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TULJARAM CHATURCHAND COLLEGE OF ARTS, SCIENCE & COMMERCE, BARAMATI.

AUTONOMOUS

SYLLABUS

FIRST YEAR B.Sc. ZOOLOGY

ACADEMIC YEAR 2019-2020

SEMESTER - I

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Scheme of Course Structure (CBCS) Faculty of Science

Department: Zoology

Class: F.Y.B.Sc. **Pattern: 50 (IA) + 50 (EA)**

Semester	Paper Code	Title of Paper	No. of Credits
Semester I	ZY:111	Animal Systematics and Diversity - I	**2**
	ZY:112	Fundamentals of Cell Biology	**2**
Semester II	ZY:121	Animal Systematics and Diversity - II	**2**
	ZY:122	Genetics	**2**
Annual	**ZY:123**	**Zoology Practical**	**4**

IA* – Internal Assessment
EA* – External Assessment

SYLLABUS (CBCS) FOR F.Y.B.Sc. ZOOLOGY (w. e. f. June, 2019)

Academic Year 2019 - 2020

Class: **F.Y.B.Sc. (Semester– I)**
Paper Code: **ZY: 111**
Paper: **I** **Title of Paper: Animal Systematics and Diversity – I**
Credit: **2** **No. of Lectures: 36**

A. Learning objectives:

- To learn basic classification and characteristics of Non- chordates.
- To learn about evolution and development of systems and animals.
- To make the students aware about conservation and sustainable use of Biodiversity.
- To emphasize on the habitat diversity of animals.

B. Learning outcomes:

- Imparts conceptual knowledge of Animals, their adaptations and associations in relation to their environment.
- Students understand the distinguishing characters and learn to identify the Non-chordate animals.
- Students acquire knowledge of Vermiculture practice and its application in day to day life.
- Students acquire knowledge about Sponge fishery.
- Contributes the knowledge for conservation and sustainable use of Biodiversity.

TOPICS / CONTENTS:

1. Principles of classification: **4**

1.1 Introduction
1.2 Importance of Classification
1.3 Systematics-Linnaean hierarchy (Phylum, Class, Order, Family, Genus and Species)
1.4 Binomial nomenclature
1.5 Three Domain & Six kingdom classification system

2. Classification with salient features of the following phyla: **10**
(Up to class with minimum one example)

2.1 Protozoa
2.2 Porifera
2.3 Coelenterata (Cnidaria)
2.4 Platyhelminthes
2.5 Aschelminthes
2.6 Annelida
2.7 Arthropoda
2.8 Mollusca
2.9 Echinodermata

3. General topics: **4**

3.1 Protozoa: Bioluminescence.
3.2 Porifera: Sponge fishery and its importance.
3.3 Cnidaria: Specialized Stinging Cells. **8**

4. Study of Earthworm:

4.1 Systematic position, Habits and habitat.
4.2 Morphology & Hydrostatic skeleton.
4.3 Digestive system.
4.4 Circulatory system in brief.

4.5 Excretory system.

4.6 Reproductive system.

4.7 Nervous system and sense organs.

5. Vermitechnology – A step towards sustainable environment. **10**

5.1 Introduction

5.2 Important Species in Vermiculture (*Eisenia foetida, Eudrillus eugeniae, Pheretima posthuma, Polypheretima elongata*)

5.3 Vermiculture: Small Scale

5.4 Vermiculture: Large Scale

5.5 Vermiculture Products

5.6 Economical and ecological importance

5.7 Economics of Vermiculture

References:

1. Textbook of Invertebrate Zoology, by Kotpal, RL. Rastogi and Co., Meerut.
2. Phylum Protozoa by Kotpal, RL., Rastogi and Co., Meerut.
3. Phylum Porifera by Kotpal, RL., Rastogi and Co. Meerut.
4. Phylum Coelenterata by Kotpal, RL., Rastogi and Co. Meerut.
5. Phylum Helminthes by Kotpal, RL., Rastogi and Co. Meerut.
6. Phylum Annelida by Kotpal, RL., Rastogi and Co. Meerut.
7. Phylum Platyhelminthes by Kotpal, RL., Rastogi and Co. Meerut.
8. Phylum Arthropoda by Kotpal, RL., Rastogi and Co. Meerut.
9. Phylum Mollusca by Kotpal, RL., Rastogi and Co. Meerut.
10. Phylum Echinodermata by Kotpal, RL., Rastogi and Co. Meerut.
11. Life of Vertebrates by Young, JZ., III Edition, Clarendon Press, London.
12. General Zoology by Goodnight and others IBH Publishing Co.
13. Invertebrate zoology By Jordan EL., and Verma PS., S. Chand and Co., NewDelhi.
14. Life of Invertebrates by Prasad,SN, Vikas Publishing House, New Delhi.
15. Zoology by S.A. Miller and J.P. Harley –Tata McGraw Hill Co.
16. Invertebrates, Richard Brusca, Sinauer Associates, Inc., Sunderland, USA.
17. Invertebrate Zoology by Dhami and Dhami.
18. Biology of the Invertebrates, Jan A. Pechenik, McGraw Hill Education.
19. Role of Earthworms in agriculture by Indian Council of Agricultural Research (ICAR) by Bhatt J.V.& Khambata S.R.

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Class: **F.Y.B.Sc. (Semester – I)**
Paper Code: **ZY: 112**
Paper: **II** **Title of Paper: Fundamentals of Cell Biology**
Credit: **2** **No. of Lectures: 36**

A Learning objectives:

- To introduce the basic cell science and related activities among the Students.
- To develop awareness about the application and implementation of Cytological skills among the students.
- To understand and learn the fundamentals of Cellular organization and its functions.
- To understand the basic process of cell division & distinguish between its types.
- To understand the basic techniques of cell identification & separation of cellular contents.

B **Learning outcomes**:

- Students understand the distinguishing characters of Pro & Eukaryotic Cells.
- Understand the basic structure & functions of Cell & organelles.
- Understand the basic process of cell division & distinguish between its types.
- Understand the basic techniques of cell identification & separation of cellular contents.
- Students acquire skills helpful for the advance studies.

TOPICS / CONTENTS:

1. Introduction to Cell Biology: **2**
1.1 Definition and brief history
1.2 Introduction to cell theory.
1.3 Scope of Cell Biology.

2. Study of Prokaryotic (*E. coli*) and Eukaryotic (Plant and Animal) cell **3**
2.1 Size, Shape, Volume, Number, Structure.

3. Structure and functions of cell membrane: **3**
3.1 Chemical composition
3.2 Fluid mosaic model
3.3 Functions of plasma membrane

4. Cytoplasm: **2**
4.1 Physical Organization.
4.2 Chemical composition and Biological properties.

5. Study of following cell organelles with respect to structure and functions in brief: **12**
5.1 Endoplasmic reticulum
5.2 Golgi complex
5.3 Lysosomes, Peroxisomes and Glyoxysomes
5.4 Ribosomes
5.5 Mitochondria
5.6 Chloroplast

6. Nucleus: **3**
6.1 Shape, size, number and position
6.2 Ultra structure of nucleus, and Nuclear - Pore complex
6.3 Functions of nucleus

7. Cell division and its significance: **5**
7.1 Cell cycle in brief
7.2 Mitosis
7.3 Meiosis

8. General Topics: **6**
8.1 Introduction to Techniques in Cell Biology in brief such as -Centrifugation, Chromatography, Electrophoresis
8.2 Microscopy: Types, Light and Phase Contrast Microscope
8.3 Micrometer and Camera Lucida: Principle, Working and Applications

References:

1. Cell Biology by Pawar CB, Himalaya Publication House.
2. Cell and Molecular Biology by Dupraw I, Academic Press, New York.
3. Cell Biology by avers, CJ. Addison Wesley Pub. Co. New York and London.
4. Cell and Molecular Biology by Carp, G., JohnWaley, USA.
5. Cell Biology by David, E., Sadava Johnes and Bartlett Publication, London.
6. Cell Structure and Function by Lowey, AG. and Siekevitz, JR., Menninger and Gallew, JAN., Saunder College Publication, Philadelphia.
7. The Cell by G.M. Cooper - Sinauer Associate Inc.
8. Cell Biology by Arumugamm Saras Publication.
9. Cytology, Genetics and Evolution by P.K. Gupta, Rastogi Publication.
10. Cell Biology by Kotpal.
11. Cell Biology by Swanson
12. Molecular Biology of the Cell, Text book by Bruce Alberts, Garland publishing, Inc. New York and London.
13. Cell and Molecular Biology by Lohar Prakash S. MJP Publishers, Chennai

