

Krishnagar Government College
(Affiliated to University of Kalyani)

Learning Outcomes

Dept. of Physics:

The outcome-based learning improves knowledge along with skill, enhancing the employability of students passing out from any higher education institution. The learning outcome of any course is best described by what a student achieves after completing the same. In this respect, the course structure of the Physics Honours designed by the affiliating university, the University of Kalyani, has been very successful. The current semester pattern course, based on what is suggested by the UGC in the CBCS curriculum, has been introduced since the academic year 2018-19. Before this course was based on the 1+1+1 pattern. Under both the courses, many students passed out with very high grades that enhanced their scope for future employment. Besides employability, the introduction of some enabled the students to learn through practical experiences exploring the nature and natural resources. studies. This is reflected by the fact that a greater number of students are taking admission for masters or other higher studies every year. This craving for higher studies among the students is also helping the society enormously, since education facilitates them to shape their social identity, framing their understanding of themselves and their relationships with other people.

Dept. of Chemistry:

Chemistry as a subject is interdisciplinary in nature and has a broad scope. After successful completion of B.Sc Chemistry Hons course, a student acquires basic knowledge in the key areas of organic, inorganic and physical chemistry and also becomes familiarized with more specialized areas of pharmaceutical chemistry, polymer chemistry and industrial chemistry. Chemistry Hons graduates become aware of the environmental aspects of chemical processes and realize the need to develop greener chemical reactions. They develop skill in safe handling of chemicals and apparatus in a chemistry laboratory.

Chemistry graduates are enabled for higher studies (M.Sc) in the subject and to further engage themselves in different emerging areas of research in science and technology. Chemistry Hons graduates are equipped to join industries as well as academics in future. In fact, a Chemistry Hons graduate achieves communication skill, problem solving skill, team management and organization skill and can find a suitable position in any profession.

Dept. of Botany:

1. The knowledge acquired during UG level will prepare the students to appear in other competitive examinations in other universities, national level examinations and institutes for higher studies.
2. Modern research area has immense scopes and possibilities for further placement in research Institutes and other applied academic fields. Hence this particular subject would generate interest among the students , and definitely help them in higher studies in institutes and even after will be helpful for jobs at Industrial sectors.
3. Field excursion are included here and documentation of field records through preparation of herbarium are also taught in this curricula that enables the students to learn through practical experiences exploring the nature and natural resources.
4. Ability Enhancement Compulsory Courses like Environmental Sciences helps in developing communicating skills and awareness about surroundings among the students.
5. Utilization of natural resources, Pharmacognosy , secondary metabolites, population, community, ecosystem, succession, flow of energy, Biodiversity, conservation studies: this exposure makes them more proficient to appear for higher education in Universities and Institutes, and also eligible for other competitive examinations.
6. Learners will be able to apply the basics of microbiology to build a foundation use of microbes in industry for food or products in large quantities; microbial effect on environment and microorganisms as tools in environmental remediation.
7. After completion of the course, the learners will be able to get an overview of the hybridization technique; explain inbreeding depression and heterosis, understand the role of biotechnology in crop improvement; analyse statistical data and understand the nature of inheritance.

Dept. of Mathematics:

The expected course learning outcomes are as follows:

1. **Disciplinary Knowledge:** Capability of demonstrating comprehensive knowledge of mathematics and understanding of one or more disciplines which form a part of an undergraduate programme of study
2. **Communication skill:** Ability to communicate long standing unsolved problems in mathematics and to use mathematics as a precise language of communication in other branches of human knowledge using examples and their geometrical visualization.
3. **Critical thinking and analytical reasoning:** Ability to employ critical thinking in understanding the concepts in every area of mathematics and to analyse the results and apply them in various problems.
4. **Thinking ability:** Ability to think, acquire knowledge and skill through logical reasoning and ability to work independently and do in-depth study of various notions of mathematics.
5. **Research ability:** Ability to acquire research related skill and digital literacy to solve the problems in mathematics.
6. **Higher study:** Course structure helps learner in building a solid foundation for higher studies in mathematics.
7. **Fit for job:** After completion of the course students will best fit for teaching profession and other Government jobs, job in banking, insurance and investment sectors, data analyst and other public and private enterprises.

Dept. of Physiology:

The purpose of framing the syllabi in Physiology Honours is to equip all undergraduate students with knowledge a basic physiological mechanism for the setpoint control of different physiological variables in healthy human beings with special references to their implications in pathogenesis of disease and the physiological basis of their management.

The Honours course content is such designed to holistically enlight students with the basic concept of cellular and systemic physiology with principles of biophysics, biochemistry, molecular biology, microbiology, biostatistics, toxicology etc.

The Outcome of B.Sc. (Honours) Program in Physiology

1. Promotion of higher education amongst many first generation learners exclusively of poor, intelligent and talented students. Going through the three year vivid theoretical and practical curriculum they are introduced to the excellence of higher education.
2. After completion of B.Sc. (Honours) Programme students pursue a master degree in core subject or Biotechnology, Biochemistry, Molecular Biology, Sports Science, Environmental science, Nutrition etc.
3. Many students pursue their career in paramedical sciences such as Medical laboratory technology (MLT), Optometry, Physiotherapy, Medical microbiology etc and thereby serving the society directly.

