ST. XAVIER'S COLLEGE (AUTONOMOUS), AHMEDABAD

CHOICE BASED CREDIT SYSTEM

B. Sc. ZOOLOGY SYLLABUS

(SEMESTER - V)

B.Sc. ZOOLOGY

PROGRAMME SPECIFIC OUTCOMES

PSO1 Build a reliable foundation of all allied subjects of Zoology, besides classical Zoology itself.

PSO2 Link Zoology to various fields in real life, viz., Parasitology, Entomology, Fisheries, Poultry Science, etc.

PSO3 Student will be able to recognize and appreciate the plethora of fields into which he/she can progress onto, after graduation, viz., Biochemistry, Biotechnology, Bioinformatics, Toxicology, Food & Nutrition, Agriculture, Ethology, Parasitology, Environmental Science, Wildlife, Fisheries, Entomology, etc.

PSO4 With the fundamental knowledge of applied Zoology subjects like Poultry Science, Sericulture, Apiculture, Fishery Science, Wildlife, etc., a zoology student can develop a STARTUP of their own.

PSO5 Create employability, skill development and entrepreneurship.

B. Sc. ZOOLOGY SEMESTER- 5 SYLLABUS (course effective from June - 2025)

1 credit in Theory equals to 1 hour of teaching per week in a semester.
1 credit in practical equals to 2 hours of teaching per week in a semester.

Course	Duration	External Marks	Internal Marks	Total Marks
Theory-Paper ZO- 5501 (Core_1) [Animal Diversity (Non-chordates)] (Theory ; 4 credits)	4 hours	50	50	100
Theory-Paper ZO- 5502 (Core_2) [Animal Biochemistry and Metabolism] (Theory ; 4 credits)	4 hours	50	50	100
Practical-Paper ZO- 5503L (A) & (B) (Core_3) (Basics of Zoology Practicals - V) [Based on Theory Papers ZO- 5501 & ZO- 5502] (Practicals ; 4 credits)	8 hours	50	50	100
Theory-Paper ZO- _____ (Microminor_1) [Essentials of Zoology-1T] (Theory ; 2 credits)	2 hours	25	25	50
Practical-Paper ZO-_____ (Microminor_2) [Essentials of Zoology-1P] (Practical ; 2 credits)	4 hours	25	25	50
Theory-Paper ZO- _____ (Minor_1) [Animal Physiology] (Theory ; 2 credits)	2 hours	25	25	50
Practical-Paper ZO- _____ (Minor_2) [Animal Physiology- Practical] (Practical ; 2 credits)	4 hours	25	25	50
Theory-Paper ZO- 5650 Skill Enhancement Course (SEC) (Online SWAYAM Course) [Animal Biotechnology] (Theory ; 2 credits)	2 hours	25	25	50

INSTRUCTIONS

1. The theory question paper comprises of FOUR/THREE questions.
2. In order to be qualified to appear in the Practical Examinations, the student must submit his/ her duly certified journal during the examinations.
3. Minimum 75% attendance is required for every student to be qualified to appear in any examination.

St. Xavier's College (Autonomous), Ahmedabad
Syllabus of Semester- 5 of the following department under Faculty of Science
based on Under Graduate Curriculum Framework - 2023 to be implemented
From the Academic Year 2025-2026
FACULTY OF SCIENCE
DEPARTMENT OF ZOOLOGY
BSc. (Hons.) ZOOLOGY
Category – IV

Major Course – 1: Animal Diversity (Non-chordates)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credit Distribution of the Course			Eligibility Criteria	Pre-requisite(s) of the course (if any)
	Lecture	Tutorial	Practical		
Animal Diversity (Non-chordates) (ZO-5501)	4	0	0	10 + 2 from a recognized board in any stream	Basic Knowledge of Biology

