DEPARTMENTOFZOOLOGY
BISWANATH COLLEGE

PROGRAMME OUTCOME:

PROGRAMME: B.Sc. Zoology
Link to the GU Syllabus:

1. Zoology Honours (CBCS): https://sites.google.com/a/gauhati.ac.in/syllabus-ug-cbcs/honours/zoology
2. Zoology Regular (CBCS): https://sites.google.com/a/gauhati.ac.in/syllabus-ug-cbcs/regular/z
3. Zoology Major (Non-CBCS): https://sites.google.com/a/gauhati.ac.in/syllabus-ug-old/undergraduate-courses/tdc-in-zoology-mjor
4. Zoology General (Non-CBCShttps://sites.google.com/a/gauhati.ac.in/syllabus-ug-old/undergraduate-courses/tdc-in-zoology-general

Graduates of the program should be able to:

A. Disciplinary Knowledge:

1. Deliver excellent explanation about the complex hierarchy of different phyla, their distribution and their relationship with the environment.
2. Describe the structural and functional properties of cell and metabolic activities associated with proper functioning of the organism.
3. Discuss complex evolutionary processes and correlate it to the anatomy, physiology and behavior of animals.
4. Describe multiple areas within Zoology such as cell biology, genetics, taxonomy, physiology, applied zoology, general embryology and public health.
5. Explain diverse commercial aspect of zoology such as agro based small scale industries like sericulture, aquaculture, and apiculture and vermicompost preparation.
6. Understand and commute the importance of environmental conservation processes and its importance, pollution control and biodiversity and protection of endangered species.

B. Laboratory Skill

1. Understand good laboratory practices and biosafety.
2. Know and classify chemical by their nature.
3. Basics on laboratory techniques on staining and biochemical analysis.
4. Proper knowledge on handling and operation of complex laboratory instrument with proper practice manual.

C. Practical Skill

1. Animal classification and identification.
2. Basic knowledge on animal diversity survey methods and instrumentation-GPS and binoculars, needed during survey.
3. Thorough knowledge on histological studies.

D. Critical Thinking and Problem Solving

Effectively communicate biological problems and solutions to both the scientific community and public at large in writing and discussion, by using basic principles of zoology, designing and running appropriate experiment on observational studies and analysis.

E. Soft Skills

1. Develop a professional foundation through activities such as internship, participation in organization, high tech laboratory visit and also field work.
2. Good oral and written communication abilities.
3. Ability to work independently or with team member.

F. Digitally Literate

1. Basic knowledge on ICT hardware and software for use in data analysis, interpretation, storing anddistribution.
2. Knowing on databases for extraction of e-resources.

G. HigherEducation,EntrepreneurshipandEmployability

1. The graduates will be able to persue higher education- M.Sc/Integrated Ph.D or even look up for job oriented professional course.
2. Acquire skill and necessary training to initiate start up in the realm of Zoology.
3. The skills so obtained will maximize the employment probability of the graduates in both course oriented and other professional public sector job like Civil Services.

H. Ethics:

Knowledge and understanding on legal restrictions and ethical considerations placed on animal welfare.

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COURSE SPECIFICOUTCOME:

Biswanath College being affiliated to Gauhati University follows the course curriculum as designed by the university. The course specific outcome for the department of Zoology hence expected from the provided course curriculum has been summarized below:

B.Sc. Honors (CBCS)

1. **Semester I:**

Code: ZOO-HC-1016: Non-chordates I: Protists to Pseudocoelomates

- Students will be able to understand the fundamental principles of systematic in which the Protist, Porifera, Cnidaria, Ctenophora, Platyhelminthes and Nemathalminthes are classified according to their characters uptoclass.
- Life cycle and pathogenicity of *Plasmodium vivax* , *Entamoeba histolytica, Fasciola hepatica, Taenia solium, Ascaris lumbricoides* and *Wuchereri abancrofti* are studied here.
- Students will also gain knowledge on origin, evolution and significance of parasitism, specialized organs, symmetry and segmentation of non-chordates.

Code: ZOO-HC-1026: Principles of Ecology.

- Students will be able to learn in details about population ecology, community ecology andecosystem ecology.
- The students will be able to link the intricacies of food chains, food webs, nutrient cycle andflow of energy through the ecosystem.
- This course will enable the students to comprehend and analyze ecological parameters by using Lotka-Volterra equation, Shannon-Weiner index, Winkler's method, fecundity tables, survivorship curve and soon.
- The learner will also be understands and appreciates the diversity of ecosystems and its role andsignificance in Wildlife Conservation and Management.
- The inclusion of National Park/Biodiversity Park/ Wild Life Sanctuary visit in the course willexpose the students to new ideas and enhance their experimental, participative and life skill.

