Shiksha Mandal's

Bajaj College of Science, Wardha

Syllabus for Four Year Multidisciplinary UG Program with DSC as Major Zoology

(e.g. Four Year B.Sc. Honors/Research Program)

Program: B.Sc. (Academic Session 2023-24) Syllabus under Autonomy

DSC – 3 offered by Department of Zoology

Name of the course: DSC **– 3 Zoology- 3 (Chordate - I and Molecular Biology)**

[4hrs/week= 15*4 Th=60 Theory And 4 hrs/week= 15 weeks* 4 Practical = 60 P]

[Credits 4 T+2 P = 6]

B.Sc. Semester III

Course description:

This course is designed in such a way that the students will gain insights of chordate animals from protochordates upto amphibians. Students will also learn about basics of molecular biology.

Course Objectives:

To learn about the basics of chordate animals & molecular biology.

Course learning outcomes:

After successful completion of the course the student is expected to -

CO1: Student will be able to understand about phylogenetic trees of evolution of chordates and about protochordates.
CO2: Students will be able to understand the concept of agnatha & fishes.
CO3: Students will be able to understand concept of respiration in fishes & about amphibians.
CO4: Students will gain basic knowledge of molecular biology with reference to DNA & RNA structure.
CO5: Students will be able to understand replication & transcription in prokaryotes.
CO6: Students will also know about translation & gene expression.
CO7: So overall with this paper students will learn about chordate animals from protochordates upto amphibian & about basics of molecular biology which includes structure of DNA, RNA, transcription translation & gene expression.

Paper I: Chordate - I & Molecular Biology

UNIT - I

1.1 Chordata – Phylogenetic Tree of Evolution- animals

1.2 Protochordata: General Characters and Classification with examples

1.3 *Herdmania* : Structure and retrogressive metamorphosis

1.4 *Branchiostoma* : External Characters and Sense organs

UNIT–II

2.1 Agnatha:- Agnatha concept, General Characters of Cyclostomata

2.2 *Petromyzon* and *Myxine* – Morphology and sigificance.

2.3 Concept of gnathostomata, Class Pisces: General features of *Chondrichthyes* and *Osteichthyes*,

2.4 Origin of paired fins in fishes

UNIT–III

3.1 Accessory respiratory organs in fishes
3.2 Osmoregulation in Fishes, Migration in fishes-Types, causes, and significance
3.3 Class Amphibia : General features and Classification with examples
3.4 Parental care in Amphibia.

Unit- IV

4.1 Chemical basis of Heredity: DNA as genetic material, properties of genetic material.
4.2 Experiments of Griffith, experiment of Avery, Macleod and McArty, experiment of Hershy and Chase
4.3 Nucleoside and Nucleotide, Purines and Pyrimidines,Watson and Crick model of DNA structure.
4.4 tRNA, rRNA, mRNA structure and function.

Unit V

5.1 Meselson-Stahl Experiment
5.2 DNA replication in prokaryotes
5.3 Transcription in Prokaryotes
5.4 Genetic Code: Properties of Genetic code, Wobble's hypothesis

Unit VI

6.1 Translation in prokaryotes
6.2 Gene structure in Eukaryotes and Prokaryotes
6.3 Regulation of gene expression in prokaryotes: Structure and regulation of Lac operon.
6.4 Tryptophan operon: Structure and regulation

PRACTICAL - Based on Chordate - I & Molecular Biology

Section A

Part I: **Identification, Classification, Distinguishing Characters and Adaptive features of**

Urochordata :- *Herdmania, Salpa, Doliolum*

Cephalochordata :- *Branchiostoma*

Cyclostomata :- *Petromyzon, Myxine*

Pisces :-*Pristis, Torpedo, Exocoetus, Clarius*,

Amphibia :-*Ichthyophis ,Bufo, Salamander*

Part II : **Study of permanent slides**
T.S. of Amphioxus through Gonad, V.S. of Skin of Fish, V.S. of Skin of Frog

Part III : **Dissection of the Brain of locally available culturable fish** (with the help available permanent slides/ ICT tools / Charts / Photographs)