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SYLLABUS

FIRST YEAR B.Sc. ZOOLOGY

Academic Year 2018-2019

SEMESTER-II

SYLLABUS (CBCS) FOR F.Y.B.Sc. ZOOLOGY (w. e. f. June, 2019)

Academic Year 2019 - 2020

Class: **F.Y.B.Sc. (Semester – II)**
Paper Code: **ZY: 121**
Paper: **I** **Title of Paper: Animal Systematics and Diversity – II**
Credit: **2** **No. of Lectures: 36**

A. Learning objectives:

To learn basic classification and characteristics of Chordates.
To learn about evolution and development of systems and animals.
To make the students aware about conservation and sustainable use of Biodiversity.
To emphasize on the habitat diversity of animals.

B. **Learning outcomes**:

Imparts conceptual knowledge of Animals, their adaptations and associations in relation to their environment.
Students understand the distinguishing characters of and learn to identify the Chordate animals.
Contributes the knowledge for conservation and sustainable use of Biodiversity.
Imparts conceptual knowledge of Animals, their adaptations and associations in relation to their environment.

TOPICS /CONTENTS:

1. **General characters and classification of following subphyla up to order with one Example:** **4**
   - 1.1 Hemichordata
   - 1.2 Urochordata
   - 1.3 Cephalochordata
2. **Salient features and classification up to order with one example of the following:** **4**
   - 2.1 Cyclostomata
   - 2.2 Pisces - (Chondrichthyes and Osteichthyes)
   - 2.3 Amphibia
3. **Study of Frog:** **18**
   - 3.1 Systematic position, Habit and habitat
   - 3.2 External characters and sexual dimorphism
   - 3.3 Digestive system, food, feeding and physiology of digestion
   - 3.4 Circulatory system (lymphatic system notexpected)
   - 3.5 Central Nervous system
   - 3.6 Sense organs
   - 3.7 Reproductive systems (male & female)
4. **General topics:** **10**
   - 4.1 Hemichordata: Affinities.
   - 4.2 Urochordata: Retrogressive metamorphosis.
   - 4.3 Pisces: Migration, Accessory respiratory organs and Scales.
   - 4.4 Amphibia: Neoteny and Parental care

References:

1. Animal Diversity by Kershaw,DR., Redwood Burn Ltd.,Trowbridge
2. Textbook of Zoology by Parker J. and Haswell, W., ELBS Edition
3. Functional Organization of chordates (part I and II) by Nigam HC. And Sobti, R., S. Chand and Co., New Delhi
4. Textbook of Vertebrate Zoology by Prasad,SN., Kashyap,V., New Age India Publishers, New Delhi
5. Modern Textbook of Zoology, Vertebrates by Kotpal, RL., Rastogi and Co. Meerut
6. The Frog-its reproduction and development -by Robert Rugh, Tata McGraw Hill Edition, New Delhi
7. Biology of Animals by Ganguly,BB., Sinha,A.K., Adhikari,S., New Central Book Agency, Kolkata
8. Introduction to Amphibia by Bhamrah, MS., Juneja,K., Amol Publication, Delhi
9. General Zoology by Goodnight and others IBH Publishing Co.
10. Life of Vertebrates by Young, JZ, III Edition, Clarendon Press, London.
11. Animal Diversity by Kershaw, DR., Redwood Burn Ltd., Trowbridge
12. Textbook of Zoology by Vidyarthi, Agrasia Publishers, Agra.
13. Chordate Zoology by Jorden EL., and Verma PS., S. Chand and Co., New Delhi.
14. Functional Organization of chordates (part I and II) by Nigam HC. And Sobti, R., S.Chand and Co., New Delhi.
15. This is Biology: The Science of Living world, Mayr, M. Universities Press Ltd.
16. J.R.B. Alfred and Ramakrishna Collection, Preservation and Identification of animals. Zoological Survey of India Publications.