2. **Semester II:**

Code: ZOO-HC-2016: Non-chordates II: Coelomates

- Students will be able to understand the fundamental principles of systematic in which the Coelomates, Annelida, Arthropoda, Onychophora, Mollusca and Echinodermata are classified according to their characters upto class.
- They will be introduced to the concept of metamorphosis in insects, respiration in Arthropoda, torsion and detorsion in gastropods, pearl formation in Mollusca and life cycles showing the intricate social structure in this invertebrates.
- The practical included in the course will enable the students to identify the specimens of the above mentioned phylum and also it's evolutionary significance.

Code: ZOO-HC-2026: CellBiology

- The learners will understands and be able to compares and differentiate between the prokaryotic and eukaryotic system.
- The students will be able understand the structures, cellular mechanisms and functioning of basic components of prokaryotic and eukaryotic cell component- particularly plasma membrane, endomembrane system, mitochondria, peroxisomes, cytoskeleton and nucleus.
- Acquire the detailed knowledge of different pathways related to cell signaling and mechanism of cell division – mitosis and meiosis.
- The practical included in the course will enable the students to visualize chromosome behavior during cell division in onion root tip and grasshopper testis.
- The students will learn to demonstrate the presence of barr body, mucopolysacchradies and protein by using appropriate stain/reaction in preparing permanent slide.

3. **Semester III:**

Code: ZOO-HC-3016: Chordata

- The students will be able to describe the origin of chordates and also general taxonomic rules on classification of chordate and protochordata.
- Students will be able to understand the fundamental principles of systematic in which the Agnatha, Pisces, Amphibia, Reptilia, Aves and Mammals are classified according to their characters up to class.

- Students will be familiarized with biting mechanism of snake, parental care in different animals, flight adaptation in birds and also adaptive radiation in mammals.

- Zoogeography included in the course will enable the students to understand the pattern of distribution of animal with the help of pertaining theories – Plate tectonic and Continental Drift Theory.

- The practical included in the course will enable the students to identify the specimens of the different class and also it's evolutionary significance.

Code: ZOO-HC-3026: Animal Physiology: Controlling and Coordinating Systems

- Students will be taught about different types of tissue and also detailed structure and function of certain components such as bone, cartilage, nervous tissue and muscle.

- The students will be introduced to the terminologies and working mechanism relating to various organs systems in animal physiology- Nervous system, Muscle, Reproductive System and Endocrine System.

- Detailed histological structures of organs of reproductive system- testis, ovary; endocrine system- hypothalamus, pituitary, pancreas, adrenal, and thyroid so on and also nerve cells of nervous system are included in the course.

- The students will be able to understand how this system interacts with each other and ultimately control and coordinate the functioning and well-being of the organism.

Code: ZOO-HC-3036: Fundamentals of Biochemistry

- Students will understand the basis and fundamental biochemistry of carbohydrate, lipids, protein and nucleic acids.

- They will also be able to understand the nature, mechanism and kinetics of enzyme action.

- The practical included in the course will enable the students to demonstrate qualitatively the presence of functional groups in carbohydrates, proteins and lipids and also working principle of salivary amylase.

- Students will learn separation techniques of amino acid and protein by paper chromatography and SDS-PAGE.

4. **Semester IV:**

Code: ZOO-HC-4016: Comparative Anatomy of Vertebrate

- The student will understand in detail about the Integumentary system, skeletal system, Digestive system, Respiratory system, circulatory system, nervous system and sensory system.
- They will be able to compare and differentiate the above mentioned systems in different vertebrate group.
- The practical included in the course will enable the students to practically visualize and demonstrate different types of scales in fish, carapace and plastron in tortoise and also mammalian skull.

Code: ZOO-HC-4026: Animal Physiology: Life Sustaining Systems

- Students will know the physiology of Digestion, Respiration, Renal physiology, Blood and Physiology of Heart.
- Students will gain in depth knowledge on functioning and intricate relationship between each of this system and also disorder associated with the failure of any of this system.
- The practical will enable the student to demonstrate and determine the ABO blood group, estimation of RBC, WBC and Haemoglobin and also preparation of haemin crystal.
- Students will also be able to learn the recording of blood pressure using sphygmomanometer.

