

Choice Based Credit System (CBCS)

# **NOWGONG COLLEGE (AUTONOMOUS)**



## **SYLLABUS DEPARTMENT OF ZOOLOGY**

**Learning Outcomes-based Curriculum Framework (LOCF)  
of  
Undergraduate Programme (Regular/Generic)**

**BACHELOR OF SCIENCE IN ZOOLOGY**

**(Effective from Academic Year 2020-21)**

Syllabus as recommended by Board of Studies, Department of Zoology  
Nowgong College (Autonomous) on 24/11/2021

## SYLLABUS FOR B. Sc. (Regular/Generic) IN ZOOLOGY

### Course and Credit Structure

Semester	Regular Core Course 12 × 6 = 72	Ability Enhancement Course 2 × 4 = 8	Skill Enhancement Course 4 × 4 = 16	Discipline Specific Elective Course 6 × 6 = 36
1 <sup>st</sup>	Course:1 XXXX-RCC-1016 Course:2 XXXX-RCC-1016 Course:3 XXXX-RCC-1016	Communicative English/Communicative MIL ENGL-AEC-1014 ASSA-AEC-1014 HIND-AEC-1014 BENG-AEC-1014		
2 <sup>nd</sup>	Course:1 XXXX-RCC-2016 Course:2 XXXX-RCC-2016 Course:3 XXXX-RCC-2016	ENST-AEC-2014		
3 <sup>rd</sup>	Course:1 XXXX-RCC-3016 Course:2 XXXX-RCC-3016 Course:3 XXXX-RCC-3016		XXXX-SEC-3014	
4 <sup>th</sup>	Course:1 XXXX-RCC-4016 Course:2 XXXX-RCC-4016 Course:3 XXXX-RCC-4016		XXXX-SEC-4014	
5 <sup>th</sup>			XXXX-SEC-5014	Course:1 XXXX-RDS-5016 Course:2 XXXX-RDS-5016 Course:3 XXXX-RDS-5016
6 <sup>th</sup>			XXXX-SEC-6014	Course:1 XXXX-RDS-6016 Course:2 XXXX-RDS-6016 Course:3 XXXX-RDS-6016

## Course Name and Abbreviation

Name of courses

Abbreviation

**Zoology**

**ZOOL**

### **Course Code**

Type of Course

Abbreviation

Honours Core Course

HCC

RCC

Regular Core Course

CCC

Compulsory Core Course Elective

HGE

### **Ability Enhancement Compulsory Course**

Ability Enhancement Course Skill

AEC

SEC

## **B.SC. (REGULAR/GENERIC) IN ZOOLOGY**

### **SEMESTER-I**

#### **ANIMAL DIVERSITY**

**PAPER CODE: ZOOL- HGE/RCC-1016**

**PAPER CREDIT: 06 (4T+2P)**

**Total Marks: 100 (T60+IA20+P20) T: Theory, IA: internal Assessment, P: Practical**

#### **Objectives:**

This course gives a framework for understanding the diversity within different groups, and interrelationship among different species and genera within each group.

1. To understand the importance of animal kingdom in context to hierarchy, body plan and their role in ecological development. This course provides an overview of the invertebrate and vertebrate animals, including sponges, cnidarians, flatworms, nematodes, annelids, molluscs, arthropods, echinoderms, invertebrate chordates, fishes, amphibians, reptiles, birds, and mammals. This paper comprises of 15 units.
2. To provide knowledge of coelom formation, different level of organization, different modes of living, evolutionary changes of Non-chordates and their salient features.

#### **Learning outcome:**

On completion of the course, students will be able to:

- Distinguish between major phyla of animals through a demonstrated understanding of their taxonomic classification and diversity.
- Understand the fundamental differences among animal body plans and relate them to function, taxonomic classification, and evolutionary relationships among phyla.
- Illustrate lifecycles, structure, function and reasons for importance of few representative organisms from different groups of animals.
- Observe living animals in the environment and relate observations to theory from the course.
- Recognize major animal phyla and animals on the basis of their external characteristics.

