory helps to know the structure and behavior of molecules and crystals depending on their different symmetry.

NAME OF COURSE (SUBJECT): **Spectroscopy & Voltammetry**

CO 1: This course covers the theory that allows us to deduce the bond lengths and bond angles from rotational spectra experiments. Vibrational spectra provide information on bond lengths, bond strength, and molecular geometry.
CO 2: NMR Technique is a powerful tool for the elucidation of molecular structure. Also, it helps us to gain insight into bonding and molecular structure.
CO 3: The EPR spectroscopy is helpful in elucidating the structures of paramagnetic complexes, and CD and ORD spectra are useful in gross structural determination of organic compounds.
CO 4: Voltametric techniques are useful in understanding the type of reactions at electrode surface and quantitative determination of electroactive compounds.

NAME OF COURSE (SUBJECT): **Statistical Mechanics and Polymer Chemistry**
CO 1: This course provides methods for calculation of microscopic properties of many-particle systems in terms of microscopic properties using statistical laws.
CO 2: This course provides the information of properties and applications of polymers in industry and biomedical field and also how electrochemical cell can be used to obtain the power.
CO 3: This course helps the students to understand how the polymer membranes are used in water and solvent purification technique and also provides utilization of information in various fields of science and technology.

NAME OF COURSE (SUBJECT): **Lab Course in Physical Chemistry**
CO 1: This lab course is designed to expand and deepen the knowledge in the variety of experimental methods presented in physical chemistry laboratory previously.
CO 2: This lab is based on several sets of advanced experiments on various topics in physical chemistry including viscosity, verification of the Debye-Huckel-Onsager equation conductometrically, reaction kinetics, potentiometric estimation of a mixture of halides, cryoscopy, pH-metry, spectrophotometric estimation of metal ion, etc.

NAME OF COURSE (SUBJECT): **Lab Course in Physical Chemistry**
CO 1: This lab course is designed with the aim that students demonstrate capabilities such as experiment design and implementation with an emphasis on safety rules, demonstrating measurement capabilities, analysis and discussion, developing independent thinking abilities.
CO 2: This lab is based on the following set of advanced experiments on various topics in physical chemistry including adsorption, conductometric titration of moderately weak acid with strong base, determination of degree of hydrolysis of urea hydrochloride by studying kinetics of hydrolysis of methyl acetate using HCl and equinormal urea hydrochloride solutions, acid and base dissociation constants of an amino acid and its isoelectric point, etc.

NAME OF COURSE (SUBJECT): **Lab Course in Physical Chemistry**
CO 1: This lab course is designed to provide students with an idea of scientific activity.
CO 2: This laboratory is based on several sets of experiments covering a wide range of topics in physical chemistry such as solubility study, the effect of addition of an electrolyte on the solubility of an organic acid, construction of phase diagram of three component system, studying the kinetics of saponification of ethyl acetate by conductance method, determination of step-wise heat of neutralization of a polybasic acid, reaction kinetics of H_2O_2 and HI: clock reaction, etc.

NAME OF COURSE (SUBJECT): **Quantum Mechanics and Solid-State Chemistry**

CO 1: This course describes the quantum mechanical treatment of the molecules by using different theories.
CO 2: The course solid-state chemistry provides the properties and applications of solids.

NAME OF COURSE (SUBJECT): **Catalysis and Polymer Chemistry**
CO 1: This course describes the reaction kinetics of homogeneous and heterogeneous catalyzed reactions and industrial applications.
CO 2: This course gives the different methods available for the polymer weight determination.
CO 3: This unit provides the information regarding thermal characterization techniques and method of polymer fabrication and synthesis of polymers.

NAME OF COURSE (SUBJECT): **Spectroscopy and Microscopy**
CO 1: The Raman spectroscopy is commonly used in chemistry to provide a structural fingerprint by which molecules can be identified.
CO 2: The mass spectrometry is helpful in determining the structure of a compound by observing its fragmentation and its uses in analytical laboratories.
CO 3: Photoelectron spectroscopy involves the study of the electronic structure of molecules. Mössbauer spectroscopy is used to study nuclear structure with the absorption and re-emission of gamma rays.
CO 4: Microscopic techniques make it possible to assess the morphology, composition, physical properties, and dynamic behavior of materials.

NAME OF COURSE (SUBJECT): **Lab Course in Physical Chemistry**
CO 1: This course is planned to familiarize and introduce the students to modern laboratory instrumentation and experimental techniques in physical chemistry.
CO 2: It consists of a number of experiments that use different techniques to explore fundamental concepts in the variation of solubility of an organic acid, studying the kinetics of saponification of ethyl acetate by conductance method and hence determine the rate constant, thermochemistry, reaction kinetics, etc.

NAME OF COURSE (SUBJECT): **Lab Course in Physical Chemistry**
CO 1: This course is intended to acquaint the students with the practice of experimental physical chemistry and to provide an introduction to this area of modern scientific activity.
CO 2: This laboratory is based on several sets of experiments covering a wide range of topics in physical chemistry such as comparison of cleansing powers of two detergent samples, construction of phase diagram of three component system, cryoscopy, mobility of ions, influence of ionic strength on the solubility of $CaSO_4$ and determination of its thermodynamic solubility product and mean ionic activity.

NAME OF COURSE (SUBJECT): **Lab Course in Physical Chemistry**
CO 1: This lab course is designed so that the students learn how to describe experimental results and analyze them quantitatively and develop the ability of scientific communication through written reports and frontal presentations.
CO 2: The experiments include determination of molecular surface energy and association factor, determination of the formula of the complex formed between copper ions and ammonia by distribution method, kinetics of oxidation of 2-propanol by chromic acid, and determination of the transport number of Ag^+ and NO^- in solution (concentration cells).

NAME OF COURSE (SUBJECT): **Analytical Chemistry**

CO 1: The classification of analytical techniques, classical quantitative techniques (volumetry and gravimetry) with regard to minimization of errors, mechanism of precipitation and factors influencing precipitation, co-precipitation, and post-precipitation, usage of organic reagents in gravimetric analysis.
CO 2: Selection of suitable indicators in various titrimetric analyses such as neutralization reactions, redox reactions, complexometric reactions, and precipitation reactions. The application of these titrimetric methods for inorganic analysis.
CO 3: The classification and theory of various chromatographic methods such as column chromatography, TLC, HPLC, GC, and Ion-exchange chromatography.
CO 4: The applications, advantages, and limitations of various chromatographic techniques. Use of solvent extraction method in the quantitative determination of metal ions.

NAME OF COURSE (SUBJECT): **Lab Analytical Chemistry - Organic Chemistry Practical**
CO 1: Quantitative analysis - Titrimetric Estimation of amino acids.
CO 2: Estimation of glucose by Bertrand's method. Estimation of keto group.
CO 3: Iodine value of oil (Chloramine-T method). Estimation of Nitro group by reduction using $SnCl_2$.
CO 4: Separation of binary mixture of organic compounds using ether and identification of separated compounds by systematic qualitative organic analysis.

NAME OF COURSE (SUBJECT): **Instrumental Methods of Analysis**
CO 1: Principles, theory, instrumentation, and analytical applications of various optical methods such as AAS, emission spectroscopy, and molecular luminescence spectroscopy.
CO 2: Principles, theory, instrumentations, and analytical applications of coulometry, amperometry, polarography, electrophpresis, electrogravimetry, supercritical fluid chromatography, voltammetry, nephelometry, and turbidometry besides their advantages of each method.
CO 3: The types and importance of ion-selective electrodes in selective determination. The use of thermal methods such as TGA, DTA, and DSC for characterization of inorganic compounds, polymers, pharmaceuticals, etc.

