Program: B.Sc (Medical)

Program Outcomes (PO)

PO1: Reading Habits: Students have been provided with a number of books and other study material that enable them to develop the habit of reading and gaining their knowledge.

PO2: Information technology: Students are encouraged to deliver seminars and power-point presentations by using overhead projectors and multi-media projector that make them learn to use the new technologies.

PO3: Scientific attitude: Students develop in them a scientific attitude towards observing and learning new things around their surroundings.

PO4: Self reliance: Students have devoted appreciable time in laboratory to develop self confidence to carry out practical's of their own and explore new things time to time.

PO5: Practical utility: Develop ability for the application of the acquired knowledge in the fields of life so as to make our country self reliant and self sufficient.

PO6: Applicability: Appreciate and apply ethical principles to biological science research and studies.

Program Specific Outcomes (PO): The course is a combination of general and specialized education, simultaneously introducing the concepts of breadth and depth in learning. It also stresses learning to learn rather than learning of specific lessons. The attempt is to prepare the students for lifelong learning by drawing attention to the vast world of knowledge of plants and animals by introducing them to the methodology of systematic academic enquiry. With this in mind, we aim to provide a firm foundation in every aspect of Botany and Zoology to explain a broad spectrum of modern trends and develop experimental, observational, computational skills also which lead him as an ambassador of sustainable development of our country.

PSO1: Know the importance and scope of the discipline.

PSO2: Students will be able to explain the ecological interconnectedness of life on earth by tracing energy and nutrient flow through the environment. They will be able to relate the physical features of the environment to the structure of populations, communities, and ecosystems.

PSO3: Inculcate interest in and love of nature with its myriad living forms.

PSO4: Make aware of natural resources and environment and the importance of conserving it.

PSO5: Impart knowledge of Science as the basic objective of Education.

PSO6: Explain various physiological changes in plant and animal bodies.

PSO7: Understand various genetic abnormalities.

PSO8: Acquire basic knowledge and skills in certain applied branches to enable them for self employment.

PSO9: Explain the role and impact of different environmental conservation programmes.

PSO10: Understanding the relationship of man with the environment and help them change his attitude for more positive, proactive, eco-friendly and sustainable lifestyles.

PSO11: To develop skill in practical work, experiments, equipments and laboratory use along with collection and interpretation of biological materials and data.

PSO12: Students will be able to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization within biology**.**

PSO13: Students will be able to explain how plants and animals function at the level of the gene, genome, cell, tissue, Flower development. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and mode of life cycle followed by different forms of plants and animals**.**

PSO14: Develop a scientific attitude to make students open minded, critical and curious.

PSO15: Develop an ability to work on their own and to make them fit for the society.

PSO16: Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explicate how descent with modification has shaped plant morphology, physiology, and life history.

PSO17: Students will be able to identify the major groups of organisms and able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of plants, algae, and fungi and animals that differentiate them from each other and from other forms of life.

PSO18: Students will be able to apply fundamental mathematical tools (statistics and calculations) and physical principles (physics, chemistry) to the analysis of relevant biological situations.

PSO19: Critically evaluation of ideas and arguments by collection relevant information about the plants, so as recognize the position of plant in the broad classification and phylogenetic level.

PSO20: Identify problems and independently propose solutions using creative approaches, acquired through interdisciplinary experiences, and a depth and breadth of knowledge/expertise in the field of Plant and Animal Identification.

Course Outcomes

Course Name: **ZOO – IA : CELL BIOLOGY**

Class: **B Sc. (Med)** Semester - **I**

Objectives of the course:

1. Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles

2. Students will understand how these cellular components are used to generate and utilize energy in cells

3. Students will understand the cellular components underlying mitotic cell division.

4. Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or physiological changes, or alterations of cell function brought about by mutation.

Course Outcomes:

a) **Knowledge and Understanding:** Apply a basic core of scientific and quantitative knowledge

b) **Intellectual Cognitive /Analytical skills:** to enhance understanding of cell structure and function at the molecular level.

c) **Practical skills:** Develop and maintain a notebook of laboratory records.

d) **Transferable skills:** Utilize laboratory skills to enhance understanding of cell structure and function while participating in a group environment.

Course Name: **ZOO – IB : BIODIVERSITY - I**

Class: **B Sc. (Med)** Semester - **I**

Objectives of the course:

1. To understand the animal kingdom.
2. To understand the taxonomic position of protozoa to annelids.
3. To understand the general characteristics of animals belonging to protozoa to annelids.
4. To understand the body organization of phylum from protozoa to annelids.
5. To understand the origin and evolutionary relationship of different phylum from protozoa to annelids.

