

DEPARTMENT OF ZOOLOGY
HOOGLY WOMEN'S COLLEGE

B.Sc. Honours in Zoology (CBCS)

2018-2021

PROGRAMME OUTCOME (PO)

Our college is affiliated under The University of Burdwan, The Choice Based Credit System (CBCS) was introduced in the academic session 2017-2018. Therefore, it is not justified to give the expert remark or to enlighten significantly about the programme outcome by sharing views with the students who have just completed only two semesters. Still with merge experience of the students and gentle discussion of the teachers with them have been able to extract a glimpse of the programme outcome of the Department of Zoology which is given below:

PO-1: There is a tendency to provide symmetry in the Honours and General stream so that both can avail the chance to get berth in Post Graduate course or be competent enough to appear in different competitive examinations throughout India.

PO-2: As the system is a choice based system, the students have option to choose the subject of choice. This apparent pliable system has the opportunity to avoid the stringent old base system.

PO-3: This system has tried to distribute the load of the subject in a symmetric manner so that it can reduce the burden propounded at a time.

PO-4: Certain activities like dissertation/term paper/assignment and excursion could cater the student for field work research, nature care etc. and to equip them in different techniques and instrumentation.

PO-5: There is certain applied part of zoology in the form of sericulture, sericulture aquarium fish farming which have traditional and modern value to make the students job oriented.

PO-6: Students gain knowledge and skill in the fundamentals of animal sciences, understands the complex interactions among various living organisms.

PO-7: The course may help the students to acquire gradual knowledge from base to its intrigue in a successful manner.

PO-8: The method and pattern of question may be helpful to make a student equipped for any public or competitive examination.

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO-1: Understand the nature and basic concepts of cell biology, taxonomy, physiology, ecology, microbiology, parasitology, endocrinology and economic zoology.

PSO-2: Analyze complex interactions among the various animals of different phylum, their distribution and their relationship with the environment.

PSO-3: Apply the knowledge of internal structure of cell, its functions in control of various metabolic functions of organisms, correlates the physiological processes of animals and relationship of organ systems.

PSO-4: Understands the complex evolutionary processes and behavior of animals.

PSO-5: Understanding of wild life conservation processes and importance of biodiversity and protection of endangered species.

PSO-6: Gain knowledge of agro based small scale industries like sericulture, aquarium fish farming, sericulture, apiculture.

PSO-7: Understands the concepts of genetics and its importance in human health.

PSO-8: Apply the knowledge and understanding of Zoology to practical aspects.

PSO-9: Perform procedures as per laboratory standards in the areas of Ecology, Immunology, and Histology and Developmental biology.

PSO-10: Gains knowledge about research methodologies and skills of problem solving methods.

COURSE OUTCOME (CO)

CO1: Non-Chordates

- a) Gain a knowledge about Animal kingdom specially subkingdom Protozoa & Metazoa.
- b) Location & importance of coral reef in nature & its economic importance.

- c) Gain detail knowledge of Classification, Excretion, Respiration, Nervous system & development of higher metazoa.
- d) Gain a special knowledge of metamorphosis in insects & echinoderms & social life of insects like termite.
- e) Gain knowledge of identifying different species taxonomically, staining some of species and comparative study of some of the groups.

CO2: Chordates

- a) Gain detail knowledge about classification of phylum Chordata.
- b) Knowledge about special behavior like migration in fish & birds, parental care in amphibia, biting mechanism in snake.
- c) Knowledge about aerodynamics in birds & echolocation in mammals.
- d) Gains knowledge of functional anatomy of vertebrates from fishes to mammals.
- e) Knowledge about distribution of animals in the world & division of world into different realms accordingly.
- f) Achieving Practical knowledge to identify species taxonomically, studying some special features as well as comparative analysis of different significant groups.

CO3: Ecology

- a) Gain sound knowledge on Population Ecology, Community Ecology and Ecosystem ecology.
- b) Interaction of biota and abiota.
- c) Knowledge on conservation and procedures of conservation.
- d) Detail understanding on Tiger conservation.
- e) Practically learned to do life tables. They are able to draw survivorship curve and draw conclusion from that.
- f) Able to do sampling in quadrat method and from that data they can do Shannon-Wiener index and can infer about any community.
- g) Expertise on study of any aquatic ecosystem.

CO4: Cell Biology

- a) Gain detail knowledge of prokaryotic & eukaryotic cell, cell organelles.
- b) Gain a practical knowledge of Cell division & study of chromosomal changes during cell division.
- c) Gain knowledge of cellular signaling and cell interaction.
- d) Gather practical knowledge of preparation of cell divisional stages and identify specialized structures in bold cells.

CO5: Animal physiology

- a) Gain fundamental knowledge of animal physiology.
- b) Detailed concepts of action potential and its propagation.
- c) Learn the concepts of endocrine systems and gain knowledge about hormones.
- d) Gain fundamental knowledge of physiology of homeostasis.
- e) Gain practical knowledges of muscle function, reflex action, and histological preparation and histological studies of tissues of various organs.

CO6: Fundamentals of Biochemistry

- a) Interactions and interdependence of physiological and biochemical processes.
- b) Gain basic knowledge about various bio molecules and their role in metabolism.
- c) Understanding through scientific enquiry into the nature of physical and biochemical functions of the cells.
- d) Gain practical knowledge of quantitative and qualitative measurement of biomolecules, separation techniques and studying enzyme actions.