#### **COURSE CONTENT: THEORY**

**CREDITS: 4**

##### **UNIT 1: KINGDOM PROTISTA**

General characters and classification up to classes; locomotion in Protozoa

##### **UNIT 2: PHYLUM PORIFERA**

General characters and classification up to classes; Canal System in *Sycon*

##### **UNIT 3: PHYLUM CNIDARIA**

General characters and classification up to classes; Polymorphism in Hydrozoa

##### **UNIT 4: PHYLUM PLATYHELMINTHES**

General characters and classification up to classes; Life history of *Taenia solium*

##### **UNIT 5: PHYLUM NEMATHELMINTHES**

General characters and classification up to classes; Life history of *Ascaris lumbricoides* and its parasitic adaptations

##### **UNIT 6: PHYLUM ANNELIDA**

General characters and classification up to classes; Metamerism in

Annelida

**UNIT 7: PHYLUM ARTHROPODA**

General characters and classification up to classes; Visionin Arthropoda, Metamorphosis in Insects

**UNIT 8: PHYLUM MOLLUSCA**

General characters and classification up to classes; Torsion in gastropods

**UNIT 9: PHYLUM ECHINODERMATA**

General characters and classification up to classes; Water- vascular system in Asteroidea

**UNIT 10: PROTOCHORDATES**

General features and Phylogeny of Protochordata

**UNIT 11: AGNATHA**

General features of Agnatha and classification of cyclostomes up to classes

**UNIT 12: PISCES**

General features and Classification up to orders; Osmoregulation in Fishes

**UNIT 13: AMPHIBIA**

General features and Classification up to orders; Parental Care

**UNIT 14: REPTILES**

General features and Classification up to orders; Poisonous and non-poisonous snakes, Biting mechanism in snakes

**UNIT 15: AVES**

General features and Classification up to orders; Flight adaptations in birds

**UNIT 16: MAMMALIA**

General features and Classification up to orders.

**Note:** Classification of Unit 1-9 to be followed from “Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition”

**COURSE CONTENT: PRACTICAL**

**CREDITS: 2**

1. Study of the following specimens: *Amoeba*, *Euglena*, *Plasmodium*, *Paramecium*, *Sycon*, *Hyalonema*, and *Euplectella*, *Obelia*, *Physalia*, *Aurelia*, *Tubipora*, *Metridium*, *Taeniasolium*, Male and female *Ascaris lumbricoides*, *Aphrodite*, *Nereis*, *Pheretima*, *Hirudinaria*, *Palaemon*, *Cancer*, *Limulus*, *Palamnaeus*, *Scolopendra*, *Julus*, *Periplaneta*, *Apis*, *Chiton*, *Dentalium*, *Pila*, *Unio*, *Loligo*, *Sepia*, *Octopus*, *Pentaceros*, *Ophiura*, *Echinus*, *Cucumaria* and *Antedon*, *Balanoglossus*, *Herdmania*, *Branchiostoma*, *Petromyzon*, *Sphyrna*, *Pristis*, *Torpedo*, *Labeo*, *Exocoetus*, *Anguilla*, *Ichthyophis/Ureotyphlus*, *Salamandra*, *Bufo*, *Hyla*, *Chelone*, *Hemidactylus*, *Chamaeleon*, *Draco*, *Vipera*, *Naja*, *Crocodylus*, *Gavialis*, Any six common birds from different orders, *Sorex*, Bat, *Funambulus*, *Loris*
2. Study of the following permanent slides: T.S. and L.S. of *Sycon*, Study of life history stages of *Taenia*, T.S. of Male and female *Ascaris*
3. Key for Identification of poisonous and non-poisonous snakes
4. An “**animal album**” containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.

### **SUGGESTED READINGS:**

- Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
- Barnes, R. S. K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science.
- Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
- Pough H. *Vertebrate life*, VIII Edition, Pearson International.
- VasantikaKashyap (2020). A Text Book of Non-Chordata II (Coelomates). I Edition, KedarNath Ram Nath Publication, Meerut.
- Nayan Jyoti Das (2020). Animal Diversity. I Edition, Mahaveer Publications, Dibrugarh.

