DIBRUGARH UNIVERSITY

UNDER GRADUATE SYLLABUS UNDER SEMESTER SYSTEM
ZOOLOGY GENERAL PROGRAMME

Semester-I

Total Marks: 400

Compulsory course-I =English–I	80+20IA =100
Non-major Course I = Zoology –I (Th) Non-chordate diversity, Systematics & Evolution	48+12IA = 60
Non-major Course I = Zoology- II (Pr) (based on Course I)	32+8IA = 40
Non-major Course II =Chemistry –I (Th)	80+20IA = 100
Non-major Course III =Botany –I (Th)	48+12IA = 60
Non-major Course III =Botany –II (Pr)	32+8IA = 40

Total =400

Semester-II

Total Marks: 400

Compulsory course-I =English–II	80+20IA =100
Non-major Course I = Zoology –III (Th) Cell Biology and Biochemistry	48+12IA =60
Non-major Course I = Zoology- IV (Pr) (based on Course III)	32+8IA =40
Non-major Course II =Chemistry –II (Th)	80+20IA =100
Non-major Course III =Botany –III (Th)	48+12IA =60
Non-major Course III =Botany –IV (Pr)	32+8IA =40

Total =400

Semester-III

Total Marks: 400

Computer Application Course –I (Th)	40+10IA =50
Computer Application Course –II (Pr)	40+10IA =50
Non-major Course I = Zoology –V (Th) Chordate diversity and Developmental Biology	48+12IA =60
Non-major Course I = Zoology- VI (Pr) (based on Course V)	32+8IA =40
Non-major Course II =Chemistry –III (Th)	48+12IA =60
Non-major Course II =Chemistry –IV (Pr)	32+8IA =40
Non-major Course III =Botany –V (Th)	48+12IA =60
Non-major Course III =Botany –VI (Pr)	32+8IA =40

Total=400

Semester-IV

Total Marks: 400

Computer Application Course –III (Th)	40+10IA =50
Computer Application Course –IV (Pr)	40+10IA =50
Non-major Course I = Zoology –VII (Th) Animal Physiology and Endocrinology	48+12IA =60
Non-major Course I = Zoology- VIII (Pr) (based on Course VII)	32+8IA =40
Non-major Course II =Chemistry –V (Th)	48+12IA =60
Non-major Course II =Chemistry –VI (Pr)	32+8IA =40
Non-major Course III =Botany –VII (Th)	48+12IA =60
Non-major Course III =Botany –VIII (Pr)	32+8IA =40

Total= 400

Semester-V

Total Marks: 400

Non-major Course I = Zoology –IX (Th) Genetics and Molecular Biology	48 +12IA = 60
Non-major Course I = Zoology- X (Pr) (based on Course IX)	32 +8IA = 40
Non-major Course II =Chemistry –VII (Th)	48 +12IA = 60
Non-major Course II =Chemistry –VIII (Pr)	32 +8IA = 40
Non-major Course III =Botany –IX (Th)	48 +12IA = 60
Non-major Course III =Botany –X (Pr)	32 +8IA = 40
Skill-based Course-I : Pisciculture/ Vermiculture/ Sericulture/ Apiculture	100

Total= 400

Semester-VI

Total Marks: 400

Non-major Course I = Zoology –XI (Th) Animal Ecology and Biostatistics	48 +12IA =60
Non-major Course I = Zoology- XII (Pr) (based on Course XI)	32 +8IA =40
Non-major Course II =Chemistry –IX (Th)	48 +12IA =60
Non-major Course II =Chemistry –X (Pr)	32 +8IA =40
Non-major Course III =Botany –XI (Th)	48 +12IA =60
Non-major Course III =Botany –XII (Pr)	32 +8IA =40
Skill-based Course-II : Project, etc.	100

Total =400

DIBRUGARH UNIVERSITY

UNDER GRADUATE SYLLABUS FOR ZOOLOGY GENERAL PROGRAMME
UNDER SYMESTER SYSTEM

ELIGIBILITY: The candidate seeking admission to the course must be 10+2 with Physics, Chemistry and Biology.

SYLLABUS

TOTAL MARKS: 600

OBJECTIVE OF THE COURSES:

The course is designed with on objective to provide the under graduate students with basic knowledge of animal diversity, their evolution, classification, development and function at cellular, organisms and molecular levels along with their interaction with environment. Skill based courses are also included to increase employability of the students.