CO7: Immunology

- a) Understanding types of immunity, antigens-antibodies and their properties.
- b) Understanding immune mechanisms in disease control, vaccination, and process of immune interactions.
- c) Gather practical knowledge of lymphoid tissues, blood cell morphology, histochemical

analysis.

d) Working process of different lymphoid organ.

e) Practical knowledge on blood grouping and idea on different blood cell.

CO8: Genetics

a) Mendelian and non Mendelian inheritance

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

c) Gain concepts of mutation, sex determination, special inheritance pattern, transposition and bacterial and viral recombination.

d) Becomes expertise through practical experience about aberration, chromosomal disorders, linkage analysis and genetic analysis techniques.

CO9: Molecular Biology

a) Sustain a basic knowledge about Nucleic acids, DNA replication, Transcription, Translation of prokaryotes and Eukaryotes as well.

b) Familiar with the gene modifications (post-translational modifications) and gene regulation.

c) Learn principles of molecular techniques such as PCR, Northern blot, Southern blot, Western blot etc.

d) Practical knowledge to handle spectrophotometer and Agarose Gel Electrophoresis.

e) Gain experience on preparing liquid, solid media for bacteria culture and determining antibiotic sensitivity and resistance zones of bacteria.

CO10: Developmental biology

a) Develop the basic concepts of development, implication of embryonic development and post developmental aspects,

b) Gains knowledge about gametogenesis, cleavage mechanisms, gastrulation and role of hormones in metamorphosis and regeneration.

c) Gather practical knowledge about developmental stages and specialised structures in

vertebrate and invertebrate models.

CO11: Evolutionary biology

- a) Knowledge of eras and evolution of species.
- b) Explain the genetic basis of evolution; correlate the theories with the evidences.
- c) Knowledge regarding human origin, mode of evolution and its significance.
- d) Gathering practical knowledge of fossil, comparison of characters to prove evolution and mathematical model of population study

CO12: Microbiology

- a) Learn some basics on microbiology and their classification.
- b) Have a lot of information on morphology of bacteria and virus.
- c) Have a good understanding on pathogenicity of microorganisms and microbial diseases.
- d) Have experience on diagnostic microbiology and bacteria culture.
- e) Gain some basic knowledge on preparing liquid, solid media for bacteria culture and determining their biochemical characterization.
- f) Have a good experience on staining of bacteria and microbial examination of milk.

CO13: Animal biotechnology

- a) Imparts the knowledge to culture animal cells in artificial media.
- b) Knowledge of animal cells in culture, growth of cell lines.
- c) Application of DNA technology and molecular biology for research
- d) Gain practical knowledge about restriction map, transformation efficiency, sequencing techniques, blot techniques, finger printing techniques and PCR

CO14: Biology of Insects

- a) Gather a general idea about taxonomy, morphological features, and physiology of insects.
- b) Knowledge about social behavior of insects like termites, bees & ants.
- c) Gain Practical knowledge about harmful insects like pest causing economic loss and vectors

spreading diseases like cholera, malaria, encephalitis, dengue, filaria etc. enables to take protective measures.

d) Gather practical knowledge regarding collection, preservation and identification of insects and their different body parts. Pest study and life cycle study

CO15: Animal Behavior

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

b) Explain the relationship of behaviour and cognition.

c) Explain rhythmic behaviours and social behaviours.

d) Collect practical knowledge of nesting of birds and insects, tactic movements, circadian function and ectogram construction

CO16: Wild life Conservation

a) Key threats to biodiversity.

b) Describe habitat management.

c) Understanding of Conservation will help protection of wildlife.

d) Explain wildlife trade that may enhance the economy.

e) Understanding of wildlife conservation, trade and management.

f) Gather and learn practical knowledge regarding faunal identification, equipment studies, identification of animal by special marks, nests, scats etc.

CO17: Parasitology

a) Explain the phenomenon of living together and symbiosis.

b) Describe parasitism.

c) Describe the life histories of some protozoan and helminthes.

d) Describe parasitic arthropods.

e) Gather practical knowledge regarding identification, staining and isolation of parasites

CO18: Endocrinology

- a) Gain detail knowledge of structure and function of endocrine glands including neuroendocrine glands and feedback mechanism.
- b) A specific knowledge of mechanism of hormone action in the cell, disorders of endocrine glands, & role of hormones in homoeostasis.
- c) A practical knowledge of demonstration of hormone assay through ELISA, anatomical and histological study of glands and tissue processing.

CO19: Reproductive biology

- a) Gain detail knowledge of structure, function, development and differentiation of gonads.
- b) A specific knowledge oh hormonal regulation of pregnancy, parturition & lactation
- c) Specific knowledge of causes & management of infertility in male and female.
- d) Gain practical knowledge of sections of male and female reproductive structures as well as vaginal fluid study.

CO20: Apiculture

- a) Learned knowledge about method of apiculture, control & preventive measures of bee diseases & enemies and economic importance of products of apiculture such as honey, bee-wax.
- b) Enriched knowledge of Apiculture will provide scope of self- employment.

CO21: Sericulture

- a) Gives knowledge of silk worm rearing.
- b) Mulberry cultivation.
- c) Pests and diseases associated with silk worm.
- d) Various process involved in silk production.
- e) Prospects of sericulture in India, how get employment in sericulture industry.

CO22: Aquarium fish keeping

- a) Provides knowledge of ornamental fish breeding which is highly professional and attractive avenue for youth.
- b) Get knowledge regarding food and feeding of aquarium fishes.

c) Setting and maintenance of aquarium.

