

**GONDWANA UNIVERSITY GADCHIROLI**  
**SEMESTER SYSTEM SYLLABUS**  
**FOR**  
**B.Sc. Part II**  
**Subject- Zoology**  
**Semester III – Paper I**  
**Life and Diversity of Animals**  
**(Chordates)**

<b>Unit- I</b>	<b>Periods</b>
<b>Pisces</b> –Salient features of Chondrychthyes and Osteichthyes.	2
<b>Labeo rohita</b> : External morphology, Digestive, Circulatory and Respiratory systems. Economic importance of fishes. Fish Migration and Accessory Respiratory organs.	10
 <b>Unit-II</b>	
<b>Amphibia</b> – Classification, Parental care and Neotony.	4
<b>Reptilia</b> - Classification based on temporal vacuities.	3
Snake venom, Poision apparatus & Biting mechanism	5
 <b>Unit-III</b>	
<b>Birds</b> – Origin of birds	3
Types of feathers	1
Flight adaptations (Morphological, Anatomical and Physiological)	4
Migration and its significance	3
Ratitae and Carinitae	1
 <b>Unit-IV</b>	
<b>Mammals</b> – General characters of Prototheria, Metatheria and Eutheria	6
Comparative account of Aortic arches and Heart.	6

**Semester - III**  
**DEVELOPMENTAL BIOLOGY**  
**Paper-II**

<b>Unit-I</b>	<b>Periods</b>
<b>Types of eggs-</b> classified on the basis of amount and distribution of yolk. Chemical composition of yolk. Mechanism and significance of Fertilization.	5
<b>Parthenogenesis-</b> Definition, types and its significance.	3
<b>Cleavage-</b> Types of cleavages	2
<b>Blastulation-</b> Definition and types of blastulation.	2
<b>Unit-II</b>	
Morphogenetic movements in the early development of frog (Invagination, Epiboly, Emboly, Involution, Ingression and Delamination).	6
Development of chick up to the formation of Primitive streak	3
Development of Extra embryonic membranes in chick and their Significance.	3
<b>Unit-III (Mammalian development)</b>	
<b>Gametogenesis-</b> (Oogenesis and Spermatogenesis).	4
Structure of Sperm and Ovum.	2
<b>Implantation-</b> Definition and types.	2
<b>Placentation-</b> Definition, Types (Based on the Morphological and histological structures). Functions of placenta.	4
<b>Unit –IV</b>	
<b>Stem Cells-</b> Totipotancy, Sources, Types and their use in human welfare.	4
<b>In Vitro Fertilization</b> (Test tube Baby)- Technique advantages and disadvantages.	4
Semen Bank, Artificial Inseminations and Contraceptives	4

**PRACTICALS**  
**B.Sc.II (Zoology), Semester-III**

Laboratory practical course and examination pattern is given below:

- 1. Identification, Classification** : distinguishing characters and adaptive features of  
a) Fishes : *Pristis, Torpedo, Notopterus, Exocoetus, Clarius, Ophiocephalus, Catla, Rohu, Mrigal.*

- b) Amphibia : *Bufo, Salamander, Ichthyophis*
- c) Reptilia : *Chameleon, Varanus, Pharynosoma, Draco, Tortoise, Cobra, krait, Russill's viper, Echis, Sea snake*.
- d) Birds: Owl, Woodpecker, Kingfisher, Kite, Duck, Parrot.
- e) Mammals: Squirrel, Mongoose, Bat, Loris, Rabbit.

**2. Anatomical Observations**

Anatomical observations, demonstration and detailed explanation of the following with the help of ICT tools/ models/ charts/ photographs etc. (Any fish)

- i. Digestive system
- ii. Reproductive system
- iii. Brain and Cranial Nerves

**3. Study of skeleton of Rabbit/ Fowl**

(Loose bones of skull not to be studied)

**4. Developmental Biology –**

Study of the following slides-

- 1. Study of permanent slide of Frog embryology, Chick embryology (18 hrs, 24 hrs, 30 hrs, 36 hrs, 72 hrs)

**5. Study of permanent slides-**

V.S. skin of Frog and Mammal

- 6. Study of permanent Preparation of the following with the help of already available permanent slides ICT tools/ models/ charts/ photographs etc.

Fish scales – placoid, cycloid, ctenoid  
 Hyaline cartilage and striated muscle

**7. Collection, study tour and submission of report**

**Distribution of Marks –**

1. Anatomical observations	10
2. Spotting- (4 specimens, 4 slides, 2 bones).	10
3. Permanent stained micro preparation	4
4. Class record,	3
5. Submission of slides and study tour report	3

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**SEMESTER SYSTEM SYLLABUS**  
**FOR**  
**B.Sc. Part II**  
**Subject- Zoology**  
**Semester IV – Paper II**  
**Animal Behavior and Evolution**  
**(Paper -I)**

<b>Unit- I</b>	<b>Periods</b>
Definition, Types and Adaptive nature of Behavior	05
Innate Behavior-Reflexes, taxes and instinctive behavior	05
Hypothalamus and behavior	02
<b>Unit-II</b>	
Imprinting, Pavlovian and Trial and Error conditioning	03
Social behavior: Aggregation, Migration and navigation,	03
Courtship (Appeasement, intentional & display movement)	03
Reproductive fighting, Dominance hierarchy	03
<b>Unit-III</b>	
Oparin's concept of Miller's experiments	01
Biochemical origin of life	02
Adaptive radiation in mammals	02
Parallel, Convergent and Divergent evolution	02
Recapitulation theory	02
Natural selection- Stabilizing, Directional and Disrupting	03
<b>Unit-IV</b>	
Populations, gene pool, gene frequency, genotype frequency	02
Hardy-Weinberg law, migration and random genetic drift	03
Mechanism of isolation	04
Mechanism and pattern of speciation	03