NAME OF COURSE (SUBJECT): **Molecular Spectroscopy**
CO 1: Importance of interaction of electromagnetic radiation with matter.
CO 2: The principle, the theory, and instrumentation of various spectroscopic techniques.
CO 3: Application of different spectroscopic techniques (UV-Vis, IR, NMR, EPR, Mossbauer) in the structural elucidation of organic/Inorganic compounds, biomolecules, etc.

NAME OF COURSE (SUBJECT): **Selected Topics in Analytical Chemistry-I**
CO 1: Classification, properties, and analytical and biological applications of different types of sensors.
CO 2: The importance of various elements in biological systems, their structural and functional roles such as dioxygen transportation and storage, electron transfer in different processes, metalloenzymes, etc.
CO 3: Use of metal complexes in medicine.
CO 4: The overview, principles, and types of automated systems and their advantages and disadvantages in the analysis.
CO 5: Use of computer software programs in chemistry for better understanding.

NAME OF COURSE (SUBJECT): **Lab Course in Analytical Chemistry – I**
CO 1: The hands-on experience of various analytical instruments such as nephelometer/turbidometer (sulphate/phosphate content in ground water) and colorimeter (Ti^{4+} using H_2O_2 and composition of $Fe(phen)_3]^{2+}$), complexometric titration using EDTA (calcium in Milk and Fe^{2+}/Fe^{3+} in a mixture), and Ion-Exchange chromatography (chloride and Bromide; Cadmium and zinc).

CO 2: Upon acquiring the required knowledge as well as practical skills, the students can extend it for the analysis of different metal ions in different samples including soil, environmental, pharmaceutical, etc. samples.

NAME OF COURSE (SUBJECT): **Lab Course in Analytical Chemistry – II**

CO 1: After carrying out the experiments mentioned in this paper, students will learn.
CO 2: The hands-on experience in paper & column chromatography (separation of amino acids and plant pigments), conductometric titrations, visual and potentiometric titrations (iron in razorblade and pharmaceuticals), complexometric titrations (Al and Mg in antacid), and precipitation titration (saccharin in Tablets). Such knowledge is helpful to students to analyze a variety of samples in quality control/quality assurance.

NAME OF COURSE (SUBJECT: Lab Course in Analytical Chemistry – III

CO 1: Polarimeter used to study the optical isomers.
CO 2: Potentiometer used to analyze the halide mixture and iron.
CO 3: Conductometer used to analyze halide mixture and sulfate.
CO 4: pH meter used to determine the strength of acids and bases.
CO 5: Spectrophotometer used to analyze the water sample.
CO 6: The above exposure makes the students carry out project work involving a variety of problems related to analysis.

NAME OF COURSE (SUBJECT): **Pollution and Analysis**

CO 1: Understand the causes of different types of pollution (soil, air, water, radiation, and noise) and their hazardous effects on life, as well as solutions for minimizing pollution.
CO 2: Different methods of analysis to understand the extent of pollution, including determining pH, organic matter, and trace metals in soil; hardness, fluoride, and dissolved oxygen in water; measurement of noise; and analysis of radionuclides.
CO 3: Analysis of pollutants present in soil, water, and air, as well as radioactive substances. Determination of Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) using laboratory techniques.
CO 4: This training enables students to analyze air, water, and soil samples by linking theory to practicals. They can also suggest suitable remedies to the concerned.

NAME OF COURSE (SUBJECT): **Quality Control, Analysis of Food, Beverages, and Pharmaceuticals**

CO 1: Understand basic concepts of quality control and quality assurance.
CO 2: Recognize the importance of quality control in drugs, pharmaceuticals, and raw materials.
CO 3: Explore law-related case studies of the quality control section in various industries.
CO 4: Classify and analyze beverages, food preservatives, adulterants, drugs, pharmaceuticals, dairy products, and edible oils.
CO 5: Acquire knowledge useful for students seeking jobs in industries related to quality assurance and quality control. The understanding of analysis in clinical studies is beneficial for diagnosing ailments or deficiencies.

NAME OF COURSE (SUBJECT): **Selected Topics in Analytical Chemistry–II**

CO 1: Conduct analysis of various biomedical samples, ores, minerals, fertilizers, metals, alloys, and cement.
CO 2: Explore the types, composition, and purification methods of crude oil.
CO 3: Analyze products and residues produced in the refinery process of crude oil.
CO 4: Understand the usage of various analytical techniques in the evaluation of crude oil and its products.

The students will realize the importance of analysis and the potential for adulteration in different samples and industries.

NAME OF COURSE (SUBJECT): **PROJECT WORK**

CO 1: During the project work, students will identify new problems in the frontier areas of research and work on them either in industry, other educational institutions, R&D organizations, or the parent institution. They will apply the theoretical and practical knowledge gained during their M.Sc course. This platform allows students to implement novel ideas for the betterment of society.

NAME OF COURSE (SUBJECT): **Instrumental Methods of Analysis**

CO 1: Analysis of water for alkalinity and acidity by pH metric method.
CO 2: Determination of strength of commercial phosphoric acid by pH titration.
CO 3: Determination of ammonia in household cleaners by conductometric titrations.
CO 4: Determination of sodium and potassium in soil by flame photometry.
CO 5: Determination of phosphate in domestic wastewater by spectrophotometry.
CO 6: Analysis of mercury/lead in industrial effluents by spectrophotometry.
CO 7: Determination of DO, BOD, and COD of a wastewater sample by titrimetry.
CO 8: Determination of fluoride by spectrophotometric method.
CO 9: Soil analysis.

NAME OF COURSE (SUBJECT): **Instrumental Methods of Analysis**

CO 1: Analysis of medicines - APC tablet, paracetamol, sulpha drugs by potentiometry/spectrophotometry/titrimetry.
CO 2: Assay of aspirin/caffeine/phenacetin by spectrophotometry.
CO 3: Determination of vitamin A in vanaspati by UV spectrophotometry.
CO 4: Isolation of casein and lactose from milk.
CO 5: Food analysis - Determination of iron in mustard sugar, phosphorus in peas, ascorbic acid in tomato, benzoic acid in food products.
CO 6: Determination of iodine value of an oil sample.
CO 7: Saponification of an oil sample.

NAME OF COURSE (SUBJECT): **Instrumental Methods of Analysis**

CO 1: Analysis of fertilizers - Urea, superphosphates.
CO 2: Analysis of pyrolusite ore.
CO 3: Analysis of alloys - Cupronickel and bronze.
CO 4: Analysis of cement.
CO 5: Determination of (i) aluminium and magnesium in a mixture.
CO 6: Analysis of Stainless steel - Ni gravimetrically using DMG, Fe volumetrically using Ce(IV), Cr volumetrically by persulphate oxidation.
CO 7: Analysis of body fluids - Determination of cholesterol, glucose in blood; uric acid, creatinine in urine.

COURSE OUTCOME (CO):

DEPARTMENT OF MATHEMATICS

Programme Specific Outcomes (PSOs)

After completion of this program, the student will be able to:
PSO1: Understand the fundamentals in mathematics.
PSO2: Be capable of developing ideas based on mathematical axioms.
PSO3: Apply different methods for the solution of problems.
PSO4: Be able to develop research studies in mathematics and related areas.
PSO5: Understand the applications of mathematics with problem-solving skills, thinking, creativity, and demonstration.