CO23: Medical diagnostic techniques

a) Gives knowledge related to the techniques involved in detection of various diseases.

b) Pathology associated with various diseases

c) Idea on chromosomal status of different genetic syndrome.

CO24: Applied Zoology

a) Describe general taxonomic rules on animal classification.

b) Classify phylum using characters and examples.

c) Acquire knowledge on artificial insemination poultry farming and fish induced breeding.

d) Concepts on host parasitic relationship.

e) Knowledge on different vector of human diseases.

f) Bionomics of stored grain pest.

CO25: Aquatic biology

a) Understands concepts of fisheries, fishing tools and site selection.

b) Idea on adaptation of marine organisms.

c) Physico-chemical parameters and nutrient cycles of lakes.

d) Get knowledge on water quality assessment.

CO26: Animal Diversity

a) Provide concepts of basic characteristics of invertebrate and vertebrates.

b) Concepts of respiratory system in invertebrate phylum.

c) Knowledge about flight mechanism in bird.

d) Gathering knowledge by observing real and preserved specimens.

e) Knowledge of poisonous and non-poisonous snakes

f) Concepts of permanent slide preparation.

CO27: Comparative anatomy and developmental biology of vertebrates

a) Detail knowledge of Respiratory, Circulatory, Digestive, Reproductive system of vertebrates.

- b) Knowledge on comparative anatomy of different system of vertebrate phylum.
- c) Concepts on embryonic development in different vertebrate animals.
- d) Concepts on different sense organ.
- e) Basic concepts on girdle and limb bones.
- f) Basic concepts on skull.
- g) Concepts on different developmental stages with slide and photograph.
- h) Knowledge on gametes by identification of slide.

CO28: Physiology and Biochemistry

- a) Details knowledge about nerve and muscle function.
- b) Concepts on digestion, excretion and reproduction.
- c) Structural correlation on endocrine gland.
- d) Concepts on carbohydrate, lipid and protein structure; details of different metabolic pathway.
- e) Idea on histological structure of different endocrine glands.
- f) Experience on biochemical test

CO29: Genetics and Evolutionary biology

- a) Knowledge on chromosome.
- b) Concepts on different chromosomal mutation.
- c) Knowledge about chromosomal map distance.
- d) Concepts on different evolutionary changes.
- e) Idea on chromosomal status of different genetic syndrome.
- f) Different phylogeny study.

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COURSE OUTCOME (CO)

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CO3: Ecology

- a) Gain sound knowledge on Population Ecology, Community Ecology and Ecosystem ecology.
- b) Interaction of biota and abiota.
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- d) Gain fundamental knowledge of physiology of homeostasis.
- e) Gain practical knowledges of muscle function, reflex action, and histological preparation and histological studies of tissues of various organs.

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- a) Understanding types of immunity, antigens-antibodies and their properties.
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- c) Gather practical knowledge of lymphoid tissues, blood cell morphology, histochemical

analysis.

d) Working process of different lymphoid organ.

e) Practical knowledge on blood grouping and idea on different blood cell.

CO8: Genetics

a) Mendelian and non Mendelian inheritance

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

c) Gain concepts of mutation, sex determination, special inheritance pattern, transposition and bacterial and viral recombination.

d) Becomes expertise through practical experience about aberration, chromosomal disorders, linkage analysis and genetic analysis techniques.

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c) Learn principles of molecular techniques such as PCR, Northern blot, Southern blot, Western blot etc.

d) Practical knowledge to handle spectrophotometer and Agarose Gel Electrophoresis.

e) Gain experience on preparing liquid, solid media for bacteria culture and determining antibiotic sensitivity and resistance zones of bacteria.

CO10: Developmental biology

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vertebrate and invertebrate models.

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- a) Knowledge of eras and evolution of species.
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- d) Gathering practical knowledge of fossil, comparison of characters to prove evolution and mathematical model of population study

CO12: Microbiology

- a) Learn some basics on microbiology and their classification.
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- c) Have a good understanding on pathogenicity of microorganisms and microbial diseases.
- d) Have experience on diagnostic microbiology and bacteria culture.
- e) Gain some basic knowledge on preparing liquid, solid media for bacteria culture and determining their biochemical characterization.
- f) Have a good experience on staining of bacteria and microbial examination of milk.

CO13: Animal biotechnology

- a) Imparts the knowledge to culture animal cells in artificial media.
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- c) Gain Practical knowledge about harmful insects like pest causing economic loss and vectors spreading diseases like cholera, malaria, encephalitis, dengue, filaria etc. enables to take

protective measures.

d) Gather practical knowledge regarding collection, preservation and identification of insects and their different body parts. Pest study and life cycle study

CO15: Animal Behavior

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

b) Explain the relationship of behaviour and cognition.

c) Explain rhythmic behaviours and social behaviours.

d) Collect practical knowledge of nesting of birds and insects, tactic movements, circadian function and ectogram construction

CO16: Wild life Conservation

a) Key threats to biodiversity.

b) Describe habitat management.

c) Understanding of Conservation will help protection of wildlife.

d) Explain wildlife trade that may enhance the economy.

e) Understanding of wildlife conservation, trade and management.

f) Gather and learn practical knowledge regarding faunal identification, equipment studies, identification of animal by special marks, nests, scats etc.

CO17: Parasitology

a) Explain the phenomenon of living together and symbiosis.