LEARNING OBJECTIVES (LO)	
LO-1	understand the structural organization of non-chordates
LO-2	Examine the physiological adaptations in non-chordates for respiration, circulation, reproduction, and locomotion.
LO-3	Compare body plans (e.g., symmetry, coelom, segmentation) across non-chordate phyla
Course OUTCOMES (CO)	
On Completion of this course, the student will be able to	
CO-1	learn the anatomical adaptative features in non-chordates
CO-2	know key nonchordates with their general characteristics

Unit I ***TYPE STUDY : LEUCOSOLENIA & SHEEP LIVER FLUKE***

A. General structure & morphology with functional anatomy of the following animal**:**

*Porifera***:** Type – *Leucosolenia* - Classification, Habits & Habitat, Ext. characters, Histology of Body wall, L.S. of *Leucosolenia*, Reproduction & Development.

1. General structure & morphology with functional anatomy of the following animal Platyhelminthes**:** Type – **Sheep Liver Fluke** (*Fasciola hepatica*)– Classification, Habits & Habitat, Ext. characters, Histology of Body Wall, Digestive system, Excretory system, Respiration, Nervous system, Reproductive systems & Reproduction.

Unit II ***TYPE STUDY: SCORPION & GENERAL TOPICS OF NONCHORDATES***

A. General structure & morphology with functional anatomy of the following animal**:** Arthropoda: Type – **Scorpion** – Classification, Habits & Habitat, Ext. characters, Digestive system, Book-lungs, Circulatory system, Excretory organs, Nervous system, Sense organs and Reproductive systems.

B. General topics**:**

2. *Porifera*: Skeleton and Canal systems
3. *Coelenterata*: Polymorphism
4. *Platyhelminthes*: Parasitic adaptations
5. *Annelida*: Nephridia & Coelomoducts

Unit III ***TYPE STUDY: CUTTLEFISH AND GENERAL TOPICS OF NONCHORDATES***

A. General structure & morphology with functional anatomy of the following animal: Mollusca: Type - **Cuttlefish** (*Sepia officinalis*) - Classification, Habits & Habitat, External Characters, Digestive System, Respiratory system, Circulation system, Excretory system, Nervous system, Sense organs and Reproductive systems.

B. General topics :

1. *Arthropoda*: Crustacean larvae
   Mouthparts of Housefly, Mosquitoes and Honey bee
2. *Mollusca*: Foot, Torsion & Detorsion.

Unit IV ***TYPE STUDY: STARFISH AND GENERAL TOPICS OF NONCHORDATES;***

A. General structure & morphology with functional anatomy of the following animal : Echinodermata: Type- **Starfish** (*Asterias*) - Classification, Habit & Habitat, External Characters, Body wall, Digestive system, Water vascular system, Reproductive system

B. General topics :

1. *Echinodermata*: Larval forms
2. *Minor phyla*: General characters with suitable examples of Phoronida, Brachiopoda and Echiuroidea

Reference Books for **Units I, II, III & IV:**

1. **Textbook of Invertebrates**, R. L. Kotpal, Rastogi Publications, Meerut.
2. **Manual of Zoology**, E. K. Ayyer, Vol. I & II.
3. **Invertebrate Zoology**, Jordan and Verma, S. Chand & Company, Delhi.

Major Course – 2:

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credit Distribution of the Course			Eligibility Criteria	Pre-requisite(s) of the course (if any)
	Lecture	Tutorial	Practical		
Animal Biochemistry and Metabolism (ZO-5502)	**4**	**0**	**0**	**10 + 2 from a recognized board in any stream**	**Basic Knowledge of Biology**

LEARNING OBJECTIVES (LO)	
LO-1	Grasp the chemical properties of biomolecules and how these properties influence molecular interactions and reactions within biological systems
LO-2	Understand major biochemical pathways and processes, such as metabolism, enzyme kinetics, and genetic information flow.
Course OUTCOMES (CO)	
On Completion of this course, the student will be able to	
CO-1	Apply quantitative methods to describe, evaluate, and model biological processes
CO-2	Understand the interdisciplinary nature of biochemistry, integrating concepts from chemistry, biology, and physics to explain the molecular basis of life.