Course Outcomes:

a) **Knowledge and Understanding:** Student should be able to describe unique characters of protozoa,porifera,coelenterate and helminthes. annelids

b) **Intellectual Cognitive /Analytical skills:** To recognise the ecological role of phylum protozoa to annelids.

c) **Practical skills:** Student should be able to recognize life functions of protozoa to annelids.

d) **Transferable skills:** To recognise the diversity from protozoa to annelids.

Course Name: **ZOO – IIA : ECOLOGY**

Class: **B Sc. (Med)** Semester - **II**

Objectives of the course:

1. To describe the interaction between organisms and enviorment.
2. To understand the exchange of nutrients within the ecosystem.
3. To describe the population dynamics.

Course Outcomes:

(a) Students are able to describe the relation between abiotic and biotic factors.

(b) Students are able to describe various biological interactions.

(c) Students are able to understand how changes in population affect the ecosystem.

Course Name: **ZOO – IIB : BIODIVERSITY - II**

Class: **B Sc. (Med)** Semester - **II**

Objectives of the course:

1. To understand the animal kingdom.
2. To understand the taxonomic position of arthropods to hemichordates.
3. To understand the general characteristics of animals belonging to arthropods upto hemichordates.
4. To understand the body organization of phylum from arthropods to hemichordates.
5. To understand the origin and evolutionary relationship of different phylum from arthropods to hemichordates.

Course Outcomes:

(a) Knowledge and Understanding: Student should be able to describe unique characters of arthropods, mollusks, echinoderms and hemichordates.

(b) Intellectual Cognitive /Analytical skills: To recognise the ecological role of phylum from arthropods to hemichordate.

(c) Practical skills: Student should be able to recognize life functions of arthropods, mollusk, echinoderms and hemichordates.

(d) Transferable skills: To recognise the diversity from arthropods to hemichordate

Course Name: **ZOO – IIIA: Evolution**

Class: **B Sc. (Med)** Semester - **III**

Objectives of the course:

Students will:

1. understand the evidence that living species share descent from common ancestry and how this fact explains the traits of living species

2. understand that evolution entails changes in the genetic composition of populations

3. understand the source of genetic variation and how it is shaped in the absence of selection (Hardy-Weinberg; genetic drift)

4. understand the concept of fitness and how heritable differences in fitness result in natural selection

5. understand the process of allopatric speciation

Course Outcomes:

a) **Knowledge and Understanding:** Have an enhanced knowledge and appreciation of evolutionary biology and behaviour.
b) **Intellectual Cognitive /Analytical skills:** Be able to develop cogent and critical arguments based on the course material.
c) **Practical skills:** Be able to perform, analyse and report on experiments and observations in whole-organism biology.
d) **Transferable skills:** Be able to integrate related topics from separate parts of the course.

Course Name: **ZOO – IIIB: BIODIVERSITY - III**

Class: **B Sc. (Med)** Semester - **III**

Objectives of the course:

1. To understand what the vertebrates are.
2. To understand different categories of vertebrates.
3. To understand the general characters of each class of vertebrates.
4. To understands the level of organization in vertebrate classes.
5. To understand the origin and evolutionary relationship in different classes of vertebrates.

Course Outcomes:

a) **Knowledge and Understanding:** Student should be able to describe unique characters of Urochordates, Cephalochordates, Cyclostomata, Pisces, amphibians, reptiles, aves and mammals
b) **Intellectual Cognitive /Analytical skills:** To understand the ecological role of different classes of vertebrates.
c) **Practical skills:** Student should be able to recognize life functions of Urochordates to mammals.
d) **Transferable skills:** To understand the diversity of vertebrates.

Course Name: **ZOO – IVA: BIOCHEMISTRY**

Class: **B Sc. (Med)** Semester - **IV**

Objectives of the course:

1. Understand the Basics of Biochemistry and Chemistry of biomolecules and their significance.
2. Understand the Protein structure i.e. Primary, Secondary, Tertiary and Quaternary.
3. Understand the chemistry of hormones.
4. Understand the structure and properties of the enzymes as well as its activity.
5. Understand the process of Lipid, Proteins and Carbohydrate metabolism.

Course Outcomes:

a) Student should be able to demonstrate an understanding of fundamental biochemical principles, such as the structure/function of biomolecules, metabolic pathways, and the regulation of biological/biochemical processes.
b) Student gained proficiency in basic laboratory techniques in both chemistry and biology.

