Paper: UGZOOMJT101

Title: Non-chordates and Cytogenetics

Course objective:

It is required to generalize about certain things and to dismiss others because the field of invertebrate biology is so extensive and runs across so many disciplinary lines that it is necessary to generalize about some topics. Classification, Structure and function were chosen as the primary focus for the curriculum that we devised for studying invertebrates so that we could establish common threads of interest. As a result, the most important objective that we have set for ourselves is to pique the students' interest in learning about the mystical world inhabited by animals that do not possess any notochords. Introduction to non-chordate is the first foot step in the zoological science. There is a brief taxonomic study starting from classification to nomenclature. This part deals with the invertebrates, starting from protista to pseudocoelomates which are the pioneers in this field with their evolutionary significance both theoretically as well as practically.

The course would provide an insight to the learner about the existence of different life forms on the Earth, and appreciate the diversity of animal life. It will help the student to understand the features of Kingdom Animalia and systematic organisation of the animals based on their evolutionary relationships, structural and functional affinities. The course will also make the students aware about the characteristic morphological and anatomical features of diverse animals; economic, ecological and medical significance of various animals in human life; and will create interest among them to explore the animal diversity in nature.

Genetics is one of the fastest-moving fields of science, with new discoveries being made every month. The study of genetics is timely, important, and fascinating because of the many new discoveries and applications of genetics that have substantial economic and ethical implications. The objective of the course is to help the students to learn and develop an understanding of a cell as a basic unit of life. This course is designed to enable them to understand the functions of cellular organelles and how a cell carries out and regulates cellular functions.

Course outcome:

- Learn about the significance of taxonomic system and structural organization of animals in animal kingdom.
- Gaining knowledge regarding the different habit and habitat of non -chordates
- The evolutionary significance and phylogenetic relationship between two taxa are required for gaining knowledge of functional and structural correlation as well as affinities.

- The type study of a species is helpful to know details regarding their origin, characteristic features, anatomy and physiology. It also gives knowledge about the other specimens of the same phyla.
- Comprehend the economic importance of non-chordates, their interaction with the environment and role in the ecosystem.
- Enhance the knowledge by team work, practical session , project work, seminars, assignments, and group discussion.
- Understand fundamental principles of cell biology.
- Explain structure and functions of cell organelles involved in diverse cellular processes.
- Appreciate how cells grow, divide, survive, die and regulate these important processes.
- Comprehend the process of cell signalling and its role in cellular functions.
- Have an insight of how defects in functioning of cell organelles and regulation of cellular processes can develop into diseases.
- Learn the advances made in the field of cell biology and their applications
- Understand the principles of inheritance, Mendel ‘s laws and the deviations
- Comprehend the facts of sex determination in Drosophila sp.
- Detect chromosomal aberrations in humans and study of pedigree analysis.

Paper: UGZOOMJT201

Title: Chordate and Physiology

Course objective:

The course is designed with an aim to provide scope and historical background of chordates. It will impart knowledge regarding basic concepts of origin of chordates and make the students understand the characteristics and classification of animals with notochord. The exclusive phenomena in chordates like biting mechanism in snakes, flight adaptations in birds etc. will be explained. The adequate explanation to the students regarding various mechanisms involved in thriving survival of the animals within their geographic realms will create interest among students.

Physiology is the study of life, specifically, how cells, tissues and organ function. It is a core and fundamental scientific discipline that underpins the health and well-being of living organisms. Besides satisfying a natural curiosity about how our body systems function, it gives us knowledge about the functions of all the parts and systems of the body. It is also of central importance in medicine and related health sciences. The course has been designed to extend the fundamental or coherent understanding of the subject to related disciplinary

areas/subjects through understanding of normal body functions, assisting in more effective treatment of abnormal or diseased states. It will equip the students with skill-based knowledge, enabling them to undertake further studies in physiology and related areas as well as in multidisciplinary subjects.

