

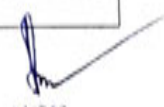


**DEPARTMENT OF ZOOLOGY, TURA GOVERNMENT COLLEGE
DISTRIBUTION OF SYLLABUS FOR ODD AND EVEN SEMESTERS, 2023-2024**

FYUG I SEMESTER ZOO- 100 (Taxonomy and Animal Diversity)

SL. No.	NAME	UNIT	TOPIC
1.	Smt Verlia Semchi G. Momin	II	Salient features and classification of the following phyla up to class with example of representatives from each class: Arthropoda and Mollusca Annelida: Leech – Morphology, digestive and urinogenital systems. Arthropoda: Cockroach – Morphology, digestive, respiratory, excretory and reproductive systems. Mollusca: Pila – Morphology, digestive, respiratory, excretory and reproductive systems.
2.	Shri. Taseng K. Marak	I, II	Taxonomy: Definition of taxonomy phylogeny, systematics, category, taxon, classification, nomenclature; Biological species concept; Taxonomic hierarchy; Binominal nomenclature. Seven-kingdom classification of organisms according to Michael A. Ruggiero et al., (2015) which include Archaea, Bacteria, Protozoa, Chromista, Fungi, Plantae, and Animalia. Salient features and classification of kingdom Protozoa up to phylum with example of representatives from each phyla. Salient features and classification of the following phyla up to class with example of representatives from each class: Nematoda, Annelida.
3.	Dr. Silme D. Shira	II, III	Salient features and classification of the following phyla up to class with example of representatives from each class: Onychophora. Onychophora: <i>Peripatus</i> –Morphology. Pisces: Labeo – Morphology, digestive and respiratory systems. Rabbit: Type Study – Morphology, digestive and respiratory systems, circulatory, urinogenital and nervous systems
4.	Dr. Grimchi T. Sangma	II	Protozoa: Paramecium-Morphology and reproduction; Salient features and classification of the following phyla up to class with example of representatives from each class: Porifera, Cnidaria, and Platyhelminthes Porifera: Sycon- Morphology and canal systems. Cnidaria: Obelia – Morphology and reproduction. Platyhelminthes: Taenia solium – Morphology and the life cycle. Nematoda: Ascaris lumbricoides – Morphology and life cycle.


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5.	Smt. Cordelia P. Warbah	II III	Introduction to Minor Phyla. Salient features and classification of the following phyla up to class with example of representatives from each class: Echinodermata, Hemichordata, and Chordata. Hemichordata: Morphology of <i>Balanoglossus</i> Cephalochordata: Morphology of <i>Amphioxus</i> Urochordata: Morphology of <i>Ascidia</i> Cyclostomata: <i>Petromyzon</i> - Morphology
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NON- NEP III SEMESTER (Paper 3A) Animal Physiology, Endocrinology and Biochemistry

SL. No.	NAME	UNIT	TOPIC
1.	Smt. Verlia Semchi G. Momin	III	Structure and functions of adrenals, testis and ovary. Introduction to neuroendocrine system in insects. Nucleic acids: Nucleosides, nucleotides and polynucleotides; Double helical structure of DNA and structure of RNA.
2.	Shri Taseng K. Marak	V	Enzymes: Properties, classification and nomenclature; Active site and mechanism of enzyme action; Factors affecting enzyme activity; Co-factors and co-enzymes.
3.	Dr. Silme D. Shira	II	Ultrastructure of neuron; Nerve impulse conduction and synaptic transmission; Reflex action. Ultrastructure of skeletal muscle; Mechanism of skeletal muscle contraction.
4.	Dr. Grimchi T. Sangma	I	Physiology of digestion and absorption of carbohydrates, proteins and lipids; Vitamins: Types, sources and their significance. Respiration: Breathing and gaseous exchange in vertebrate lung. Composition and functions of blood; Types of heart in vertebrates.
5.	Smt. Cordelia P. Warbah	IV	Classification and significance of carbohydrates, proteins and lipids. Amino acids: Essential and non essential. Glycolysis and TCA cycle; β -Oxidation of fatty acids.
6.	Susan J. Nongkynrih	III	Structure and functions of major endocrine glands: Hypothalamus, Pituitary, Thyroid, Parathyroid, Pancreas
7.	Smt. Chesime M. Sangma	II	Structure of mammalian kidney and nephron; Physiology of urine formation. Structure of mammalian heart.