Course Name: **ZOO – IVB: Animal Physiology**

Class: **B Sc. (Med)** Semester - **IV**

Objectives of the course:

1. Understand the Importance of physiology and branches of it.
2. Understand the terms-Osmosis, diffusion, pH and Buffer.
3. Understand the Digestion, Respiration and Excretion process by studying the Organs of it.
4. Understand the process of Metabolism.
5. Understand physiology of behaviour.
6. Understand the Circulatory system and Lymphatic system.
7. Study the muscular system, nervous system and endocrine system.

Course Outcomes:

1. Students have an enhanced knowledge and appreciation of animal physiology.

2. Students are able to understand the functions of important physiological systems including the digestion, cardio-respiratory, renal, nervous, endocrine, muscular and metabolic systems

3. Students are able to learn about the physiology of behavior.

4. Students are able to perform, analyse and report on experiments and observations in physiology.

5. Students are able to recognize and identify principal tissue structures.

Course Name: **ZOO – VA: DEVELOPMENTAL BIOLOGY**

Class: **B Sc. (Med)** Semester - **V**

Objectives of the course:

1. To understand how organisms maintain gametic population.
2. To understand fertilization process.

3. To understand way of cleavage and different patterns to form zygote.
4. To understand the fundamental embryonic development.
5. To understand the complete process of formation of germ layers.

Course Outcomes:

Students will

1. Be able to list the types of characteristics that make an organism ideal for the study of developmental biology.
2. Be familiar with the events that lead up to fertilization.
3. Be able to describe the first four rounds of cell division in different groups.
4. Be able to describe the stages and cellular mechanisms for gastrulation.
5. Able to understand difference between specification and determination.

Course Name: **ZOO – VB: GENETICS**

Class: **B Sc. (Med)** Semester - **V**

Objectives of the course:

1. To understand how the behavior of chromosomes during meiosis can explain mendal law.
2. To understand how inheritance patterns are affected by position on chromosomes
3. To understand the similaritiesand differences between how genetic information is passed on in prokaryotes and eukaryotes.
4. To understand gene interactions.
5. To understand the chemical nature of heredity.

Course Outcomes:

1. Comprehensive and detailed understanding of the chemical basis of heredity.
2. Understanding about the role of genetics in evolution.
3. The ability to evaluate conclusions that are based on genetic data.

4. The ability tounderstand results of genetic experimentation in animals.

Course Name: **ZOO – VIA: MEDICAL ZOOLOGY**

Class: **B Sc. (Med)** Semester - **VI**

Objectives of the course:

1. Brief introduction to pathogenic microbes, viruses, Ricketsiae, spirochaetes and bacteria.
2. Brief accounts of life history, mode of infection and pathogenicity of different protozoans and helminthes diseases to man; prophylaxis and treatment.
3. Life cycle and control measures of arthropod vectors of human disease.
4. Epidemic diseases, such as Typhoid, Cholera, Small pox; their occurrence and eradication programs.
5. Brief introduction to human defence mechanisms.
6. To study Antigen and antibody interactions and vaccines.

Course Outcomes:

Students are able:

1. To study and understand the scope and branches of Medical Zoology.
2. To aware the students for various parasites and diseases which spreads in human with the help of study of host-parasite relationship.
3. To increase awareness for the health in students.
4. Understand the various disease causing vectors like Mosquitoes.
5. To aware about the typhoid,cholera like disease.
6. Understand the importance of medical diagnostic.
7. To learn about antigen antibody interactions.

Course Name: **ZOO – VIB: MEDICAL LABORATORY TECHNOLOGY**

Class: **B Sc. (Med)** Semester - **VI**

Objectives of the course:

1. Understand the Principle, parts, and its application of Microscopic techniques.
2. Understand the principle of analytical instruments.
3. Understand the working principle of UV-Vis principle, Colorimeter, Fluorimeter, Electrophoresis, Radioactivity, Centrifugation, Incubator, pH meter.
4. Understand the cell culture techniques and separation techniques in biology.
5. Understand Bacteriology, sterilization techniques and culture media.
6. To study histopathological techniques.

Course Outcomes:

Students are able:

1. To collect and prepare human samples for analysis. Store or transport samples for analysis using appropriate preservation methods.
2. To follow prescribed procedures, and with adequate orientation, perform routine testing in chemistry, microbiology, immunology, immunohematology, hematology, hemostasis, and molecular diagnostics.
3. To operate and calibrate clinical laboratory instruments or equipment after proper orientation.
4. To recognize and correct basic instrument malfunctions. Refer serious instrument problems to a senior laboratorian or a supervisor when necessary.
5. To prepare reagents or media from a prescribed procedure, including calculating necessary computations, using an analytical balance, and adjusting the pH if necessary.