Unit I ***CARBOHYDRATES*****:**

1. Asymmetry, Isomers, Optical isomerism and Mutarotation.
2. Introduction, definition and classification of Carbohydrates.
3. **Monosaccharides:**

Definition, General formula, Classification upto Hexoses (with structures of suitable examples) Ring/Cyclic structures (Fischer & Haworth)

Chemical properties**:**

a) Reaction involving glycosidic –OH group.
b) Reaction involving alcoholic –OH group (Etherification).
c) Reactions involving both, glycosidic as-well-as alcoholic –OH groups (Esterification).
d) Reactions involving both, –OH as-well-as –CHO/-C=O groups
e) Oxidation**:** Sugar acids (Oxidation with metal hydroxides).
f) Reduction**:** Reaction with sodium amalgam, Reaction with dilute alkalis.
g) Osazone formation **:** Reaction with phenyl hydrazine.

3. **Disaccharides:**
   - Definition
   - Flow-chart of classification, based upon the type of glycosidic linkages.
   - Occurrence, formation, structure and general properties of Maltose, Lactose, Cellobiose and Sucrose.
4. **Polysaccharides:**
   - Definition
   - Flow-chart of classification, based upon structures and functions.
   - Occurrence, formation, structure and general properties of **:**
     a) Homopolysaccharides – Starch, Glycogen, Cellulose and Chitin.
     b) Heteropolysaccharides – Mucopolysaccharides **:** Hyaluronic acid, Chondrotin, Chondroitin sulphate.
5. Biological significance of Carbohydrates.

Unit II ***LIPIDS*****:**

1. Introduction and definition.
2. **Components:**
   a) Alcohols
   b) Fatty acids
3. **Types of Fatty Acids:**
   a) *Saturated acids***:** Butyric, Palmitic, Stearic and Arachidic.
   b) *Unsaturated acids***:** Monoethenoid, Diethenoid, Triethenoid and Tetraethenoid.
4. **Classification of Lipids:**
   a) *Simple***:** i. Triglycerides (Fats) ii. Waxes (*Formulae not required*)
   b) *Compound***:** Phospholipids**:** Phosphoglycerides**:**
      i. Lecithin
      ii. Cephalins
      iii. Plasmalogens
   c) Derived Lipids**:** Steroids(Basic steroid nucleus and Cholesterol only).

5. **Properties:**
   a) *Physical* - Colour, Odour, Taste, Solubility, Melting point, Specific gravity, Insulation and Emulsification.
   b) *Chemical* - Reactions involving –COOH group
      i) (Hydrolysis, Saponification and Hydrolytic rancidity)
      ii) Reactions involving double bonds (Hydrogenation, Halogenation and Oxidative rancidity).
6. Significance of Lipids.

Unit III *ENZYMES*:

1. Nomenclature & Classification
2. Chemical nature of enzymes
3. Mechanisms of enzyme action
4. Factors affecting enzyme activity/enzyme catalysed reaction **:**
   a) Temperature
   b) pH
   c) Inhibitors
   d) Enzyme concentration
   e) Substrate concentration
5. Some clinically important enzymes
   Serum acid phosphatase, Serum alkaline phosphatase, SGOT, SGPT, LDH, Serum creatine phosphokinase, Serum amylase, Serum lipase and Serum isocitrate dehydrogenase

Unit IV *METABOLISM*:

A. *Metabolism of Carbohydrates*:

1. Glycogenesis (structures not required)
2. Glycogenolysis (structures not required)
3. Glycolysis (EM Pathway) (structures required)
4. Krebs Cycle (structures required)
5. ETS (structures not required)
6. Gluconeogenesis (structures not required)
7. HMP Shunt Pathway (structures required)

B. *Metabolism of Proteins*:

1. Deamination
2. Transamination
3. Decarboxylation
4. Urea synthesis (structures required)

C. *Metabolism of Lipids*:

1. Glycerol metabolism (structures not required)
2. Fatty acid metabolism**:**
   β-oxidation of saturated fatty acids (structures required).

