SYLLABUS FOR B.Sc. ZOOLOGY (GENERAL) DEGREE PROGRAM UNDER CBCS w.e.f. 2017-18 OF SEM-I & II

Course Structure of B.Sc. Zoology Degree Program

SEMESTER I (F.Y. B.Sc.)				
PAPER CODE	**TITLE**		**CREDITS**	**TOTAL CREDITS**
ZOCG 1	Diversity of Non-Chordates & Cell Biology	Theory	04	**06**
		Practical	**02**	
SEMESTER II (F.Y. B.Sc.)				
ZOCG 2	Diversity of Chordates & Genetics	Theory	04	**06**
		Practical	**02**	
SEMESTER III (S.Y. B.Sc.)				
PAPER CODE	**TITLE**		**CREDITS**	**TOTAL CREDITS**
ZOCG 3	Comparative Anatomy of Vertebrates and Developmental Biology	Theory	04	**06**
		Practical	**02**	
GEG 1A*	Aquarium Fish keeping	Theory	03	**04**
		Practical	**01**	
GEG 1B*	Wildlife and Eco-tourism	Theory	03	**04**
		Practical	**01**	
SEMESTER IV (S.Y. B.Sc.)				
ZOCG 4	Physiology and Biochemistry	Theory	04	**06**
		Practical	**02**	
GEG 2A#	Environment Impact Assessment	Theory	03	**04**
		Practical	**01**	
GEG 2B#	Milk & Milk Processing	Theory	03	**04**
		Practical	**01**	
SEMESTER V (T.Y. B.Sc.)				
PAPER CODE	**TITLE**		**CREDITS**	**TOTAL CREDITS**
ZOEG 1A@	Endocrinology	Theory	04	**06**
		Practical	**02**	
ZOEG 1B@	Economic Zoology	Theory	04	**06**
		Practical	**02**	
SECG 1	Haematology	Theory	03	**04**
		Practical	**01**	
SEMESTER VI (T.Y. B.Sc.)				
ZOEG 2A$	Genetics and Molecular Biology	Theory	04	**06**
		Practical	**02**	

ZOEG 2B[$]	Developmental Biology	Theory	04	**06**
		Practical	**02**	
SECG 2	Fish and fish products	Theory	03	**04**
		Practical	**01**	
ZOPG[&]	Project			**04**

NOTE:

ZOCG = Discipline Specific Core; GEG = Generic Elective; ZOEG = Discipline Specific Elective; SECG = Skill Enhancement Course; * Select any one; [#] Select any one; [@]Select any one; [$] Select any one; [&] = In lieu of one DSEG (from any one discipline)

SEMESTER I

ZOCG 1: Diversity of Non-chordates and Cell Biology

Theory **Credits: 04**

Learning Objective: To know the general characters and classification of Non-Chordates and understand the structure and function of animal cell.

Learning Outcome: On completion of the course the student should be able to know the general organization of Non-Chordates as a group and know the taxonomy and characteristic features of the various Non-Chordate phyla. The student should also understand the architecture and functions of a cell.

Topics	Duration *(in clock hours)*
Unit 1: Kingdom Protista General characters and classification up to classes; Locomotory Organelles and locomotion in Protozoa	**3**
Unit 2: Phylum Porifera General characters and classification up to classes; Canal System in *Sycon*	**3**
Unit 3: Phylum Cnidaria General characters and classification up to classes; Polymorphism in Hydrozoa	**3**
Unit 4: Phylum Platyhelminthes General characters and classification up to classes; Life history of *Taenia solium*	**3**
Unit 5: Phylum Nemathelminthes General characters and classification up to classes; Life history of *Ascaris lumbricoides* and its parasitic adaptations	4
Unit 6: Phylum Annelida General characters and classification up to classes; Metamerism in Annelida	**3**
Unit 7: Phylum Arthropoda General characters and classification up to classes; Vision in Arthropoda, Metamorphosis in Insects	**5**
Unit 8: Phylum Mollusca	**3**