Course Name: **PAPER–I A: DIVERSITY OF MICROBES**

Class: **B Sc. (Medical)**

Semester - **I**

Objectives of the course:

1. To provide the students the knowledge about structural diversity, life cycle patterns, economic importance, classification of Bacteria, Viruses, Algae and Fungi.

2. To make the students understand the features and symbiotic association significance of Lichens.
3. To provide the students the theoretical, practical as well as analytical skills in the field of diversity of microbes and plant pathology.
4. To inculcate among the students the critical evaluation and scientific communication skills.

Course Outcomes:

e) **Knowledge and Understanding:** Understand the diversity among Algae, the systematic, morphology and structure, of Algae, Fungi, Bacteria, Viruses and Lichens.

f) **Intellectual Cognitive /Analytical skills:** Students will be able to identify the major groups of organisms and be able to classify them. Students will be able to compare and contrast the characteristics of plants, algae, and fungi that differentiate them from each other and from other forms of life.

g) **Practical skills:** Gram staining of Bacteria, Microscopic observation and identification of algae, fungi, and lichens. Observation of crop plants infected by the pathogens included in the syllabus and study of symptoms and causative agents.

h) **Transferable skills:** Students will be able to communicate orally as well as express in the written form the knowledge gained by them in the field of microbes diversity.

Course Name: **PAPER–I B: DIVERSITY OF CRYPTOGAMS**

Class: **B Sc. (Medical)**

Semester - **I**

Objectives of the course:

1. To provide the students the detailed knowledge of the morphological diversity of Bryophytes and Pteridophytes.
2. To understand the economic importance of the Bryophytes and Pteridophytes and know the evolution of Bryophytes and Pteridophytes .

Course Outcomes:

e) **Knowledge and Understanding:** The range of cryptogamic diversity in terms of structure, function and environmental relationships and the evaluation of cryptogam diversity.

f) **Intellectual Cognitive /Analytical skills:** Students will be able to identify the major groups of cryptogams and be able to classify them. Students will be able to compare and contrast the characteristics of bryophytes and pteridophytes that differentiate them from each other and from other forms of life.

g) **Practical skills:** Students will be able to identify the lower plants and assign them to different categories of plants like bryophytes or pteridophytes based on the microscopic examination of plant parts and other characters.

h) **Transferable skills:** Students will be able to communicate orally as well as express in the written form the knowledge gained by them in the field of cryptogams diversity.

Course Name: **PAPER–II A: CELL BIOLOGY**

Class: **B Sc. (Medical)**

Semester - **II**

Objectives of the course:

1. To understand structural organization and variation in chromosome as well as karyotype analysis.
2. To learn about the extra-chromosomal inheritance in plant system.
3. To study the structure and organization of cell membrane and cell wall, process of membrane transport and membrane models.
4. To understand the DNA structural organization and biochemical composition of genetic material.

Course Outcomes:

(e) Knowledge and Understanding: Students will gain knowledge about Cell Science and understand cell wall, plasma membrane, cell organelles. Students will understand the biochemical nature of nucleic acids, their role in living systems, experimental evidences to prove DNA as a genetic material.

(f) Intellectual Cognitive /Analytical skills: Students will be able to explain how organisms function at the level of the gene, genome, cell, tissue, organ and organ-system.

(g) Practical skills: Observation and analysis of electron micrographs of cell organelles, microscopic techniques to study the structural organization of cells, stomata, plastids etc.

(h) Transferable skills: Students will be able to work as an individual as well as in a team to work on different aspects of cell biology and will be able to communicate about these aspects.

Course Name: **PAPER–II B: GENETICS**

Class: **B Sc. (Medical)**

Semester - **II**

Objectives of the course:

1. To know the molecular biology in relation to genetic material, its inheritance, modification, replication and repair.
2. To understand transcription, translation post translation modification of protein.
3. To know gene regulation in prokaryotes and the eukaryotic cell cycle and mitotic and meiotic cell division
4. To study Mendelian and Neo-mendelian genetics, phenomenon of dominance, laws of segregation, independent assortment of genes.
5. To understand the different types of genetic interaction, incomplete dominance, codominance, inter allelic genetic interactions, multiple alleles and quantitative inheritance etc.

Course Outcomes:

(a) Knowledge and Understanding: Learn the scope and importance of molecular biology, understand the hereditary and genetic principles.

(b) Intellectual Cognitive /Analytical skills: Students will be able to analyse the genetic principles of inheritance and understand the different hereditary patterns and their application in the field of improving the plant varieties.

(c) Practical skills: Training students to prepare micro preparation and showing the stages of mitosis (Onion root tips) and showing permanent slides/photographs of mitosis and meiosis.