***Reference Books for* Units I, II, III & IV :**

1. **Elementary Biochemistry,** J. L. Jain, S. Chand & Company, Delhi.
2. **Biochemistry,** L. Stryer, Freeman.
3. **Harper's Biochemistry,** Lange, McGraw-Hill.
4. **Principles of Biochemistry,** Lehninger, CBS Publications.

PAPER ZO-5503L (A)

CO1 learn anatomy of nonchordates of major phyla
CO2 learn the peculiarities of nonchordates (*Based on Theory Paper ZO-5501*)

1. ***ANIMAL DIVERSITY*** **(Nonchordates):**
   *Study of Leucosolenia by charts/models/specimens/ppt***:**
   1. W.M. of *Leucosolenia*
   2. L.S. of *Leucosolenia*
2. ***ANIMAL DIVERSITY*** **(Nonchordates):**
   *Study of Sheep Liver Fluke by charts/models/specimens/ppt***:**
   1. WM of liver fluke
   2. T. S. through body wall of liver fluke
   3. Reproductive systems of liver fluke
   4. Life cycle of liver fluke (larvae)
3. ***ANIMAL DIVERSITY*** **(Nonchordates):**
   *Study of Scorpion by charts/models/specimens/ppt***:**
   1. External characters of scorpion
   2. Digestive system of scorpion
   3. Nervous system of scorpion
   4. Male reproductive system
   5. Female reproductive system
   6. Book lungs and Pectine
4. ***ANIMAL DIVERSITY*** **(Nonchordates):**
   *Study of Cuttle fish by charts/models/specimens/ppt***:**
   1. Study of external characters.
   2. Study of Digestive system
   3. Study of Nervous system
   4. Jaws, Spermatophore, Cuttle bone
5. ***ANIMAL DIVERSITY*** **(Nonchordates):**
   *Study of Starfish by charts/models/specimens/ppt***:**
   1. Study of external characters
   2. Study of Water-vascular system
   3. Tube feet
6. ***ANIMAL DIVERSITY*** **(Nonchordates):**
   *Study by charts/models/specimens/ppt to study peculiarities of***:**
   Canal systems in Porifera, Spicules, Porpita, Physalia, Obelia (W.M. & Medusa), Crustacean larvae(Nauplius, Zoea, Megalopa), Echinoderm larvae(Bipinnaria, Brachiolaria, Echinopluteus, Ophiopluteus, Auricularia, Doliolaria), Bonelia, Lingula, Phoronis.

PAPER ZO-5503L(B)

(*Based on Theory Paper ZO-5502*)

CO1 gain proficiency basic laboratory methodologies in biochemistry.
CO2 apply their scientific knowledge to biochemistry experimentations.
CO3 demonstrate excellent critical thinking abilities to interpret their experimental data

1. ***CARBOHYDRATES*****:**
   Detection of carbohydrates**:**
   Monosaccharides – Glucose and Fructose
   Disaccharides - Lactose, Maltose and Sucrose

2. ***PROTEINS*:**
   Detection of Proteins – Albumin and Casein
3. ***LIPIDS*:**
   Study by charts/ppt of:
   - Basic steroid nucleus and Cholesterol
4. ***COLORIMETRIC ESTIMATION OF*:**
   - Proteins (Preparation of Std. Curve by Biuret method)
   - Glucose (Nelson-Somogyi method)