Course Outcome:

- Understand different classes of chordates, level of organization and evolutionary relationship between different subphyla and classes, within and outside the phylum.
- Study about diversity in animals making students understand about their distinguishing features.
- Appreciate similarities and differences in life functions among various groups of animals in Phylum Chordata.
- Comprehend the circulatory, nervous and skeletal system of chordates.
- Know about the habit and habitat of chordates in marine, freshwater and terrestrial ecosystems.
- Course Learning Outcome: Upon completion of the course, students will be able to:
- Know the basic fundamentals and understand advanced concepts so as to develop a strong foundation that will help them to acquire skills and knowledge to pursue advanced degree courses.
- Comprehend and analyze problem-based questions
- Recognize and explain how all physiological systems work in unison to maintain homeostasis in the body and use of feedback loops to control the same
- Learn an integrative approach to understand the interactions of various organ systems resulting in the complex overall functioning of the body. Synthesize ideas to make connection between knowledge of physiology and real world situations, including healthy life style decisions and homeostatic imbalances
- Know the role of regulatory systems viz. endocrine and nervous systems and their amalgamation in maintaining various physiological processes.
- Learn about the diversity, morphology, anatomy, and physiology of different chordate groups.
- Comprehend the identification of species and their evolutionary relationships.
- Understand the animal world and pursuing further studies and research that are directly linked to human welfare, such as disease control, animal husbandry, and functional studies.
- Develop the skills to identify different classes and orders of Chordates.
- Enhance of basic laboratory skill like keen observation and drawing.
- Comprehend the regulatory mechanisms for maintenance of function in the body.
- Develop the skills to identify different types of blood cells.
- Enhance basic laboratory skill like keen observation, analysis and discussion.

Paper:UGZOOMJT301

Title: Ecology and Evolution

Course objective:

Ecology deals with concept of ecosystem. The goal of this course to understand the basics of ecology. It includes population growth models, population genetics, community characteristics ecological succession etc. These disciplines of ecology help to develop an appreciation of the modern scope of scientific inquiry in the field of ecology and develop an understanding of the differences in the structure and function of different types of ecosystems.

In evolutionary study it aims to acquire knowledge about the evolutionary history of earth - living and non-living, to acquire basic understanding about evolutionary concepts and theories. It also includes the distribution of animals on earth, its pattern, evolution and causative factors which impart basic knowledge on animal behavioural patterns and their role. The study of evolutionary biology is essential for anyone who seeks to obtain an understanding of life and natural world. It is a unifying thread which joins all organisms from prokaryotes to highest of eukaryotes. This course emphasizes on the development of evolutionary thought by dealing in general with the process and pattern of biological evolution. On one hand, it offers a chance to students to learn about deciphering evidences ranging from fossil records to molecular data and arranges them to establish phylogenetic relationships of species, while, on the other, it provides a platform to understand various forces which bring about variations among populations of a species and cause them to diversify into new species.

Course Outcome:

- Become familiar with the variety of ways that organisms interact with both the physical and the biological environment.
- Develop an understanding of the differences in the structure and function of different types of ecosystems.
- Learn techniques of data analysis as well as methods of presenting scientific information in figures and tables.
- Develop an appreciation of the natural world through direct experience with local ecosystems.
- Learn techniques for gathering data in the field.
- Develop an understanding on Life's beginnings – RNA world hypothesis along with natural selection which is one of several processes that can bring about evolution. Demonstrate knowledge of the concept of speciation, population genetics, Zoogeographical realms, Adaptation, Geological time scale, Phylogenetic trees etc. that will give a better understanding of how evolutionary science generates

knowledge by way of hypothesis testing, systematic observations, and the comparative

- Apply knowledge gained, on populations in real time, while studying speciation, behaviour and susceptibility to diseases.
- Gain knowledge about the relationship of the evolution of various species and the environment they live in.
- Get motivated to work towards mitigating climate change so that well adapted species do not face extinction as a result of sudden drastic changes in environment.
- Use knowledge gained from study of variations, genetic drift to ensure that conservation efforts for small threatened populations are focused in right direction.
- Predict the practical implication of various evolutionary forces acting on the human population in the field of human health, agriculture and wildlife conservation.
- Use various software to generate interest towards the field of bioinformatics and coding used in programming language,

Paper: UGZOOMJT401

Title:Molecular Biology and Developmental Biology

Course objective:

Molecular biology deals with nucleic acids and proteins and how these molecules interact within the cell to promote proper growth, division, and development. It is a large and ever-changing discipline. This course (Group A) will emphasize the molecular mechanisms of DNA replication, repair, protein synthesis. In the part of developmental biology (Group B) student will gain a detailed understanding of the molecular, biochemical and cellular events that regulate the development of specialised cells, tissues and organs during embryonic development. In particular, cell signalling pathways that regulate embryonic induction, tissue interactions and pattern formation, and expression of regulatory genes. A particular focus is the experimental strategies and techniques that are used to identify molecular and cellular mechanisms of development.