NAME OF COURSE (SUBJECT): Algebra-I
CO1: To simplify algebraic expressions using commutative, associative, and distributive properties.
CO2: Identify the types of groups.
CO3: Understand the concepts of Sylow's theorem.
CO4: Explain and demonstrate accurate and efficient use of advanced techniques.
CO5: Prove and explain the concepts from advanced algebra.

NAME OF COURSE (SUBJECT): **Real Analysis**
CO1: Describe the real line as a complete ordered field and prove the properties of real numbers.
CO2: Understand interior point, limit point, closed set, open set, compact set, and prove their properties.
CO3: Explain the basic theory of metric space and its related concepts such as continuity, completeness, compactness, and connectedness and prove their results in the metric space.
CO4: Apply the Mean Value Theorem and the Fundamental Theorem of Calculus to problems in the context of real analysis.
CO5: Determine the Riemann integrability of a bounded function and prove theorems concerning integration.

NAME OF COURSE (SUBJECT): Topology-I
CO1: Understand to construct topological spaces using general properties of open sets, closed sets, neighborhoods, basis, and sub-basis and from metric spaces.
CO2: Apply the properties of open sets, closed sets, interior points, accumulation points, and derived sets in deriving the proofs of various characterizations of topological spaces.
CO3: Use continuous functions and homeomorphisms to understand the structure of topological spaces.
CO4: Understand the concepts and properties of compact, locally compact, and connected topological spaces.

NAME OF COURSE (SUBJECT): **Differential Equations-I**
CO1: Solve ordinary differential equations (ODE) with constant coefficients.
CO2: Apply the method of variation of parameters.
CO3: Apply Strum comparison theorem.
CO4: Apply Picard's method for the solution of initial value problems (IVP).
CO5: Apply Laplace Transforms to solve ODE.

NAME OF COURSE (SUBJECT): **Discrete Mathematics**
CO1: Understand Boolean algebra.
CO2: Apply coding theory.
CO3: Understand the basic graph theory.
CO4: Check traversability of a network.

NAME OF COURSE (SUBJECT): **Computer Programming**
CO1: Develop algorithms.
CO2: Understand computer programming languages.

CO3: Develop skills for C-Programming.
CO4: Understand the data structure in the program.

NAME OF COURSE (SUBJECT): **Operations Research**
CO1: Formulate Linear Programming problems.
CO2: Apply methods to solve Linear Programming Problems.
CO3: Understand Transportation Problems and Assignment Problems.
CO4: Compute Game Theory Problems.
CO5: Use Queuing Theory for Stochastic Process and Markov Chain.

II– SEMESTER

NAME OF COURSE (SUBJECT): Algebra-II
CO1. Understand rings, ideals, field and Euclidean domain.
CO2: Find the roots of polynomials.
CO3: Understand the characteristics of rings and fields.
CO4: Understand the fundamental concepts of homomorphisms and their role in mathematics.
CO5: Apply uniqueness theorem.

NAME OF COURSE (SUBJECT): **Complex Analysis-I**
CO1: Discuss the convergence of power series expansions.
CO2: Use Cauchy's Theorem and Cauchy's Integral Formulae to solve contour integration.
CO3: Express an analytic function in terms of power series in the domain of analyticity.
CO4: Understand the characteristics of a complex function in the neighborhood.
CO5: Acquire the skill of contour integration to evaluate complicated real integrals via residue calculus.
CO6: Apply Rouché's theorem to determine the number of zeros and poles of a meromorphic function in the given domain.

NAME OF COURSE (SUBJECT): Linear Algebra
CO1. Understand Vector spaces
CO2.Apply Linear Transformations
CO3.Compute eigen values and eigen vectors
CO4.Formulate the diagonalization of matrices.

NAME OF COURSE (SUBJECT): Functions of Several Variables
CO1. Understand inner product space
CO2.Applymetricspace
CO3.DiscussconvergenceofsequencesinR^n
CO4.Apply Inverse and Implicit Function Theorem in R^n

NAME OF COURSE (SUBJECT): Differential Equations-II
CO1. Understand series solution about ordinary and regular singular points.
CO2. Apply Power and Frobenius methods.
CO3. Understand variable coefficient ODE.
CO4. Understand orthogonality of special functions.

NAME OF COURSE (SUBJECT): Programming Lab-I
CO1.DevelopC-languagecodes.

CO2. Develop Programme to solve mathematical problems.CO3.ComputescientificproblemswithC-Programming.
CO4.Analyzeobtaineddata.

NAME OF COURSE (SUBJECT): OEC-Fuzzy Sets and Fuzzy Logic
CO1. Understand Fuzzy sets and fuzzy logic.
CO2. Apply operations on fuzzy sets.
CO3. Understand fundamentals of computers.
CO4. Apply ability logically and arithmetically for quantitative aptitude.

M.Sc.III SEMESTER

NAME OF COURSE (SUBJECT): Measure Theory
CO1. Understand measure of a set and measurable sets.
CO2. Understand measurable functions.
CO3. Approximating measurable functions by specific functions.
CO4. Compute Lebesgue integrals.

NAME OF COURSE (SUBJECT): Complex Analysis-II
CO1. Understand the characteristic of analytic functions.
CO2. Understand conformal mapping to compute geometric mappings.
CO3. Extend analyticity continuation to analytic function and its natural boundary.
CO4. Discuss convergence of a sequence of complex functions.
CO5. Understand the effect of uniform convergence.

NAME OF COURSE (SUBJECT): Topology-II
CO1. Understand to construct the separation axioms using open and closed sets.
CO2. Know the concepts of convergence and compactification.
CO3. Demonstrate knowledge and understanding of metric spaces.
CO4. Apply theoretical concepts in topology to understand the real-world applications.

NAME OF COURSE (SUBJECT): Differential Geometry-I
CO1. Understand Euclidean space, Tangent vectors, Vector fields.
CO2. Find directional derivatives.
CO3. Obtain dot product in E3 and dot product of tangent vectors.
CO4. Understand curvature and torsion of a unit-speed curve..

NAME OF COURSE (SUBJECT): CO1. Understand error analysis.
CO2. Apply Numerical methods for solving nonlinear equations.
CO3. Use interpolation and extrapolation for Numerical differentiation and Integration.
CO4. Apply multistep methods for solving Initial Value Problems (IVP).

NAME OF COURSE (SUBJECT): **Programming Lab-II**
CO1. Understand for loop to solve matrix-related problems.
CO2. Solve diversified solutions such as arithmetic operations on matrices and finding the norm of a matrix.
CO3. Solve system of equations by implementing C-Programming.
CO4. Handle runtime errors during execution.

NAME OF COURSE (SUBJECT): **OEC-Discrete Mathematical Structures**

CO1. Understand the concept of Mathematical induction.
CO2. Perform operations on sets and Relations.
CO3. Apply counting principle.
CO4. Understand tree network.
CO5. Solve data interpretation problems.

NAME OF COURSE (SUBJECT): CO1. Understand the concept of Normed linear spaces, Banach spaces, and Hilbert spaces.
CO2. Compute the dual spaces of certain Banach space and Hilbert space.
CO3. Find the orthonormal vectors.
CO4. Obtain self-adjoint and normal operators.