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NON- NEP V SEMESTER (PAPER V A) (Functional Anatomy, Zoogeography and Adaptations)

SL. No.	NAME	UNIT	TOPIC
1.	Verlia Semchi G. Momin	IV	Aves: Flight adaptations and migration in birds. Mammalia: Affinities of Monotremata and Marsupialia; Dentition in mammals. Comparative anatomy of kidney in vertebrates.
2.	Taseng K. Marak	II	Onychophora: General organisation and affinities. Arthropoda: Types of mouthparts and feeding in insects; Vision in insects. Mollusca: Torsion and Detortion in Gastropoda. Echinodermata: Comparative study of water vascular system.
3.	Dr. Silme D. Shira	I	Protozoa: Locomotion and nutrition Porifera: Canal and Skeletal systems Cnidaria: Polymorphism in <i>Siphonophora</i> ; Corals and coral reefs. Morphological and physiological adaptations of parasitic helminthes. Annelida: Excretory system.
4.	Grimchi T. Sangma	V	Zoogeography: Concepts and Zoogeographic realms. Patterns and regulation of behaviour: genetic and hormonal; Colouration and mimicry. Adaptations in vertebrates: Aquatic, desert, arboreal, cursorial and deep sea adaptations.
5.	Cordelia P. Warbah	III	Hemichordata: Affinities of <i>Balanoglossus</i> Protochordata: Affinities of <i>Amphioxus</i> Retgressive metamorphosis in <i>Ascidia</i> Agnatha: Comparative study of <i>Petromyzon</i> and <i>Myxine</i> .
6.	Susan J. Nongkynrih	III IV	Pisces: Scales and fins in fishes; Accessory respiratory organs; Migration of fishes. Dipnoi: General characters and affinities. Amphibia: Parental care. Reptilia: Poisonous and non-poisonous snakes; Poison apparatus and mechanism of biting.


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NON- NEP V SEMESTER (PAPER VI A) (Cell & Molecular Biology and Genetics)



SL No.	NAME	UNIT	TOPIC
1.	Verlia Semchi G. Momin	III	Sex determination in man; Genetic disorders in man- Down's, Turner's and Klinefelter's syndromes, Phenylketonuria, Hemophilia.
2.	Taseng K. Marak	I	Genome organisation in virus, bacteria and eukaryotes; Central dogma of molecular biology; DNA replication in prokaryotes; Transcription and translation in prokaryotes; Genetic code. Regulation of gene expression in prokaryotes: <i>lac</i> operon
3.	Dr. Silme D. Shira	II	Fine structure of gene: Cistron, recon and muton; Split genes and overlapping genes; Transposons. Gene mutation: Types and mutagenic agents; DNA damage and repair. Detection of mutation in <i>Drosophila</i> (Muller's CIB method).
4.	Dr. Grimchi T. Sangma	IV	Humoral and cell-mediated immunity; Characteristics of antigens; Antibodies: Structure, classes and functions; Antigen-antibody interaction; Major histocompatibility complex; Introduction to cytokines.
5.	Smt. Cordelia P. Warbah	III	Extra-nuclear inheritance; Kappa particles in <i>Paramecium</i> . Sex-linked inheritance in <i>Drosophila</i> (eye colour) and man (colour blindness); Dosage compensation and Lyon's hypothesis. Non-disjunction of sex chromosomes in <i>Drosophila</i> ; Human karyotype.
6.	Smt. Susan J. Nongkynrih	V	Principles and applications of biological techniques: Light and electron microscopy; Centrifugation; Chromatography (paper, gel filtration and ion-exchange)


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FYUG I SEMESTER ZOO- 100 PRACTICAL

Teachers: Smt. Dr. Silme D. Shira and Smt. Chesime M. Sangma

Unit-IV:

1. Dissection

Dissection of Prawn - nervous system; b) Dissection of Prawn - statocysts; c) Dissection of *Channa/Labeo*/common carp - digestive system; d) Dissection of *Channa/Labeo*/common carp - reproductive system.

2. Mounting

General protocol for preparation of permanent mount; b) Permanent mount of: *Obelia* colony, parapodium of *Nereis*, gemmules of sponge, and cycloid scale of fish.


3. Museum Specimens

(Preferably representatives from the different classes/orders of the phylum. The number within the brackets indicates the minimum number of specimens to be studied).

