ShikshaMandal's

**Bajaj College of Science, Wardha**

**Proposed 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 –I offered by Department of Zoology**

Name of the course: **DSC –I Zoology- I (Non Chordate I and cell biology)**

**[4hrs/week= 15*4 Th=60$^{Th}$ And 4 hrs/week= 15 weeks* 4 pract = 60 P]**

**[Credits 4 T+2 P = 6]**

## Course Description

This course is designed in such a way that the students will gain insights of Non-chordates animals till Phylum Annelida. The students will also learn about Cell Biology with respect to the structure, functions of the organelles as well as cell division.

## Course Objectives

To learn the basics about Nonchordate animals upto Annelida and Cell Biology

## Course Learning Outcomes

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

CO1: Students will be able to understand and have basic knowledge of Animal Kingdom, Animal Diversity, and its Classification with Major and Minor Phyla.

CO2:. The student should gain insights of the concept of Invertebrate animals starting from Protozoa (Single Cell Animalcules) to multicellular primitive animals like Porifera and Coelenterates to the higher Invertebrates up to Annelida.

CO3: Students will be able to understand the concept of Phylogenetic Tree of Evolution of Animals from primitive organic particles to higher Invertebrates.

CO4: Students will gain the basic knowledge of types of cells, cell structure, its organelles and functions.

CO5: Students will also get insights on origin, structure and function of primitive cell; its evolution and formation of advanced cell, reproduction of cell and abnormal cell division, uncontrolled cell division and cell culture technique.

CO6: Student passing out in semester I will acquire the knowledge of Non-chordates upto phylum Annelida as well as Cell Biology

**UNIT - I**

1.1 Animal Kingdom - Classification – Flow diagram of classification upto major phylum with few characters and examples.
1.2 Protozoa -General Characters.
1.3 Paramecium - Structure.
1.4 Malaria- Causative organism & its Life cycle.

**UNIT - II**

2.1 Porifera - General characters, External features of Sycon.
2.2 Canal system in Sponges - Brief account.
2.3 Colenterata- General characters.
2.4 Corals & Coral reef formation, Economic importance of corals.

**UNIT - III**

3.1 Helminthes - General characters, Platyhelminthes &Aschelminthes.
3.2 Taenia Morphology, Ascaris Morphology
3.3 Annelida- General characters.
3.4 Leech – Morphology.

**UNIT-IV**

4.1 Cell as basic unit of life. Structure and function of Prokaryotic (E. coli) and Eukaryotic cells (Animal and Plant Cell)
4.2 Structure and Functions of plasma membrane. Fluid mosaic model of Plasma Membrane.
4.3 Transport across membranes: Active and Passive transport, Facilitated transport, exocytosis, endocytosis, phagocytosis – vesicles and their importance in transport.
4.4 Endoplasmic Reticulum: Type, structure and Function.

**UNIT V**

5.1 Structure and Functions of Golgi Complex, Lysosomes and Ribosomes.
5.2 Structure of Nucleus: Nuclear envelope, Nuclear pore complex, Nucleoplasm, Nucleolus. Functions of Nucleus.
5.3 Chromatin: Eu-chromatin and Hetro-chromatin, nature and differences.
5.4 Mitochondria: ultrastructure and function of mitochondrion.

**UNIT VI**

6. 1 Introduction to Cell Division. Need for Cell divison
6.2 Cell cycle (G1, S, G2, M phases),
6.3 Mitosis.
6.4 Meiosis.

**Practical based on Non-chordates and Cell Biology**

**Part A: Nonchordates**

**Study of museum specimens(Classification of animals up to orders)**

| | | |
|---|---|---|
| *I.* | Protozoa(Slides) | :-*Paramecium,Euglena,Amoeba,Plasmodiumvivax* |
| *II.* | Porifera | :-*Sycon,Leucosolenia,Hyalonema,Euplectella,* |
| *III.* | Coelenterata | :-*Obelia,Aurelia,Tubipora,Adamsia* |
| *IV.* | Platyhelminthes | :-*Planaria,Fasciola,Taenia* |
| *V.* | Aschelminthes | :-*Ascaris,Wuchereria* |
| *VI.* | Annelida | :-*Aphrodite,Nereis,Hirudinaria* |

**II. Study of Permanent Slides**
Sponge spicules, T.S.*Sycon, Redia* and Cercaria larvae of *Fasciola,* T.S.male and female *Ascaris,* Scolex of *Taenia*

**III. Whole mount preparation of or Study of permanent preparation of** *Pila* Gill lamella *Obelia* colony, with the help of already available permanent slides/ICTtools/Charts/Photographs.