**B.SC. (REGULAR/GENERIC) IN ZOOLOGY**  
**SEMESTER-II**  
**COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF**  
**VERTEBRATES**

**PAPER CODE: ZOOL- HGE/RCC-2016**

**PAPER CREDIT: 06 (4T+2P)**

**Total Marks: 100 (T60+IA20+P20) T: Theory, IA: internal Assessment, P: Practical**

**Objectives:**

This course aims to provide the undergraduate students a thorough knowledge of structural details and comparative account of the different organ systems of the body from lower to higher vertebrates, and protochordates, thus enabling them to appreciate the incredible vertebrate diversity. The course furnishes an understanding of evolutionary basis of morphological and anatomical differences as well as similarities that occur among vertebrates. It helps students propose possible homology between structures, and understand how they evolved as the vertebrates dwelled different habitats.

**Learning outcome:**

On completion of the course, students will be able to:

- Explain comparative account of the different vertebrate systems
- Understand the pattern of vertebrate evolution, organisation and functions of various systems.
- Learn the comparative account of integument, skeletal components, their functions and modifications in different vertebrates.
- Understand the evolution of heart, modification in aortic arches, structure of respiratory organs used in aquatic, terrestrial and aerial vertebrates; and digestive system and its anatomical specializations with respect to different diets and feeding habits.
- Learn the evolution of brain, sense organs and excretory organs to a complex, highly evolved form in mammals;
- Learn to analyze and critically evaluate the structure and functions of vertebrate systems, which helps them to discern the developmental, functional and evolutionary history of vertebrate species.
- Understand the importance of comparative vertebrate anatomy to discriminate human biology.

**COURSE CONTENT: THEORY**

**CREDITS: 4**

**UNIT 1:INTEGUMENTARY SYSTEM**

Derivatives of integument w.r.t. glands and digital tips

**UNIT 2: SKELETAL SYSTEM**

Visceral arches in vertebrates.

**UNIT 3: DIGESTIVE SYSTEM**

Brief account of alimentary canal and digestive glands

#### **UNIT 4: RESPIRATORY SYSTEM**

Different types of respiratory organs in vertebrates

#### **UNIT 5: CIRCULATORY SYSTEM**

Evolution of heart and aortic arches

#### **UNIT 6: URINOGENITAL SYSTEM**

Succession of kidney, Evolution of urinogenital ducts

#### **UNIT 7: NERVOUS SYSTEM**

Comparative account of brain

#### **UNIT 8 SENSE ORGAN**

Types of receptors

#### **UNIT 9: EARLY EMBRYONIC DEVELOPMENT**

Gametogenesis: Spermatogenesis and oogenesis  
w.r.t. mammals, vitellogenesis in birds.

Fertilization: external (amphibians), internal (mammals),  
blocks to polyspermy

Early development of frog and mammal (structure of mature egg and its membranes,  
patterns of cleavage, up to formation of gastrula.

**UNIT 10: LATE EMBRYONIC DEVELOPMENT** Implantation of embryo in  
mammal, Formation of placenta and its functions, different types of placenta, Metamorphic  
events in frog life cycle and its hormonal regulation.

#### **UNIT 11: CONTROL OF DEVELOPMENT**

Fundamental processes in development (brief idea) – Gene activation, determination,  
induction, differentiation, morphogenesis,

#### **COURSE CONTENT: PRACTICAL**

**CREDITS: 2**

1. Osteology:

- a) Disarticulated skeleton of fowl and rabbit
- b) Carapace and plastron of turtle/tortoise
- c) Mammalian skulls: One herbivorous and one carnivorous animal.

2. Frog - Study of developmental stages - whole mounts and sections through permanent slides – cleavage stages, blastula, gastrula, neurula, tail bud stage, tadpole external and internal gill stages.
3. Developmental stages of chick embryo in laboratory incubating the fertilized egg
4. Study of the different types of placenta---through permanent slides or photomicrographs.
5. Examination of gametes - frog/rat - sperm and ova through permanent slides or photomicrographs.

#### **SUGGESTED READINGS**

- Kardong, K.V. (2005) *Vertebrates' Comparative Anatomy, Function and Evolution*. IV Edition. McGraw-Hill Higher Education.
- Kent, G.C. and Carr R.K. (2000). *Comparative Anatomy of the Vertebrates*. IX Edition. The McGraw-Hill Companies.
- Hilderbrand, M and Gaslow G.E. *Analysis of Vertebrate Structure*, John Wiley and Sons.
- Walter, H.E. and Sayles, L.P; *Biology of Vertebrates*, Khosla Publishing House.
- Gilbert, S. F. (2006). *Developmental Biology*, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
- Balinsky, B.I. (2008). *An introduction to Embryology*, International Thomson Computer Press.
- Carlson, Bruce M (1996). *Patten's Foundations of Embryology*, McGraw Hill, Inc.