Dept. of Zoology:

According to the Revised Syllabus for B.Sc. (**Honours**) Course in
Zoology (w.e.f. the session 2016 - 2017)
University of Kalyani
New Examination Pattern (Non CBCS System)
Part – I, Part – II & Part – III

Programme outcomes

1. To provide a knowledge on basic and applied zoology
2. To prepare a successful career in teaching and research
3. To make familiar with sophisticated instruments, different techniques, software and data analysis
4. To develop the power of communication and documentation
5. To develop the ability to work as a team in laboratory classes and at educational excursion
6. To develop awareness about environment
7. To develop an analytical and scientific mind

Programme Specific Outcomes

1. To understand basic concepts of cell biology, genetics, molecular biology, taxonomy, ecology, microbiology, physiology and applied zoology
2. To understand life and diversity of animal
3. To understand evolutionary processes, behavior of animals, biodiversity and conservation
4. To gain knowledge about economic zoology
5. To understand human health and medicine
6. To be acquainted with good laboratory practices, safety measures and professional ethics

Course Outcomes

Part I (Honours)

Paper I: Unit I: Non-chordates, Unit II: Chordates, Unit III: Specialized features of Non-chordates and Chordates

Paper II: Unit I: Cell Biology, Unit II: Economic Zoology Unit III : Applied Zoology

- To get an idea about Life and diversity of Non-chordates which include Protozoa to Echinodermata
- To get knowledge about Life and diversity of Chordates which include Lower chordates to Mammalia
- To gain knowledge on Specialized features of Non-chordates and Chordates like Canal system in sponges, Torsion and detorsion in Gastropoda, Water vascular system of *Asterias*, Retrogressive metamorphosis in *Ascidia*, Poison apparatus and Biting

mechanism of snakes, Principles of bird flight, Ruminant stomach in mammals and Echolocation in bats

- To get an extended knowledge on Cell Biology with topics like Cell-cell communication, Intracellular transport, Membrane transport, Regulation of Cell cycle progression,
- Cell Death and Cell Renewal and Cancer
- To widen the knowledge of Economic Zoology with the topics like Integrated Pest Management, Medical and veterinary zoology and Vector biology
- To get an idea about Applied Zoology with Sericulture, Apiculture, Pisciculture, Pearl culture, Poultry keeping and Dairy

Paper III: Practical paper

- Demonstration of dissection through computer simulation which elaborate the knowledge of the students in different systems like nervous system, reproductive system digestive system etc. of both Non chordates and chordates
- Identification of animals to extend the taxonomic knowledge of the students
- To give the students an idea about the animals in their natural habitat through field visit
- To give the students an idea about the method of documentation through Laboratory note book and field note book

Part II (Honours)

Paper IV: Unit I: Ecology, Unit II: Biodiversity and Wild life, Unit III: Environmental Biology and Toxicology

Paper- V Unit I: Ethology Unit II: Zoogeography, Evolution and Taxonomy Unit III: Biological techniques

- To get knowledge on ecology with topics like Ecological efficiencies, population dynamics, community structure and Wetland ecosystem
- To get an extended idea about Biodiversity and Wild life with topics like Endangered Mammals of India, International organizations and legislations and People's Biodiversity Register
- To get an idea about Environmental Biology and Toxicology with GIS and Remote sensing, Biosafety of GMOs., Environmental impact assessment, Sustainable Development, water harvesting, Depletion of resources and Xenobiotics
- To extend the knowledge on animal behavior with topics like Instinct and learning, Communication, Eusociality, Altruism, Parental care and Migratory behavior
- To get an elaborate knowledge on Zoogeography, Evolution and Taxonomy with topics like Zoo - Geographical Realm and Bathymetric (Halobiotic and Limnobioc) Distribution of animals, Modern synthetic theory of Evolution Concepts of species, Adaptation, Hardy-Weinberg Equilibrium and its application, Definition of taxonomy and relationship with systematic, Zoological nomenclature, principle of priority; synonym and homonym, Type and Sub-species and Kinds of taxonomic concepts
- To get an idea about modern Biological techniques with topics like Cell and tissue culture techniques, Separation of techniques like centrifugation, chromatography, electrophoresis and Microscopic-Principles

Paper VI: Practical papers

- To get knowledge on osteology through vertebrae, Limb girdles and Limb bones identifications
- To get an idea on physicochemical parameters of water through measurement of DO, CO₂, productivity etc.
- To get familiar with the Use of microscope
- To give an idea to present a topic through Seminar presentation
- To give the students an idea about the animals in their natural habitat through field visit
- To give the students an idea about the method of documentation through Laboratory note book and field note book

Part III

Paper VII Unit I: Parasitology and Immunology Unit II: Biostatistics Unit III: Bioinformatics Unit IV: Microbiology

Paper VIII: Unit I Genetics Unit II Molecular Biology Unit III Biotechnology Unit IV Biochemistry

Paper IX Unit I: Histology and Histochemistry, Unit II: Endocrinology Unit III: Physiology Unit IV: Developmental Biology

- To get an elaborate knowledge about Parasitology including diseases caused by parasites and prophylactic measures, immune system and different immunodeficiency diseases
 - To become familiar with Biostatistics through Methods of Sampling, General idea of Probability, Calculation of central tendency, Standard Deviation and Standard Error, Hypothesis testing (Chi-square, t-test), Correlation and Regression test and One way ANOVA
 - To get an idea about Bioinformatics through Bioinformatics databases, National Center for Biotechnology Information and DNA Data Bank of Japan and Swiss-Prot
 - To get an idea about Microbiology through the study of virus and bacteria, Microbial interactions and immune responses along with Applied microbiology
- Paper VIII Unit I : Genetics Unit II: Molecular biology Unit III: Biotechnology Unit IV: Biochemistry
- To extend the knowledge on Genetics through structure of DNA and RNA, study of Inheritance of sex-linked traits, Mutation, DNA repair mechanisms and Genetic disorders
 - To extend the knowledge on Molecular biology through the study of Replication, RNA Modifications and Gene Regulation
 - To widen the knowledge on Biotechnology Gene cloning, Gene Therapy and Genetic Counselling, DNA sequencing, DNA Fingerprinting and Bioremediation and Biosensors
 - To extend the knowledge on Biochemistry thorough the structure of carbohydrate, protein and lipid, Carbohydrate Metabolism, Lipid Metabolism, Protein Metabolism, Enzymes and ETC
 - To extend the knowledge on Histology and Histochemistry through Histochemical staining techniques, Fixation and Double staining