EXAMINATION:

There shall be 12 (twelve) papers; 6 (six) each of theory and practical papers in zoology (general course). 20% of marks of each theory and practical paper shall be evaluated as Internal Assessment (IA). The distribution of courses and marks will be as follows:

SEMESTER	PAPER	TITLE OF THE PAPER	MARKS		
			IA	End Sem	TOTAL
I	ZooGT- 101	Non-chordate diversity, Systematics and Evolution	12	48	60
	ZooGP- 102	Practical based on ZooGT- 101	08	32	40
II	ZooGT- 201	Cell Biology and Biochemistry	12	48	60
	ZooGP- 202	Practical based on ZooGT- 201	08	32	40
III	ZooGT- 301	Chordate diversity and Developmental Biology	12	48	60
	ZooGP- 302	Practical based on ZooGT- 301	08	32	40
IV	ZooGT- 401	Animal Physiology and Endocrinology	12	48	60
	ZooGP- 402	Practical based on ZooGT- 401	08	32	40
V	ZooGT- 501	Genetics and Molecular Biology	12	48	60
	ZooGP- 502	Practical based on ZooGT- 501	08	32	40
VI	ZooGT- 601	Ecology and Biostatistics	12	48	60
	ZooGP- 602	Practical based on ZooGT- 601	08	32	40
				Total marks =	**600**

SEMESTER-I

ZooGT- 101: Non-chordate diversity, Systematics and Evolution

Marks: 12 (IA) + 48 (End Sem) = 60
42 lecture hours

Unit -1: Non chordates: Salient features and classification up to classes of different phyla; Protozoa: locomotion, nutrition and reproduction in *Paramecium and Leishmania*.

Unit -2: Porifera and Coelentrata: Canal system in Porifera, corals and coral reefs; Platyhelminthes and Nemathelminthes: life cycle of *Ascaris* and *Taenia*, reproduction and parasitic adaptation.

Unit -3: Annelida: Coelom and excretion in annelida; Arthropoda: mouth parts and legs in insects; crustacean larval forms, social life in honey bee.

Unit-4: Mollusca: torsion and detorsion in gastropoda; economic importance of mollusca; Echinodermata: feeding and locomotion of starfish.

Unit-5: Systematics- definition, classification and its hierarchy; concept of species and speciation; concept of evolution, evolutionary theories; origin of life on earth; variation, mutations, recombination, isolation and natural selection; adaptive radiation.

ZooGP- 102: Practical based on ZooGT- 101

Marks: 8 (IA) + 32 (End Sem) = 40
20 lecture hours

1. **Dissection:** Leech- urinogenital systems; Cockroach– nervous system, digestive system; *Pila* / *Acatina*– digestive system.
2. **Identification:** *Trypanosoma, Leishmania, Entamoeba histolytica, Euglena, Noctiluca, Volvox, Grantia, Spongila*, Gammules of sponge, Spicules of sponge, L.S. and T.S. of *Sycon, Madrepora, Porpita, Vallela, Aurelia*, Sea-anemone, *Corallium, Pennatula, Aleyonium, Obelia* colony with medusa, *Fasciola, Taenia, Ascaris, Planaria*, Scolex and Proglottid of *Taenia*, *Nereis, Aphordite, Heteronereis, Limulus*, Scorpion, Spider, Centipede, Millipede, *Squilla*, Lobster, Crab, *Balanus, Lepas, Peripatus*, Locust, Mantis, Beetle, Wasp, Termite, *Chiton, Dentallium, Pecten*, Pearl Oyster, *Loligo, Sepia*, one representative from Asteroidea/Holothuroidea/Ophiurioidea.
3. Preparation of permanent slides from suitable materials from invertebrate animals.

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

1. Dissection	10
2. Preparation of permanent slides	6
3. Spotting including permanent slides	6
4. Practical record book	5
5. Viva voce	5
Total	**= 32**

SEMESTER-II

ZooGT- 201: Cell Biology and Biochemistry

Marks: 12 (IA) + 48 (End Sem) = 60
42 lecture hours

Unit –1: General structure and function of prokaryotic and eukaryotic cells; structure and function of plasma membrane, Golgi bodies, endoplasmic reticulum; membrane transport -osmosis, diffusion and active transport.

Unit- 2: Structure and function of mitochondria, nucleus and chromosomes.

Unit-3: Cell cycle and cell division (amitosis, mitosis & meiosis); basic concept of cancer.

Unit- 4: Basic principles of biochemistry, acid, base, pH and buffer; types of carbohydrates, proteins, fats; nature and function of enzymes; vitamins their sources and functions.

Unit-5: Biological oxidation, glycolysis and Krebs cycle; electron transport system, synthesis of ATP.

ZooGP- 202: Practical based on ZooGT- 201

Marks: 8 (IA) + 32 (End Sem) = 40
20 lecture hours

1. Study of mitosis and meiosis with the help of permanent slides.
2. Preparation of slide for the study of mitosis and meiosis with suitable materials.
3. Preparation of normal and molar solution
4. Qualitative test of carbohydrate, protein and fat.
5. Qualitative test of salivary amylase.