**Part B: Cell Biology**

**I.** Study of cell: Preparation of temporary mount of human buccal epithelial cells.
**II.** Preparation of blood smears to observe the blood cells
**III.** Temporary preparation of mitotic cell from onion roots
**IV.** Study of Cell organelles (any three) by using microphotographs

**Reference Books**

**Nonchordates - I**


1. Barnes –Invertebrate Zoology (Halt-Saunders international) Philadelphia, USA
2. Barradaile L.A. & Potts F.A. – The Invertebrate
3. Nigam –Biology of Nonchordates
4. Kotpal, Agrawal&Khetrapal –Modern Text Book of Zoology - Invertebrates, Rastogi Publication, Meerut
5. Puranik P.G. & Thakur R.S. –Invertebrate Zoology
6. Majupuria T.C. –Invertebrate Zoology
7. Dhami&Dhami –Invertebrate Zoology
8. Parker &Hashwell -Textbook of Zoology Vol. I (Invertebrates) A.Z.T.B.S. Publishers & Distributors, New Delhi
9. Dr. S.S. Lal - Practical Zoology Invertebrates 9thedition, Rastogi Publication Meerut
10. EJW Barrington– Invertebrate Structure and Function ELBS III Edition
11. R.L. Kotpal –Phylum Protozoa to Echinodermata (series), Rastogi and Publication, Meerut

**Cell Biology**


1. Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI EditionJohn Wiley and Sons.Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. (2006).Cell and Molecular Biology.VIIEdition. Lippincott Williams and Wilkins, Philadelphia.
3. 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.
4. 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.
5. 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
6. Inside the Cell (2005); US Department of Health Sciences, National Institute of Health, Natinal institute of General Medicine Sciences.
7. Lodish, H., D. Baltimore, A. Berk, L. Zipursky, M. Matsudaira and J. Darnell. (2010).
8. Molecular Cell Biology, Eds. 3, Scientific American & W. H. Freeman. New York.
9. Powar C B.: Cell Biology, Himalaya Publication, Meerut

# DSC –II offered by Department of Zoology

## Name of the course: DSC-II Zoology II
## (Non Chordate II and Genetics)

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

**[Credits 4 T+2 P = 6]**

**B.SC. Semester II**

**Paper II: Non Chordates-II and Genetics**

**Course Description**

This course is designed in such a way that the students will gain insights of Non-chordates animals from Arthropoda to Hemichordata. Students will also learn about different types of parasites and vectors. The students will also gain insights on Genetics and its applications.

**Course Objectives**

To learn the basics about Nonchordates animals and Genetics

**Course Learning Outcomes**

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

CO1: Students will be able to understand and have basic knowledge of Animal Kingdom, Animal Diversity, and its Classification with from Arthropoda to Hemichordata.

CO2: The student should gain insights of the concept of parasitology and knowledge of vectors.

CO3: Students will be able to understand the concept of Genetics with respect to Mendelian and Non mendelian genetics

CO4: Students will gain the basic knowledge of Population genetics and Hardy Weinberg Law.

CO5: Students will also get insights on genetic disorders

CO6: Student passing out in semester II will acquire the knowledge of Non-chordates from Arthropoda to Hemichordata as well as Genetics

**UNIT - I**

1.1 Arthropoda :- General characters and external features of Cockroach.
1.2 Mollusca :- General characters and external features of Pila.
1.3 Pearl formation in mollusc.
1.4 Larval forms :- Nauplius, Zoaea, Megalopa, Glochidium, Veliger

**UNIT-II**

2.1 Echinodermata :- General characters, Echinoderm Larvae
2.2 *Asterias* :- External features, Water vascular system and locomotion
2.3 Hemichordata :- General features and phylogeny
2.4 *Balanoglossus* :- External features.

**UNIT III**

3.1 Parasitism - Concept, Parasite Protozoa – Entamoeba, Leshmania
3.2 Parasitic Helminthes Adaptation
3.3 Taenia life cycle, Ascaris life cycle
3.4 Vector- Biological & Mechanical, Insect vector, Housefly

**UNIT IV**

4.1 Mendelian Principles: Mendel and his experiments with pea plant. Law of segregation: Monohybrid cross, back cross and test cross. Dominance and Recessive, Law of Independent Assortment: Dihybridcross in Pea plant and Drosophila.
4.2 Exceptions to Mendelian Inheritance: Epistasis, Incomplete dominance, Co-dominance, Multiple alleles.
4.3 Cytoplasmic inheritance- Kappa particles in Paramecium, CO2 sensitivity in Drosophila, Extra nuclear inheritance: (mitochondria).
4.4 Mutation, Types of mutations: spontaneous, induced, somatic, gametic, forward, reverse. Types of point mutation - deletion, insertion, substitution, transversion, transition. Mutagenic agents : UV radiation and ionising radiation, Base analogs, alkylating and intercalating agents.