The main aim of the paper on Developmental Biology is to provide the undergraduate students an in-depth knowledge on the embryonic and post embryonic developmental processes. An important aspect of developmental biology is its implication in medicine which is also dealt with in this course. The approach of this paper is to make the students realize the most fascinating aspect of developmental biology that a single fertilized egg can give rise to a fully developed complex organism. The course explains the basic principles and concepts underlying the developmental processes at the cellular and molecular level. To understand morphogenesis, the students are introduced to model organisms like Sea urchin, Drosophila, Frog and Chick to study different types of eggs, cleavage patterns and various morphogenetic movements during gastrulation leading to formation of germ layers and their fate. By understanding the developmental processes, the students can relate to errors occurring during

development leading to congenital disorders and human diseases. The paper also addresses the problems of infertility in humans. The students are familiarized with the technique of IVF and pre-diagnostic methods to identify any abnormality arising during development. The students are made aware of the areas of great interest including stem cell therapy, tissue engineering and regenerative medicine.

Course Outcomes:

- Describe the core principles of molecular biology.
- Describe the genetic structure and types of chromatins.
- Elucidate the types, damage and repair of DNA, types of RNAs, genetic code, Understand the concept of mutations.
- Explicate the mechanism of gene regulation in prokaryotes.
- Understand the concept of gene expression in eukaryotes.
- Describe the morphological processes that transform a fertilised egg into a multicellular organism.
- Explain the molecular, biochemical and cellular events that regulate the development of specialised cells, tissues and organs during embryonic development.
- Identify model organisms used to investigate developmental biology and compare the developmental programmes of different organisms.
- Describe genetic, molecular and cellular techniques, including genome editing, used to investigate developmental and molecular biology processes in various organisms.
- Gain higher level thinking skills that is necessary for research.
- Understand the events that lead to formation of a multicellular organism from a single fertilized egg, the zygote.
- Acquire basic knowledge of the cellular processes of development and the molecular mechanisms underlying these.
- Describe the general patterns and sequential developmental stages during embryogenesis; and understand how the developmental processes lead to establishment of body plan of multicellular organisms.
- Discuss the general mechanisms involved in morphogenesis and to explain how different cells and tissues interact in a coordinated way to form various tissues and organs.
- Understand about the evolutionary development of various animals.
- Know the process of ageing leading to interventions that can improve the overall health and quality of life in aged people.
- Learn the importance of latest techniques like stem cell therapy, in vitro fertilization and amniocentesis etc. to be applied for human welfare.
- Develop the skill to raise and maintain culture of model system; Drosophila in the laboratory.

Paper: UGZOOMJT402

Title: Parasitology and Immunology

Course objective:

Parasites are vast menagerie. They can cause diseases without pardon. They can slip into a person's brain wrecking the biological clock turning the day into nights. They can cause livers of cattle useless and roots of plants functionless. They may cause a tourist spot an epicenter of epidemic disease. There is an enormous diversity of parasites in nature and knowing and understanding them well becomes very important in the light of controlling and managing the parasites effectively. The economic impact of these organisms is often huge and that makes it even more important to study them. Parasitology will enable us diagnose parasites correctly, understand their life cycle and control them effectively and use some of them as bio control agents. Parasitology; especially the study of life cycles of parasites;has helped in defying the stigmas and religious taboos for many societies making free many of the people from superstition and ill health. Developing countries like our country where majority of the people are engaged in agricultural activities and living in poor conditions have advantages to be harvested from the study of parasitology. The course shall surely skill the students to see, appreciate and understand the diversities of parasites in the whole spectrum of the study of life. The course shall also make the students aware about the possible scopes of the subject which include research and applied aspects including entrepreneurial works.