- To extend the knowledge on Endocrinology through General idea of Invertebrate and Vertebrate Endocrine systems, Biosynthesis of hormones, Major Endocrine disorders in Human and Hormone assays
- To extend the knowledge on Physiology through the Structure and function of Haemoglobin, Physiology of urine formation, synaptic transmission, muscle contraction, Thermoregulation in Mammals, Physiology of Vision and Hearing in Mammals
- To extend the knowledge on Developmental Biology through the Gametogenesis, Fertilization, Organizer concept, Placenta formation, stem cells potency and
- Implications of Developmental Biology

Paper X and XI (Practical):

- To make the students familiar with the problems of biostatistics through Chi square, t-test, One way ANOVA, pedigree analysis, bioinformatics with Database handling (Protein and nucleic acid), Modeller, Spread sheet and Power point presentation
- To give an idea to present a topic through Seminar presentation
- To make the students familiar with Micro technique - Fixation, embedding, block making, section cutting, staining of histological material
- To make the students familiar with different biological techniques with the topics Isolation of DNA, Preparation of Pituitary extract from Major Carp, Microbiology: Staining of Bacteria from curd sample by Gram staining method, Isolation and staining of gut parasites
- To give the students an idea about the method of documentation through Laboratory note book

According to the Revised Syllabus for B.Sc. (**General**) Course in
Zoology (w.e.f. the session 2016 - 2017)
 University of Kalyani
 New Examination Pattern (Non CBCS System)
 Part – I, Part – II & Part – III

Programme outcomes

1. To provide a knowledge on basic and applied zoology
2. To prepare a successful career in teaching
3. To make familiar with different instruments, techniques, software and data analysis
4. To develop the power of communication and documentation
5. To develop the ability to work as a team in laboratory classes and at educational excursion
6. To develop awareness about environment
7. To develop an analytical and scientific mind

Programme Specific Outcomes

1. To understand basic concepts of cell biology, genetics, biotechnology, taxonomy, ecology, microbiology, physiology and applied zoology
2. To understand life and diversity of animal
3. To understand evolutionary processes, behavior of animals, biodiversity and conservation
4. To gain knowledge about economic zoology
5. To understand human health and medicine
6. To be acquainted with good laboratory practices, safety measures and professional ethics

Course Outcomes

Part I

Paper I

Unit I: Life and diversity of Non-chordates, Unit II : Life and diversity of Chordates Unit III : Cell Biology and Genetics Unit IV : Parasitology

- To get an idea about Life and diversity of Non-chordates which include Protozoa to Echinodermata
- To get knowledge about Life and diversity of Chordates which include Lower chordates to Mammalia
- To get an extended knowledge on Cell Biology with topics like Cell-cell communication, Cell junctions, Cell adhesion and extracellular matrix, cell signaling, Sex determination, Mutations, Genetic disorders and Replication
- To get an idea about Host - parasite interaction, Life history, Mode of infection, pathogenicity and control measures of different parasites, Parasitic adaptation and Vectors

Part II

Paper II

Unit I: Ecology, Biodiversity, Wild life and Environmental Biology Unit II : Zoogeography, Evolution and Taxonomy Unit III: Animal Physiology and Biochemistry Unit IV: Developmental Biology

- To get an idea about Population Dynamics, Community, Ecological Succession, Biodiversity, Global environment change and Solid waste and its management
- To get an idea about Zoo-Geographical realms, Biological species concept, Geological time scale, Fossils, types and Hardy-Weinberg Equilibrium and its application, taxonomy and relationship with systematics , Linnaean hierarchy and Zoological nomenclature
- To get knowledge on Thermoregulation in Mammals, Physiology of Vision, Physiology of nerve impulses and synaptic transmission, Structures, Classification and functional significance of Carbohydrates, Proteins and Lipids, Carbohydrate Metabolism, Protein Metabolism and Enzymes

- To get knowledge on Gametogenesis, Fertilization, Structure and function of Human placenta and Implications of Developmental Biology

Paper III (Practical)

- Demonstration of dissection through computer simulation which elaborate the knowledge of the students in different systems like nervous system, reproductive system digestive system etc. of both Non chordates and chordates
- Identification of animals to extend the taxonomic knowledge of the students
- To get an idea on physicochemical parameters of water through measurement of DO, CO₂, productivity etc.
- Field visit

Part III

Paper IV: Unit I: Ethology Unit II: Applied Zoology Unit III: Histology and Endocrinology Unit IV: Immunology and Biotechnology

- To get knowledge on Basic concept of Instinct and Learning behavior, Communication in Honey bees, Eusociality in Termites, Biological rhythms and Parental care in Amphibia
- To get knowledge on Apiculture, Sericulture, Pisciculture, Poultry and Dairy
- To get an idea about Histology of liver, kidney, thyroid, pancreas, testis and ovary in mammals, Locations, name of hormones and functions of different endocrine glands like Pituitary, Thyroid, Pancreas, Testis and Ovary and Menstrual cycle of human
- To get an idea about immune system, Basic principles of vaccination, Recombinant DNA technology, Cloning vectors, Applications Gene cloning and Transgenic animals

Paper V: Practical

- To get an idea about estimation of different parameters of blood
- To understand economic importance of different animals
- To get an idea about transverse sections of different histological slides
- To get an idea about different developmental stages of embryo

According to the **CHOICE BASED CREDIT SYSTEM (CBCS)**
Syllabus for M.Sc. Course in Zoology
University of Kalyani
Effective from 2014-2015 Session

Programme outcomes

1. To provide a knowledge on basic and applied zoology
2. To prepare a successful career in teaching, wildlife projects, industries and research
3. To make familiar with sophisticated instruments, different techniques, software and data analysis
4. To develop the power of communication and documentation
5. To develop the ability to work as a team in laboratory classes and at educational excursion
6. To develop awareness about environment
7. To develop an analytical and scientific mind