**UNIT V**

5.1 Sex linked inheritance in human: Colour – blindness, Haemophilia, Hypertrichosis
5.2 Types of sex determination: -XX-XY, ZZ-ZW, XX-XO and Parthenogenesis, Hypodiploidy, Gynandromorphism
5.3 Human karyotype: Classification of chromosomes based on position of centromere.Types of banding, and karyotype technique applications
54 Genetic disorders, Structural & numerical alterations of chromosomes (chromosomal aneuploidy - Down, Patau, Edward, Turner and Klinefelter syndromes).

**UNIT VI**

6.1 Basic Concepts in population genetics: Mendelian population, gene pool, gene / allele, Frequency

6.2 Hardy Weinberg law and its equilibrium

6.3 Genetic counseling

6.4 Genetic Diagnostics & breeding technology.

**Practicals based on Non-chordates-II and GeneticsPart A: Nonchordates-II**

**I. Study of museum specimens (Classification of animal suptoorders)**

**I.** Arthropoda :- *Peripatus,Daphnia,Limulus,Scolopendra,*Moth

**II.** Mollusca :- *Chiton,Pila,Mytilus,Octopus*

**III.** Echinodermata :- *Asterias,Holothuria,Echinus*

**IV.** Hemichordata :- *Balanoglossus*

**II. Study of Permanent Slides** Nauplius, Zoea of Arthopoda, Glochidium larva of Mollusca, T.S. of arm of starfish, Bipinnaria larva, T.S.*Balanoglossus* through proboscis

**III. Anatomical observation/Demonstration & Detail explanation** Digestive and reproductive system of Cockroach **through ICT tools / Models / Charts / Photography**

**Part B: Genetics**

**I.** Study of Monohybrid and Dihybrid ratio

**II.** Study of Normal Human Karyotype ( Normal male and female)

**III.** Study of characters and Karyotypes of Syndrome like Down, Klinefelter& Turner

**IV.** Field survey of Genetic traits in Human being and Submission of Diary

**V.** Drosophila culture: Media preparation and handling of flies

**VI** Study of *Drosophila* life cycle and its external morphology.

**VII** Study of *Drosophila* mutants.

**Reference BooksNonchordates-II**


1. Barnes –Invertebrate Zoology (Halt-Saunders international) Philadelphia, USA
2. Barradaile L.A. & Potts F.A. – The Invertebrate
3. Nigam –Biology of Nonchordates
4. Kotpal, Agrawal&Khetrapal –Modern Text Book of Zoology - Invertebrates, Rastogi Publication, Meerut
5. Puranik P.G. & Thakur R.S. –Invertebrate Zoology
6. Majupuria T.C. –Invertebrate Zoology
7. Dhami & Dhami –Invertebrate Zoology
8. Parker & Hashwell -Textbook of Zoology Vol. I (Invertebrates) A.Z.T.B.S. Publishers & Distributors, New Delhi
9. Dr. S.S. Lal - Practical Zoology Invertebrates 9thedition, Rastogi Publication Meerut
10. EJW Barrington– Invertebrate Structure and Function ELBS III Edition
11. R.L. Kotpal –Phylum Protozoa to Echinodermata (series), Rastogi and Publication,Meerut


**Genetics**


1. Joshi - Genetics & Genetic Engineering
2. Joshi - Genetic Engineering & its applications
3. Gardener - Genetics
4. Winchester - Genetics
5. Gupta - Genetics
6. Sinnot Dunn, Dobzansy - Principles of Genetics
7. Ahluwalia - Genetics
8. Sarin – Genetics
9. Singleton - Elementary Genetics
10. Owen & Edger General Genetics
11. Alenberg - Genetics
12. Pai - Foundation of Genetics
13. Strickberger - Genetics
14. Veerbala Rastogi - T. B. of Genetics
15. Benjamin Lewis - Gene VI Oxford press
16. Benjamin Lewis - Gene VIII Oxford press
17. Pawar C. B. - Genetics Vol. I and II Himalaya publication