NAME OF COURSE (SUBJECT): Fuzzy Topology

CO1. Construct the appropriate fuzzy sets using the membership function of uncertain problems.
CO2. Understand the differences in crisp sets and fuzzy sets.
CO3. Construct the fuzzy numbers corresponding to uncertain and imprecise collected data.
CO4. Create new fuzzy topological spaces by using fuzzy sets.

NAME OF COURSE (SUBJECT): Dimension Theory

CO1. Understand local finiteness and point-finiteness of a family of subsets of a topological space.
CO2. Identify paracompact spaces and its related spaces.
CO3. Discuss perfect function.
CO4. Understand Local dimension Theory.

NAME OF COURSE (SUBJECT): Relativity

CO1. Represent Lorentz group, Time dilation, Space contraction.
CO2. Understand contraction symmetric and skew symmetric tensors.
CO3. Understand tensor algebra and calculus in curved space-time.
CO4. Derive Einstein field equation.

NAME OF COURSE (SUBJECT): Ring Theory

CO1. Understand the characteristics of ring and ideal.
CO2. Discuss Modules.
CO3. Apply Schur's lemma and Jordan-Holder theorem.
CO4. Determine ideals in matrix ring.
CO5. Understand Noetherian and Artinian rings.

NAME OF COURSE (SUBJECT): **Galois Theory**

CO1. Understand characteristic of a field and splitting field of a polynomial.
CO2. Understand algebraic extension, algebraic closure, and algebraically closed field.
CO3. Apply Artin's theorem, Hilbert's theorem, and Artin–Schreier's theorem.
CO4. Discuss Galois groups of quadratic, cubic, and quartic polynomials.

NAME OF COURSE (SUBJECT): Number Theory

CO1. Understand residues systems and linear congruences.
CO2. Discuss Diophantine equations.
CO3. Discuss primitive roots with modulo p.

CO4. Understand quadratic congruences.
CO5. Apply Euler's partition theorem.

NAME OF COURSE (SUBJECT): Graph Theory
CO1. Discuss factorization and coverings of graphs.
CO2. Understand the planarity of graphs.
CO3. Apply coloring of graphs.
CO4. Discuss spectra of graphs.
CO5. Discuss domination parameters of graphs.

NAME OF COURSE (SUBJECT): Differentiable Manifolds
CO1. Understand the charts and atlases.
CO2. Discuss pull back functions, tangent vectors and tangent spaces.
CO3. Understand the dual of the differential map.
CO4. Discuss Tensor product of finite-dimensional vector spaces.
CO5. Understand torsion and curvature tensors.

NAME OF COURSE (SUBJECT): Nevanlinna Theory
CO1. Understand entire and meromorphic functions.
CO2. Apply Poisson–Jenson's formula for meromorphic functions.
CO3. Discuss Proximity function, Counting function, and Characteristic function.
CO4. Apply Picard's theorem and Borel's theorem to prove the second fundamental theorem of Nevanlinna theory and uniqueness theorem.

NAME OF COURSE (SUBJECT): Geometric Function Theory
CO1. Discuss conformal mapping, Unit disc transformation and normal families.
CO2. Discuss Dirichlet's problem.
CO3. Discuss power series with finite radius of convergence.
CO4. Apply Area theorem, Distortion theorem, Bieberbach theorem.

NAME OF COURSE (SUBJECT): Group Theory
CO1. Understand groups, subgroups, normal subgroup, factor group.
CO2. Apply Cauchy's theorem and Sylow theorem.
CO3. Discuss solvable groups.
CO4. Discuss Automorphism groups, semidirect products and factor sets.
CO5. Discuss infinite abelian groups, torsion, reduced groups and finitely generated abelian groups.

NAME OF COURSE (SUBJECT): Commutative Algebra
CO1. Understand rings, subrings, ideals, quotient rings.
CO2. Apply operations on ideals.
CO3. Understand modules, submodules, and quotient modules.
CO4. Discuss properties of rings.
CO5. Understand Noetherian module. Artinian module. Modules of finite length.

NAME OF COURSE (SUBJECT): Differential Equations-III
CO1. Understand critical and simple critical points of linear and nonlinear system.
CO2. Discuss periodic solutions.
CO3. Understand classification of second-order PDEs.
CO4. Understand the solution of fundamental PDE's.

NAME OF COURSE (SUBJECT): Differential Geometry-II

CO1. Understand arbitrary speed curves and Frenet formulas.
CO2. Discuss connection forms of a frame field.
CO3. Understand patches.
CO4. Understand topological properties of surfaces and Manifolds.
CO5. Discuss normal Curvature, Gaussian curvature, and Special curves in surfaces.

NAME OF COURSE (SUBJECT): Integral Transforms and Integral Equations

CO1. Understand linear integral equations of the first and second kind.
CO2. Discuss solution by successive substitutions and successive approximations.
CO3. Apply Laplace Transform techniques to understand

NAME OF COURSE (SUBJECT): Programming Lab-III

CO1. Write and execute C-programming for numerical methods.
CO2. Discuss subroutines of C-programming.
CO3. Discuss arrays, functions, and strings in mathematical problems.
CO4. Handle possible errors during program execution.

NAME OF COURSE (SUBJECT): Project Work

CO1. Survey literature.
CO2. Understand real-world problems through mathematical modeling.
CO3. Formulate the problem and apply the suitable techniques for solution.
CO4. Write the dissertation.

COURSE OUTCOME (CO):

DEPARTMENT OF PHYSICS

M.Sc.Physics

ProgrammeOutcomes(POs): M.Sc.Physics Program outcomes are expected to be aligned closely with attributes. The program consists of theory, practical and project work. After successful completion of the program, the students will be able

PO 1: To create, apply, and disseminate knowledge leading to innovation in physics.
PO 2: To think critically, explore possibilities, and exploit opportunities positively.
PO 3: To develop the ability to identify, formulate, analyze, and solve problems.

PO 4: To develop ability to use and learn techniques, skills, and modern tools for scientific practices.
PO 5: To work in teams, facilitating effective interaction in workplaces.
PO 6: To provide research ambience and develop related technical proficiency.
PO 7: To work in R&D projects to pursue further research and finding placement avenues through it.
PO 8: To communicate effectively on general and scientific topics with the scientific community and with society at large.
PO 9: To inculcate academic and social ethical values and apply ethical issues related to one's work, avoid unethical behavior such as fabrication of data, committing plagiarism, and unbiased truthful actions in all aspects of work among the students.

SEMESTER–I

NAME OF COURSE (SUBJECT):MathematicalMethodsinPhysicalSciences
CO 1:Interpret the various special mathematical functions to understand the physical consequences.
CO 2:Discuss and interpret the matrices for solving the physical problems.
CO 3:Apply the group theory for knowing the physical properties of the matter.
CO 4:Describe the mathematical techniques for the statistical interpretation of the physical sciences
CO 5:Studying the Probability functions using Monte Carlo Simulations

NAME OF COURSE (SUBJECT):ClassicalMechanics
CO 1:Demonstrate a basic and advanced knowledge of Lagrangian and Hamilton's principles and solve related problems.
CO 2:Demonstrate the concept of motion of a particle under central force, concepts of different orbits and apply advanced methods to deal with the central force problems.
CO 3:Understand the kinematics and dynamics of rigid body in detail and ideas regarding Euler's equations of motion and techniques for solving problems of rigid body mechanics.
CO 4:Learn the details of fixed and moving co-ordinate systems, Coriolis force acting on falling body, torque free motion and motion of symmetric top.
CO 5:Understand the Hamiltonian formalism in solving physics problems and understand Poisson bracket method in tackling physical problems.
CO 6:Use Hamilton-Jacobi theory for finding the solutions of various classical systems.
CO 7:Understand the fundamentals of rocket propulsion, including thrust equation, specific impulse of a rocket engine.
CO 8:Understand the effect of gravity on rocket, equation for burnout velocity, rocket staging and optimization of multistage rocket.