General characters and classification up to classes; Torsion in gastropods

Unit 9: Phylum Echinodermata **3**

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

Unit 10. Introduction to cell biology **2**

Overview of general organization of cells (Prokaryotic cells and Eukaryotic cells)

Unit 11. Cell Environment **05**

- Chemical bonds
- Inorganic- water, salts and ions
- Organic- proteins, carbohydrates, lipids, nucleic acids, vitamins
- Effect of radiation on cells (UV radiations, photodynamic sensitization)

Unit 12. Cell Organelles **15**

Structure and function of Plasma membrane, Mitochondria- Structure, and function (ETC system) Structure and functions of Endoplasmic reticulum, Ribosomes, Golgi complex, Lysosomes (polymorphism of lysosomes), Microbodies (Peroxisomes and Glyoxysomes), Cytoskeleton (Microtubules, microfilaments and centrioles)

Unit 13. Nucleus **04**

Nuclear envelope, Nucleoplasm, Euchromatin and Heterochromatin, Nucleolus, Nucleosomes.

Unit 14. Cancer Biology **04**

- Characteristics of cancer cell
- Carcinomas, Sarcomas, Lymphomas, Leukemia
- Carcinogenesis

PRACTICALS **Credits: 02**

- Study of animals belonging to Protozoa, Porifera, Cnidaria, Ctenophora, Platyhelminthes, Aschelminthes and Annelida with special reference to systematic position up to class level, habit, habitat, characteristic features and economic importance (one example of each class and Local examples are to be given more emphasis) with the help of Museum specimens , models, charts, Microslides, Photographs and Digital sources.
- Study of sand Foraminiferans
- Identification of Protozoans and Coelenterates in pond water sample
- Digestive system of Earthworm(Museum specimen/digital sources)
- Nervous system of Earthworm(Museum specimen/digital sources)
- Study of Binary fission and Conjugation in Paramoecium, sponge spicules
- Polymorphism in Obelia / Physalia
- L.S. of Hydra

- Scolex of Taenia
- Parapodium of Nereis
- Nephredia and setae in earthworm
- larval forms of liverfluke with the help of Permanent slides/ Microphotographs/ digital sources
- Study of Prokaryotic cells- Gram's staining technique
- Study of Eukaryotic Cell using suitable staining technique (Buccal epithelial Cells)
- Method of protozoan culture (Any one)
- Study of cytoplasmic movements in *Paramecium*
- Cytoplasmic localization of proteins, fats and carbohydrates
- Study of osmosis using human RBC's
- Localization of Mitochondria by Janus Green stain
- Study of Cancer cells through permanent slides
- Study of cell organelles through electron micrographs
- Study of Mitosis using suitable material/Meiosis using permanent slides

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
- Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson
- Jordan E.L., Verma P.S. (2001), *Invertebrates Zoology.*, S. Chand and company, New Delhi
- Barnes, R.D. *Invertebrate Zoology* (1982) VI Edition. Holt Saunders International Edition.
- D.W. and J.I., Spicer (2002) *The Invertebrates: A New Synthesis. III* Edition. Blackwell Science.
- Boradale, L.A. and Potts, E.A. (1961) *Invertebrates: A Manual for the use of Students.* Asia Publishing Home.
- Bushbaum, R. (1964) *Animals without Backbones.* University of Chicago Press.
- Karp, G. (2010). *Cell and Molecular Biology: Concepts and Experiments*. VI Edition. John Wiley and Sons. Inc.
- De Robertis, E.D.P. and De Robertis, E.M.F. (2006). *Cell and Molecular Biology*. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
- Cooper, G.M. and Hausman, R.E. (2009). *The Cell: A Molecular Approach*. V Edition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.
- Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). *The World of the Cell*. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
- Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson James (2008). *Molecular Biology of the Cell*, V Edition, Garland publishing Inc., New York and London.