**Semester - IV**  
**Genetics and Genetic Engineering**  
**(Paper -II)**

<b>Unit- I</b>	<b>Periods</b>
Structure of DNA and RNA. Types of RNA Concept of gene as cistron, muton and recon.	3
Gene regulation in Prokaryotes (Lac operon in E. coli)	2
Salient feature of genetic code.	2
Protein synthesis- Transcription and Translation.	3
<b>Unit- II</b>	
Genic balance mechanism of sex determination in <i>Drosophila</i> .	3
Cytoplasmic inheritance: Kappa particles in <i>Paramecium</i> , Milk factor in Mice.	3
Gene mutation and Mutagenic agents – (physical and chemical).	4
<b>Unit-III</b>	
Definition and Types of Eugenics. Eutelogenesis.	1
Basic concept in recombinant DNA technology	1
Isolation of gene- DNA manipulation enzyme: Nucleases, ligase, Polymerases, Alkaline phosphatase and topoisomerases	3
Gene isolation methods- shotgun Method, hybridization and reverse transcription.	3
Cloning vectors: Plasmid, Bacteriophage, Lamda, Cosmids YAC's (Yeast artificial chromosome)	2
<b>Unit IV</b>	
Splicing technique - Insertion of DNA and ligation using blunt ends, Cohesive ends.	2
Introduction of recombinant DNA in to host cell by Genetic transformation, Transfection, Transduction and Transgenesis.	4
Application of genetic engineering- Production of insulin, Vitamins and monoclonal Antibodies.	4

## **PRACTICALS**

### **B.Sc.II (Zoology), Semester-IV**

1. Study of chemotaxis and phototaxis in animals.
2. Identification of wild and mutant type *Drosophila*.
3. Demonstration of monohybrid by beads.
4. Demonstration of Dihybrid by beads.
5. Study of sickle cell anemia.
6. Study of Thalassemia.
7. Study of ABO and Rh blood groups in human society.
8. Study of Drum stick in the human blood.
9. Study of Barr body in vaginal smear or buccal epithelium.
10. Study of human genetic trait by using Hardy-Weinberg equations- Rolling of tongue, baldness, widow peak, length of index and ring finger, attached and free ear lobe.
11. Study of pictures of human chromosome abnormalities.
12. Study of pictures of Adaptive radiations in Reptilia and Mammals.
13. Study of pictures of Parallel, Convergent and Divergent evolution.
14. Study of picture of Stabilizing, Directional and Disruptional evolution.
15. Preparation of models on genetics.

### **Distribution of marks for Practical at the end of Semester-IV**

1. Study of monohybrid/dihybrid cross by beads.	05
2. Identification of pictures (2 marks each).	08
3. Study of any human trait by using H-W equation.	06
4. Study any one of experiment (From 6 to 10).	04
5. Submission of any genetic model .	02
6. Viva-voce	02
7. Class Record	03
Total .....	30

**Books Recommended –**

**Paper –I : Chordate and Developmental biology**

1. T. B. of Zoology vol II – Parker & Haswell
2. T. B. of Vertebrate zoology \_ S. N. Orasad
3. Vertebrate zoology –E. L. Jorden
4. Vertebrate zoology – Vishwanath
5. Zoology of chordates – Nigam H. C.
6. Phylum Chordata –n Newman H.H.
7. Biology of vertebrates –Walter & Sayles
8. The vertebrate body – Romer A. S.
9. Comparative anatomy of the vertebrates – Kingslay J. D.
10. The Biology of Amphibia – Noble G. K.
11. Snakes of India – Gharapura K. G.
12. Life of Mammals – Young J.Z.
13. Vertebrates – Kotpal R. L.
14. Introduction to Chordates – Majupuria T.C.
15. Vertebrate Zoology – Dhama & Dhama
16. T. B. Vertebrate Zoology – Agrawal
17. Protochordates – Chatterjee & Pandey
18. Protochordates – Bhatia
19. T. B. of Chordates – Bhamrah and Juneja
20. Chordate anatomy – Arora M.P.
21. The Chordates – Alexander.
22. T. B. of animal embryology – Puranik
23. T. B. of Chordate embryology – Dalella & Verma
24. T. B. of embryology – Sandhu
25. S.Y B. Sc Zoology Sem-III- Dhamani, Bakare, Harney & Bhute

26. S.Y B. Sc Zoology Sem-IV- Dhamani,Bakare,Harney & Bhute

**(Paper-III) Animal Behavior and Evolution**

1. Animal Behavior- M.P. Arora, Himalaya Publication New Delhi.
2. Animal Behavior- Vinod Kumar, Himalaya Publication, New Delhi.
3. Animal Behavior- N.Arumugam, Saras Publication, Nagercoil.
4. Text Book of Animal Behavior- H.S. Singh, Anmol Publications Pvt. Limited, Edition, 1999.
5. Animal Behavior- H.S. Gundevia and H.G.Singh, S.Chand Publication, New Delhi.
6. Cell Biology, Genetics, Evolution and Ecology-P.S.Verma and V.K.Agarwal, S. Chand and Company, New Delhi, edition, 1986.
7. Organic Evolution- M.P. Arora, 2010, Himalaya Publication New Delhi.
8. Organic Evolution- N.Arumugam, Saras Publication, Nagercoil.
9. Organic Evolution- Veer Bala Rastogi, Rastogi Publication, Meerut.
10. Organic Evolution- Richard Swann Lull, The Mac- Millan Company: New York, Revised edit., 1948.