Code: ZOO-HC-4026: Animal Physiology: Life Sustaining Systems

- Student will understand basic about metabolism of carbohydrate, lipid and protein.
- They will gain knowledge on how the metabolism of above mentioned macromolecules leads to synthesis of energy (ATP) and the role of Mitochondrial Respiratory Chain in ATP Synthesis.
- The students will learn how to estimate macromolecules quantitatively using various method

5. **Semester III:**

Code: ZOO-SE-3014: Ornamental Fish and Fisheries

- Students will learn about the diversity of fish in North East India.

- They will learn in details about aquarium construction and about all basic necessities of required in an aquarium.
- They will also be able to identify the ornamental fish and their management.

6. **Semester IV:**
   Code: ZOO-SE-4014: Non- Mulberry Sericulture

- Students will learn about the history and present status of mulberry and non-mulberry sericulture.
- They will also be able learn about the life cycles, rearing, pest management and entrepreneurship in non-mulberry sericulture.

B.Sc. General (CBCS)

1. **Semester I (General):**
   Code: ZOO-HG-1016: Animal Diversity

- Students will be able to understand the fundamental principles of systematic in which the Protist, Porifera, Cnidaria, Ctenophora, Platyhelminthes, Nemathalminthes, Arthropoda, Mollusca, Echinodermata, Protochordates, Agnatha, Pisces, Anphibia, Reptiles, Aves and Mammals are classified according to their characters up to class.
- They will also be learning about life cycle, parental and specialized organs systems in this organism.
- The students will also be able to identify specimens belonging to different class and phylum.

2. **Semester II (General):**
   Code: ZOO-HG-2016: Comparative Anatomy and Development Biology of Vertebrates

- The student will understand in detail and compare the integumentary system, skeletal system, digestive system, respiratory system, circulatory system, nervous system and sensory system of different groups of vertebrate.

- Students will learn the different aspects of early, late and post embryonic developments and its control.

3. Semester III (General):
Code: ZOO-HG-3016: Physiology and Biochemistry

- The students will be introduced to the terminologies and working mechanism relating to various organs systems in animal physiology- Nervous system, Muscle, Reproductive System and Endocrine System.
- Students will understand the basis and fundamental biochemistry of carbohydrate, lipids, protein and nucleic acids.
- They will also be able to understand the nature, mechanism and kinetics of enzyme action.
- The practical included in the course will enable the students to demonstrate qualitatively the presence of functional groups in carbohydrates, proteins and lipids and also working principle of salivary amylase.

4. Semester IV (General):
Code: ZOO-HG-4016: Genetics and Evolutionary Biology

- Students will learn the fundamental genetics like Mendelian and Non Mendelian inheritance, linkage, mutation and sex determination of various animals.
- They will also be able know about population genetics, origin of species, speciation and extinction.

B.Sc. Major (Non- CBCS)

5. Semester V:
Paper: M-501: Animal Physiology

- The students will be introduced to the terminologies and working mechanism relating to various organs systems in animal physiology- Digestive System, Respiratory system, Blood and Physiology of Heart, Excretory System, Nervous System and Muscle chemistry

- They will also learn about osmoregulation in vertebrates.

Paper: M-502: Biochemistry and Bioenergetics

- The students will learn about the chemical foundation of biology- pH. pK , acid and base, buffer and free energy.
- Students will understand the basis and fundamental biochemistry of carbohydrate, lipids, protein and nucleic acids.
- They will also be able to understand the nature, mechanism and kinetics of enzyme action.
- Students will understand the role of thermodynamics in biology and ATP in metabolism.

Paper: M-503: Endocrinology and Immunology

- Students will understand the basis of hormone and histology and functioning of endocrine glands.
- They will learn about the synthesis and mechanism of hormone action and also role of hormones in various aspects of body functioning.
- Students will develop knowledge on structure and function of the components of an immune system.
- They will also be able to understand the concept of cell-mediated and humoral immune system and the working mechanism behind vaccination.

Paper: M-504: Biological Techniques and Biostatistics

- The students will be able to understand the working principle and use of instruments such as- pH meter, Colorimeter, Spectrometer, Ultra Centrifuge and Microscope.
- The will also be introduced with biological techniques like separation techniques using- chromatography and electrophoresis; microtomy, cryopreservation and autoradiography.
- Students will also understand the various aspects of biostatistics such as Central tendencies, t- test, chi-square, correlation and regression and also its utility in biology.

- Students will also be familiarized with basic computational tools.

