Zoology (Theory)

Total: 5 hours /week
Lecture: 3 hours/week
Tutorial: 0 hour/week
Practical: 0 hours/week
Lab: 2 hours/week

Course Description
This basic course in zoology discusses the characteristics of unicellular and multicellular structures. The course contains introductory zoology, economic zoology, life process of mammals, evolution of organisms, application of zoology, human health and a brief introduction about snakes found in Nepal. In order to be more relevant to the students of health science, the course involves a detailed study of different kinds of tissues, the life history of relevant parasites, and a detailed study of the anatomy and physiology of mammals.

Practical zoology includes the study of microscopes, a general study of animal kingdom (museum specimens), preparation of temporary slides, dissection of mammals so as to expose different systems and the life cycle of mosquitoes and houseflies. It also includes the measurement of blood pressure and its effects. The practical zoology also gives the knowledge about the identification of blood groups in human and its significances.

Course Objectives
At the end of the course, the student will be able to:

- Tell the meaning, scope and different branches of zoology.
- Explain structure and functions of different kinds of tissues in a body.
- Explain different kinds of parasites and arthropods related to human welfare.
- Describe different systems of mammals.
- Describe how organisms of today have been evolved from the ancestral ones.
- Describe the importance and strategy of wildlife conservation.
- Describe the different applications of biotechnology in human health.
- Identify the causes, symptoms and control of some health disorders.
- Identify common poisonous and nonpoisonous snakes and their effects.
- Handle microscope properly.
- Identify different kinds of animals.
- Prepare temporary slide mount of the given specimen.
- Dissect the mammal so as to expose its different systems.
- Describe different stages in the life cycle of mosquitoes and houseflies.
- Know the methods of measurement of blood pressure and identification of blood groups in human.

Content
Unit 1: Introduction to Zoology **2hrs**

- Meaning of Zoology
- Scope of Zoology

- Different branches of Zoology related to medical science:On the basis of structure and function - morphology, anatomy, physiology, histology, cytology, microbiology, ethology.
- On the basis of specific unit or field - toxicology, genetics, embryology, evolution, mycology, microbiology, ecology, pathology, parasitology, paleontology, taxonomy.
- On the basis of specific group - entomology, helminthology, protozoology, bacteriology, virology, ichthyology, ornithology, hepetology.

Unit 2:Animal tissues and their types **12hrs**

- Epithelial tissue
  - Definition of tissue and its types.
  - Functions of epithelial tissues i.e. protection, secretion, excretion, absorption, exchange of materials/gases, sensory.
  - Structure, locations and functions of different types of epithelial tissues.
  - Types of epithelial tissue; Simple epithelium, compound epithelium and specialized epithelium (ciliated, germinal, sensory and glandular epithelium)
- Connective tissues
  - Defination of connective tissue and its types.
  - Structural and functional study of different types of connective tissues.
  - Structure, location and function of connective tissue proper (areloar, adipose, tendon and ligament)
  - Structure, location and function of (cartilage and bone)
  - Composition and functions of blood and lymph
- Muscular tissues
  - Definition of muscular tissue and its types.
  - Structure and function of different types of muscular tissues.
  - Location of different types of muscular tissues in different regions of our body.
  - Differences between striated, smooth and cardiac muscles of animals.
- Nervous tissues
  - Definition of nervous tissue and its types.
  - Components of nervous tissue.
  - Structural and functional study of neuron.
  - Types of neurons and their location.
  - Difference between neuron and neuroglia.

Unit 3: Diversity of Animal Life **3hrs**

- Definition of taxonomy, species as a basic unit of classification, systematics, taxon, lower and higher taxa.
- Binomial system of nomenclature adopted by Carolus Linnaeus (1707-1778).
- Selected examples of binomial nomenclature of animals.
- Five kingdom system of classification.
- Chief characteristics and examples of five kingdoms.
- Modern trends in taxonomy.

Unit 4: Economic Zoology **33hrs**

Sub unit 4.1: Hosts and parasites

- Meaning of hosts and parasites

- Common types of hosts and parasites with examples.
- Types of relationships between a host and a parasite.
- Delicate adjustments between hosts and parasites.