(d) Transferable skills: Convey the knowledge gained in the field of genetics to the scientific as well as non scientific audience and help people in making them aware about role of genetics in the improvement of plant varieties.

Course Name: **PAPER - III A – STRUCTURE, DEVELOPMENT AND REPRODUCTION IN FLOWERING PLANTS–I**

Class: **B Sc. (Medical)**

Semester - **III**

Objectives of the course:

1. To study the various forms of growth habit in plants.
2. To understand the vascular tissues, structure of woods and anomalous secondary growth, anatomical variations and tissue systems in plant shoot system.
3. To know various tissue systems and understand the normal and anomalous secondary growth in plants.
4. To study the leaf structural variations and anatomical specifications.

Course Outcomes:

e) **Knowledge and Understanding:** The students will get to know about the structural and anatomical variations in the shoot system and leaves of plants in reference to variation in growth habit.

f) **Intellectual Cognitive /Analytical skills:** Students will be able to differentiate the monocots and dicots on the basis of morphological and anatomical characters of plants and further evaluate the adaptive characters of plants growing in different conditions.

g) **Practical skills:** preparation of temporary and stained mounts of the anatomical sections of the stem and leaves and identify various types of plants based on anatomical characters.

h) **Transferable skills:** Students will be able to communicate orally as well as express in the written form the knowledge gained by them in the field of structural organization in plants.

Course Name: **Paper–III B: STRUCTURE, DEVELOPMENT AND REPRODUCTION IN FLOWERING PLANTS–II**

Class: **B Sc. (Medical)**

Semester - **III**

Objectives of the course:

1. To understand the scope & importance of Anatomy and Embryology.
2. To understand structure and development in microsporangium and megasporangium.
3. To understand microsporogenesis and megasporogenesis.
4. To understand male and female gametophytes.
5. To know fertilization, endosperm and embryogeny.

Course Outcomes:

(a) Knowledge and Understanding: Students will come to know about historical development of embryology, understand structure and development of microsporangium, megasporangium, embryo and endosperm, know the methods of pollination and fertilization.

(b) Intellectual Cognitive /Analytical skills: Students will be able to understand the applications of embryology in plant tissue culture and realize the applications of palynology in human welfare.

(c) Practical skills: Microscopic examination of the embryological preparations to understand anther structure, embryo sacs, different types of ovules, placentation types etc.

(d) Transferable skills: Students will be able to work as an individual as well as in a team to work on different aspects of plant anatomy and embryology and will be able to communicate about these aspects.

Course Name: **Paper–IV A: DIVERSITY OF SEED PLANTS AND THEIR SYSTEMATICS–I**

Class: **B Sc. (Medical)**

Semester - **IV**

Objectives of the course:

1. To study the evolution of seed habit in plants.
2. To know the vegetative characteristics of the Gymnosperms and their classification
3. To learn about the reproductive characteristics of the type specimens of major categories of Gymnosperms

Course Outcomes:

(a) Knowledge and Understanding: the students will get the knowledge about the morphological anatomical and developmental aspects of the gymnosperms like Cycas, Pinus, Ephedra and Ginkgo.

(b) Intellectual Cognitive /Analytical skills: Students will be able to analyze the morphological and developmental differences of the seed bearing and non seed bearing plants as well as be able to differentiate the gymnosperms from angiosperms on the basis of their structural and anatomical variations.

(c) Practical skills: section cutting and microscopic examination of the roots, stem, leaves etc of Cycas, Pinus, Ephedra and Ginkgo. The evolution of reproductive parts from sporophylls in cycas to cones in Pinus evolving to primitive flowers in Ephedra.

(d) Transferable skills: Convey and express the knowledge gained in the field of Gymnosperm diversity and evolutionary role for the development of angiosperms.

Course Name: **Paper–IV B: DIVERSITY OF SEED PLANTS AND THEIR SYSTEMATICS–II**

Class: **B Sc. (Medical)**

Semester - **IV**

Objectives of the course:

1. To understand the diversity of angiosperms and comparative account among the families of angiosperms.
2. To know the economic importance of the angiosperm plants.
3. To understand the distinguishing features of angiosperm families.
4. To know the conceptual development of taxonomy & systematics and understand the general range of variations in the group of angiosperms.

5. To trace the history of development of systems of classification emphasizing angiospermic taxa.

Course Outcomes:

(a) Knowledge and Understanding: Students will learn about the characters of biologically important families of angiosperms, know the floral variations in angiospermic families, their phylogeny and evolution, understand various rules, taxonomy and understand major evolutionary trends in various parts of angiospermic plants

(b) Intellectual Cognitive /Analytical skills: Critically evaluation of ideas through relevant information about the plants in order to identify and classify plants and use taxonomical information to evaluate and formulate a position of plant in taxonomy.