8. To develop skill to work in interdisciplinary areas

Programme specific outcomes

1. To understand basic concepts of cell biology, genetics, molecular biology, taxonomy, ecology, microbiology, physiology and applied zoology
2. To understand life and diversity of animal
3. To understand evolutionary processes, behavior of animals, biodiversity and conservation
4. To gain knowledge about economic zoology
5. To understand human health and medicine
6. To be acquainted with good laboratory practices, safety measures and professional ethics

Course Outcomes

SEMESTER -I

HARD CORE THEORY PAPERS

- **ZHT-101 Non Chordate and Insect Organization**

After successful completion of this unit students will able to gain knowledge on followings:

- Cell organelles, Osmoregulation and Cell association in Protozoa
- Morphology, Visual organs, Sensory organelles of insects, Integument, respiratory organs, central nervous system, Metamorphosis and Exocrine glands of insect
- Evolution of insect

ZHT-102 Parasitology and Ecology

After successful completion of this unit students will able to gain knowledge on followings:

- Life cycle, biology, pathogenesis, epidemiology and control of important human and veterinary helminthes and Zoonosis
- Salient features of plant parasitic nematodes
- The Ecosystem, Niche theory, Community, Biogeochemical cycle, Population attributes and Metapopulation

ZHT-103 Developmental Biology and Cytogenetics

After successful completion of this unit students will able to gain knowledge on followings:

- Sex, Gametes and Fertilization, Egg organization, Axis specification in vertebrates, The Vertebrate organizer Key molecular components a. Cell adhesion molecules b. Extra cellular matrix components
- Prokaryotic genome, Genome organization in eukaryotes, Mitochondrial genome organization and Eukaryotic cell cycle

ZHT 104: Animal Physiology & Biochemistry and Metabolic Processes

After successful completion of this unit students will able to gain knowledge on followings:

- Respiratory function of blood, Physiology of muscles, Physiology of excretion
Synaptic and functional transmission
- Protein folding and protein stability, Bioenergetics and oxidative metabolism, Amino-acid metabolism, Brief knowledge of growth factors and Apoptosis

HARD CORE LAB

ZHL 101: Non Chordate & Insect Organization

ZHL 102: Parasitology & Ecology

ZHL 103: Developmental Biology & Cytogenetics

After successful completion of these units students will able to gain knowledge on followings:

- Dissection to give an idea about different systems of non chordates
- To gain a knowledge on Collection, fixation, staining and preservation of different parasites
- To understand the method of analysis of different physicochemical parameters of water and soil
- To get an idea about different developmental stages of embryo
- To understand chromosomal morphology at different stages of cell division
- To understand the method of DNA extraction and chromosome preparation
- To understand different metabolic processes like kinetic study of an enzyme

SEMESTER -II

HARD CORE THEORY PAPERS

ZHT-205: Structure and Function of Chordate & Fish Biology

After successful completion of this unit students will able to gain knowledge on followings:

- Blood, respiratory system, nervous system and thermoregulation in chordates
- Excretion, reproduction, electroreception and migration in fishes

ZHT-206: Environment, Wild life and Conservation and Biosystematics and Taxonomy

After successful completion of these units students will able to gain knowledge on followings

- Concept of Environment, Anthropogenic impact on environment, Wild life management and National and International efforts for conservation
- Species concept, theories of biological classification, phenetic method of classification, cladistic method of classification, cytotaxonomy, biochemical taxonomy, immunotaxonomy

ZHT-207: Advanced Parasitology and Immunobiology

After successful completion of these units students will able to gain knowledge on followings

- Mode of transmission, pathogenicity and prevention of tetanus and rabies

- Physiology, immunopathology of *Plasmodium sp.* \ immunity of *Plasmodium sp.*
- Fish parasites and its control
- Cellular basis of immunity, Humoral immune system, Major histocompatibility complex, Vaccination and immunization

ZHT-208: Cell Physiology & Human Population Genetics

After successful completion of these units students will able to gain knowledge on followings

- Biomembranes, Cell-to-cell signaling, Cell-to-cell adhesion, Intracellular protein traffic, Cell cycle
- Basic concept of human genetics
- Human genetics and society
- Quantitative genetics

HARD CORE LAB

ZHL 205: Structure and Function of Chordate & Fish Biology

ZHL 206: Environment, Wild life and Conservation and Biosystematics and Taxonomy

ZHL 207: Advanced Parasitology and Immunobiology ZHL 208: Cell Physiology and Human Population Genetics

After successful completion of these units students will able to gain knowledge on followings:

- Dissection to give an idea about different systems of chordates with special emphasis on fish
- To get knowledge about Environment, Wild life and Conservation and Biosystematics and Taxonomy through Wastewater analyses, study of Diversity indices, Preparation of materials for taxonomic study, Identification of nematodes, Identification, preparation of taxonomic keys unci taxonomic studies of insects and collection, fixation and staining of protozoa for taxonomic study.
- To get knowledge about Advanced Parasitology and Immunobiology Advanced Parasitology through Staining and mounting of platyhelminth parasites, Protozoan parasites of freshwater fish, Insects of economic importance, Identification of some parasitic protozoa, analysis of blood group A,B,AB, O and Rh factor, study of immunodiffusion and identification of lymphoid organs
- To get knowledge about Cell Physiology and Human Population Genetics through Hemoglobin, and Arneth count of blood, Determination of acid number of lipids,study of Chromosome aberration, micronuclei, sperm head anomaly study,Solving problems on linkage and chromosomal mapping

SEMESTER -III

HARD CORE THEORY PAPERS

ZHT-309: Arthropod of economic importance and biodiversity and resource management

After successful completion of this unit students will be able to gain knowledge on followings

- Insect pests, Pest management, Lac culture, Sericulture, Parasitic insects and Acarines
- Meanings of Biodiversity, Threats to species diversity, Biodiversity Resource Management and Vermiculture