Part IV : **Permanent stain micro preparation of scale of fish** (with the help available permanent slides/ ICT tools / Charts / Photographs)

Section B: Molecular Biology

1. Introduction to basic laboratory instruments: Autoclave, pH meter, Electrophoresis apparatus
2. Isolation of Genomic DNA (from any available sources)
3. Quantitative analysis of DNA
4. Quantitative analysis of RNA
5. Agarose Gel Electrophoresis
6. Demonstration of Polymerase Chain Reaction (PCR)

List of Recommended Books:-

Chordate - I & Molecular Biology

1. S. N. Prasad - T. B. of Vertebrate Zoology
2. E. L. Jorden and P. S. Verma - Chordate Zoology
3. Vishwanath - Vertebrate Zoology
4. Nigam H. C. - Zoology of Chordates
5. Newman H.H. - Phylum: Chordata
6. Walter & Sayles - Biology of Vertebrates
7. Romer A. S. - The Vertebrate Body
8. Kingslay J. D. - Comparative Anatomy of the Vertebrates
9. Noble G. K - The Biology of Amphibia
10 Kotpal R. L. - Vertebrates
11. Majupuria T.C. - Introduction to Chordates
12. Dhami & Dhami - Vertebrate Zoology
13. Agrawal - T. B. Vertebrate Zoology
14. Chatterjee & Pandey - Protochordates
15. Bhatia - Protochordates
16. Bhamrah and Juneja - T. B. of Chordates
17. Arora M.P. - Chordate Anatomy
18. Alexander - The Chordates
19. Dr.S. S. Lal - Practical Zoology Vertebrates Rastogi Publication, Meerut
20. P. S. Verma - A manual of Practical Zoology Vertebrates
21. Pranav Kumar - Fundamentals And Techniques Of Biophysics And Molecular Biology
22. Verma P.S. And Agarwal V.K. - Molecular Biology
23. P.K. Gupta - Molecular Biology
24. Dr. P. S. Verma & Dr. V. K. Agarwal - Cell Biology, Genetics, Molecular Biology, Evolution and Ecology
25. Veer Bala Rastogi - Principles Of Molecular Biology, 2nd Edn
26 Gupta P.K. - Cell And Molecular Biology

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Program: B.Sc. (Academic Session 2023-24) Syllabus under Autonomy

DSC **– 4 offered by Department of Zoology**

Name of the course: DSC **– 4 Zoology- 4 (Chordate - II and Ethology)**

[4hrs/week= 15*4 Th=60 Theory And 4 hrs/week= 15 weeks* 4 Practical = 60 P]

[Credits 4 T+2 P = 6]

B.Sc. Semester IV

Course description:
This courses in designed in such a way that the students will gain basic knowledge about chordate animals – Reptiles to mammals & about ethology

Course objectives:
To learn about the basics of chordate animals & ethology.

Course learning outcomes:
After successful completion of the courses the student is expected to –

CO1: Students will be able to understand about Reptiles.
CO2: Students will be able to understand about birds.
CO3: Students will be able to understand about mammals.
CO4: Students will be able to understand about behaviour pattern.
CO5: Students will be able to understand about communication & social organization.
CO6: Students will be able to know about reproductive behaviour & courtship.
CO7: Overall with this course student will acquire knowledge about chordates reptiles to mammals & ethology.

Paper I: Chordate - II & Ethology

UNIT-I

1.1 Class Reptilia- General features and classification
1.2 Classification based on temporal vacuities
1.3 Snakes : General Characters, Poisonous and Non-Poisonous snakes,
1.4 Poison apparatus, Snake venom properties

UNIT - II

2.1 Class Aves– General features and Classification
2.2 Comparison of *Ratitae* and *Caranitae*
2.3 Flightless Birds : Origin and General characters with examples
2.4 Migration in Birds

Unit III

3.1 Class Mammalia – General characters of Prototheria, Metatheria and Eutheria
3.2 Adaptive radiations in mammals
3.3 Comparative account of Heart in Reptiles and Mammals
3.4 Urinogenital systems in Mammals

Unit IV

4.1 Ethology as a branch of Biology, Classification of behaviour patterns.
4.2 Innate behaviour, Types of Innate behaviour.
4.3 Control of behaviour : Neural behaviour, hormonal behaviour.
4.4 Development behaviour – Genetic components, Environmental components.