(c) Practical skills: study the morphological variations in flowers of different angiospermic families and microscopic examination of the ovary sections of the flowers.

(d) Transferable skills: Students will be able to communicate orally as well as express in the written form the knowledge gained by them in the field of angiosperm taxonomy.

Course Name: **PAPER–VA: PLANT PHYSIOLOGY**

Class: **B Sc. (Medical)**

Semester - **V**

Objectives of the course:

1. To know importance and scope of plant physiology.
2. To understand the plants and plant cells in relation to water. Learn about the movement of sap and absorption of water in plant body.
3. To learn and understand about mineral nutrition in plants.
4. To understand the process of photosynthesis in higher plants with particular emphasis on light and dark reactions, C3 and C4 pathways.
5. To understand the plant movements, the growth and developmental processes in plants.

Course Outcomes:

(a) Knowledge and Understanding: Students will know about movement in plants, understand the process of translocation of solutes in plants, photosynthesis, growth and development in plants.

(b) Intellectual Cognitive /Analytical skills: Students will be able to analyze the physiological status of the plants by observing the physical state of plants growing in different conditions and thus apply the knowledge for improving the plant growth through environmental manipulations.

(c) Practical skills: apply appropriate techniques, resources, and modern instruments and equipments for cellular and physiological activities of plants

(d) Transferable skills: students will be able to interact with different sections of society and contribute towards the improved vegetational profile through nutrient and other environmental manipulations to improve the physiological status of the plants.

Course Name: **PAPER–VB: BIOCHEMISTRY AND BIOTECHNOLOGY**

Class: **B Sc. (Medical)**

Semester - **V**

Objectives of the course:

1. To learn about the metabolites synthesized by plants.
2. To understand the Biochemical nature of cell.
3. To study structure and general features of enzymes, concept of enzyme activity and enzyme inhibition.
4. To understand the fundamentals of totipotency and plant tissue culture techniques.
5. To know the transgenic technology for the improvement of quality and quantity of plant and thereby product and understand the advantages of in vitro propagation in various areas.
6. To understand the respiration in higher plants with particular emphasis on aerobic and anaerobic respiration.

Course Outcomes:

(a) Knowledge and Understanding: Students will know the chemical nature of biomolecules and understand the different types of interaction in Biomolecules understand plant structures in the context of physiological functions of plants.

(b) Intellectual Cognitive /Analytical skills: Realize the application and importance of plant tissue culture and transgenic plants.

(c) Practical skills: apply appropriate techniques, resources, and modern instruments and equipments for Biochemical estimation, Molecular Biology, Biotechnology, Plant Tissue culture experiments, cellular and physiological activities of plants.

(d) Transferable skills: students will be able to interact and communicate with different sections of society and contribute towards the improvement of plants through modern technologies like plant tissue culture and transgenics.

Course Name: **Paper-VIA: ECOLOGY**

Class: **B Sc. (Medical)**

Semester - **VI**

Objectives of the course:

1. To characterize and distinguish biotic and abiotic components of terrestrial, marine and fresh water environments.
2. To describe population structures and growth, and identify the factors that limit the distribution and abundance of populations.
3. To describe community structure and the dynamics of community organization and change including the process of ecological succession.
4. To compare and contrast the effects of competition, predation, and mutualism on individual life histories and behaviour, population growth, community structure and ecosystem function.
5. To analyze human impacts on ecosystems using the general principles of ecology.

Course Outcomes:

(a) Knowledge and Understanding: Students will get the knowledge of the interaction of living organisms with biotic and abiotic aspects of their environment. Population, community and ecosystem ecology are examined along with a consideration of topics in evolutionary ecology like life history theory, and social behaviour.

(b) Intellectual Cognitive /Analytical skills: The students will be able to analyze the aspects related to conservation of biological diversity and the impact of human activities on natural systems.

(c) Practical skills: Sampling techniques used in ecological studies like use of quadrates, point frames etc. and techniques involved in soil testing, leaf area injury as a parameter of pollution levels etc.

(d) Transferable skills: Students will be able to describe the principles of field sampling and conduct field research using a variety of sampling techniques, interpret field results, perform simple statistics and write reports, research an ecological topic and communicate the results in a written report, oral presentation and/or poster.