NAME OF COURSE (SUBJECT):ElectronicsandCommunication(General)
CO 1:Understand the basic principles of working of operational amplifiers and design op- amp based circuits such as amplifier, integrator, differentiator, full wave and half wave rectifiers. Understand the design of various electronic circuits.
CO 2:Gain knowledge of designing additional op-amp based filter circuits and oscillators, comparators, frequency multipliers, basics of modulation and demodulation.
CO 3:Appreciate the importance and working of Optical Fibre Communication system, its design and applications which help the student to appreciate the current advances in communication system.
CO 4:Gain knowledge of working of various Gates and logic circuits, sequential circuits which form the elements of Digital circuits.

CO 5:Will be able to implement the above practically with the help of Numerical problems solving.

NAME OF COURSE (SUBJECT):CondensedMatterPhysics(General)

CO 1:The formation of crystalline state in solids along with the basic definitions associated with geometrical arrangement of atom in crystal can be understood.
CO 2:The atomic arrangement in real crystals can be studied experimentally by using X-ray diffraction by introducing the concept of reciprocal lattice.
CO 3:The crystal binding of solids through chemical bonding is an important topic to understand the strength and physical properties of materials that can be achieved by this course.
CO 4:The behavior of materials in terms of interaction of atoms and electrons in subject to applied external fields/force can be understood.

NAME OF COURSE (SUBJECT):ElectronicsandCondensedMatterPhysics

CO 1:It helps to solve the crystal structure of given X-ray patters and hence to estimate the lattice and lattice parameters.
CO 2:The experiment gives an idea to measure the energy gap of a given semiconductor through the temperature dependent resistivity measurement.
CO 3:It clears the concept of structure factor and its significance.
CO 4:Design and learn implementing the operational amplifier IC 741 based amplifier, adder, subtractor, differentiator, integrator circuits
CO 5:Design and learn implementing op-amp 741 based circuits in generation of sinusoidal and triangular waveforms and characterize them
CO 6:Design and learn implementing op-amp based low-pass, high-pass and band-pass filter circuits.
CO 7:Learn simplification of Boolean expressions using NAND gates
CO 8:Learn using FORTRAN programming for solving E&C related problems

NAME OF COURSE (SUBJECT):Practical-II:Atomic&MolecularPhysicsandNuclear&ParticlePhysics(General)

CO 1:Understand the fundamentals of various physical phenomena and physical concepts.
CO 2:Understand the interference and diffraction by means of He-Ne laser.
CO 3:Determine the ionization potentials in atoms by the Franck-Hertz experiment.
CO 4:Understand the impact of electric and magnetic fields on electron and determine e/m of electron using Zeeman Effect.
CO 5:Understand the dispersion of a Grating Spectrograph.
CO 6:Write the Fortran program, compile and execution to solve the spectroscopy problems.
CO 7:Understand the performance and characteristics of Geiger-Muller counter for estimating the random nature of radioactive decay and attenuation of beta particles.
CO 8:Understand the performance and characteristics of NaI(Tl) scintillation gamma ray spectrometers.

NAME OF COURSE (SUBJECT):Quantum Mechanics–I

CO 1:Basic postulates of Quantum mechanics, Ehrenfest’s theorem and simple applications of Quantum Mechanics.
CO 2:Reduction of two body problem to single particle problem. Centre of mass and relative motions, eigen values and eigen functions.
CO 3:Theory of time-independent perturbation theory (the case of a system with non- degenerate energy levels) its applications.
CO 4:Theory of time-dependent perturbation theory its concept and its applications.

CO 5:Scattering theory: Differential and total cross-section. Born approximation and its derivation of the expression for different cross-section.

NAME OF COURSE (SUBJECT):Atomic&MolecularPhysics(General)

CO 1:How to interpret microwave and mid IR spectra due to diatomic molecules, their relevance in chemical sciences, astrophysics & planetary science.
CO 2:How to interpret optical spectra using theoretical models & achieve agreement with experiment.
CO 3:How typical lasers work, their use in advanced frontier areas.

NAME OF COURSE (SUBJECT):Nuclear & Particle Physics(General)

CO 1:Describe the basic properties of nucleus, its structure and different models that explain the static and dynamical properties of a nucleus.
CO 2: Understand the phenomenon of radioactive decays of alpha and beta particles and gamma rays, their detailed formalism and outcomes.
CO 3: Acquire knowledge about various type of radiation detectors used in nuclear physics experiments, unique properties of different detectors and their applications.
CO 4: Differentiate between different types of nuclear reactions, relevant aspects associated with nuclear reactions and kinematics of such reactions.
CO 5:Learn about conditions of controlled chain reaction in different nuclear reactors.
CO 6:Know about different elementary particles their classifications and quark model to understand the fundamental forces of nature and classification.
CO7:Understand the stopping power of different energetic charged particles inamediumandmechanismsofinteractionofgamma photonwithmatter.
CO8:Understand the trace elemental analysis and applications of radio isotopesincancertreatment,agricultureandindustry.

NAME OF COURSE (SUBJECT):
Practical III: Electronics and Condensed Matter Physics

CO 1:Students learn to measure the Hall effect which in turn helps to measure the basic parameters such as carrier density, sign of carriers and mobility of charge carriers in a semiconductor.
CO 2:It helps to explore the temperature dependent properties of a diode estimate the energy gap of a semiconductor.
CO 3:The indexing of cubic patterns and calculation of lattice parameters is possible.

NAME OF COURSE (SUBJECT):
Practical-IV - Atomic & Molecular Physics and Nuclear & Particle Physics

CO 1: Demonstrate the production and analysis of elliptically polarized light.
CO 2: Understand the Beer's Law to measure the fraction of the incident light transmitted through a solution.
CO 3: Understand the dispersion spectra of radiations using glass prism spectrograph.
CO 4: Acquire practical knowledge on calibrating Nal(TI)gamma ray spectrometer and to determine the energy of a given gamma ray source and calculate the energy resolution.
CO 5: Able to determine the attenuation of gamma rays in matter using Nal(TI) gamma ray spectrometer.
CO 6: Understand the semi-empirical mass formula to calculate the binding energy of any nucleus using Fortran 77 computer programming.

Semester–III

NAME OF COURSE (SUBJECT):Quantum Mechanics–II

CO 1:How to formulate the foundational aspects of quantum mechanics in the formalism of linear vector algebra.
CO 2:How to use different approximate methods for solving higher problems.
CO 3:How the different aspects of angular momentum can be used in theoretical models to understand variety of physical problems.
CO 4:How the synthesis of two fundamental theories – theory of relativity & quantum mechanics – leads to enhanced understanding of new major results in agreement with experiment.

NAME OF COURSE (SUBJECT):Electronics & Communication–I
CO 1:Learn transmission of electrical energy from one point to another and will be able to analyse the working of different types of transmission lines and also clear understanding of working of wired telephone communication system.
CO 2:Working of transmission lines at higher frequencies such as Radio Frequencies which helps student to appreciate the use of transmission lines in video/picture transmission.
CO 3:Get a comprehensive picture of signal transmission, analysing various waveguides as well as antennas.
CO 4:Gain knowledge of how satellites communicate with ground stations and help in appreciating various applications.
CO 5:Will be able to implement the above practically with the help of Numerical problems solving.