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CO18: Endocrinology

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a) Gain detail knowledge of structure, function, development and differentiation of gonads.

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b) Mulberry cultivation.

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d) Various process involved in silk production.

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

b) Get knowledge regarding food and feeding of aquarium fishes.

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CO23: Medical diagnostic techniques

- a) Gives knowledge related to the techniques involved in detection of various diseases.
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- c) Idea on chromosomal status of different genetic syndrome.

CO24: Applied Zoology

- a) Describe general taxonomic rules on animal classification.
- b) Classify phylum using characters and examples.
- c) Acquire knowledge on artificial insemination poultry farming and fish induced breeding.
- d) Concepts on host parasitic relationship.
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CO25: Aquatic biology

- a) Understands concepts of fisheries, fishing tools and site selection.
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- e) Practically learned to do life tables. They are able to draw survivorship curve and draw conclusion from that.

f) Able to do sampling in quadrat method and from that data they can do Shannon-Wiener index and can infer about any community.

g) Expertise on study of any aquatic ecosystem.

CO4: Cell Biology

a) Gain detail knowledge of prokaryotic & eukaryotic cell, cell organelles.

b) Gain a practical knowledge of Cell division & study of chromosomal changes during cell division.

c) Gain knowledge of cellular signaling and cell interaction.

d) Gather practical knowledge of preparation of cell divisional stages and identify specialized structures in animal cells.

CO5: Animal physiology

a) Gain fundamental knowledge of animal physiology.

b) Detailed concepts of action potential and its propagation.

c) Learn the concepts of endocrine systems and gain knowledge about hormones.

d) Gain fundamental knowledge of physiology of homeostasis.

e) Gain practical knowledges of muscle function, reflex action, and histological preparation and histological studies of tissues of various organs.

CO6: Fundamentals of Biochemistry

a) Interactions and interdependence of physiological and biochemical processes.

b) Gain basic knowledge about various bio molecules and their role in metabolism.

c) Understanding through scientific enquiry into the nature of physical and biochemical functions of the cells.

d) Gain practical knowledge of quantitative and qualitative measurement of biomolecules, separation techniques and studying enzyme actions.

CO7: Immunology

- a) Understanding types of immunity, antigens-antibodies and their properties.
- b) Understanding immune mechanisms in disease control, vaccination, and process of immune interactions.
- c) Gather practical knowledge of lymphoid tissues, blood cell morphology, histochemical analysis.
- d) Working process of different lymphoid organ.
- e) Practical knowledge on blood grouping and idea on different blood cell.

CO8: Genetics

- a) Mendelian and non Mendelian inheritance
- b) Concept behind genetic disorder, gene mutations-various causes associated with inborn errors of metabolism.
- c) Gain concepts of mutation, sex determination, special inheritance pattern, transposition and bacterial and viral recombination.
- d) Becomes expertise through practical experience about aberration, chromosomal disorders, linkage analysis and genetic analysis techniques.

CO9: Molecular Biology

- a) Sustain a basic knowledge about Nucleic acids, DNA replication, Transcription, Translation of prokaryotes and Eukaryotes as well.
- b) Familiar with the gene modifications (post-translational modifications) and gene regulation.
- c) Learn principles of molecular techniques such as PCR, Northern blot, Southern blot, Western blot etc.
- d) Practical knowledge to handle spectrophotometer and Agarose Gel Electrophoresis.
- e) Gain experience on preparing liquid, solid media for bacteria culture and determining antibiotic sensitivity and resistance zones of bacteria.

CO10: Developmental biology

- a) Develop the basic concepts of development, implication of embryonic development and post

developmental aspects,

- b) Gains knowledge about gametogenesis, cleavage mechanisms, gastrulation and role of hormones in metamorphosis and regeneration.
- c) Gather practical knowledge about developmental stages and specialised structures in vertebrate and invertebrate models.

CO11: Evolutionary biology

- a) Knowledge of eras and evolution of species.
- b) Explain the genetic basis of evolution; correlate the theories with the evidences.
- c) Knowledge regarding human origin, mode of evolution and its significance.
- d) Gathering practical knowledge of fossil, comparison of characters to prove evolution and mathematical model of population study

CO12: Microbiology

- a) Learn some basics on microbiology and their classification.
- b) Have a lot of information on morphology of bacteria and virus.
- c) Have a good understanding on pathogenicity of microorganisms and microbial diseases.
- d) Have experience on diagnostic microbiology and bacteria culture.
- e) Gain some basic knowledge on preparing liquid, solid media for bacteria culture and determining their biochemical characterization.
- f) Have a good experience on staining of bacteria and microbial examination of milk.

CO13: Animal biotechnology

- a) Imparts the knowledge to culture animal cells in artificial media.
- b) Knowledge of animal cells in culture, growth of cell lines.
- c) Application of DNA technology and molecular biology for research
- d) Gain practical knowledge about restriction map, transformation efficiency, sequencing techniques, blot techniques, finger printing techniques and PCR

CO14: Biology of Insects

- a) Gather a general idea about taxonomy, morphological features, and physiology of insects.
- b) Knowledge about social behavior of insects like termites, bees & ants.
- c) Gain Practical knowledge about harmful insects like pest causing economic loss and vectors spreading diseases like cholera, malaria, encephalitis, dengue, filaria etc. enables to take protective measures.
- d) Gather practical knowledge regarding collection, preservation and identification of insects and their different body parts. Pest study and life cycle study

CO15: Animal Behavior

- a) Imparts conceptual knowledge of vertebrates, their adaptations and associations in relation to their environment.
- b) Explain the relationship of behaviour and cognition.
- c) Explain rhythmic behaviours and social behaviours.
- d) Collect practical knowledge of nesting of birds and insects, tactic movements, circadian function and ectogram construction

CO16: Wild life Conservation

- a) Key threats to biodiversity.
- b) Describe habitat management.
- c) Understanding of Conservation will help protection of wildlife.
- d) Explain wildlife trade that may enhance the economy.
- e) Understanding of wildlife conservation, trade and management.
- f) Gather and learn practical knowledge regarding faunal identification, equipment studies, identification of animal by special marks, nests, scats etc.