ZHT-310 Environmental Toxicology and Endocrinology

After successful completion of this unit students will be able to gain knowledge on followings

- Basic concept of toxicology, Toxicity testing, Toxicants of public health hazards, Toxicokinetics,
- Organ toxicity Plant Allelochemicals, Plant signaling chemicals and insect response.
- Phylogeny of Endocrine Glands, Biosynthesis, secretion and regulation of hormones, Neuroendocrine system and neurosecretion, Physiological role of hormones and Mechanism of hormone action

SOFT CORE THEORY

ZST 301 Applied Ichthyology

After successful completion of this unit students will be able to gain knowledge on followings

- Aquaculture methods, Ornamental fish culture and Nutrition of fish

ZST 302: Developmental Dynamics

After successful completion of this unit students will be able to gain knowledge on followings

- Common features of development, Developmental processes, Techniques for the study of development Stem cells, i) Embryonic stem cells, ii) Stem cell niches and iii) Trans differentiation

HARD CORE LAB

ZHL 309: Arthropod of economic importance and Biodiversity and resource management

ZHL 310: Environmental Toxicology and Endocrinology

After successful completion of these units students will be able to gain knowledge on followings

- Arthropods of Economic Importance, Sericulture (Mulberry): Silk worm, silk cocoon.
- Biodiversity & Resource management 1. Preparation of PBR 2. Quadrant analysis
- Determination of LC50 / LD50 and 95% Confidence limit of any toxicant to a selected aquatic/ terrestrial organism, Effects of toxicants on blood parameters of fish, Instrumentation AAS/ HPLC for residue analyses of toxicant, Performance of castration and ovariectomy in rat /mice, *in vitro* study of motility of epididymal spermatozoa and Evaluation of hypothyroidic stages of rat/ chick comb biopsy.

ELECTIVE THEORY-I

ZET 301: Fish and Fisheries

After successful completion of this unit students will able to gain knowledge on followings:

- Introduction to inland capture fisheries resources, Fisheries of Lakes and reservoirs, Cold water fisheries, Limnological characteristics of lentic and lotic water systems, Biological characteristics of inland waters, Biology and culture of some important fish food organisms

ZET 301: Parasitology and Immunology

After successful completion of this unit students will able to gain knowledge on followings:

- Classification of Apicomplexa, Origin of parasitic protozoa, Some general consideration of protozoan parasites, Arthropods as blood suckers and disease transmitters, Primary amoebic meningoencephalitis, Parasite -host specificity with reference to protozoan parasites, Immunity and resistance with reference to protozoan infection

ZET 302: Fish and Fisheries

After successful completion of this unit students will able to gain knowledge on followings:

- Different systems of aquaculture Design, criteria and construction -offish farms (carps), Preparation and management of ponds for culture, fish toxicants, fish diseases, Role of pituitary and gonadotropins, induced breeding, multiple breeding, limitations-inbreeding depressions, Concept of biotechnology, biofertilization, bioprocessing and biofiltration in aquaculture, cryopreservation of gametes and transgenesis

ZET 302: Parasitology and Immunology

After successful completion of this unit students will able to gain knowledge on followings:

- Classification of helminth, Origin and evolution of parasitic helminth, Life cycle pattern in trematoda, cestoda, and nematode, Biology, pathogenesis and control of *Diphyllobothrium latum*, *Echinococcus granulosus* and *Loa loa*, Epidemiology: General and landscape Malaria, Leishmania and filarial, Nosology in relation to protozoa, Leishmaniasis with reference to drug resistance and Immunity in human trypanosomiasis

Fish and Fisheries

ZEP 301: LAB

After successful completion of this unit students will able to gain knowledge on followings:

- Assessment of Field studies (Fish Farm, Market, Co-operative societies etc.), Limnological parameters of water: Organic carbon, Plankton, Algal Blqom, Bottom Biota, Preparation of pituitary extracts and induced breeding and Identification of fish

- **ZES 301:** To give an idea to present a topic through Seminar presentation

Parasitology and Immunology

ZEP 301: LAB

After successful completion of this unit students will able to gain knowledge on followings:

- Standardization of Microscope, Fixation, staining and identification of a cephaline gregariana of annelid & insect, Blood parasites of birds and fishes, Myxozoan parasites of fishes, Ciliate parasites of fishes, Coccidia of birds, Parasites of toads and frogs, Disease transmitting arthropod parasites and Identification
- **ZES 301: ZES 301:** To give an idea to present a topic through Seminar presentation

SEMESTER -IV

ZHT-411: Animal Behaviour and Vector Biology

After successful completion of this unit students will able to gain knowledge on followings:

- Introduction to animal behavior, Learning and memory, Kinship, Conflict, Infanticide, Communications, Evolution of feeding behavior, Life cycle, mode of transmission, control and importance of Anopheles sp., Culex sp., Aedes sp., Ticks and mites, Sand flies, Tabanid fly, Black fly and Flea

ZHT-412: Molecular Biology and Biotechnology and Tools and Technique

After successful completion of this unit students will able to gain knowledge on followings:

- Regulation of gene expression, protein synthesis, Recombinant DNA technology and Transgenic animals, Techniques for Cell Study, Cell Fractionation Methods, Separation of Cell Constituents, Spectroscopy, Blotting Methods and Pesticide formulation

ZST409: Medical Embryology

After successful completion of this unit students will able to gain knowledge on followings:

- Medical implications: Infertility- Diagnostic infertility, causes of infertility, Assisted Reproductive Technologies, Genetic errors of human development and Future of medicine Techniques used in Medical Embryology

ZST410: Aquaculture Technology

After successful completion of this unit students will able to gain knowledge on followings:

- Stock Improvement, Non conventional aquaculture technology, Coastal aquaculture and Grow out of shrimp

HARD CORE LAB

ZHL 411: Animal Behaviour and Vector Biology

ZHL 412: Molecular Biology and Biotechnology and Tools and Technique

After successful completion of these units students will able to gain knowledge on followings:

- Demonstration of behavioral change of fish /chick in relation to toxicant /chemicals, Study of habituation to light stimulus in the earthworm, Demonstration of photo tactic response of house fly, Mouthparts of Anopheles mosquito and Tabanid fly, Mouthparts of Culex mosquito, Mouthparts of Aedes fly, Whole mount of Ticks and Mites, Setting up and solving of genetic crosses, Demonstration of human chromosomes and preparation of karyotypes, Demonstration of short term tissue culture, Identification of meiotic and mitotic stages of mice, Centrifugation technique: Differential centrifugation for separation of nuclei, cell debris, mitochondria, Colorimetric estimation of Protein, DNA/RNA and Demonstration of PAGE

ZET 403: Fish and Fisheries

After successful completion of this unit students will able to gain knowledge on followings:

- Fishing crafts and gears, Post harvest technology, Spoilage of fish Preservation, processing and curing of fish and Fish by products.

ZET 403: Parasitology and Immunology

After successful completion of this unit students will able to gain knowledge on followings:

- Structure and biology of *Trichomonas vaginalis*, Structure and biology of *Trypanosoma evansi* and Surra disease, Structure, life-cycle, pathology and Control of Myxozoa in fishes and Microspora in insects, General consideration of amoebae in man and Coccidia and coccidiosis in birds (with special reference to *Eimeria tenella*), Avian and simian malarial parasites, Comparative characterization of human malaria parasites, Zoonoses with special reference to Japanese Encephalitis and Toxoplasmosis, Ultra structure of Trypanosomes and Structure, biology and control of Sand fly, anopheles, tick

ZET 404: Fish and Fisheries

After successful completion of this unit students will able to gain knowledge on followings:

- Marine Fisheries, Survey of marine fisheries, Coastal fisheries, Bionomics and production of some economically important marine fisheries, Marketing, Cooperative societies and Conservation of fisheries

ZET 404: Parasitology and Immunology

After successful completion of this unit students will be able to gain knowledge on followings:

- Membrane transport mechanism in parasites, Reproductive physiology in parasites, Energy metabolism in parasitic protozoa and helminthes, Principles of immunity in relation to virus, bacteria, protozoa, helminthes, Structure and function of antibody, T-cell receptor organ and functions of immune response, Antigen-antibody reaction and its role in clinical parasitology, Basic immunological changes due to parasitic infection, antigen, vaccination, immunopathology

Fish and Fisheries

ZEL 402: Lab

After successful completion of this unit students will be able to gain knowledge on followings:

- Physico-chemical analyses of soil: pH and available phosphate, Gut content analyses of fish and Feed formulation
- On designing experiment and research through Project and Review Point

Parasitology and Immunology

ZEL 402: Lab

After successful completion of these units students will be able to gain knowledge on followings:

- Isolation and identification of peritoneal macrophages of rat, Parasites of fishes, Identification of lymphoid tissue (spleen, thymus and lymph node, Bursa of Fabricius), Blood parasites of birds and fishes, Deposition of collected materials and laboratory note book
- On designing experiment and research through Project and Review Point

Dept. of Geography:

The 1+1+1 system of undergraduate Honours education of the University of Calcutta is a combination of six theoretical papers of a total of 500 marks and four practical papers of a total of 300 marks.

CO1 Part-I syllabi of Geography covers two theory papers of 150 marks in which are included Geo-tectonics, Geomorphology, Hydrology, Oceanography and Economic Geography. The 50 marks practical component covers concepts and applications of scales and cartograms: Identification of rock and mineral specimens and study of geological maps.

CO2 Similarly the Part-II syllabi involve two theory papers of 150 marks that teach climatology, Soil Geography, Bio Geography, Political & Social Geography. The 50 marks practical components is a combination of the study of Survey of India Topographical sheets and Survey equipment that includes Prismatic Compass and Dumpy Level.

CO3 The Part-III syllabi consists of two theory papers of 200 marks that cover Population, Settlements, Culture, Geographical thought, Environmental Hazards and contemporary issues. The Practical component of 200 marks is a combination of four modules. Higher Cartograms, Soil and Climatological data mapping, Geographical information systems, Satellite image, Aerial Photograph mapping, Statistical Techniques and Hazard mapping are taught in these papers. Preparation of questionnaire and Field Reports which is a culmination of Geographical excursion is incorporated in part-III practical.

Program Outcomes - Geography Honours:

Completion of the 1+1+1 Honours course in Geography prepares learners simultaneously for professions and higher learning. The high scorers proceed for post-graduation degrees In Calcutta and outside. The medium scorers enrol for courses that prepare them for All India Level Competitive Examinations. Scorers at the low end will directly move on to the service sectors seeking employment in Govt. and Private institutions including schools, Investment and Insurance companies as well as multinational consultancy services.

Program Specific Outcome - Geography Honours:

An Honours undergraduate degree in Geography opens up possibilities of enrolment in Human Resource, Hospital, Urban, Tourism and Environment management. With some advanced training in Remote Sensing, Geography Hons Graduates can be employed in institutes that work on resource, Infrastructure, Hazards and Hazard prone area mapping to name a few.

Geography Honours Course (CBCS System) and Geography Post graduate Course (CBCS System):

Geography as a discipline mainly concerns all spheres of the planet Earth and discuss dynamic nature of spatial attributes. The Honours core course in geography at UG level focuses on spatial studies – both qualitative and quantitative, and emphasises on man-environment relationship. The students acquire the knowledge on natural and physical systems such as geomorphologic processes and natural hazards.

The students are exposed to historical, economic, cultural, social and physical characteristics of regions, in terms of both their uniqueness and similarities. They will thus gain a perspective about social and cultural diversity of the world. Different methodologies like cartographic techniques, tailored to meet the students' specific educational and professional goals in mind.