The aim of the course in immunology is to apprise the student with the working of the immune system in normal health and how it fights the disease and may sometimes contributes to disease. The immune system is incredibly complex. This course is hence designed to enable understanding the molecular and cellular basis of the development and function of the immune system and identification of its biological, clinical and therapeutic implications.

Course Outcomes:

- Identify the different types of parasites.
- Classify parasites causing diseases to humans.
- Assess the reasons of infections with parasites.
- Explain the life cycles of various parasites.
- Discuss the relationship between each parasite and its host.
- Conduct procedures related to isolation of some parasites.
- Define the principles of management for some common parasitic diseases.
- Outline the methods of parasitic disease treatment, prevention and control.
- Functioning in multi-disciplinary teams to advise the general public on scientific basis to prevent infections with parasite. Discuss the function of cells and organs involved in immunity.
- Explain features and mechanisms of innate and adaptive immunity.
- Describe the mechanisms involved in acute and chronic inflammation.

- Explain about autoimmune diseases.
- Clarify the antigen-antibody interactions and monoclonal antibody production.
- Apply the acquired knowledge to explain defence mechanisms against infectious agents.
- Advise the general public why vaccination is necessary.

Paper: UGZOOMJT501

Title:Taxonomy and Biostatistics

Course objective:

Taxonomy is the science of classification in general, but more specifically the classification of living and extinct organisms—i.e., biological classification. The term comes from the Greek words taxis (arrangement) and nomos (law). Taxonomy is thus the methodology and principles of systematic Botany and Zoology that organizes plant and animal species into hierarchies of superior and subordinate groups. In 1813, the Swiss botanist Augustin Pyramus de Candolle proposed the term for plant classification. This course is designed to clear the basic fundamental idea regarding traditional and molecular taxonomy. In the portion of Biostatistics, the students will have an exposure on the basic statistical tools that are an essential part of modern biological research.

The second unit of this course provides some of the most important and fundamental analytical tools used in Biological Sciences that will engorge the students with technical knowledge that could help them in better understanding of biological processes in broad range.

Course Outcomes:

Students will have learning about the basic taxonomy and systematics and classification of animal kingdom. In this course students will also learn about various data analyzing tools and techniques such as central tendency, t-test, chi-square, ANOVA, correlations and regression etc. They will handle common software used in statistical analysis and bio-informatics. They are expected to gather knowledge on implementation of various tools in biomedical research works.

Paper:UGZOOMJT502

Title:Economic Zoology

Course Objectives:

1. To provide students with knowledge regarding parasitological terms, types of parasites and host parasite relationship.
2. To provide students with knowledge concerning biological and epidemiological aspects of parasites causing diseases to humans.
3. To enable students to understand the pathogenesis, clinical presentations and complications of parasitic diseases.
4. To enable students to learn diagnosis and know the general outline of treatment, prevention and control of parasitic infections.
5. To provide students with knowledge regarding basic idea of zoonosis and zoonotic diseases. To provide an adequate knowledge about the basic concepts of health and diseases.
6. To provide students with knowledge regarding cells and organs of the immune system.
7. To enable students to understand the innate and adaptive immunity.
8. To provide students with knowledge about antigens and immunoglobulins.
9. To enable students to understand the antigen-antibody interactions and monoclonal antibody production.
10. To provide an adequate knowledge regarding vaccines and autoimmune diseases.

Course Outcomes:

Economic Zoology: In this section students will learn about the concepts and methods of aquaculture, sericulture apiculture, lac culture and poultry farming. They will also learn the methods of integrated pest management. After learning such concepts and tools they will be able to employ these strategies in their practical life and will be able to establish or manage farms.

Paper:UGZOOMJT601

Title:Clinical Physiology

Course objective: Clinical Physiology is the study of life, especially how cells, tissues and organs function. It is a core and fundamental scientific discipline that underpins the health and well-being of living organisms. This paper provides a course of study in mammalian (principally human) systems and their physiology, based on the knowledge of basic physiological principles already studied in Semester II. The main objective of this paper is to

expand some areas touched in Semester II and also introduce new and more complex physiological functions.

Course Outcomes

- Students will learn about basics of histology.
- They will also understand the physiology of muscles, nerves, reproductive systems and bone.
- They will learn details of endocrinology with classification of hormones, their biosynthesis, receptors, mode of molecular actions, physiological function, feedback controls and related disorders.
- Students will know the physiology of digestion, respiration, circulation, excretion etc. In this section students will learn about the basic concept and mechanism of reproductive physiology as well as practical implications of the reproductive biology such as IVF, contraception, and how to medically manage menopause and andropause.