CO17: Parasitology

- a) Explain the phenomenon of living together and symbiosis.
- b) Describe parasitism.

- c) Describe the life histories of some protozoan and helminthes.
- d) Describe parasitic arthropods.
- e) Gather practical knowledge regarding identification, staining and isolation of parasites

CO18: Endocrinology

- a) Gain detail knowledge of structure and function of endocrine glands including neuroendocrine glands and feedback mechanism.
- b) A specific knowledge of mechanism of hormone action in the cell, disorders of endocrine glands, & role of hormones in homoeostasis.
- c) A practical knowledge of demonstration of hormone assay through ELISA, anatomical and histological study of glands and tissue processing.

CO19: Reproductive biology

- a) Gain detail knowledge of structure, function, development and differentiation of gonads.
- b) A specific knowledge oh hormonal regulation of pregnancy, parturition & lactation
- c) Specific knowledge of causes & management of infertility in male and female.
- d) Gain practical knowledge of sections of male and female reproductive structures as well as vaginal fluid study.

CO20: Apiculture

- a) Learned knowledge about method of apiculture, control & preventive measures of bee diseases & enemies and economic importance of products of apiculture such as honey, bee-wax.
- b) Enriched knowledge of Apiculture will provide scope of self- employment.

CO21: Sericulture

- a) Gives knowledge of silk worm rearing.
- b) Mulberry cultivation.
- c) Pests and diseases associated with silk worm.
- d) Various process involved in silk production.
- e) Prospects of sericulture in India, how get employment in sericulture industry.

CO22: Aquarium fish keeping

- a) Provides knowledge of ornamental fish breeding which is highly professional and attractive avenue for youth.
- b) Get knowledge regarding food and feeding of aquarium fishes.
- c) Setting and maintenance of aquarium.

CO23: Medical diagnostic techniques

- a) Gives knowledge related to the techniques involved in detection of various diseases.
- b) Pathology associated with various diseases
- c) Idea on chromosomal status of different genetic syndrome.

CO24: Applied Zoology

- a) Describe general taxonomic rules on animal classification.
- b) Classify phylum using characters and examples.
- c) Acquire knowledge on artificial insemination poultry farming and fish induced breeding.
- d) Concepts on host parasitic relationship.
- e) Knowledge on different vector of human diseases.
- f) Bionomics of stored grain pest.

CO25: Aquatic biology

- a) Understands concepts of fisheries, fishing tools and site selection.
- b) Idea on adaptation of marine organisms.
- c) Physico-chemical parameters and nutrient cycles of lakes.
- d) Get knowledge on water quality assessment.

CO26: Animal Diversity

- a) Provide concepts of basic characteristics of invertebrate and vertebrates.
- b) Concepts of respiratory system in invertebrate phylum.
- c) Knowledge about flight mechanism in bird.
- d) Gathering knowledge by observing real and preserved specimens.

e) Knowledge of poisonous and non-poisonous snakes

f) Concepts of permanent slide preparation.

CO27: Comparative anatomy and developmental biology of vertebrates

a) Detail knowledge of Respiratory, Circulatory, Digestive, Reproductive system of vertebrates.

b) Knowledge on comparative anatomy of different system of vertebrate phylum.

c) Concepts on embryonic development in different vertebrate animals.

d) Concepts on different sense organ.

e) Basic concepts on girdle and limb bones.

f) Basic concepts on skull.

g) Concepts on different developmental stages with slide and photograph.

h) Knowledge on gametes by identification of slide.

CO28: Physiology and Biochemistry

a) Details knowledge about nerve and muscle function.

b) Concepts on digestion, excretion and reproduction.

c) Structural correlation on endocrine gland.

d) Concepts on carbohydrate, lipid and protein structure; details of different metabolic pathway.

e) Idea on histological structure of different endocrine glands.

f) Experience on biochemical test

CO29: Genetics and Evolutionary biology

a) Knowledge on chromosome.

b) Concepts on different chromosomal mutation.

c) Knowledge about chromosomal map distance.

d) Concepts on different evolutionary changes.

e) Idea on chromosomal status of different genetic syndrome.

f) Different phylogeny study.

DEPARTMENT OF ZOOLOGY
HOOGLY WOMEN'S COLLEGE
B.Sc. Honours in Zoology (CBCS)
2021-2024

PROGRAMME OUTCOME (PO)

Our college is affiliated under The University of Burdwan, The Choice Based Credit System (CBCS) was introduced in the academic session 2017-2018. With merge experience of the students and gentle discussion of the teachers with them have been able to extract a glimpse of the programme outcome of the Department of Zoology which is given below:

PO-1: There is a tendency to provide symmetry in the Honours and General stream so that both can avail the chance to get berth in Post Graduate course or be competent enough to appear in different competitive examinations throughout India.