NAME OF COURSE (SUBJECT): Condensed Matter Physics–I
CO 1:The effect of periodic structure a lattice on the electron energy states can be learnt.
CO 2:The concept of Fermi surface is important in the understanding the properties of crystalline materials. The can be thoroughly understood by studying this course.
CO 3:The quantization of lattice vibrations that leads to formation of quantum particle that is phonon can be understood.
CO 4:The course helps to apply the Boltzmann transport equation to understand the charge transport mechanism in metals and semiconductors.

NAME OF COURSE (SUBJECT):Atomic & Molecular Physics–I
CO 1:Students will learn application of theoretical models to the interpretation of atomic spectra in agreement with experiment.
CO 2:Electronic structure of atoms under the influence of electric & magnetic fields.
CO 3:Application of theoretical models to the interpretation of diatomic molecular CO CO 4:states, electronic, vibrational & rotation spectra in agreement with experiment.
CO 5:Relevance of these spectra in understanding atmosphere, comets, stars and inter- galactic matter

NAME OF COURSE (SUBJECT):Nuclear & Particle Physics–I
CO 1:Learn the scattering phenomenon using high energy electrons on nucleus to understand the electric and magnetic form factors of protons, and magnetic form factor of neutron.
CO 2:Understand electric quadrupole moment due to single nucleon is a state J and magnetic dipole moment for odd proton and odd neutron using extreme single particle model.
CO 3:Know and learn about the theory of deuteron, explore its ground state properties of and applications with square well potential.
CO 4:Know the range of tensor interaction using quadrupole moment to understand the saturation of nuclear forces.
CO 5:Understand the neutron-proton scattering and concept of scattering length and its effective range theory along with spin dependence of nuclear force.
CO 6:Learn the effect of Coulomb and nuclear scattering, and Meson theory of nuclear force.

CO 7:Understand the symmetry classification of elementary particles and apply the Gellmann Nishijima and Gell-Mann-Okubo formula to solve numerical problems.
CO 8:Learn the basics of strong interactions and quark structures, experimental support for quark model and quark dynamics.

NAME OF COURSE (SUBJECT): Electronics & Communication–II
CO 1:Get a clear picture of various transducer based electronic instruments used for measuring various physical quantities such as light, pressure, temperature, humidity, etc.
CO 2:Obtain a detailed knowledge of role of technology in medicine, biomedical signals and medical instrumentation system such as ECG, EEG, EMG, MRI, etc.
CO 3:Learn classification of signals and systems and various mathematical techniques employed to study and analyse these.
CO 4:A detailed knowledge about conversion of signals from frequency domain to time domain and vice-versa, detailed mathematical background for resolving the signals in both domains.
CO 5:Will be able to implement the above practically with the help of Numerical problems solving.

NAME OF COURSE (SUBJECT):Condensed Matter Physics–II
CO 1:The classification of magnetic materials and Weiss molecular field theory of ferromagnetism can be understood.
CO 2:It clears the concept of formation of magnons at very low temperature in a ferromagnetic material and their behavior through Bloch T3/2 law will be evident.
CO 3:Other class of magnetic materials like anti-ferromagnetic and ferromagnetic can be understood.
CO 4:The significance of dielectric materials and their associated phenomena such as dipolar polarizibility, ferroelectrics and piezoelectric can be learn.

NAME OF COURSE (SUBJECT):Atomic & Molecular Physics–II
CO 1:Students will learn how to employ the analytical techniques for the analysis of atomic and molecular samples.
CO 2:How to select an analytical technique for a given application.
CO 3:How to apply the basic knowledge to characterize atomic & molecular samples.
CO 4:How to set up these analytical techniques in a physical, chemical & life science laboratory.

NAME OF COURSE (SUBJECT): Nuclear & Particle Physics–II
CO 1:Learn about the classification, mechanisms, properties and factors affecting performance of scintillator detectors.
CO 2:Learn about the differences between single channel analyzer and multichannel analyzer in NaI(TI) gamma ray spectrometers and to estimate calibration constant.
CO 3:Know the basics, construction, working, advantages and disadvantages of semiconductor detectors and types and characteristics of solid-state detectors.
CO 4:Understand about the various types of nuclear accelerators and their basic components and types of accelerations and principles of operation.
CO 5:Understand the basic principles, construction and working of energy and wavelength dispersive x-ray fluorescence spectrometers.
CO 6:Learn the basics and working principles of positron annihilation spectroscopy and perturbed angular correlation for study of condensed matter.
CO 7:Learn about the neutron classification, sources of neutrons and neutron detectors, especially BF3 counter and 3He based neutron detector.

CO 8:Understand the theory of neutron diffraction of powder and single crystals, neutron diffraction patterns of superconductors and magnetic materials.

NAME OF COURSE (SUBJECT): Electronics & Communication Practical–I

CO 1:Design and learn implementing the operational amplifier IC 741 based wave form generator circuits
CO 2:Design and learn implementing op-amp 741 based instrumentation amplifier and characterize it
CO 3:Design and learn implementing op-amp based twin-T and notch filter circuits.
CO 4:Implementation of 2's complement addre and subtractor and bidirectional shift registers

NAME OF COURSE (SUBJECT): Condensed Matter Physics Practical–I

CO 1:Calculation of d-spacing, structure factor and indexing of cubic and non-cubic pattern can be understood.
CO 2:The significance of intensity of X-ray scattering and its relation to the position of atoms in an unit cell can be learnt.
CO 3:The experimental measurement of specific heat of different metals can be realized.

NAME OF COURSE (SUBJECT): Atomic & Molecular Physics Practical–I

CO 1:Basic experiments related to atomic & molecular physics.
CO 2:Hands-on experience in setting up experiments.
CO 3:Analysis of both measured & given data as assignments.
CO 4:Interpretation of results and make critical comments.

NAME OF COURSE (SUBJECT): Practical Nuclear & Particle Physics–I

CO 1:acquire practical knowledge on calibrating NaI(Tl)gamma ray spectrometer and to determine the energy of a given gamma ray source.
CO 2:Learn various modes in a multichannel analyzer and use them to calculate the energy resolution, energy of gamma ray.
CO 3:Determine the mass attenuation coefficient of beta particles from 204Tl, 210Pb and 137Cs sources in Al foils using G.M. Counting system.
CO 4:Able to verify the Bohr's frequency condition and Moseley's law using MCA based NaI(Tl) scintillation detector.
CO 5:Understand the defects present in metals and semiconductors using positron annihilation lifetime parameters.
CO 6:Construct the pulse generator circuit using IC 4049 and study its output waveforms.
Determine the gamma ray attenuation coefficient for different absorbers using NaI(Tl) gamma ray spectrometer using 137Cs source.
CO 7:Learn the rotational energy and angular momentum of a compound nucleus.