Sub-unit4.2: Medically important protozoans

- Systematic position, distribution, habitat, morphology, life cycle, mode of transmission, pathogenic effects and Preventive measures of : Entamoeba histolytica, Plasmodium vivax, and Leishmania donovani
- Miscellaneous Protozoa:
  - Systematic position, distribution, habitat, morphology, mode of transmission, pathogenecity and preventive measures of : Entamoeba gingivalis, Giardia lamblia, Trichomonas vaginalis

Sub-unit4.3: Medically important helminthes

- Distribution, habitat, morphology, life cycle, mode of transmission, pathogenic effects and Preventive measures of: Taenia solium**,,** Ascaris lumbricoides, Schistosoma haematobium, Wuchereria bancrofti.
- Miscellaneous Helminthes
  - Distribution, habitat, morphology, mode of transmission, pathogenecity and preventive measures of: Taenia *s*aginata, *Fasciolopsis* buski**,** *Enterobius* vermicularis, Dracunculus medinensis..

Sub-unit4.4: Medically important arthropods

- Introduction, Classification and public health importance of medically important arthropods.
- Distribution, habit and habitat, morphology, diseases and control measures of :Mangemite (*Sarcoptes scabiei*)**,**Cockroaches (*Periplaneta americana*)**,** Houseflies (*Musca nebulo*)**,** Mosquitoes (*Culex*, *Anopheles* and *Aedes*)**.**
- General concept of integrated vector management (IVM) approaches.

Unit 5: Life Process of Mammals 35hrs

Sub-unit5.1 :Digestive System

- Structure and functions of parts of alimentary canal of human (Mouth, buccal cavity, pharynx, esophagus, stomach, small intestine and large intestine).
- Structure and functions associated digestive glands (salivary gland, liver, pancreas, gastric gland and intestinal gland).
- Enzymatic actions of digestive glands for the digestion of carbohydrates, proteins and lipids.
- Absorption sites and processes of absorption of digested food

Sub unit 5.2: Respiratory System

- Definition and types of respiration in animals.
- Structure and functions of the respiratory organs of human.
- Mechanisms of breathing
- Exchange of gases in lungs and tissue.
- Transport of oxygen and carbondioxide.
- Internal respiration, Bohr effect and Chloride shift.

Sub unit 5.3: Circulatory System

- Definition and types of circulation.
- Structure (external and internal) of the heart of mammals.
- Course of blood circulation in heart.

- Double circulation (systemic and pulmonary circulation).
- Origin, conduction and regulation of heart beat.
- Concept of artificial pacemaker, Blood pressure and cardiac cycle.
- General concept of blood grouping and its significances in human beings

Sub unit 5.4: Excretory System

- Define excretion and excretory system.
- Name the types of excretory organs in mammals such as skin, lungs, liver and kidney.
- List excretory functions of skin, lungs, liver and kidney.
- Describe external and internal structure of a kidney.
- Describe the structure and functions of different parts of nephron.
- Describe the process of urine formation in mammals.
- List composition of urine and mechanism of micturition.
- Explain the homeostatic function of the kidney.

Sub unit 5.5: Reproductive System

- Definition of reproduction and its types - sexual and asexual.
- Structure and functions of male reproductive organs.
- Structure and functions of female reproductive organs.
- Menstruation cycle in female.
- Definition of nervous system.
- Types of nervous system (central, peripheral and autonomous).
- Structure and functions of different parts of brain.
- Transmission of nerve impulses.

Sub-unit 5.6: Nervous system

- Definition of nervous system.
- Types of nervous system (central, peripheral and autonomous).
- Structure and functions of different parts of brain.
- Transmission of nerve impulses.

Sub unit 5.7: Endocrine Glands

- Define endocrine gland and enlist the endocrine glands.
- Structure, location and functions of endocrine glands (pituitary gland, thyroid, parathyroid and adrenal glands)
- Disorders related to the hyposecretion and hypersecretion of various hormones.

Unit 6: Evolution **7hrs**

- Brief description about origin of life.
- Definition and Pattern of organic evolution
- Morphological and anatomical, palaeontological, and biochemical evidences.
- Description of : Lamarckism, Darwinism and Neo-Darwinism (modern synthetic theory of evolution) With examples.
- Summarize the evolution of modern man starting from human ancestors Dryopithecus.

Unit 7: Human health disorders **5hrs**

- Brief description about origin of life.
- Definition and Pattern of organic evolution
- Morphological and anatomical, palaeontological, and biochemical evidences.

- Description of : Lamarckism, Darwinism and Neo-Darwinism (modern synthetic theory of evolution) With examples.
- Summarize the evolution of modern man starting from human ancestors Dryopithecus.