PO-2: As the system is a choice based system, the students have option to choose the subject of choice. This apparent pliable system has the opportunity to avoid the stringent old base system.

PO-3: This system has tried to distribute the load of the subject in a symmetric manner so that it can reduce the burden propounded at a time.

PO-4: Certain activities like dissertation/term paper/assignment and excursion could cater the student for field work research, nature care etc. and to equip them in different techniques and instrumentation.

PO-5: There is certain applied part of zoology in the form of sericulture, sericulture aquarium fish farming which have traditional and modern value to make the students job oriented.

PO-6: Students gain knowledge and skill in the fundamentals of animal sciences, understands the complex interactions among various living organisms.

PO-7: The course may help the students to acquire gradual knowledge from base to its intrigue in a successful manner.

PO-8: The method and pattern of question may be helpful to make a student equipped for any public or competitive examination.

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO-1: Understand the nature and basic concepts of cell biology, taxonomy, physiology, ecology, microbiology, parasitology, endocrinology and economic zoology.

PSO-2: Analyze complex interactions among the various animals of different phylum, their distribution and their relationship with the environment.

PSO-3: Apply the knowledge of internal structure of cell, its functions in control of various metabolic functions of organisms, correlates the physiological processes of animals and relationship of organ systems.

PSO-4: Understands the complex evolutionary processes and behavior of animals.

PSO-5: Understanding of wild life conservation processes and importance of biodiversity and protection of endangered species.

PSO-6: Gain knowledge of agro based small scale industries like sericulture, aquarium fish farming, sericulture, apiculture.

PSO-7: Understands the concepts of genetics and its importance in human health.

PSO-8: Apply the knowledge and understanding of Zoology to practical aspects.

PSO-9: Perform procedures as per laboratory standards in the areas of Ecology, Immunology, and Histology and Developmental biology.

PSO-10: Gains knowledge about research methodologies and skills of problem solving methods.

COURSE OUTCOME (CO)

CO1: Non-Chordates

- a) Gain a knowledge about Animal kingdom specially subkingdom Protozoa & Metazoa.
- b) Location & importance of coral reef in nature & its economic importance.
- c) Gain detail knowledge of Classification, Excretion, Respiration, Nervous system & development of higher metazoa.

d) Gain a special knowledge of metamorphosis in insects & echinoderms & social life of insects like termite.

e) Gain knowledge of identifying different species taxonomically, staining some of species and comparative study of some of the groups.

CO2: Chordates

a) Gain detail knowledge about classification of phylum Chordata.

b) Knowledge about special behavior like migration in fish & birds, parental care in amphibia, biting mechanism in snake.

c) Knowledge about aerodynamics in birds & echolocation in mammals.

d) Gains knowledge of functional anatomy of vertebrates from fishes to mammals.

e) Knowledge about distribution of animals in the world & division of world into different realms accordingly.

f) Achieving Practical knowledge to identify species taxonomically, studying some special features as well as comparative analysis of different significant groups.

CO3: Ecology

a) Gain sound knowledge on Population Ecology, Community Ecology and Ecosystem ecology.

b) Interaction of biota and abiota.

c) Knowledge on conservation and procedures of conservation.

d) Detail understanding on Tiger conservation.

e) Practically learned to do life tables. They are able to draw survivorship curve and draw conclusion from that.

f) Able to do sampling in quadrat method and from that data they can do Shannon-Wiener index and can infer about any community.

g) Expertise on study of any aquatic ecosystem.

CO4: Cell Biology

- a) Gain detail knowledge of prokaryotic & eukaryotic cell, cell organelles.
- b) Gain a practical knowledge of Cell division & study of chromosomal changes during cell division.
- c) Gain knowledge of cellular signaling and cell interaction.
- d) Gather practical knowledge of preparation of cell divisional stages and identify specialized structures in bold cells.

CO5: Animal physiology

- a) Gain fundamental knowledge of animal physiology.
- b) Detailed concepts of action potential and its propagation.
- c) Learn the concepts of endocrine systems and gain knowledge about hormones.
- d) Gain fundamental knowledge of physiology of homeostasis.
- e) Gain practical knowledges of muscle function, reflex action, and histological preparation and histological studies of tissues of various organs.

CO6: Fundamentals of Biochemistry

- a) Interactions and interdependence of physiological and biochemical processes.
- b) Gain basic knowledge about various bio molecules and their role in metabolism.
- c) Understanding through scientific enquiry into the nature of physical and biochemical functions of the cells.
- d) Gain practical knowledge of quantitative and qualitative measurement of biomolecules, separation techniques and studying enzyme actions.

CO7: Immunology

- a) Understanding types of immunity, antigens-antibodies and their properties.
- b) Understanding immune mechanisms in disease control, vaccination, and process of immune interactions.
- c) Gather practical knowledge of lymphoid tissues, blood cell morphology, histochemical analysis.

- d) Working process of different lymphoid organ.
- e) Practical knowledge on blood grouping and idea on different blood cell.

CO8: Genetics

- a) Mendelian and non Mendelian inheritance
- b) Concept behind genetic disorder, gene mutations-various causes associated with inborn errors of metabolism.
- c) Gain concepts of mutation, sex determination, special inheritance pattern, transposition and bacterial and viral recombination.
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CO9: Molecular Biology

- a) Sustain a basic knowledge about Nucleic acids, DNA replication, Transcription, Translation of prokaryotes and Eukaryotes as well.
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- d) Practical knowledge to handle spectrophotometer and Agarose Gel Electrophoresis.
- e) Gain experience on preparing liquid, solid media for bacteria culture and determining antibiotic sensitivity and resistance zones of bacteria.