## **B.SC. (REGULAR/GENERIC) IN ZOOLOGY**

### **SEMESTER-III**

#### **PHYSIOLOGY AND BIOCHEMISTRY**

**PAPER CODE: ZOOL- HGE/RCC-3016**

**PAPER CREDIT: 06 (4T+2P)**

**Total Marks: 100 (T60+IA20+P20) T: Theory, IA: internal Assessment, P: Practical**

#### **Objectives:**

Physiology is the study of life, specifically, how cells, tissues and organ function. It is a core and fundamental scientific discipline that defines the health and well-being of living organisms. Besides satisfying a natural curiosity about how our body systems function, it gives us knowledge about the functions of all the parts and systems of the body. It is also of central importance in medicine and health sciences. The course has been designed to apply the theoretical concept to the laboratory exercises for acquiring skills. The students will be equipped with skill-based knowledge to help them undertake further studies in physiology and related areas as well as in multidisciplinary subjects.

#### **Learning outcome:**

On completion of the course, students will be able to:

- Have a clear knowledge of basic fundamentals and understanding of advanced concepts so as to develop a strong foundation that will help them to acquire skills and knowledge to pursue advanced degree courses.
- Comprehend and analyze problem-based questions on physiological aspects.
- Recognize and explain how all physiological systems work in unison to maintain homeostasis in the body; and use of feedback loops to control the same.
- Learn an integrative approach to understand the interactions of various organ systems resulting in the complex overall functioning of the body.
- Gain knowledge and skill in the interactions and interdependence of physiological and biomolecules

#### **COURSE CONTENT: THEORY**

**CREDITS: 4**

##### **UNIT 1: NERVE AND MUSCLE**

Structure of neuron, conduction of nerve impulse through myelinated and non myelinated nervefibres, Ultrastructure of skeletal muscle and mechanism of muscle contraction, neuromuscular junction.

##### **UNIT 2: DIGESTION**

Physiology of digestion in the alimentary canal; Absorption of carbohydrates, proteins, lipids

##### **UNIT 3: RESPIRATION**

Pulmonary ventilation, Respiratory volumes and capacities, Transport of Oxygen and carbon dioxide in blood

##### **UNIT 4: EXCRETION**

Structure of nephron, Mechanism of Urine formation, Counter-current Mechanism

## **UNIT 5: CARDIOVASCULAR SYSTEM**

Composition of blood, Hemostasis, Structure of Heart, Origin and conduction of the cardiac impulse, Cardiac cycle

## **UNIT 6: ENDOCRINE SYSTEM**

Structure and functions of endocrine glands-Pituitary, thyroid, parathyroid, pancreas, adrenal and gonads

Hormonal control of spermatogenesis and oogenesis, hormonal control of menstrual cycle

## **UNIT 7: CARBOHYDRATE METABOLISM**

Glycolysis, Krebs cycle, pentose phosphate pathway, gluconeogenesis

## **UNIT 8: ENZYMES**

Introduction, mechanism of enzyme action and inhibition and regulation

### **COURSE CONTENT: PRACTICAL**

**CREDITS: 2**

1. Preparation of haemin crystals
2. Study of permanent histological sections of mammalian pituitary, thyroid, pancreas, adrenal gland
3. Study of permanent slides of spinal cord, duodenum, liver, lung, kidney, bone, cartilage
4. Qualitative tests to identify functional groups of carbohydrates in given solutions (Glucose, Fructose, Sucrose, Lactose)
5. Estimation of total protein in given solutions by Lowry's/Bradford method.
6. Study of activity of salivary amylase under optimum conditions

### **SUGGESTED READINGS:**

- Tortora, G.J. and Derrickson, B.H. (2009). Principles of Anatomy and Physiology, XII Edition, John Wiley & Sons, Inc.
- Widmaier, E.P., Raff, H. and Strang, K.T. (2008) Vander's Human Physiology, XI Edition., McGraw Hill
- Guyton, A.C. and Hall, J.E. (2011). Textbook of Medical Physiology, XII Edition, Harcourt Asia Pvt. Ltd/ W.B. Saunders Company
- Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H Freeman and Co.
- Nelson, D. L., Cox, M. M. and Lehninger, A.L. (2009). Principles of Biochemistry. IV Edition. W.H. Freeman and Co.
- Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009). Harper's Illustrated Biochemistry. XXVIII Edition. Lange Medical Books/McGraw Hill.