   Cholesterol in Serum (Ferric chloride method). -Creatinine in urine.
5. ***PREPARATION OF ATOMIC MODELS OF CARBOHYDRATES*:**
   - Acyclic as-well-as all cyclic structures of Ribose, Arabinose, Ribulose, Glucose, Mannose, Galactose, Fructose and Tagatose.
   - Maltose, Lactose and Sucrose.
6. ***PREPARATION OF ATOMIC MODELS OF LIPIDS*:**
   - Glycerol, Butyric acid, Crotonic acid, Tributyrin, Lecithins, Cephalins
7. ***ENZYMES*:**
   Study by charts/ppt of:
   Factors affecting enzyme activity:
   1. Temperature
   2. pH
   3. Graph showing effect of [S] on the velocity of an enzyme catalysed reaction
8. ***METABOLISM*:**
   Study by charts/ppt of:
   1. Glycogenesis (structures not required).
   2. Glycogenolysis (structures not required).
   3. Glucogenesis (structures required).
   4. Gluconeogenesis (structures not required).
   5. Glycolysis (EM Pathway) (structures required)
   6. Krebs Cycle (structures required).
   7. ETS (structures not required).
   8. HMP Shunt Pathway (structures required).
   9. Urea synthesis (structures required).
   10. β-oxidation of saturated fatty acids (structures required).

Micro Minor Course – 1: Esssentials of Zoology-1T (Theory)

PAPER ZO-

(Essentials of Zoology-1T)

Micro minor Paper (For Zoology major students)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credit Distribution of the Course			Eligibility Criteria	Pre-requisite(s) of the course (if any)
	Lecture	Tutorial	Practical		
Essentials of Zoology-1T	2	0	0	10 + 2 from a recognized board in any stream	Basic Knowledge of Biology

LEARNING OBJECTIVES (LO)	
LO-1	learn abiotic and biotic factors and characteristics of freshwater and marine ecosystems; learn ecological adaptations in animals
LO-2	learn sources and impact of environmental pollution on animals
LO-3	Understand physiology of human reproduction
LO-4	Study structure of human muscles and mechanism of muscle contraction
Course OUTCOMES (CO)	
On Completion of this course, the student will be able to	
CO-1	explain: i. role of components of ecosystem ii. structural and physiological adaptations in animals
CO-2	able to critically analyze changes in environment and their harmful effects
CO-3	Understand process of human reproduction
CO-4	Learn functioning of muscles in human body

Unit I ECOLOGY

A) *Adaptations***:**

Arboreal, Cursorial, Volant, Desert and Deep sea.

B) *Marine Ecosystem***:**

1. Physico-chemical aspects of Marine Environment**:** Light, Temperature, Pressure, Salinity, Currents and Tides.
2. Zonations in Marine Environment/Sea.
3. Biodiversity in Rocky shore and Sandy shore.

C) *Fresh water ecosystem***:**

a) Characteristics **:** Salinity, pH, Water current, Transparency, O_2, CO_2, Pressure, Density, Light, Temperature and Thermal stratification (Summer & Winter stratifications).

b) Lentic system **-** Ponds**:** Characteristics, Types, Zonations, Flora and Fauna.
Lakes**:** Characteristics, Types.

c) Lotic system **-** Rivers**:** Characteristics (Current, Land-water interchange, Oxygen)
Zonations (Flowing-water, Rapid/Riffle, Pool zones)
Types of river-beds (Eroding, Depositing, Sandy).

***Reference Books for* Unit I :**

1. **Fundamentals of Ecology**, P. S. Odum, Saunders.
2. **Concepts of Ecology**, N. Arumugam, Saras Publication, Nagercoil.
3. **Ecology and Environment**, P. D. Sharma, Rastogi Publications, Meerut.
4. **Ecology**, Ricklefs. W. H. Freeman.
5. **Concepts of Ecology**, 4th Edition, E. J. Kormondy, Prentice-Hall of India.

Unit II ENVIRONMENTAL POLLUTION

A) Various pollutants & their effects on animal life

1. Air pollutants:
   a) Gaseous - CO, SO_2, NO_2.
   b) Particulate - Dust, Lead, Aerosol.
2. Water pollutants:
   Biological organisms (bacteria & protozoa), acids, alkalies, dyes, hydrogen sulphide, pesticides, fertilizers, toxic metals (Fluoride, Hg, Arsenic), faeces, domestic wastes, and suspended matters.