CO10: Developmental biology

- a) Develop the basic concepts of development, implication of embryonic development and post developmental aspects,
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- a) Learn some basics on microbiology and their classification.
- b) Have a lot of information on morphology of bacteria and virus.
- c) Have a good understanding on pathogenicity of microorganisms and microbial diseases.
- d) Have experience on diagnostic microbiology and bacteria culture.
- e) Gain some basic knowledge on preparing liquid, solid media for bacteria culture and determining their biochemical characterization.
- f) Have a good experience on staining of bacteria and microbial examination of milk.

CO13: Animal biotechnology

- a) Imparts the knowledge to culture animal cells in artificial media.
- b) Knowledge of animal cells in culture, growth of cell lines.
- c) Application of DNA technology and molecular biology for research
- d) Gain practical knowledge about restriction map, transformation efficiency, sequencing techniques, blot techniques, finger printing techniques and PCR

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- a) Gather a general idea about taxonomy, morphological features, and physiology of insects.
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d) Gather practical knowledge regarding collection, preservation and identification of insects and their different body parts. Pest study and life cycle study

CO15: Animal Behavior

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

b) Explain the relationship of behaviour and cognition.

c) Explain rhythmic behaviours and social behaviours.

d) Collect practical knowledge of nesting of birds and insects, tactic movements, circadian function and ectogram construction

CO16: Wild life Conservation

a) Key threats to biodiversity.

b) Describe habitat management.

c) Understanding of Conservation will help protection of wildlife.

d) Explain wildlife trade that may enhance the economy.

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CO17: Parasitology

a) Explain the phenomenon of living together and symbiosis.

b) Describe parasitism.

c) Describe the life histories of some protozoan and helminthes.

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a) Gain detail knowledge of structure and function of endocrine glands including neuroendocrine glands and feedback mechanism.

- b) A specific knowledge of mechanism of hormone action in the cell, disorders of endocrine glands, & role of hormones in homoeostasis.
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- a) Gain detail knowledge of structure, function, development and differentiation of gonads.
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CO20: Apiculture

- a) Learned knowledge about method of apiculture, control & preventive measures of bee diseases & enemies and economic importance of products of apiculture such as honey, bee-wax.
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- a) Gives knowledge related to the techniques involved in detection of various diseases.
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CO24: Applied Zoology

- a) Describe general taxonomic rules on animal classification.
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- c) Acquire knowledge on artificial insemination poultry farming and fish induced breeding.
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- a) Understands concepts of fisheries, fishing tools and site selection.
- b) Idea on adaptation of marine organisms.
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- d) Get knowledge on water quality assessment.

CO26: Animal Diversity

- a) Provide concepts of basic characteristics of invertebrate and vertebrates.
- b) Concepts of respiratory system in invertebrate phylum.
- c) Knowledge about flight mechanism in bird.
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- e) Knowledge of poisonous and non-poisonous snakes
- f) Concepts of permanent slide preparation.

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- a) Detail knowledge of Respiratory, Circulatory, Digestive, Reproductive system of vertebrates.
- b) Knowledge on comparative anatomy of different system of vertebrate phylum.

- c) Concepts on embryonic development in different vertebrate animals.
- d) Concepts on different sense organ.
- e) Basic concepts on girdle and limb bones.
- f) Basic concepts on skull.
- g) Concepts on different developmental stages with slide and photograph.
- h) Knowledge on gametes by identification of slide.

CO28: Physiology and Biochemistry

- a) Details knowledge about nerve and muscle function.
- b) Concepts on digestion, excretion and reproduction.
- c) Structural correlation on endocrine gland.
- d) Concepts on carbohydrate, lipid and protein structure; details of different metabolic pathway.
- e) Idea on histological structure of different endocrine glands.
- f) Experience on biochemical test

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- a) Knowledge on chromosome.
- b) Concepts on different chromosomal mutation.
- c) Knowledge about chromosomal map distance.
- d) Concepts on different evolutionary changes.
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- f) Different phylogeny study.

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COURSE OUTCOME (CO)

CO1: Non-Chordates

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d) Gain a special knowledge of metamorphosis in insects & echinoderms & social life of insects like termite.

e) Gain knowledge of identifying different species taxonomically, staining some of species and comparative study of some of the groups.

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c) Learn the concepts of endocrine systems and gain knowledge about hormones.

d) Gain fundamental knowledge of physiology of homeostasis.

e) Gain practical knowledges of muscle function, reflex action, and histological preparation and histological studies of tissues of various organs.

CO6: Fundamentals of Biochemistry

a) Interactions and interdependence of physiological and biochemical processes.

b) Gain basic knowledge about various bio molecules and their role in metabolism.

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d) Gain practical knowledge of quantitative and qualitative measurement of biomolecules, separation techniques and studying enzyme actions.

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a) Understanding types of immunity, antigens-antibodies and their properties.

b) Understanding immune mechanisms in disease control, vaccination, and process of immune interactions.

c) Gather practical knowledge of lymphoid tissues, blood cell morphology, histochemical analysis.

d) Working process of different lymphoid organ.

e) Practical knowledge on blood grouping and idea on different blood cell.