**B.SC. (REGULAR/GENERIC) IN ZOOLOGY**  
**SEMESTER-IV**  
**GENETICS AND EVOLUTIONARY BIOLOGY**  
**PAPER CODE: ZOOL- HGE/RCC-4016**

**PAPER CREDIT: 06 (4T+2P)**

**Total Marks: 100 (T60+IA20+P20) T: Theory, IA: internal Assessment, P: Practical**

**Objectives:**

- The objective of this course is to enable the students to learn the classical genetics along with inheritance pattern and genetic variations and their causes. To provide detail understanding of genetic traits and their inheritance, gene interactions and their phenotypic effects.
- This course also provides the students in depth knowledge of origin of life and evolution of different life forms. To explore salient features of various theories of evolution. To develop comprehensive knowledge regarding various sources of variations and their role in speciation. To give detail account of Extinctions and their types.

**Learning Outcomes:**

**After completion of the course students will learn:**

- to develop comprehensive knowledge on molecular evolution, macro evolutionary changes, sources of variations, different theories imparted by evolutionist.
- most of the essential aspects of Evolutionary biology in detail which will help them in acquiring better understanding regarding the subject.

**COURSE CONTENT: THEORY**

**CREDITS: 4**

**UNIT 1: INTRODUCTION TO GENETICS**

Mendel's work on transmission of traits, Genetic Variation, Molecular basis of Genetic Information

**UNIT 2: MENDELIAN GENETICS AND ITS EXTENSION**

Principles of Inheritance, Chromosome theory of inheritance, Incomplete dominance and co-dominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, sex linked inheritance, extra-chromosomal inheritance

**UNIT 3: LINKAGE, CROSSING OVER AND CHROMOSOMAL MAPPING**

Linkage and crossing over, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and coincidence, Somatic cell genetics – an alternative approach to gene mapping

#### **UNIT4: MUTATIONS**

Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy; Gene mutations: Induced versus Spontaneous mutations, Back versus Suppressor mutations

#### **UNIT 5: SEX DETERMINATION**

Chromosomal mechanisms, dosage compensation

#### **UNIT 6: HISTORY OF LIFE**

Origin of life, chemical evolution

#### **UNIT 7: INTRODUCTION TO EVOLUTIONARY THEORIES**

Lamarckism, Darwinism, Neo-Darwinism

#### **UNIT 8: DIRECT EVIDENCES OF EVOLUTION**

Types of fossils, Dating of fossils, Phylogeny of horse

#### **UNIT 9: PROCESSES OF EVOLUTIONARY CHANGE**

Organic variations; Isolating Mechanisms; Natural selection (Example: Industrial melanism); Types of natural selection, Artificial selection

#### **UNIT 10: SPECIES CONCEPT**

Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric)

#### **UNIT 11: EXTINCTION**

Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Role of extinction in evolution

#### **COURSE CONTENT: PRACTICAL**

**CREDITS: 2**

1. Study of Mendelian Inheritance and gene interactions (Non Mendelian Inheritance) using suitable examples. Verify the results using Chi-square test.
2. Study of Linkage, recombination, gene mapping using the data.
3. Study of Human Karyotypes (normal and abnormal).
4. Study of fossil evidences from plaster cast models and pictures
5. Study of homology and analogy from suitable specimens/pictures
6. Charts:
  - a) Phylogeny of horse with diagrams/ cut outs of limbs and teeth of horse ancestors
  - b) Darwin's Finches with diagrams/ cut outs of beaks of different species

## 7. Visit to Museums (Preferably natural history) /submission of report

### **SUGGESTED READINGS**

- Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics.VIII Edition.WileyIndia.
- Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics.V Edition.John Wiley and SonsInc.
- Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. X Edition. BenjaminCummings.
- Russell, P. J. (2009). Genetics- A Molecular Approach.III Edition. Benjamin Cummings.
- Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. Introduction to Genetic Analysis. IX Edition. W. H. Freeman andCo.
- Ridley, M. (2004). Evolution.III Edition. Blackwell Publishing
- Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H.(2007).Evolution. Spring, Harbour Laboratory Press.
- Hall, B. K. and Hall grimsson, B. (2008). Evolution.IV Edition. Jones and Bartlett Publishers
- Campbell, N. A. and Reece J. B. (2011). Biology. IX Edition, Pearson, Benjamin,Cummings.
- Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates

**B.SC. (REGULAR) IN ZOOLOGY**  
**SEMESTER-V**  
**APPLIED ZOOLOGY**  
**PAPER CODE: ZOOL- HGE/RCC -5016**  
**PAPER CREDIT: 06 (4T+2P)**

**Total Marks: 100 (T60+IA20+P20) T: Theory, IA: internal Assessment, P: Practical**

**Objectives:**

It will provide an insight to the learner about Parasitology, Epidemiology, insects of economic and medical importance, animal husbandry and technology involved in pisciculture industry

**Learning outcome:**

- In parasitology part, life cycles of zoonotic parasites and the role of parasites in global public health is discussed.

Attain a solid foundation in insect biology and animal husbandry basics

**COURSE CONTENT: THEORY**

**CREDITS: 4**

**UNIT 1: INTRODUCTION TO HOST-PARASITE RELATIONSHIP**

Host-Types, Definitive host, Intermediate host, Reservoir host, Parasitism, Symbiosis, Commensalism, Zoonosis

**UNIT 2: EPIDEMIOLOGY OF DISEASES**

Transmission, Prevention and control of diseases: Tuberculosis, typhoid

**UNIT 3: RICKETTSIAE AND SPIROCHAETES**

Brief account of *Rickettsia prowazekii*, *Borreliarecurrentis* and *Treponemapallidum*

**UNIT 4: PARASITIC PROTOZOA**

Life history and pathogenicity of *Entamoeba histolytica*, *Plasmodium vivax* and *Trypanosomagambiense*

**UNIT 5: PARASITIC HELMINTHES**

Life history and pathogenicity of *Ancylostomaduodenale* and *Wuchereriabancrofti*

**UNIT 6: INSECTS OF ECONOMIC IMPORTANCE**

Biology, Control and damage caused by *Helicoverpa armigera*, *Pyrilla perpusilla* and *Papilio demoleus*, *Callosobruchus chinensis*, *Sitophilus oryzae* and *Tribolium castaneum*

**UNIT 7: INSECTS OF MEDICAL IMPORTANCE**

Medical importance and control of *Pediculus humanus corporis*,

*Anopheles, Culex, Aedes, Xenopsylla cheopis*

**UNIT 8: ANIMAL HUSBANDRY**

Preservation and artificial insemination in cattle; Induction of early puberty and synchronization of estrus in cattle

**UNIT 9: POULTRY FARMING**

Principles of poultry breeding, Management of breeding stock and broilers, Processing and preservation of eggs

**UNIT 10: FISH TECHNOLOGY**

Genetic improvements in aquaculture industry; Induced breeding and transportation of fish seed

**COURSE CONTENT: PRACTICAL**

**CREDITS: 2**

1. Study of *Plasmodium vivax*, *Entamoeba histolytica*, *Trypanosoma gambiense*, *Ancylostoma duodenale* and *Wuchereria bancrofti* and their life stages through permanent slides/photomicrographs or specimens.
2. Study of arthropod vectors associated with human diseases: *Pediculus*, *Culex*, *Anopheles*, *Aedes* and *Xenopsylla*.
3. Study of insect damage to different plant parts/stored grains through damaged products/photographs.
4. Identifying feature and economic importance of *Helicoverpa (Heliothis) armigera*, *Papilio demoleus*, *Pyrilla perpusilla*, *Callosobruchus chinensis*, *Sitophilus oryzae* and *Tribolium castaneum*
5. Visit to poultry farm or animal breeding centre. Submission of visit report
6. Maintenance of fresh water aquarium
7. Collection of local ornamental fishes, agricultural pests,

**SUGGESTED READINGS**

- Park, K. (2007). *Preventive and Social Medicine*. XVI Edition. B.B Publishers.
- Arora, D. Rand Arora,B.(2001).*Medical Parasitology*. II Edition. CBS Publications and Distributors.
- Kumar and Corton. *Pathological Basis of Diseases*.
- Atwal, A.S. (1986). *Agricultural Pests of India and South East Asia*, Kalyani Publishers.
- Dennis, H. (2009). *Agricultural Entomology*. Timber Press (OR).
- Hafez,E.S.E.(1962). *Reproduction in Farm Animals*. Lea & Fabiger Publisher
- Dunham R.A. (2004). *Aquaculture and Fisheries Biotechnology Genetic Approaches*.