NAME OF COURSE (SUBJECT):Electronics & Communication Practical–II

CO 1:Implement Use of crystal oscillator and frequency division circuits
CO 2:Conduct Analog and digital optical fiber experiments
CO 3:Study of staircase generator using 4-bit counters and decade counter with 7-segment display
CO 4:Study Phase locked loop ICs and characteristics

NAME OF COURSE (SUBJECT):Condensed Matter Physics Practical–II

CO 1:It helps to experimentally measure the ratio of fundamental constants like e and kB.
CO 2:The magneto-resistance effect in a semiconductor can be determined.
CO 3:The ferromagnetic to paramagnetic phase transition in a metallic sample can be carried out.
CO 4:The experimental determination of electrical resistivity of semiconductor by four probe method can be understood

NAME OF COURSE (SUBJECT):Atomic & Molecular Physics Practical–II

CO 1:How to set up experiments using hands-on experience & different techniques.
CO 2:How to analyze data & interpret them.
CO 3:How to connect class room learning with lab experience to reduce the gap in understanding.

NAME OF COURSE (SUBJECT):Practical Nuclear & Particle Physics–II

CO 1:Understand the mass attenuation coefficient of 2260 keV and 545 keV beta particles in Al foils using 90Sr - 90Y source using G.M. Counting system.
CO 2:Determine the half-life of 116In nucleus by observing the beta activity with time using G.M. Counting System
CO 3:Learn the gamma ray attenuation coefficient for different absorbers using NaI(Tl) gamma ray spectrometer using 137Cs source.
CO 4:Determine the end point energy of beta particles from 204Tl source using Nomogram method using G. M. Counting System.
CO 5:Estimate the K x-ray fluorescence yield and K x-ray production cross section in silver target using 57Co source using MCA based NaI(Tl) scintillation spectrometer.
CO 6:Design and construct linear pulse amplifier using BC 107 and AC 128 transistors and to study its performance, output pulse height is linearly proportional to input pulse height.
CO 7:Determine the rest mass energy of electron using NaI(Tl) gamma ray spectrometer using different gamma sources (137Cs, 60Co, 54Mn).

Semester–IV

NAME OF COURSE (SUBJECT):Classical Electrodynamics

CO 1:Understand the basics of Electrostatics, Poisson Laplace equations, boundary conditions and electrostatic energy in dielectric media.
CO 2:Learn about Magneto statics, current density, continuity equation, magnetic moment and energy in the magnetic field.
CO 3:Understand the basics of electrodynamics, faradays laws of induction, displacement current, Maxwell's equations, conservation of energy and momentum in electromagnetic fields.
CO 4:Learn about electromagnetic waves, propagation of waves in linear media, reflection and transmission at normal and oblique incidence, skin depth and refection at conducting surface.

NAME OF COURSE (SUBJECT):Statistical and Thermal Physics

CO 1:Understand the basic postulates of statistical mechanics, different types of ensembles, fundamental differences between microstates and macrostates.
CO 2:Learn about different types of partition functions for the system of particles and apply these to calculate important thermo dynamical quantities.
CO 3:Learn the fundamental differences between classical and quantum statistics and learn about postulates of quantum statistical mechanics.
CO 4: Formulate the quantum statistical distribution laws, viz. Fermi-Dirac (FD) and Bose- Einstein (BE) statistics and origin of Bose-Einstein condensation and its applications.
CO 5: Understand fluctuations in ensembles and quantum gases and their analysis.
CO 6: Describe the theoretical basis of Brownian motion on the basis of Langevin approach.
CO 7: Understand the concept of random walk, Einstein relation for mobility and diffusion, time CO 8:dependence of fluctuations, their spectral analysis and applications in noises.
CO 9: Understand the reversible and irreversible thermodynamic processes, analysis of Onsager reciprocity relations in thermoelectric phenomena.

CO 10: Understand the Saha theory of ionization of a gas in thermal equilibrium to the temperature and pressure.
CO 11: Understand superfluid properties and quantum theory of 3He and mixture of 3He-4He.

NAME OF COURSE (SUBJECT): Electronics & Communication–III

CO 1:Understand the architecture of 8085 microprocessor which completes the basic foundation necessary to understand how CPU works and communicates with RAM, ROM and external devices.
CO 2:Get information about execution of each commands written in language form. This includes knowledge of arithmetic operations, looping, stacking, etc.
CO 3:Understand Interfacing peripherals of 8085 microprocessor with 7-segment display, analog to digital system vice-versa, additional input/output devices etc., incorporated to account the applications.
CO 4:Gain knowledge about 8051 microcontroller architecture to programming, the complete idea of execution of commands, instructions to interfacing with external input/output devices.
CO 5:Will be able to implement the above practically with the help of Numerical problems solving.

NAME OF COURSE (SUBJECT): CondensedMatterPhysics–III

CO 1:The course offers a good understanding on the basics of semiconductors.
CO 2:Theoretical understanding of charge transport in semiconductors can be understood.
CO 3:It also helps to clear the basic concepts on the effect of external fields on the electron transport in a crystalline state.
CO 4:It makes is clear how the working of basic devices like pn-junction, Gunn diode, laser diode etc. can be understood.
CO 5:Finally, the course gives an idea on the importance of low dimensional semiconductors, their synthesis and the formation of electronic devices.

NAME OF COURSE (SUBJECT): AtomicandMolecularPhysics–III

CO 1:Interpretation of vibrational IR and Raman spectra of polyatomic molecules.
CO 2:Methods of determining vibrational properties of polyatomic molecules based on IR and Raman spectra.
CO 3:How to apply combined analysis of vibrational & electronic spectra for characterizing irrational properties that may be correlated to identification of molecules, structure and other phenomena.

NAME OF COURSE (SUBJECT): Nuclear&ParticlePhysics–III

CO 1:Learn the evidences for nuclear shell structure and understand the energy levels according to the infinite square well potential and harmonic oscillator potential.
CO 2:Get knowledge about the collective nuclear model, vibrational energy levels of even nuclei and rotational energy levels of deformed even-even nucleus.
CO 3:Know the concept of cross section and apply it to resonance theory of scattering and absorption and learn the Briet –Wigner formula for scattering and reaction.
CO 4:Understand the principle of detailed balance–optical model–mean free path – optical potential and its parameters for elastic scattering.
CO 5:Understand the plane wave Born approximation (PWBA) and its predictions of angular distributions, distorted wave Born approximation (DWBA) and spectroscopic factors.
CO 6:Learn the importance of heavy ion reactions, formation compound nucleus, fusionof heavy ions and formation of super heavy nuclei in heavy ion reactions.
CO 7:Understand the Feynman diagrams, leptonic, semi leptonic and non-leptonic processes, verification of electromagnetic and weak interactions.
CO 8:learn about the intermediate vector bosons: W and Z bosons, their masses and range of weak interactions, charged weak interactions of quarks: Cabibbo factor, CPT theorem

NAME OF COURSE (SUBJECT): Electronics&Communication–IV

CO 1: Upon completion of this course, the students will be able to-Get a complete knowledge of use of modulation in electronic communication, amplitude modulation, the instrumentation and techniques of amplitude modulation, transmitters and receivers used in amplitude modulation and their functioning.

CO 2: Understand theory of frequency modulation, FM instrumentation, its advantages over AM, experimental techniques of FM, etc.

CO 3: Learn the basics of pulse modulation, types of pulse modulation, pulse amplitude modulation, pulse position modulation, pulse width modulation and other methods that form basis of Digital Communication.

CO 4: Deal with communication techniques which lie in the base band region with explanation of inter symbol interference, pulse data transmission, scrambling and descrambling, pulse shaping, etc.

CO 5: Will be able to implement the above practically with the help of Numerical problems solving.

NAME OF COURSE (SUBJECT): Condensed Matter Physics–IV

CO 1: The experimental discovery and various experimental properties of superconductors can be understood.

CO 2: The concept and predictions of fundamental BCS theory of superconductivity can be studied.