Paper: M-505: Physiology (Practical)

- The practical will enable the student to demonstrate and determine the ABO blood group, estimation of RBC, WBC and Haemoglobin and also preparation of haemin crystal.

- They will also learn to demonstrate the cardiac cycle in frog/rat using kymograph.

Paper: M-506: Biochemistry and Endocrinology (Practical)

- The practical included in the course will enable the students to demonstrate quantitatively total glucose, total proteins and total lipids, ascorbic acid, vitamin A, mono, di, tri polysaccharides and also working principle of salivary amylase/pepsin.

- They will also learn to separate amino acid using separation technique- paper chromatography and also visualize endocrine gland through dissection.

2. Semester VI:

Paper: M-601: Animal Behavior

- Students will know in details about pattern of behavior, survival strategies, social and cooperative behavior.

- The learner will also be able to understand the mode of communication the animals uses.

Paper: M-602: Evolution and Adaptation

- Students will learn about different theories on origin and evolution of life on earth particularly that of human, horse and bird.

- Zoogeography included in the course will enable the students to understand the pattern of distribution of animal with the help of pertaining theories – Plate tectonic and Continental Drift Theory.

- They will also understand how study of fossil helps in tracing back evolution.
- The survival strategies adopted by organism in the course of evolution – adaptation and mimicry will also be taught to the students

Paper: M-603:Economic Zoology

- Students will learn how commercial aspects of zoology and hence will be introduced to commercial farming and management- Sericulture, Apiculture, Aquaculture, Lac culture.
- They will learn in details about the rearing methodologies and preventive measures for disease control for maximum economic benefit.
- The students will also learn about pest and their various methods of management.

Paper: M-604: Biotechnology, Bioinformatics and computer application

- Students will learn basic concept of genetic engineering, tissue culture, cloning, gene libraries and gene transfer.
- They will also learn the integration between biology and informatics tools and basic computer application.

Paper: M-605: Economic Zoology (Practical)

- The students will learn to identify variety of silkworm, pest and commercially important fishes.
- They will also learn about life cycle of honey bee and prepare slide of its pollen basket.

Paper: M-606: Project

- This course aims to prepare the students for research purpose by introducing them to basis of research methods and methodologies and research writing.

B.Sc. General (Non-CBCS)

1. **Semester V:**

Paper: E-501: Cell Biology, Genetics and Developmental Biology.

- The learners will understands and be able to compares and differentiate between the prokaryotic and eukaryotic system.
- The students will be able understand the structures, cellular mechanisms and functioning of basic components of prokaryotic and eukaryotic cell component- particularly plasma membrane, endomembrane system, mitochondria and chromosome.
- Acquire the detailed knowledge of mechanism of cell division – mitosis and meiosis.
- Students will learn the fundamental genetics like, linkage, crossing over, sex determination of various animals, gene expression and mutation.
- They will gain knowledge on basic of developmental biology- gametogenesis, fertilization, cleavage, induction, extra embryonic membrane and parthenogenesis.

Paper: E-502: Cell Biology, Genetics and Developmental Biology (Practical)

- The students learn to demonstrate, barr body, mitosis and meiosis in onion root tip and grasshopper testis and also the staining techniques to visualize the nucleus, chromosomes and nucleolus.
- They will learn to identify different tissues and stages of development of frog embryo.

2. **SEMESTER VI**

Paper: E-601: Physiology, Biochemistry and Endocrinology.

- The students will be introduced to the terminologies and working mechanism relating to various organs systems in animal physiology- Digestive System, Respiratory system, Blood, Excretory System and Nervous System.
- The students will learn about the chemical foundation of biology- pH. pK , acid and base, buffer and free energy.

- Students will understand the basis and fundamental biochemistry of carbohydrate, lipids, protein and nucleic acids and cellular respiration.

- They will also be able to understand the nature, mechanism and kinetics of enzyme action.

- They will be briefed with the overall outline of endocrinology and regulation of hormone.

- Basic knowledge on biostatistics- Central tendencies and graphical representations will also be taught to the students.

Paper: E-601: Physiology, Biochemistry and Endocrinology (Practical)

- The practical will enable the student to demonstrate and determine the ABO blood group, estimation of RBC, WBC and Haemoglobin and also preparation of haemin crystal.

- The practical included in the course will enable the students to demonstrate glucose (mono, di, tri polysaccharides, proteins and lipids, and also working principle of salivary amylase/pepsin.

- They will also learn to dissect and visualize weberian ossicle and pituitary gland of fish.