Protozoa whole mount (2); b) Porifera (2); c) Cnidaria (3); d) Platyhelminthes (2); e) Nematoda (1); f) Annelida (3); g) Onychophora (1); h) Arthropoda (5);

Mollusca (5); j) Echinodermata (3); k) Hemichordata (1); l) Cephalochordata (1); m) Urochordata (1); n) Agnatha (1); o) Pisces (4); p) Amphibia (3); q) Reptilia (3); r) Aves (2); s) Mammalia (3).


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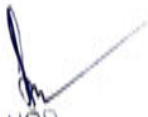


PAPER 3B (Animal Physiology, Endocrinology and Biochemistry)

Teachers: Smt. Cordelia P. Warbah and Smt. Susan J. Nongkynrih

1. Preparation of haemin crystals from human blood.
2. Determination of clotting time of human blood.
3. Oxygen consumption in fish with reference to body weight.
4. Study of histology of endocrine glands from permanent slides (pituitary, thyroid, thymus, pancreas, adrenal, testis and ovary).
5. Detection of carbohydrates, lipids and proteins (at least 3 tests each)
6. Estimation of ascorbic acid by titration method.


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PAPER 5B (Functional Anatomy, Zoogeography and Adaptations)

Concerned teachers: Taseng K. Marak & Dr. Grimchi T. Sangma

A. Dissections:

1. Nervous system in prawn/earthworm
2. Accessory respiratory organs in teleost fish.
3. Digestive system in Clarias
4. Reproductive system in Clarias

B. Mounting (Permanent):

1. Cyclops
2. Setae of earthworm
3. Spicules of sponge
4. Scales (cycloid, ctenoid and placoid) of fishes.
5. Feathers of birds (filoplumes, down feathers, barbs and barbules).

C. Study of permanent slides and specimens:

1. Histology: T/S of stomach, intestine, liver, kidney, spleen and gonads of fish/aves/mammals
2. Permanent slides of representatives from Protozoa to Echinodermata (sections and whole mounts).
3. Adaptive modifications of beak and feet in birds using charts and models.

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PAPER 6B (Cell & Molecular Biology and Genetics)

Concerned teachers: Taseng K. Marak & Dr. Grimchi T. Sangma

1. Separation and identification of amino acids by paper chromatography.
2. Demonstration of antigen-antibody interaction in vitro: Single radial immune-diffusion in agarose gel.
3. Study of nucleic acids from models/charts.
4. Colorimetric estimation of DNA and RNA.
5. Preparation and identification of meiotic stages from grasshopper testis.
6. Karyotyping of normal human chromosomal complement from supplied photographic plates.
7. Karyotyping of chromosomal complement of Down's/ Turner's/ Klinefelter's syndrome from supplied photographic plates.
8. Demonstration of electrophoretic separation of DNA/protein.

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NEP FYUG II SEMESTER ZOO-150: (Functional and Comparative Anatomy)

SL. No.	NAME	UNIT	TOPIC
1.	Smt. Verlia Semchi G. Momin	III	Pisces: Scales and fins in fishes; Accessory respiratory organs. Amphibia: Comparative study of the morphological features of the three orders. Reptilia: Venomous and non-venomous snakes; Poison apparatus and mechanism of biting. Aves: Comparative study of Flight and flightless birds.
2.	Shri. Taseng K. Marak	I, III	Arthropoda: Comparative study of respiratory systems. Mollusca: Torsion and detorsion in Gastropoda. Echinodermata: Comparative study of water vascular system. Mammalia: Affinities of Monotremata, Affinities of Marsupialia, and dentition in mammals.
3.	Dr. Silme D. Shira	I	Protozoa: Locomotion and nutrition. Porifera: Canal system and skeletal systems. Cnidaria: Polymorphism in Siphonophora; Corals and coral reefs. Annelida: Excretory system.
4.	Dr. Grimchi T. Sangma	II	Hemichordata: Affinities of <i>Balanoglossus</i> . Cephalochordata: Affinities of <i>Amphioxus</i> . Urochordata: Retrogressive metamorphosis in <i>Ascidia</i> . Agnatha: Comparative study of <i>Petromyzon</i> and <i>Myxine</i>
5.	Smt. Chesime M. Sangma		Comparative anatomy of kidney in vertebrates. Comparative anatomy of heart in vertebrates. Comparative anatomy of respiratory organs (skin, gills, lungs, and air sacs) in vertebrates.