Title:UGZOOMJT602

Paper: Biochemistry

Course Objectives:

Students in this advanced course in Biochemistry and metabolic processes will learn about thermodynamics, interplay, catalysis, how cellular reactions are possible in living systems, and how important metabolic pathways work, viz: regulation and inter-dependence of the pathways on one another, their roles in both health and disease will be studied. Enzymes, enzyme kinetics of first- and second-order processes, inhibitions, and regulators are all topics covered in the course. Biochemistry courses in undergraduate programmes expose students to advanced topics including free radicals and their roles in living systems, growth factors, and other aspects of their own biochemistry as well.

Course Outcomes:

- Students will understand the basic and fundamental biochemistry of carbohydrates, proteins, lipids and nucleic acids.
- They will also understand the nature, mechanism, and kinetics of enzyme action. The students are expected to learn to prepare various types of solutions.
- Some instrumentation such as Colorimetry/ Spectrophotometry, SDS-PAGE etc. will also be learnt.
- Upon completion of the course, students should be able to: Gain knowledge and skill in the fundamentals of biochemical sciences, interactions and interdependence of physiological and biochemical processes.

- Get exposed to various processes used in industries and gain skills in techniques of chromatography and spectroscopy.
- Demonstrate foundation knowledge in biochemistry; synthesis of proteins, lipids, nucleic acids, and carbohydrates; and their role in metabolic pathways along with their regulation.
- Know about classical laboratory techniques, use modern instrumentation, design and conduct scientific experiments, and analyze the resulting data.
- chemicals Be knowledgeable in proper procedures and regulations in handling and disposal of.

Paper: UGZOOMJT603

Title:Adaptation and Animal Behaviour

Course Objective: Animal Behavior has been associated with educational curricula for introductory courses in biological science for more than 40 years. When it comes to studying animal behaviour, a more integrated approach is needed to stay up to date with the developments in this field. This course emphasizes research that links behaviour to the brain, genes and hormones as well as to environmental and social factors. It also aims to test out fresh theories on how animal behaviour has evolved. Finally, its fundamental objective is to provide students with a window into the multiple levels of analysis that researchers employ to explain why all living things behave, often in complex ways

Course Outcomes:

Students will know in details about patterns of behaviors, survival strategies, social and cooperative behaviors, design of signals and chronobiology.

Paper:UGZOOMJT701

Title:Non-Chordate structure and function

Course Objective:

The field of invertebrate biology is so vast and runs across so many disciplinary lines so, it is necessary to make certain generalisation and to avoid others. Structure and function are the two primary focuses for the curriculum which is necessary to build up common threads of interest among students. The first topic, structure gives the general idea about the fundamentals of functional body architecture. The second group of themes emphasises on the degree to which the structure has been adapted over time to fulfil a specific function for the

organism that bears it. After the completion of this course the student's interest will be widen in knowing about the complex diversity of our living world inhabited by the animals which does not have notochord in any stage of their life cycle.

Course Outcome:

This curriculum will provide a wide and vast understanding about the evolutionary changes of the invertebrate systems which depends upon their survival and reproduction within the natural habitat.

Paper:UGZOOMJT702

Title: Chordate structure and function

Course Objective:

The biology of chordates provides awareness and understanding about the fundamental scientific concepts that reflects upon the concepts of how science of the natural world works. As John A. Moore put it, science is the "way of knowing". The comparative anatomy of vertebrates provides comparison between the organisms of the living world. The skeleton system of animals relies upon the basic anatomy while evolution of vertebrates deals with the progression and development of a complicated interrelated system of organs and their functions. The anatomy of vertebrates gives a strong example of how the evolution of an integrated organism works. From this section of the lesson, students will learn about the exciting journey of vertebrates and how evolution has shaped them to fit the demands of their surroundings.

Course Outcome:

After completion of the course students will gain knowledge about the diversity, morphology, basic anatomy, and physiology of the different groups of chordates which will help them to understand the animal world and the further studies that are directly linked to human welfare, such as disease control, animal husbandry, and functional studies.