Unit – V

5.1 Communication : Chemical visual, light, audio, specificity of songs, evolution of language.
5.2 Ecological aspects of behaviour : Habit selection, Food selection, Optimal forage theory, Antipredation defenses, territoriality.
5.3 Social behaviour : Aggretion, Schooling in fishes, flocking in birds.
5.4 Social organization in insects, social organization in primates.

Unit VI

6.1 Reproductive behaviour – Introduction, evolution of sex and reproductive strategies
6.2 Mating systems : Types of female and male mating systems, other mating systems
6.3 Courtships : Courtship in birds, Amphibians, fishes, insects
6.4 Sperm competition, sexual selection

PRACTICAL - Based on Chordate - II & Ethology

Section A

Part I : Identification, Classification, Distinguishing Characters and Adaptive features of

Reptilia :- *Chameleon,* Cobra, Russel's Viper, Rat Snake
Birds :- Owl, Kingfisher, Duck, Parrot
Mammals :- Squirrel, Bat, *Loris*, Rabbit

Part II: Study of permanent slides
V.S. of skin Reptiles, V.S. skin of Bird, V.S. of skin of Mammals with the help available permanent slides/ ICT tools / Charts / Photographs

Part III : Study of skeleton of Rabbit

Section B

1. To study the behavioural responses of *Drosophila* / other insects to food stimuli.
2. To study geotaxis behaviour in earthworm /*Drosophila*
3. To study phototaxis behaviour in insect larvae.
4. Study of courtship behaviour in birds and insects from short videos/films.
5. Study of social organization in honey bees from videos/films

List of Recommended Books:-

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8. Kingslay J. D. - Comparative Anatomy of the Vertebrates
9. Gharpura K. G. - Snakes of India
10. Life of Mammals – Young J.Z.
11. Kotpal R. L. - Vertebrates
12. Majupuria T.C. - Introduction to Chordates
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15. Bhamrah and Juneja - T. B. of Chordates
16. Arora M.P. - Chordate Anatomy
17. Alexander - The Chordates
18. Dr.S. S. Lal - Practical Zoology Vertebrates Rastogi Publication, Meerut
19. P. S. Verma - A manual of Practical Zoology Vertebrates
20. Animal Behaviour by Drickamar.
21. John Alcock, Animal Behaviour, Sinauer Associate Inc., USA.
22. Paul W. Sherman and John Alcock, Exploring Animal Behaviour, Sinauer Associate Inc.,Massachusetts, USA.
23. Chronobiology Biological Timekeeping: Jay. C. Dunlap, Jennifer. J. Loros, Patricia J. DeCoursey(ed). 2004, Sinauer Associates, Inc. Publishers, Sunderland, MA, USA
24. Insect Clocks D.S. Saunders, C.G.H. Steel, X., Afopoulou (ed.) R.D. Lewis. (3rdEd) 2002 Barensand Noble Inc. New York, USA

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UNIT-I

1.1 Class Reptilia- General features and classification
1.2 Classification based on temporal vacuities
1.3 Snakes : General Characters, Poisonous and Non-Poisonous snakes,
1.4 Poison apparatus, Snake venom properties

UNIT - II

2.1 Class Aves– General features and Classification
2.2 Comparison of *Ratitae* and *Caranitae*
2.3 Flightless Birds : Origin and General characters with examples
2.4 Migration in Birds

Unit III

3.1 Class Mammalia – General characters of Prototheria, Metatheria and Eutheria
3.2 Adaptive radiations in mammals
3.3 Comparative account of Heart in Reptiles and Mammals
3.4 Urinogenital systems in Mammals

Unit IV

4.1 Ethology as a branch of Biology, Classification of behaviour patterns.
4.2 Innate behaviour, Types of Innate behaviour.
4.3 Control of behaviour : Neural behaviour, hormonal behaviour.
4.4 Development behaviour – Genetic components, Environmental components.

Unit – V

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PRACTICAL - Based on Chordate - II & Ethology

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