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NON- NEP IV SEMESTER (Paper 4 A) (Developmental biology, Ecology and Economic Zoology)

SL. No.	NAME	UNIT	TOPIC
1.	Smt. Verlia Semchi G. Momin	IV	Pisciculture: Culturable fish species of India; Culture and management of fish with reference to composite fish culture; Induced breeding. Sericulture: Different species of silk moth; Life history of Bombyx mori and methods of culture; Products of sericulture and its economic importance.
2.	Shri. Taseng K. Marak	III	Ecological niche. Population: Growth and regulation. Concepts of biotic community. Inter and intraspecific interactions. Resources (renewable and non-renewable) and their management. Environmental pollution (air, water and soil).
3.	Dr. Silme D. Shira	V	Apiculture: Species of honey bees; Life history and social organisation; Methods of bee keeping, economic importance.
4.	Dr. Grimchi T. Sangma	I	Process of blastulation, fate map and Gastrulation in frog upto the formation of three germ layers; Metamorphosis in insects and frog.
5.	Cordelia P. Warbah	II	Ecology: Concepts, subdivisions, scope and importance; Levels of organisation in the biosphere. Structure of ecosystem- Ecological factors (biotic and abiotic); Trophic structure: Food chains, food webs and energy flow; Trophic relationships- ecological pyramids. Productivity.
6.	Smt. Susan J. Nongkynrih	I	Gametogenesis: Spermatogenesis and oogenesis; Fertilisation; Parthenogenesis. Types of eggs; Cleavage and Types of cleavage.
7.	Smt. Chesime M. Marak	V	Integrated pest management (Physical, chemical, hormonal and biological).


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NON- NEP VI SEMESTER (Paper 7A) (Biochemistry, Animal Physiology and Endocrinology)

SL. No.	NAME	UNIT	TOPIC
1.	Smt. Verlia Semchi G. Momin	V	Reproductive cycles (estrous and menstrual) in mammals; Hormonal regulation of spermatogenesis and oogenesis in humans; In vitro fertilisation and embryo transfer technology; Pregnancy hormones; Lactation; Contraceptive methods for males and females.
2.	Shri. Taseng K. Marak	I	Chemical foundations of physiology: Concept of normal, molar and molal solutions; Acids, bases, pH and buffers; Diffusion and osmotic pressure. Enzyme kinetics: Michaelis-Menten equation and its relation to enzyme activity; Significance of K_m and V_{max} ; Enzyme inhibition (reversible and irreversible).
3.	Dr. Silme D. Shira	II	Carbohydrates: Linear and ring forms of monosaccharides (Pentose and Hexose); Polysaccharides (starch, glycogen and hyaluronic acid); Glycogenesis and glycogenolysis. Electron transport system and oxidative phosphorylation.
4.	Dr. Grimchi T. Sangma	III	Structure and functions of haemoglobin; Blood coagulation: Coagulation factors and mechanism. Cardiac cycle. Blood pressure and its regulation. Mechanism of gaseous exchange through gills and lungs. Osmoregulation in fish.
5.	Smt. Cordelia P. Warbah	IV	Neurosecretory cells; Types of neurohormones, Endocrine and paracrine hormones, Placental hormones; Hormones of gastrointestinal tract, Pheromones. Biosynthesis of thyroid hormones. Mechanism of hormone action: Peptide protein and steroid hormones.
6.	Smt. Chesime M. Sangma	II	Amino acids, peptides and proteins: levels of organisation, transamination; deamination and urea cycle


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NON- NEP VI SEMESTER (Paper 8A) (Developmental Biology, Environmental Biology and Biotechnology)

SL. No.	NAME	UNIT	TOPIC
1.	Smt. Verlia Semchi G. Momin	V	Introduction to genetic engineering; Restriction enzymes. Cloning vectors: Plasmid, cosmid, λ phage, shuttle vectors; Expression vectors. Introduction to host cells: Transformation, transduction; Particle gun.
2.	Shri. Taseng K. Marak	V	Southern blotting; PCR; DNA Fingerprinting; Genomic library and c DNA library; Application of recombinant DNA technology. Ethical issues and Biosafety regulations.
3.	Dr. Silme D. Shira	III	Salient features of aquatic and terrestrial ecosystems. Liebig's law of limiting factors and Shelford's law of tolerance. Biogeochemical cycles: carbon, phosphorous and nitrogen cycles. Ecological succession. Major Biomes
4.	Dr. Grimchi T. Sangma	IV	Environmental concerns: Radioactive pollution; Biological indicators; Biomagnification; Anthropogenic activity and environment: Ozone depletion; Greenhouse effect and global warming; Acid rains.
5.	Smt. Cordelia P. Warbah	IV	Wildlife conservation: In situ (sanctuaries, national parks and biosphere reserves) and ex situ (botanical and zoological gardens, Germplasm Bank).
6.	Smt. Susan J. Nongkynrih	I	Patterns of cleavage; Morphogenetic movements (epiboly, invagination, ingression, involution and delamination); Embryonic induction and concept of Organiser; Gastrulation in chick up to the formation of three germinal layers.
7.	Smt. Chesime M. Sangma	II	Foetal membranes and types of placenta in mammals; Organogenesis of the vertebrate eye; Regeneration in invertebrates and vertebrates; Teratogenesis and developmental birth defects. Concepts of Ageing.