Unit 8: Application of biology **5hrs**

- Definition, types and application of antibiotics, immunity and v**accine** in human health.
- Definition and meaning of organ transplantation.
- Application of organ transplantation, examples of tissue and organ transplantation.
- Definition, brief process, advantage and disadvantage of amniocentesis.
- Definition and brief process of formation of test-tube baby.

Unit 9: Poisonous and nonpoisonous snakes **3hrs**

- Generall characteristics of snakes.
- Characteristics of poisonous snakes in Nepal.
- Distinguish between poisonous and non-poisonous snakes.
- Common poisonous snakes found in Nepal and their geographical distribution.
- Identification between a poisonous snakebite and a non-poisonous snakebite.
- Nature and types of snake venum according to their effects in our body.
- First-aid treatment of snake bite.

Reference Books

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- Arora, D.R. and Arora B. Medical Parasitology. CBS Publisher and Distributors, New Delhi.
- A textbook Chemistry, Surya Publication.
- Lull, R.S. 1926. Organic Evolution. Macmillan, Newyork.
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- Paniker, C.K. 1993. Textbook of Medical Parasitology.Jaypee Brothers Medical Publishers (P) Ltd., New Delhi, India.
- Wilson, Kathleen J.W. and Waugh, A. 1998.Anatomy and Physiology.Churchill Living stone, U.K.
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- Gupta and Malik, Practical Zoology (Invertebrate)
- Gupta and Malik, Practical Zoology (Chordate)

Final written exam marking scheme

unit	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Total**
Unit hours	**2**	**12**	**3**	**33**	**35**	**7**	**5**	**5**	**3**	**105**
Marks	**2**	**9**	**2**	**25**	**27**	**5**	**4**	**4**	**2**	**80**

Zoology (Practical)

Practical 70 hours

- Demonstrate the different parts of simple Microscope
- Observe the general characteristics of following museum specimens:
    - Protozoa:
        - Rhizopoda : - Amoeba, *Entamoeba histolytica*
        - Mastigophora : - *Euglena, Giardia, Leishmania*
        - Ciliata : - *Paramecium, Balantidium*
        - Ciliata : - *Paramecium, Balantidium*
    - Porifera: Sycon
    - Coelenterata: Hydra
    - Platyhelminthes:
    - Cestodes : - Taenia saginata, Taenia solium, Echinococcus granulosus
    - Trematoda : - Fasciola hepatica
    - Nemathelminthes: Ascaris lumbricoides, Enterobious vermicularis, Ancyclostoma duodenale,
    - Annelida: Pheretima (Earthworm), Hirudinaria (Cattle Leech).
    - Arthropoda:
        - Crustacea: - Prawn, Crab.
        - Arachnida: - Scorpion, Spider
        - Myriapoda: - Millipede, Centipede
        - Insecta: - Anopheles and Culex, Pediculus, Cimex.
    - Mollusca:Unio, Limax and Pila
    - Echinodermata: Starfish
    - Chordata:
        - Pisces: - Scoliodon,Labeo rohita
        - Amphibia: - Frog and Toad
        - Reptilit:- Wall Lizard,Tortoise, Viper,Bungarus and Natrix
        - Aves :- Crow and Pigeon
        - Mammalia:- Bat, Rabbit
- Prepare the temporary slides of following material and observe under microscope:
    - Striated muscle, larvae of mosquito, mouth parts of mosquito
- Demonstrate animal tissue through permanent slide.
    - Epithelial tissue: Squamous, Cuboidal and Columnar.
    - Connective tissue: Areolar, Adipose, Blood
    - Muscular tissue: Striated, Smooth and Cardiac
    - Nervous tissue**:** Neuron
- Perform the following biochemical experiment:
    - Detection of sugar in urine sample.
    - Measurement of human blood pressure with the help of sphygmomanometer and stethoscope.
    - Identify the human blood group with the help of antisera.
    - Detection of human blood sugar with the help of glucometer.
- Perform the dissection of mammals
    - digestive, arterial, venous, reproductive, brain through direct observation of the preserved body.
- Demonstrate the Life cycle of Anopheles and Culex mosquitoes and housefly**.**

- Demonstration of chart of different organ systems of human (Alimentary canal, Respiratory organs, Kidney, Heart and mammalian brain).
- Demonstration the chart of lifecycle of *Plasmodium*, *Ascaris*, and *Taenia.*
- Field visit and Report writing (compulsory).