**B.SC. (REGULAR) IN ZOOLOGY**  
**SEMESTER-VI**  
**INSECT, VECTORS AND DISEASES**  
**PAPER CODE: ZOOL- HGE/RCC -6016**  
**PAPER CREDIT: 06 (4T+2P)**

**Total Marks: 100 (T60+IA20+P20) T: Theory, IA: internal Assessment, P: Practical**

**Objectives:**

- The main objective of this course is to strengthen the knowledge of undergraduate students on emerging vector born diseases, vectors and their role in transmission and measures to control their populations to mitigate the spread of these diseases.

**LEARNING OUTCOMES:**

After completion of this course students will be able to

- describe about of different groups like dipteran, siphonaptera, sipunculata, hemiptera and the diseases transmitted by them.
- describe about vector adaptations, host vector relationship, vectorial capacity etc.

**COURSE CONTENT: THEORY**

**CREDITS: 4**

**UNIT I: INTRODUCTION TO INSECTS**

General Features of Insects, Morphological features, Head – Eyes, Types of antennae, Mouth parts with respect to feeding habits

**UNIT II: CONCEPT OF VECTORS**

Brief introduction of Carrier and Vectors (mechanical and biological vector), Reservoirs, Host-vector relationship, vectorial capacity, Adaptations as vectors, Host Specificity

**UNIT III: INSECTS AS VECTORS**

Classification of insects up to orders, detailed features of orders with insects as vectors – Diptera, Siphonaptera, Siphunculata, Hemiptera

**UNIT IV: DIPTERAN AS DISEASE VECTORS**

Dipterans as important insect vectors – Mosquitoes, Sand fly, Houseflies; Study of mosquito-borne diseases – Malaria, Dengue, Chikungunya, Viral encephalitis, Filariasis; Control of mosquitoes, Study of sand fly-borne diseases – Visceral Leishmaniasis, Cutaneous Leishmaniasis, Phlebotomus fever; Control of Sand fly, Study of house fly as important mechanical vector, Myiasis, Control of house fly

## **UNIT V: SIPHONAPTERA AS DISEASE VECTORS**

Fleas as important insect vectors; Host-specificity, Study of Flea-borne diseases– Plague, Typhus fever; Control of fleas

## **UNIT VI: SIPHUNCULATA AS DISEASE VECTORS**

Human louse (Head, Body and Pubic louse) as important insect vectors; Study of louse-borne diseases –Typhus fever, Relapsing fever, Trench fever, Vagabond's disease, Phthiriasis; Control of human louse

## **UNIT VII: HEMPITERA AS DISEASE VECTORS**

Bugs as insect vectors; Blood-sucking bugs; Chagas disease, Bed bugs as mechanical vectors, Control and prevention measures

## **COURSE CONTENT: PRACTICAL**

**CREDITS: 2**

1. Study of different kinds of mouth parts of insects
2. Study of following insect vectors through permanent slides/ photographs: *Aedes*, *Culex*, *Anopheles*, *Pediculus human uscapitis*, *Pediculus human uscorporis*, *Phithirus pubis*, *Xenopsylla cheopis*, *Cimex lectularius*, *Phlebotomus argentipes*, *Musca domestica*, through permanent slides/ photographs
3. Study of different diseases transmitted by above insect vectors
4. Collection and submission of disease vectors with special reference to insects
5. Submission of a project report on any one of the insect vectors and disease transmitted

## **SUGGESTED READINGS**

- Imms, A.D. (1977). A General Text Book of Entomology. Chapman & Hall, UK
- Chapman, R.F. (1998). The Insects: Structure and Function. IV Edition, Cambridge University Press, UK
- Pedigo L.P. (2002). Entomology and Pest Management. Prentice Hall Publication
- Mathews, G. (2011). Integrated Vector Management: Controlling Vectors of Malaria and Other Insect Vector Borne Diseases. Wiley-Blackwell SK

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