CO8: Genetics

a) Mendelian and non Mendelian inheritance

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

c) Gain concepts of mutation, sex determination, special inheritance pattern, transposition and bacterial and viral recombination.

d) Becomes expertise through practical experience about aberration, chromosomal disorders, linkage analysis and genetic analysis techniques.

CO9: Molecular Biology

a) Sustain a basic knowledge about Nucleic acids, DNA replication, Transcription, Translation of prokaryotes and Eukaryotes as well.

b) Familiar with the gene modifications (post-translational modifications) and gene regulation.

c) Learn principles of molecular techniques such as PCR, Northern blot, Southern blot, Western blot etc.

d) Practical knowledge to handle spectrophotometer and Agarose Gel Electrophoresis.

e) Gain experience on preparing liquid, solid media for bacteria culture and determining antibiotic sensitivity and resistance zones of bacteria.

CO10: Developmental biology

a) Develop the basic concepts of development, implication of embryonic development and post developmental aspects,

b) Gains knowledge about gametogenesis, cleavage mechanisms, gastrulation and role of hormones in metamorphosis and regeneration.

c) Gather practical knowledge about developmental stages and specialised structures in vertebrate and invertebrate models.

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- a) Knowledge of eras and evolution of species.
- b) Explain the genetic basis of evolution; correlate the theories with the evidences.
- c) Knowledge regarding human origin, mode of evolution and its significance.
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- a) Learn some basics on microbiology and their classification.
- b) Have a lot of information on morphology of bacteria and virus.
- c) Have a good understanding on pathogenicity of microorganisms and microbial diseases.
- d) Have experience on diagnostic microbiology and bacteria culture.
- e) Gain some basic knowledge on preparing liquid, solid media for bacteria culture and determining their biochemical characterization.
- f) Have a good experience on staining of bacteria and microbial examination of milk.

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- a) Imparts the knowledge to culture animal cells in artificial media.
- b) A specific knowledge of mechanism of hormone action in the cell, disorders of endocrine glands, & role of hormones in homeostasis.
- c) A practical knowledge of demonstration of hormone assay through ELISA, anatomical and histological study of glands and tissue processing.

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- c) Specific knowledge of causes & management of infertility in male and female.
- d) Gain practical knowledge of sections of male and female reproductive structures as well as vaginal fluid study.

CO20: Apiculture

- a) Learned knowledge about method of apiculture, control & preventive measures of bee diseases & enemies and economic importance of products of apiculture such as honey, bee-wax.
- b) Enriched knowledge of Apiculture will provide scope of self-employment.

CO21: Sericulture

- a) Gives knowledge of silk worm rearing.
- b) Mulberry cultivation.
- c) Pests and diseases associated with silk worm.
- d) Various process involved in silk production.
- e) Prospects of sericulture in India, how get employment in sericulture industry.

CO22: Aquarium fish keeping

- a) Provides knowledge of ornamental fish breeding which is highly professional and attractive avenue for youth.
- b) Get knowledge regarding food and feeding of aquarium fishes.
- c) Setting and maintenance of aquarium.

CO23: Medical diagnostic techniques

- a) Gives knowledge related to the techniques involved in detection of various diseases.
- b) Pathology associated with various diseases
- c) Idea on chromosomal status of different genetic syndrome.

CO24: Applied Zoology

- a) Describe general taxonomic rules on animal classification.
- b) Classify phylum using characters and examples.
- c) Acquire knowledge on artificial insemination poultry farming and fish induced breeding.
- d) Concepts on host parasitic relationship.
- e) Knowledge on different vector of human diseases.
- f) Bionomics of stored grain pest.

CO25: Aquatic biology

- a) Understands concepts of fisheries, fishing tools and site selection.
- b) Idea on adaptation of marine organisms.
- c) Physico-chemical parameters and nutrient cycles of lakes.
- d) Get knowledge on water quality assessment.

CO26: Animal Diversity

- a) Provide concepts of basic characteristics of invertebrate and vertebrates.
- b) Concepts of respiratory system in invertebrate phylum.
- c) Knowledge about flight mechanism in bird.
- d) Gathering knowledge by observing real and preserved specimens.
- e) Knowledge of poisonous and non-poisonous snakes
- f) Concepts of permanent slide preparation.

CO27: Comparative anatomy and developmental biology of vertebrates

- a) Detail knowledge of Respiratory, Circulatory, Digestive, Reproductive system of vertebrates.
- b) Knowledge on comparative anatomy of different system of vertebrate phylum.
- c) Concepts on embryonic development in different vertebrate animals.
- d) Concepts on different sense organ.
- e) Basic concepts on girdle and limb bones.
- f) Basic concepts on skull.
- g) Concepts on different developmental stages with slide and photograph.
- h) Knowledge on gametes by identification of slide.

CO28: Physiology and Biochemistry

- a) Details knowledge about nerve and muscle function.
- b) Concepts on digestion, excretion and reproduction.
- c) Structural correlation on endocrine gland.
- d) Concepts on carbohydrate, lipid and protein structure; details of different metabolic pathway.

e) Idea on histological structure of different endocrine glands.

f) Experience on biochemical test

CO29: Genetics and Evolutionary biology

a) Knowledge on chromosome.

b) Concepts on different chromosomal mutation.

c) Knowledge about chromosomal map distance.

d) Concepts on different evolutionary changes.

e) Idea on chromosomal status of different genetic syndrome.

f) Different phylogeny study.