3. Soil/Land Pollutants:
   a) Industrial solid wastes - Toxic metals like Cu, Pb, Ni.
   b) Urban wastes - Garbage, paper, glasses, metal cans, plastics, faeces.
   c) Agricultural sources - Wastes from cattle sheds & poultry farms, fertilizers, pesticides and fumigants.
4. Radioactive Pollution
5. Noise Pollution

***Reference Book for* Unit II**

1. **Environmental Pollution (Popular Science)**, N. Manivasakan, National Book Trust, New Delhi.
2. **Ecology and Environment**, P. D. Sharma, Rastogi Publications, Meerut.

Unit III *HUMAN PHYSIOLOGY – REPRODUCTION*

1. Role of male sex hormones in men
2. Role of female sex hormones in women
3. Constituents of normal semen
4. T.S. of uterus
5. Menstrual cycle
6. Menopause

Unit IV *HUMAN PHYSIOLOGY – MUSCLE CONTRACTION:*

a. T.S. of a skeletal muscle
b. Histology of a striated muscle fibre
c. Motor unit
d. NMJ
e. Mechanism of muscle contraction and relaxation

***Reference Books for* Units III & IV:**

1. **Principles of Anatomy and Physiology,** Tortora and Anagnostakos, HarperCollins College Publishers, 4th Edition.
2. **Animal Physiology and Related Biochemistry**, H. R. Singh, Shobhan Lal Naginchand & Co. Edu. Pub., Jalandhar.
3. **Textbook of Animal Physiology**, A. K. Berry, Emkay Pub., New Delhi.

Micro Minor Course – 1: Esssentials of Zoology-1P (Practical)

PAPER ZO-_____

(Essentials of Zoology-1)

Micro minor Paper (For Zoology major students)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credit Distribution of the Course			Eligibility Criteria	Pre-requisite(s) of the course (if any)
	Lecture	Tutorial	Practical		
Essentials of Zoology-1P (ZO-)	0	0	4 Hours	10 + 2 from a recognized board in any stream	Basic Knowledge of Biology

1. ECOLOGY **:**

A) *Ecological adaptations of the following animals according to their habitat***:**

Adaptations		**Animals**
Sedentary & Fixed Animals	:	Sponges, Gorgonia
Tubeworms	:	Arenicola, Sabella
Planktons	:	Daphnia
Nectons	:	Fish, Prawn
Benthic	:	Solefish, Sting rayfish
Arboreal	:	Hyla, Squirrel
Burrowing	:	Snake, Hedgehog
Flying	:	Bird, Bat.

B) *Study by charts of***:**

Summer & Winter Thermal stratifications in Fresh water ecosystems

2. ***POLLUTION*****:**

Titrimetric Estimations of **(***in water samples***):**

- Acidity, Alkalinity (using Phenolphthalein and Methyl Orange indicators), Calcium hardness (using Murexide indicator), Total hardness (using Eriochrome Black T indicator), Dissolved oxygen.

3. ***HUMAN PHYSIOLOGY*** **– Reproduction:**

*Study by charts/ppts of***:**

1. T.S. of uterus
2. Menstrual cycle
3. Molecular structures of Testosterone, Estrogen and Progesterone

4. ***HUMAN PHYSIOLOGY*** **– Muscle contraction:**

*Study by charts/ppts of***:**

1. T. S. of muscle
2. Ultrastructure of sarcomere
3. Ultrastructure of Neuro-muscular junction

Minor Course – 1: Animal Physiology (Theory)

PAPER ZO-_____

(Animal Physiology)

Minor Paper (For Botany major students)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credit Distribution of the Course			Eligibility Criteria	Pre-requisite(s) of the course (if any)
	Lecture	Tutorial	Practical		
Animal Physiology (ZO-5101T)	2	0	0	10 + 2 from a recognized board in any stream	Basic Knowledge of Biology

LEARNING OBJECTIVES (LO)	
LO-1	understand principles and process of urine formation in human body
LO-2	study mechanism of digestion
LO-3	Study basic structure and types of neurons
LO-4	to know how neurons works in human body