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SEMESTER II

ZOCG 2: Diversity of Chordates & Genetics

Theory **Credits: 04**

Learning Objective*:* To know the general characters and classification of Chordates and understand the fundamentals of genetics.

Learning Outcome: On completion of the course the student should be able to identify and classify the Chordates and also know about the abnormalities of the chromosomes the pattern of inheritance of genetic traits

Topics	**Duration** *(in clock hours)*
Unit 1: Introduction to Chordates General features and Phylogeny of Protochordata	**2**
Unit 2: Agnatha General features of Agnatha and classification of cyclostomes up to classes	**3**
Unit 3: Pisces General features and Classification up to orders; Migration and parental care in Fishes	**5**
Unit 4: Amphibia General features and Classification up to orders; Parental care in Amphibia	**5**
Unit 5: Reptiles General features and Classification up to orders, Mesozoic Reptiles, Poisonous and non-poisonous snakes	**5**
Unit 6: Aves General features and Classification up to orders; Volant adaptations in birds, Migration in Birds.	**5**
Unit 7: Mammals Classification up to orders; Origin of mammals,	**5**
Unit 8: Mendelian Genetics & its Extension Overview of Mendelian Genetics Epistasis and Hypostasis, Multiple genes and multiple alleles, Sex linked, sex limited and sex influenced inheritance	**10**

Unit 9: Chromosome Structure **06**

Eukaryotic Chromosome, Types of Eukaryotic Chromosome (based on centromere position), Eukaryotic and prokaryotic chromosomal organisation, Giant chromosomes

Unit 10: Gene Mutation **05**

Natural and Induced Mutations, Types of gene mutation (base pair substitution and frame shift) Types of chromosomal aberration, Spontaneous and induced mutations (chemical mutagens and radiations)

Unit 11: Inbreeding and Heterosis **04**

Definition of Inbreeding, Inbreeding depression, Practical applications of Inbreeding. Heterosis – Genetic basis; Application and Evolutionary significance.

Unit 12: Inheritance of Human traits **05**

Human karyotype, Pedigree analysis

Inheritance of human traits: Brown eyes, Polydactyly, Diabetes insipidus, Sickle cell anemia, PKU Eugenics and Genetic counseling

PRACTICALS **Credits: 02**

- Study of following specimens:
  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, Bat, *Funambulus, Loris*
- Key for Identification of poisonous and non-poisonous snakes
- Solving Inheritance problems through beads/seed mixture (monohybrid and Dihybrid ratios)
- Inheritance problems on multiple alleles and multiple genes
- Inheritance problems based on Epistatic interactions
- ABO blood grouping and Rh factor in humans
- Drosophila culture technique
- Study of Polytene chromosome in Drosophila/Chironomous larva
- Determination of genetic sex by Barr body
- Human Karyotype analysis: Normal male and female, Klienfelter's syndrome, Turner's syndrome, Down syndrome, Philadelphia syndrome
- Determination of allelic frequency of following Mendelian human traits:
- Tongue rolling, earlobes, Widow's peak, hand clasping, folding of arms, thumb cross pattern, Hitch-hiker's thumb.

SUGGESTED READINGS

- Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
- Pough H. *Vertebrate life,* VIII Edition, Pearson International.
- Darlington P.J. *The Geographical Distribution of Animals*, R.E. Krieger Pub Co.
- Hall B.K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.
- Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). *Principles of Genetics*. VIII Edition. Wiley India
- Snustad, D.P., Simmons, M.J. (2009). *Principles of Genetics*. V Edition. John Wiley and Sons Inc
- Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). *Concepts of Genetics*. X Edition. Benjamin Cummings
- 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 and Co
- Fletcher H. and Hickey I. (2015). *Genetics.* IV Edition. GS, Taylor and Francis Group, New York and London.

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