1. The students will be exposed to cartographic information and will develop map reading skills, ranging from the simple reckoning of locations to the understanding of the spatial structure and process that maps represent.
2. Students will become familiar with standard quantitative and qualitative methods, enabling them to accurately understand the meaning of information and how this information can be used to understand economic and social issues.
3. In addition to the ability of understanding and reading maps, students will develop cartography skills and will be able to create maps on their own.
4. Students will learn how to use Geographic Information Systems (GIS), particularly for the purpose of qualitative and quantitative information analysis

as well as for cartography. GIS will be the main tool in which students will apply the geographical methodology.

Learning Outcomes: After the completion of the course, students will be able to -

1. Identify and explain the Indian Geographical Environment, from global to local scales.
2. Apply geographical knowledge to everyday living.
3. Apply knowledge of global issues to a unique scientific problem.
4. Show an awareness and responsibility for the environment and India.
5. Evaluate the impacts of human activities on natural environments with special reference to India.

Dept. of Economics:

Learning Outcomes relating to Economics Honours Syllabus (University of Kalyani) can be broadly subdivided into two parts:

- Intellectual growth in terms of theoretical understanding
- Development of application related skills.

Considering the first one, after a successful completion of the course, any student will be endowed with a clear theoretical understanding of the following concepts:

1. Functioning of markets under different market structures and role of price in allocation mechanism,
2. Connection between market and social welfare,
3. Concept of equilibrium and its stability in microeconomic as well as macroeconomic context,
4. Market failure, Mixed economy, Government budget, Budget deficit and Role of Public debt
5. Government policy effectiveness under different macroeconomic frameworks,
6. Reasons, pattern, extent and consequent impact of domestic economy - global economy connections,
7. Economic growth vis-à-vis development, its sustainability and the concept of human development,
8. Contribution of Economics to the analyses of social and environmental issues,
9. Historical journey and present day scenario of Indian economy.

With respect to the second part, a successful student of the course will be equipped with the following application related skills:

1. Expression of economic theories in formal algebraic language, analyses of those algebraic models using mathematical techniques and economic interpretation of those mathematical results,
2. Collection, processing, presentation and interpretation of data on economic variables using statistical tools,

3. Testing of economic theories using preliminary econometric techniques.

Dept. of Philosophy:

Philosophy is generally known as the subject of reasoning and critically thinking about all human problems which initiates a trend of reflective thought process for the learners. After studying of this course, students may easily participate in any argument in day to day discussion and derive valid conclusion. Ethics which is associated with values create an ideal human being by applying moral values. The outcome of the concept of moral values may make a peaceful society. Ethical theories and its applied mode certainly influence and motivate the students to be moral and responsible to the society and environment. The study of religion is also one of the important parts in the course. From the study of 'comparative religion' learners will confirm that the end and the ideal of all religions are same, differences are made only by its followers. Apart from this the study of 'philosophy of mind' create curiosity and inspire students to critical thinking about many unsolved questions of the world in their mind. Philosophical study satisfies our intellectual mind.

Dept. of Political Science:

The syllabus prepared by the University of Kalyani from the year 2009-10 was in force till 2018-2019 when the new CBCS-based semester-wise syllabus was introduced. The former syllabus focused on the Basic Principles of Political Theory and Comparative Constitutional Systems for the first year undergraduate honours students. In the next two years, they were subsequently exposed to Indian Government and Politics, Western political thought, International Relations, Indian Political Thought and Freedom Movement, Political Sociology and Public Administration. General students also learned Political Theory, Political Thought, Indian Administration etc. It was a well laid-out comprehensive syllabus that gave the students a thorough and functional understanding of the subject for their subsequent studies.

The new CBCS curriculum came into effect from academic year 2018-19. It completely changed the traditional Honours paper and elective paper based system and introduced the concept of Core Course, General Elective Course, Discipline Specific Elective Course, Ability Enhancement Compulsory Course and Skill Enhancement Course. The new

system opened up a wider array of choices for students in terms of subject combinations and choice of skill enhancement courses. This interdisciplinary approach to learning, along with the introduction of internationally recognized Grade point and Credit Point system has afforded more academic mobility to the students. In the new semester based system, the papers, while retaining all the crucial theoretical and practical components of the earlier syllabus, have been significantly modernized and long, cumbersome papers have been divided into two or more papers across semesters. The General elective Courses, offered to students of honours disciplines other than Political Science encompass Human Rights, Gender, Environment and contemporary challenges to the Indian governance system. The compulsory ability enhancement courses focus on English communication, thereby giving the students an edge in communication and integrating with the wider academic sphere. Last but not the least, the Skill Enhancement Courses, offered to the General students, teach practical applications of Social Science.

Department of History:

After the successful completion of the course the students will be able to –

1. Define History, pre -history and proto- history.
2. Gather knowledge of chronology, social, economic and political formations and developments and cultural and religious patterns, turning points and personalities of the world civilizations, as well as India from ancient to modern times.
3. Learn about the expansion and consolidation of colonial rule in India, economic developments, Indian awakening, cultural changes, socio – religious reform movements, various uprisings against colonial rule, contemporary political trends and national movements.
4. Acquire knowledge of Historiography as well as different sources of history.
5. Gather knowledge of the cultural diversity as well as socio- cultural heritage of India.
6. Learn about the art , architecture and painting of India as well as the Bengal School of art and architecture and folk art.
7. Learn about the history of women in India.
8. Acquire knowledge about post- independent India.
9. Acquire knowledge about social, economic, political and cultural trends of contemporary world.

10. Learn about different concepts and theories relating to sports history and history of sports in India.
11. Learn about the history of music in Bengal from ancient to post -colonial period.
12. Learn about the history of Bangladesh, Africa, China and Japan.

Moreover, they will be able to understand the technique of historical analysis and learn the ethical use of historical sources. They will also be able to develop the ability of critical thinking and historical analysis as well as national and international understanding.