Course OUTCOMES (CO)	
On Completion of this course, the student will be able to	
CO-1	explain mechanism of urine formation and digestion in human body
CO-2	Explain functioning of neurons and role of neurotransmitters in human body

Unit 1 Anatomy of human kidneys

1. Location
2. Gross anatomy
3. V. S. of human kidney
4. *The Nephron*:
   -Basic structure and parts of nephron
   -Ultrastructure of nephron

Unit 2 Renal Physiology

A. Physiology of urine formation

a) Glomerular filtration / Ultrafiltration:
   - Filtration membrane
   - Net Filtration pressure
   - Glomerular filtration rate

b) Tubular reabsorption & Secretion :
   - Reabsorption and Secretion in the Proximal Convoluted Tubule
   - Reabsorption in Loop of Henle
   - Reabsorption and Secretion in the Collecting Duct

B. Characteristics of Urine

1. *Physical characteristics of normal urine:*
   a) Volume
   b) Appearance
   c) Turbidity
   d) Odour
   e) pH
   f) Specific gravity
2. *Chemical composition of normal urine:*
   a) Water
   b) Electrolytes
   c) Urea
   d) Uric acid
   e) Creatinine
3. *Physical characteristics of abnormal urine:*
   a) Appearance
   b) Specific gravity
   c) Blood and tissue cells
   d) Odour
   e) pH
   f) Cast
4. Abnormal constituents of urine:
   a) Protein b) Carbohydrates c) Fat d) Ketone bodies
   e) RBC and WBC f) Bilirubin g) Urobilinogen h) Acetone
   i) Pus j) Urinary calculi k) Microbes

Unit 3 Physiology of Digestion

-Digestion of Carbohydrates, Proteins and Lipids

-Absorption of Monosaccharides, Amino acids, Fatty acids and Glycerol

Unit 4 Physiology of nervous system

1. Structure of neuron
2. Types of neurons
3. Conduction/Propagation/Transmission of nerve impulse:
   - A) Conduction in a nerve-fibre
     - along a non-myelinated neuron
     - along a myelinated neuron
   - B) Transmission through a synapse
4. Neurotransmitters:
   - Acetylcholine, Epinephrine, Nor-epinephrine, Dopamine.

Minor Course – 1: Animal Physiology (Practical)

PAPER ZO-_____

(Animal Physiology)

Minor Paper (For Botany major students)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credit Distribution of the Course			Eligibility Criteria	Pre-requisite(s) of the course (if any)
	Lecture	Tutorial	Practical		
Animal Physiology (ZO-5101T)	2	0	0	10 + 2 from a recognized board in any stream	Basic Knowledge of Biology

LEARNING OBJECTIVES (LO)	
LO-1	Learn concepts of physiology of urine formation and digestion
LO-2	Understand conduction of nerve impulse
Course OUTCOMES (CO)	
On Completion of this course, the student will be able to	
CO-1	learn urine analysis by performing biochemical tests
CO-2	Demonstrate process of digestion of starch
CO-3	Understand structure and functioning of neurons

1. *HUMAN URINE ANALYSIS*

A) *Physical analysis*:

- Colour appearance, odour, deposits if any.
- Determination of pH and Specific gravity

B) *Chemical analysis*:

a) Detection of abnormal constituents in urine: Sugar, Proteins, Bile salts, Ketones (Rothera's test), Urea (using soyabean powder) and Creatinine (Jaffe's test).

2. ***HUMAN URINARY SYSTEM***

*Study by permanent slides/charts of***:**

a) V.S. of kidney
b) Renal corpuscle
c) Juxta glomerular apparatus

3. Physiology of Digestion

- Digestion of starch by human amylase

4. Study of the structure and types of neurons:

A) Unipolar, Bipolar, Multipolar, Non-myelinated and Myelinated neurons

B) Study of conduction of nerve impulse by charts:

- Propagation in non-myelinated nerve-fibre
- Propagation in myelinated nerve-fibre
- Transmission through synapse

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