SCHEME OF THE PRACTICAL EXAMINATION:
Time: 4 hrs.

1. Cytological preparation/ experiment	8
2. Biochemical Experiment-I	8
3. Spotting	5
4. Practical record book	5
5. Viva voce	5
Total	**= 32**

SEMESTER-III

ZooGT- 301: Chordate diversity and Developmental Biology

Marks: 12 (IA) + 48 (End Sem) = 60
42 lecture hours

Unit- 1: General characters of chordates; Protochordates: classification up to orders, structural organization of hemichordates, urochordates; Fishes: classification up to orders, respiratory organs and migration.

Unit- 2: Amphibia: Classification up to orders, parental care; Reptilia: classification up to orders, extinct reptiles, poisonous snakes of India; Biting mechanism.

Unit- 3: Aves: classification up to super-orders, beaks and claws, perching and flight mechanism, bird migration; Mammalia: classification up to orders; dentition in mammals.

Unit-4: Gametogenesis – spermatogenesis and oogenesis, types of animal eggs; vitellogenesis, egg membranes; Fertilization – types and mechanisms; parthenogenesis.

Unit-5: Patterns of cleavage; germ layers, gastrulation, fate maps and cell linage; extra embryonic membranes; types and physiology of placenta.

ZooGP- 302: Practical based on ZooGT- 301

Marks: 8 (IA) + 32 (End Sem) = 40
20 lecture hours

1. Dissection: Scoliodon – External morphology, afferent branchial system, efferent branchial system, internal ear; carp fish – Efferent branchial system
2. Identification (specimens/ models): *Balanoglossus, Herdmania, Amphioxus, Doliolum, Salpa, Pristis, Chimera, Labeo, Catla, Puntius, Heteropneustes, Wallago, Cirrhinus, Exocoetus, Hippocampus, Hilsa*, Electric ray, *Protopterus, Lepidosiren, Ichthyophis, Cryptobranchus, Necturus, Ambystom*a, Axolotol larva, *Hyla, Chameleon, Gecko*, Wall lizard, Flying lizard, *Mabuiya, Varanus, Typhlops, Hydrophis*, Banded Krait, Pit viper, Russel viper, Fowl Duck, Crow, Dove, Cuckoo, Myna, Owl, Parrot, House Sparrow, Vulture, Bulbul, Kite, Squirrel, Rat, Monkey, Hedgehog, Bat, Loris, Langur, Mouse.
3. Preparation of permanent slides from suitable materials from vertebrate animals.
4. Study of chick embryo development up to 72 hrs. by permanent slides.

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

1. Dissection	10
2. Spotting/Identification including embryological slide	6
3. Preparation of permanent slides using suitable chordates material	6
4. Practical record book	5
5. Viva voce	5
Total	**= 32**

SEMESTER-IV

ZooGT- 401: Animal physiology and Endocrinology

Marks: 12 (IA) + 48 (End Sem) = 60
42 lecture hours

Unit –1: Balanced diet; digestion and absorption of carbohydrate, proteins and fats.

Unit –2: Physiology of respiration and excretion in mammals; composition and constituents of blood groups and Rh factor, Blood coagulation.

Unit –3: Neurons and conduction of nerve impulse; drug addiction and its impact on society.

Unit –4: A brief outline of the organization of endocrine system in mammals; anatomy of pituitary, thyroid, pancreas and adrenal gland; neuroendocrine system in insects.

Unit –5: General character of hormones, feedback mechanism; functions of hormones of pituitary, thyroid, pancreas and adrenal.

ZooGP- 402: Practical based on ZooGT- 401

Marks: 8 (IA) + 32 (End Sem) = 40
20 lecture hours

1. Preparation of haemin crystals.
2. Blood group determination
3. Counting of WBC/RBC (haemocytometer)
4. Display pituitary and gonad of fishes
4. Study of histological slides of endocrine glands

SCHEME OF THE PRACTICAL EXAMINATION:
Time: 4 hrs.

1. Physiological Experiment	8
2. Endocrinological Experiment	6
3. Spotting/Identification	4
4. Preparation of slide	4
5. Practical record book	5
6. Viva voce	5
Total	**= 32**

SEMESTER-V

ZooGT- 501: Genetics and Molecular Biology

Marks: 12 (IA) + 48 (End Sem) = 60
40 lecture hours

Unit –1: Principles of heredity; Mendel's laws; linkage and crossing over; non-chromosomal inheritance; sex determination in animals.
Unit –2: Concept of gene; mutation, chromosomal aberrations, mutagens and their application.
Unit-3: Nucleic acids, DNA as genetic material, structure and functions of DNA and RNA.
Unit-4: Concept of central dogma, genetic code, basic steps of transcription and translation.
Unit-5: Genetic engineering; basic steps in gene cloning; cloning vectors; restriction enzymes.