CO 3: The concepts, classification, and important properties of new materials like amorphous semiconductors, polymers and liquid crystals can be explored.

CO 4: Nanoscience is emerging branch of Physics, its concepts, importance, characterizations are studied and selected applications will be explored.

NAME OF COURSE (SUBJECT): Atomic & Molecular Physics IV

CO 1: Principles, working and scientific and practical applications of different laser types.

CO 2: How design parameters will produce lasers.

CO 3: How intense lasers can be used to produce nonlinear optical effects & their exploitation in the working of lasers.

CO 4:How high-resolution spectroscopy is achievable based on principles of nonlinear effects, lasers and physical optics.

CO 5:How nonlinear Raman effects can be produced by intense laser as radiation sources combined with physical optics. In addition, wide ranging applications in spectroscopy and other fields.

NAME OF COURSE (SUBJECT): Nuclear b& Particle Physics–IV

CO 1:Learn the theory of nuclear fission, evidence for the existence of second well in fission isomers, nuclear fission with heavy ions and nuclear fission-fission time scale.

CO 2: Understand the basic nuclear fusion processes, controlled thermonuclear reactions and magnetic confinement systems for controlled thermonuclear fusion.

CO 3: Learn the slowing down of neutrons by elastic collisions, logarithmic decrement in energy, thermalization, slowing down power and moderating ratio.

CO 4: Understand the theory of diffusion of neutrons, spatial distributions of neutron flux in different mediums, reflections of neutrons – Albedo.

CO 5: Learn about Fermi age equation, correction for absorption, resonance escape probability, pile equations, buckling: critical size for spherical and rectangular piles.

CO 6: Know the classification of beta transition on the basis of ft values and learn the selection rules, detection of neutrino and its properties.

CO 7: Learn the symmetry breaking in beta decay, the relevance of pseudo scalar quantities, Wu-Ambler experiment, fall of parity conservation and discovery of W and Z bosons

CO 8: Understand the gamma decay transition probability for single particle transition in nuclei-Weisskopf'sestimates: comparison with experimental values.
CO 9: Learn the lifetime measurements and understand the angular correlation for dipole- dipole transitions, gamma-gamma correlation and polarization of gamma radiation.

NAME OF COURSE (SUBJECT): Electronics & Communication Practical–III
CO 1: Implement 8085 microprocessor interfacing – stepper motor interface Cary out ADC and DAC circuit interfacing
CO 2: Implement 8085 Programming – mathematical operations, block transfer and sorting of 8-bit and 16-bit data
CO 3: Understand the use of code conversion methods Study 8085 interrupts and subroutines

NAME OF COURSE (SUBJECT): CondensedMatterPhysicsPractical–III
CO 1:Indexing of tetragonal and hexagonal patterns can experimentally realize.
CO 2:Precise lattice parameters on the experimentally recorded X-ray patterns can be studied.
CO 3:Characterization of solar cell, magnetic materials and skin depth in metals can be carried out.
CO 4:Many other experiments to measure the basic properties of dielectrics and ferroelectrics can be carried out under this course.

NAME OF COURSE (SUBJECT): Atomic&MolecularPhysicsPractical–III
CO 1:How to set up experiments using hands-on experience & different techniques.
CO 2:How to analyze data & interpret them.
CO 3:How to connect class room learning with lab experience to reduce the gap in understanding.

NAME OF COURSE (SUBJECT): Nuclear&ParticlePhysicsPractical–III
CO 1: Understand the Z2 dependence of external brems strahlung radiations using NaI(Tl)gamma ray spectrometer using 90Sr – 90Y beta source.
CO 2: Design and construct the double coincidence circuit using transistors, study its output wave form and determine its resolving time.
CO 3: Understand the energy spectrum of beta particles using 204Tl source and determine the end point energy of beta particles from 204Tl using Si(Li) detector spectrometer.
CO 4: Determine the K shell internal conversion coefficient αK of 137Ba using NaI(Tl) gamma ray spectrometer.
CO 5: Determine the half-life of 40K using GM counting system and to analyze the results.
CO 6: Determine the range of 1.150 MeV beta particles from 210Pb by Feather's method using G.M. counting system with unknown source 204Tl.
CO 7: Determine the effective atomic number of brass by measuring gamma ray attenuation coefficient using NaI(Tl) gamma ray spectrometer.

NAME OF COURSE (SUBJECT): Project in Electronics &Communication
CO 1:Implement a Project in analog/digital electronics under guidance of a supervisor

NAME OF COURSE (SUBJECT): Project in Solid State Physics
CO 1: Project helps students to search the research problem.
CO 2: It also helps to carry out the systematic research work on individual topics with the help of research mentor.
CO 3: Students also leans how present, prepare and if possible to publish their findings in the projects work.

NAME OF COURSE (SUBJECT): Project in Atomic & Molecular Physics

CO 1: How a detailed study of one aspect of the subject should be studied.
CO 2: How the methodology (i.e. selecting a problem, understanding theoretical & empirical principles, set up experiments, conduct measurements, etc) should be adopted to execute the work.
CO 3: How to work in a team while remain active to learn independently.
CO 4: How scientific method works to successfully carry out project work.
CO 5: How to use advanced analytical techniques for a chosen project topic.

NAME OF COURSE (SUBJECT): Project in Nuclear and Particle Physics

CO 1: Demonstrate knowledge and understanding of the scientific principles, gain experience in researchable to design the nuclear physics research project.
CO 2: Understand need of literature review to decide the research problem and understand the synthesis methods and characterization techniques for different applications.
CO 3: Understand and get familiar with operation of various instruments and software for Characterizations, data collection and analysis of results using computer programs.
CO 4: Understand how to analyze, interpret the experimental data, and make conclusions based on the results and able to write a research article and scientific research project.
CO 5: They will understand the research methodology and will help them in their future research career.

NAME OF COURSE (SUBJECT): OPEN ELECTIVE COURSES IN PHYSICS

ElectiveI–ModernPhysics

CO 1: Learn nature of black body spectrum, classical radiation laws and their limitations; Laws of photoelectric effect and Einstein photoelectric equation and Compton Effect.
CO 2: Understand the atomic structure, matter waves, Quantum Physics and its applications.
CO 3: Acquire knowledge about nuclear structure and Molecular structure, quantum statistics, F-D and B-E distributions. Lasers action its characteristics.
CO 4: Acquire knowledge about nuclear fission/fusion nuclear reactor stellar energy and their applications.

Elective-II:
CoursePHET3.4a: Instrumental Methods

CO 1: Understand the basic principles of working of Digital voltmeter, electronic multimeter, digital multimeter, power meter, electronic LCR meter and cathode ray oscilloscope.
CO 2: Learn about UV/Visible absorption spectrometry and gain knowledge of about Single/double beam spectrometer. Infrared absorption spectroscopy, sample techniques etc.
CO 3: Understand the basic principles of Fluorescence and Phosphorescence, energy level diagram, Fluorimeter construction, working its applications.
CO 4: Learn about radioactivity and its applications as well as nuclear Physics applications

Elective-II:
Course PHET3.4b: Physics of Nanomaterials

The course offers a good understanding on the basics of nanoscience.
CO 1: The course offers a good understanding basic quantum Mechanics.
CO 2: It also helps to synthesis and characterization of nano-materials using SEM, TEM, STEM, AFM and Diffraction techniques.
CO 3: Learn about properties of nano-materials like electrical mechanical, band structures etc.