Course Name: **Paper-VIB: ECONOMIC BOTANY**

Class: **B Sc. (Medical)**

Semester **- VI**

Objectives of the course:

1. To learn about various uses of plants and plant products and to learn about the biological reasons for the importance of plant resources.
2. To acquire an increased awareness and appreciation of plants and plant products encountered in everyday life.
3. To recognize geographic, historical, & cultural differences in the uses and importance of plants.

4. To relate diverse aspects of human cultural variations to plant resources, and to gain a better understanding and perspective of the origins, histories, and roles of important plants and plant products in reference to the development of human culture.

Course Outcomes:

(a) Knowledge and Understanding: Students will gain an understanding of plants as a source of food, beverages, herbs and spices, fibres and medicine. Detailed information regarding the timber yielding, firewood plants, bamboos and rubber cultivation and processing.

(b) Intellectual Cognitive /Analytical skills: Students will be skilled to identify and describe the impact of economic botany on the environment and society.

(c) Practical skills: Students will become proficient in utilizing the modern techniques involved in the metabolite and microchemical studies of the plants and plant products.

(d) Transferable skills: Economic Botany will provide knowledge base information necessary for communication of information concerning basic plant structure and function, the role of plants in society, and plants of the region.

Course Name **CHEMISTRY (INORGANIC CHEMISTRY–I)**

Class: **B.Sc (Medical & Non-Medical)** Semester :**I**

Objective of the course:

- This course is intended to provide the students an in-depth understanding of the basic concepts of Inorganic Chemistry.
- To know the atomic structure, arrangement of elements in the periodic table and the periodic properties.
- To identify the nature of chemical bond as well as the existence of special types of compounds through weak chemical forces.

Course Outcomes:

- Acquire knowledge and understanding of essential facts, concepts, principles and theories relating to the Inorganic Chemistry.
- To develop skills to evaluate, analyze and solve problems competently.

- The students will be able to pursue their career objectives in higher education, scientific research and teaching.

Course Name **CHEMISTRY (ORGANIC CHEMISTRY–I)**

Class: **B.Sc (Medical & Non- Medical)** Semester **I**

Objective of the course:

1. This course is intended to provide the students an in-depth understanding of the basic concepts of Organic Chemistry.
2. To understand the structure and bonding of organic compounds.
3. To know the method of naming and preparation of organic compounds, stereochemistry and the mechanism of organic reactions.
4. To understand the stereochemistry of aliphatic and aromatic hydrocarbons.

Course Outcomes:

- This course will equip the students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Organic chemistry.
- To develop skills to evaluate, analyze and solve problems competently.
- The students will be able to pursue their career objectives in higher education, scientific research and teaching.

Course Name **CHEMISTRY (INORGANIC CHEMISTRY–II)**

Class: **B.Sc (Medical & Non-Medical)** Semester :**II**

Objective of the course:

- This course is intended to provide the students an in-depth understanding of the groups of elements in Inorganic Chemistry.
- To know the periodic properties of s, p and d block elements.
- To understand the physical and chemical properties of elements and their compounds.

Course Outcomes:

- Acquire knowledge and understanding of essential facts, concepts, principles and theories relating to the Inorganic Chemistry.
- To develop skills to evaluate, analyze and solve problems competently.
- The students will be able to pursue their career objectives in higher education, scientific research and teaching.

Course Name **CHEMISTRY (Physical CHEMISTRY–I)**

Class: **B.Sc (Medical & Non- Medical)** Semester **II**

Objective of the course:

5. This course is intended to provide the students an in-depth understanding of the basic concepts of Physical Chemistry.
6. To understand the physical aspects of chemical reactions.
7. To know the methods of evaluating the physical parameters .
8. To understand the numerical concepts.

Course Outcomes:

- This course will equip the students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Physiacl chemistry.
- To develop skills to evaluate, analyze and solve problems competently.
- The students will be able to pursue their career objectives in higher education, scientific research and teaching.

Course Name **CHEMISTRY (ORGANIC CHEMISTRY–II)**

Class: **B.Sc (Medical & Non-Medical)** Semester **III**

Objective of the course:

- This course is intended to provide the students an in-depth understanding of the stereochemistry of organic compounds.

- To provide a complete knowledge of nomenclature, structure and bonding, methods of preparation and chemical reactions of the compounds related to functional groups like alcohols, phenols, aldehydes and ketones.

Course Outcomes:

- This course will equip the students with the necessary chemical knowledge concerning the organic chemistry of functional groups.
- To develop skills to interpret and explain the mechanism of organic reactions involving different functional groups.
- The students will be able to pursue their career objectives in higher education, scientific research and teaching.