ZooGP- 502: Practical based on ZooGT- 501

Marks: 8 (IA) + 32 (End Sem) = 40
20 lecture hours

1. Mendelian problems on monohybrid and dihybrid cross
2. Construction of nucleotides using Ball and stick model
3. Preparation of slides for study of mitosis and meiosis using suitable material

SCHEME OF THE PRACTICAL EXAMINATION:
Time: 4 hrs.

1. Mendelian problems	8
2. Ball and stick model for nucleotides	4
3. Preparation of slides for study of meiosis	10
4. Practical record book	5
5. Viva voce	5
Total	**= 32**

SEMESTER-VI

ZooGT- 601: Animal Ecology and Biostatistics

Marks: 12 (IA) + 48 (End Sem) = 60
40 lecture hours

Unit –1: Basic concept of ecosystem; Brief account of abiotic and biotic factors in grassland and aquatic ecosystem; population structure.

Unit-2: Food chain and energy flow, food web.

Unit-3: Environmental pollution- types, sources, cause control and prevention of air and water pollution; biogeochemical cycles (Carbon and Nitrogen) green house effect, ozone layer depletion and its impact.

Unit-4: Basic concept of wildlife and Protected Areas of Assam, endangered fauna of NE India and their conservation.

Unit –5: Sampling of data; graphic presentation of data; histogram, bar diagram and oogive; Mean, median, and mode; Mean deviation and standard deviation; Significance test (Students't-test).

ZooGP- 602: Practical based on ZooGT- 601

Marks: 8 (IA) + 32 (End Sem) = 40
20 lecture hours

1. To find out the abundance and density of soil fauna by quadrate method.
2. Find out the biotic components of a grassland/pond ecosystem and make probable food chain and food web.
3. Study of man-made ecosystems (biotic and abiotic components)
4. Simple biostatistical calculation involving mean, median, mode and standard deviation.

SCHEME OF THE PRACTICAL EXAMINATION:
Time: 4 hrs.

1. Ecological Experiment on soil macrofauna		10
2. Ecological Experiment (minor)		5
3. Biostatistical calculation		7
4. Practical record book		5
5. Viva voce		5
Total	**=**	**32**

BOOKS RECOMMENDED

(For all papers: ZooGT-101, ZooGT-201, ZooGT-301, ZooGT-401, ZooGT-501 and ZooGT-601)

- Annand, B.K. and S.K. Manchand: Text Book of Physiology, TATA McGraw Hill, New Delhi, 1976.
- Ayyar, B. : A Manual of Zoology Part I
- Ayyar, B. : A Manual of Zoology Part II
- Bailey, N.T.J.: Statistical Method in Biology, REBS Publishers, New Delhi.
- Bailey: Histology
- Balinsky, B.I.: An Introduction to Embryology, W.B. Saunders Co. 1976.
- Dedson, B.O.: Evolution, Process & Products, Rginhold Publication, C.N.Y.
- Gardener, B.J.: Principle of Genetics, John Willey N.Y. 1972. .
- Giese, A.C.: Cell Physiology, Boxwood, 1975.
- Kotpal, R.L.: Text Book of Invertebrates, Rastogi Publications, Meerut
- Kotpal, R.L.: Text Book of Vertebrate, Rastogi Publications, Meerut
- Lull, R.S.: Organic Evolution, Revised Indian Edn. By Light & Life Publishers, New Delhi, 1976.
- Mahler, H.F. & B.H. Cords: Biological Chemistry: Gapper & Raw, N.Y. 1971.
- Marshall, A.J.: Text Book of Zoology Vol. I; S.W.D. Williams.
- Mody, P.A.: Introduction of Evolution, Harper & Raw, N.Y. 1964.
- Odum, B.P.: Fundamentals of Ecology; W.R. Saunders, Toflan co. Tokyo, 1971.
- Parker, T. J. and B.A. Haswell: Text Book of Zoology
- Prani Bigyan: Dibrugarh University.
- Prasad, S.N.: A Text book of Invertebrate Zoology, Kitab Mahal, Allahabad, 1977.
- Prasad, S.N.: Chordate Zoology, Kitab Mahal, Allahabad.
- Roberts, B.D., W. Newinski & F. Sacz: Cell Biology, W.B. Saunders Co. London, 1975.
- Trehan, K.: Biochemistry, Wiley Eastern Ltd. New Delhi.
- Turner, C.D. and J.I. Bangara: General Endocrinology, W.B. Saunders Co. 1971.
- Winestler, A.M.: Genetics, Oxford & IBH, Calcutta 1971.

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