Paper: UGZOOMJT703

Title: Ecosystem Structure and Function

Course Objective: The term "Ecology" refers to the study of inter-relationships between organisms and their physical environment. There are various ways in which these relationships can regulate the natural ecosystem such as distribution and abundance of living organisms, the variety of species living together, and the energy flow in natural ecosystem. Since environmental change is occurring at a rapid rate in the early twenty-first century it is vital that we better comprehend the ecology of the planet. While most people associate ecologists with fieldwork, ecologists who develop theoretical models or do laboratory research have made some of the most significant contributions to ecological theory. We can clearly see that our simplistic description of ecology does not adequately convey its vastness or the diversity of its practitioners. Let's talk at this course to have a better grasp of what ecology is all about.

Paper:UGZOOMJT801

Title; Cell, Tissue Structure and Function

Course Objective:

To understand the complicated cellular chemistry, a comprehensive study of sub-cellular component is prerequisite. Recently developed mathematical/computational approaches explained cellular behaviour through the generation of quantitative information, some of which have yet to be invented. Emerging approaches in the evaluation of quantitative information has now become the primary focus for cell biologists.

Course Outcome:

The students will know more about the key concepts that underlies the cellular biochemistry. The importance of well-synchronised activity of the cell is necessary for the continued existence of a living organism.

UGZOOMJT802

Clinical Immunology and Infection Biology

Course Objective:

This topic gives emphasis on the advanced immunological aspects including treatments related to immunity. The students will be able to understand the theoretical framework about the complex molecular mechanisms involved in the immunity and the related immunological methods. Along with these the students will be able to understand about tolerance, immunodeficiency and vaccination, immunology of transplantation, the immunology of tumors, immunomodulation, and immunopharmacology.

Course Outcome:

After completion of this elective, student will understand the fundamentals of molecular mechanism behind immunity. They will have a wide knowledge of many immunological techniques that include immunohistochemistry, ELISA, FACS etc. They will simply gain the basics of tolerance, autoimmunity, immunological disease, and cancer immunology. They will also understand the basic idea of immunomodulation and immunopharmacology.

Paper: UGZOOMJT803

Title: Biodiversity; Wild life Management & Conservation

Course Objective: Due to significant loss of biodiversity and deterioration of natural ecosystems, there is little room for argument that all life on earth is currently in jeopardy. As a result, this course is available to all graduate students, regardless of their academic expertise, in order to make them aware of and sensitize them to this survival dilemma. Students who complete this course will have gained a solid foundation in the importance of biodiversity and ecosystem services in supporting life on Earth, as well as an understanding of the dangers posed by the careless behavior of man.

Course Outcome: Biodiversity and wildlife: Student will be learning the various issues related to biodiversity loss and conservation as well as status, conditions and conservation of forests and wildlife. They will also be able to use various tools used in field biology.

Paper: UGZOOMJT804

Title: Reproductive Biology

Course Objectives: Reproductive Biology covers principles and techniques in reproduction. It also enlightens the areas including Physiology of human reproductive system and its hormonal regulation, Applications of Reproductive Biology like Artificial Reproductive Techniques (ARTs) etc**.** that will help to develop further practical skills or research ability of the students.

Course outcome: Reproductive Biology: In this section students will learn about the basic concept and mechanism of reproductive physiology as well as practical implications of the reproductive biology such as IVF, contraception, and how to medically manage menopause and andropause.

Paper: UGZOOMJT805

Title: Biotechnology

Course Objective: Biotechnology has transformed the planet. Advances in biotechnology now can track many inherited disorders. People may now live in considerably higher population densities due to biotechnology's ability to produce more food per acre. As a result of advance biotechnology, we now know more about genomes of a wide range of creatures, from viruses to trees to people. Science has been shifted from a descriptive to a variety of fields that generate new items such as pharmaceuticals, vaccines, and meals thanks to the application of this knowledge. This course is designed to flash the spotlight of Biotechnology on student to make them equipped with the modern science

Course Outcome: The key objective of this class is to provide fundamental knowledge about the structural and functional features of biological macromolecules such as DNA, RNA, and proteins. After completion of this course the students will be able to use this knowledge in their scientific discipline and in future higher studies.