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**NEP FYUG II SEMESTER ZOO-150: FUNCTIONAL AND
COMPARATIVE ANATOMY**

UNIT IV (Practical)

Teachers: Dr. Silme D. Shira and Smt. Chesime M. Sangma

1. Dissection

a) Accessory respiratory organs in teleost fish; b) Dissection of *Channa/Labeo*/common carp
- Afferent branchial vessels

2. Permanent mounting

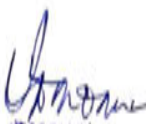
Setae of earthworm; b) Scales (placoid and ctenoid) of fish; c) Feathers
{down, filoplume, contour (showing barb and barbules)} of birds.

3. Study of permanent sections

Histological study of tissues: epithelia, connective, muscle, and nervous;
Histological study of stomach, intestine, kidney, liver, lungs, testis, and ovary of vertebrate;
c) Transverse sections of: *Ascaris* male and female; Earthworm through typhlosolar region;
Amphioxus through branchial region.

4. Osteology

Study of skull of rabbit/guinea pig b) Study of pelvic and pectoral girdle of rabbit/guinea pig;
c) Study of humerus, radius-ulna, femur, tibio-fibula of rabbit/guinea pig; d) Study of
vertebrae: Atlas, axis, and typical vertebra of rabbit/guinea pig.


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IV SEMESTER PRACTICAL

PAPER 4B (Developmental biology, Ecology and Economic Zoology)

Teachers: Smt. Verlia Semchi G. Momin and Smt. Cordelia P. Warbah

1. Study of types of eggs in vertebrates
2. Study of larval forms (crustacean, molluscan and echinoderm) from permanent slides.
3. Study of the stages of development of frog from permanent slides in whole mount/sections (cleavage, blastula and gastrula).
4. Preparation of permanent slides of non- chordate larval forms (Mysis, Nauplius, mosquito larva).
5. Study of metamorphosis in Amphibia (using Charts/Models)
6. Estimation of dissolved oxygen in water samples.
7. Estimation of carbon dioxide in water samples.
8. Estimation of total alkalinity in water samples.
9. Qualitative study of plankton from fresh water samples.
10. Study of the life cycle of silk moth.
11. Study of different castes of honey bee
12. Identification of Indian major carps and common exotic carps


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V SEMESTER PRACTICAL

PAPER 7B (Biochemistry, Animal Physiology and Endocrinology)

Teachers: Shri Taseng K. Marak and Dr. Grimchi T. Sangma

1. WBC count in human blood.
2. RBC count in human blood.
3. Estimation of glucose by colorimetric method.
4. Estimation of protein by colorimetric method (Lowry's/Biuret) method
5. Study of human salivary amylase activity in relation to temperature.
6. Estimation of haemoglobin in human blood.
7. Dissection and display of pituitary and gonads in a teleost.
8. Dissection and display of endocrine glands in albino mouse/rat.
9. Microtomy: Preparation of histological slides of vertebrate tissues- liver, kidney, gonads, intestine and adrenal (minimum four slides of different tissues).


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PAPER 8B (Developmental Biology, Environmental Biology and Biotechnology)

Teachers: Shri Taseng K. Marak and Dr. Grimchi T. Sangma

1. Preparation of whole mount of chick embryo.
2. Study of regeneration in Hydra/Planaria.
3. Study of whole mount/sections of different developmental stages of chick embryo from permanent slides.
4. Community analysis
5. Qualitative analysis of aquatic communities from different water bodies.
6. Estimation of total hardness of water samples.
7. Quantitative estimation of plankton.
8. Analysis of community similarities and species diversity indices.
9. Field trip and submission of Field Report.

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