Dept. of Sanskrit:

1. Sanskrit not only helps us to envision the past but also opens new vistas for viewing the grand future of our nation. It is a binding force with the notion of 'one nation - one idea'.
2. Sanskrit is offered as a major/core subject as part of U.G syllabus (Honours & General) in this college. The department of Sanskrit offers full- time U.G program under old syllabus (Part I+II+III) and new CBCS syllabus.
3. The mind of an undergraduate student of this field can be developed simultaneously in two directions - immersive and critical engagement on one side, while at the same time being empathetic and attuned to the lifestyle he/she endeavors to follow.
4. The initiative aspires to establish a close connection of education with individual and cultural lives in the Indian context and to foster the association between learning and employment. Rooted in the disciplinary developments the courses of this framework relate to the traditional Indian cultural ethos as well as contemporary realities including globalization.
5. We must remember that a student is an active processor of information with his / her unique scheme of acquisition and retention. Therefore, a pedagogy which compels the learner to be active is a desirable precondition for effective learning.

Dept. of English:

The students of English B.A. Honours (Core Course), in the span of three years undergraduate studies, learn about the literature written in English from all over the world. Studying British Literature (from the medieval to the modern age), Indian and European Classical Literature, Indian Writing in English, American Literature, Popular Literature, Postcolonial Literatures, Women's Writing, and Modern European Drama help them to gain a deeper appreciation of the poetry, novels, plays and short stories produced by the writers (both past and present) hailing from English-speaking populations of different cultures of the world. The students also achieve a proficiency in the appreciation of a variety of literary genres, terminologies, history of literature in English (1+1+1 old syllabus), literary criticism and theory, and socially-relevant literary movements.

English is now a Global Language and serves as an important connecting link between various communities and cultures across the globe. Moreover, English happens to be one of the most widely used languages in the country and the world. Therefore, it is advantageous if Indian students from across all disciplines are equipped with a proficiency in English when applying for jobs in any sector. The objective of LOCF (Learning Outcome based Curriculum Framework) in the case of students studying B.A./B.Sc. (Hons. and Generic) courses is to create an awareness of values, both human and literary, to make them comprehend and realise the value of literature as one of the defining factors of the concept called humanity. Further, the curriculum is aimed at providing the students with adequate knowledge and skill to use English as a language of communication and exchange of ideas in various professional fields as diverse as pedagogy, business management, and scientific enquiry and research. In this regard it may be said that the Department of English teaches and trains every single student of the college, through GE (Academic Writing and Composition, Text and Performance, Linguistics), DSC (Research Methodology, Literary Criticism and Theory) and AECC (English communication) courses, and successfully achieves the aims of LOFC from one academic session to another. Skill Enhancement Course (SEC) outcomes

include improvement of vocabulary and development of soft skills, pertaining to English language Teaching.

- Appreciate use of language and stylistic features in literary texts.
- Comprehend literary points of views, and critically appreciate complex plot-structures and value-systems inherent in texts.
- Understand historical, socio-cultural and geo-political contexts of regional and world literatures written in English.
- Learn research methodology (including how to write a research paper, citation of sources and formulation of research questions) and develop academic writing skills.
- Logically and objectively evaluate a text, and communicate the same (both verbally and in writing) with clarity.
- Participate in class discussions, and share original ideas and arguments.
- Learn how to develop English writing skills for business communication i.e. reports, minutes of meetings, e-correspondence.
- Learn the basic methods and approaches of English Language Teaching.

Dept. of Bengali:

Fulfilling the National level UGC Guidelines, Kalyani University started its CBCS Semester process from 2018-19. When it was introduced in the Under- Graduate level, almost a paradigm shift occurred. The profound characteristics of this new course of study were as follows :

1. In terms of modernisation of subjective knowledge an age of discretion was observed when parallel to traditional courses, Children's Literature, Detective Novels, Folklore, Literature of Bangladesh, studying MILs were introduced as core courses. Similarly, just like the Post Graduate Level, a special paper was offered in the UG Level also.
2. Secondly, with the introduction of SEC the methodology of teaching learning, group study, symposia, knowledge of writing Book Review etc. were significantly implemented as an applied field of Humanities.
3. As benevolent and assertive part of CBCS, students could intensify their intelligentsia with

interdisciplinary field of studies. As a result of which, research ability and capabilities to reconnect the literature with other course of studies may definitely be fruitful.

4. Replacing year based long-term evaluation procedure, the semester process emphasises on short term evaluation method. It helps to recast the students with continuous study and evaluation system. It benefitted them to score a good result and to crosscheck their errors simultaneously.

Note: The course outcomes heavily focusses on the application of new knowledge by the students, including the knowledge of research methodology, theatre studies and performative aspect of literature, academic writing and acquiring practical skills .

Dept. of Statistics

Statistics general students should be able to:

1. Distinguish types of studies and their limitations and strengths,
2. Describe a data set including both categorical and quantitative variables to support or refute a statement,
3. Apply laws of probability to concrete problems,
4. Perform statistical inference in several circumstances and interpret the results in an applied context,
5. Use mathematical tools, including calculus and linear algebra, to study probability and mathematical statistics and in the description and development of statistical procedures,
6. Communicate concepts in probability and statistics using both technical and non-technical language.

Environmental Sciences:

1. **Promotes Respect for Nature:** By studying the subject, it becomes easy to promote love and respect for nature and students can value the natural things around.
2. **Encourages Students to Live a Healthy Lifestyle:** The subject helps students to understand how to live healthy, how to contribute to a safe and sustainable environment.
3. **Students Learn Responsibility and Safety:** Students show more responsibility toward the environment and get to know how to work for its protection, safety, and betterment.
4. **Prepares Students for Future Careers:** Students can be assured of a safe, successful and bright future and can earn as an environmentalist or freelance writer.

5. Nature refreshes the mind and spirit: Studying environmental science helps students escape day to day worries. While learning the subject, they will have to go to the field and chances of refreshing their mind will be higher.