Course Name **CHEMISTRY (PHYSICAL CHEMISTRY–II)**

Class: **B.Sc (Medical & Non -Medical)** Semester **III**

Objective of the course:

This course is intended:

- To provide the students an in-depth understanding of the basic concepts of thermodynamics discussing the fundamental laws.
- To provide a complete knowledge related to phase as well as chemical equilibrium while discussing various examples.

Course Outcomes:

- **T**his course will help the students to acquire knowledge and understanding of basic concepts of thermodynamics as well as equilibrium in a detailed manner.
- **T**he students will be able to pursue their career objectives in higher education, scientific research and teaching.

Course Name **CHEMISTRY (ORGANIC CHEMISTRY–III)**

Class: **B.Sc (Medical & Non-Medical)** Semester **IV**

Objective of the course:

- This course is intended to provide the students an in-depth understanding of the stereochemistry of organic compounds.

- To provide a complete knowledge of nomenclature, structure and bonding, methods of preparation and chemical reactions of the compounds related to functional groups like carboxylic acids, ethers and epoxides, organic compounds of nitrogen.

Course Outcomes:

- This course will equip the students with the necessary chemical knowledge concerning the organic chemistry of functional groups.
- To develop skills to interpret and explain the mechanism of organic reactions involving different functional groups.
- The students will be able to pursue their career objectives in higher education, scientific research and teaching.

Course Name **CHEMISTRY (INORGANIC CHEMISTRY–III)**

Class: **B.Sc (Medical & Non -Medical)** Semester **IV**

Objective of the course:

- This course is intended to provide the students an in-depth understanding of the coordination chemistry of inorganic compounds.
- To provide a complete knowledge of non aqueous solvents, oxidation and reaction behaviour, chemistry of lanthanoids and actinoids etc.

Course Outcomes:

- This course will equip the students with the necessary chemical knowledge concerning the biological properties of inorganic compounds.
- To develop skills to devise uses of inotganic compounds in medicine and industry.
- **T**he students will be able to pursue their career objectives in higher education, scientific research and teaching.

Course Name **CHEMISTRY (INORGANIC CHEMISTRY–IV)**

Class: **B.Sc (Medical & Non-Medical)** Semester **V**

Objective of the course:

This course is intended:

- To provide the students an in-depth understanding of bonding and magnetic properties of transition metal complexes.

- To discuss various factors affecting the kinetic as well as thermodynamic stability, electronic spectra.
- To give brief introduction to organometallic compounds.

Course Outcomes:

- This course will equip the students with the necessary chemical knowledge concerning the inorganic chemistry of transition metal complexes.
- To develop skills to interpret and explain the bonding, magnetic as well as spectral properties of transition metal complexes.
- **T**he students will be able to pursue their career objectives in higher education, scientific research and teaching.

Course Name **CHEMISTRY (PHYSICAL CHEMISTRY–III)**

Class: **B.Sc (Medical & Non-Medical)** Semester **V**

Objective of the course:

This course is intended:

- To provide the students an in-depth understanding of basic as well as advanced concepts of electrochemistry.
- To discuss the nuclear chemistry in detail including various laws governing the nuclear processes and various factors affecting them.
- To give brief introduction to spectroscopy discussing rotational and vibrational spectroscopy and electronic spectrum.

Course Outcomes:

- To understand the inter conversion of chemical and electrical energy and to link thermodynamics with electrochemistry.
- To apply the concepts of electrochemistry, spectroscopy to different chemical processes as well as in practicals.
- The students will be able to pursue their career objectives in higher education, scientific research and teaching.

Course Name **CHEMISTRY (PHYSICAL CHEMISTRY–IV)**

Class: **B.Sc (Medical & Non -Medical)** Semester **VI**

Objective of the course:

This course is intended:

- To provide the students an in-depth understanding of the basic concepts of quantum mechanics.
- To provide a complete knowledge related to solid state and photochemistry.

Course Outcomes:

- **T**his course will help the students to acquire knowledge and understanding of basic concepts of quantum chemistry in a detailed manner.
- **T**he students will be able to pursue their career objectives in higher education, scientific research and teaching.

Course Name **CHEMISTRY (ORGANIC CHEMISTRY–IV)**

Class: **B.Sc (Medical & Non-Medical)** Semester **VI**

Objective of the course:

This course is intended:

- To provide the students an in-depth understanding of spectroscopy of organic compounds.
- To discuss various spectroscopic techniques and spectral analysis.
- To give complete knowledge of amino acids, peptides and nucleic acids.

Course Outcomes:

- This course will equip the students with the necessary knowledge concerning uses of spectroscopic techniques.
- To develop skills to interpret and explain the spectras.
- **T**he students will be able to pursue their career objectives in higher education, scientific research and teaching.