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Class: **F.Y.B.Sc. (Semester – II)**
Paper Code: **ZY: 122**
Paper: **II** **Title of Paper:** **Genetics**
Credit: **2** **No. of Lectures: 36**

A. Learning objectives:

- To introduce the basic Mendelian & non Mendelian Genetics.
- To understand and learn the fundamentals of genetics and its applications for the benefit of human being.
- To develop interest of Human Genetics & its applications.

B. **Learning outcomes**:

- Students understand the basic Mendelian & non-Mendelian Genetics.
- Students acquire knowledge of Genetic disorders, syndromes etc.
- Students understand importance of Genetics & its applications for human welfare.
- Students acquire Genetical Problem Solving Ability.

TOPICS / CONTENTS:

1. Introduction to Classical Genetics: **4**
1.1 Mendelian Inheritance: Laws of heredity and their practical applications
1.2 Test cross and back cross

2. Gene Interaction: **5**
2.1Concept of gene interaction, co-dominance and incomplete dominance.
2.2 Complementary factors (9:7)
2.3 Supplementary factors(9: 3:4)
2.4 Inhibitory factors (13:3)
2.5 Duplicate dominant factors (15:1)

3. Lethal genes in *Mus musculus* (Mice) **1**

4. Multiple Alleles and Polygenic Inheritance: **5**
4.1 Concept, characteristics and importance of Multiple alleles, ABO & Rh-blood group system and its medico-legal importance.
4.2 Concept of polygenic inheritance withReference to skin Colour in Human being.
4.3 Pleiotropism and Sickle cell anemia

5. Chromosomes: **6**
5.1 Introduction to morphology and composition
5.2 Classification based on the centromeric position
5.3 Types of chromosomes (autosomes and sexchromosomes)
5.4 Chromosomal aberrations: Structural and Numerical Changes.

6. Drosophila as Genetic model organism: **2**
6.1 Morphology, Sexual dimorphism and Life cycle.
6.2 Mutants: eye, wings and body Colour (Two mutants of each type)

7. Human genetics: **6**
7.1 Study of human karyotype
7.2 Syndromes:
a) Autosomal-Down's (Mongolism) and Cri-du-chat.
b) Sex chromosomal abnormalities in human: Klinefelter's and Turner's syndrome
7.3 Inborn errors of metabolism: Albinism, Phenylketonuria and Alkaptonuria.
7.4 Genetic Counseling and its importance

8. Sex-determination: **4**

8.1 Introduction

8.2 Chromosomal theory of sex determination (XX-XY, ZZ-ZW, XX-XO & Haploid-Diploid method)

8.3 Parthenogenesis and Gynandromorphism.

8.4 Environmental Sex Determination

9. Sex linked inheritance in human: **3**

9.1 Inheritance of Colour-blindness, Haemophilia and Hypertrichosis

References:

1. Genetics by Verma, PS. And Agrawal, VK., S.Chand and Co. New Delhi
2. Principle of Genetics by Sinnott, Dunn and Dobzhansky, Tata McGraw Hill Edition, New Delhi
3. Genetics by Gupta, PK., Rastogi Publication, Meerut
4. Genetics by Sarin, C., Tata McGraw Hill,New Delhi
5. Principles of Genetics by Gardner, EJ., Simmons,MJ. And Snustad,DP. John Wiley and Sons
6. Cytology and Genetics by Dnyanasagar, V.R., Tata McGraw Hill Pub. Co. Ltd., New Delhi.
7. Concepts of Genetics, 9th edition William S. Klug, Michael R. Cummings, Charlotte Spencer, and Michael A. Palladino, Publisher-Benjamin Cummings
8. Principles of Genetics, 4th edition, Snustad D. Peter and Simmons J. Micheal, Publisher John Wiley and Sons. Inc.
9. Principles of Genetics, Eldon J. Gardner, D.P. Snustad, M.J. Simmons, and D. Peter Snustad Publisher-John Wiley and Sons. Inc.
10. General Genetics, Leon A. Snyder, David Freifelder, Daniel L. Hartl PublisherJones and Bartlett.
11. Genetics, 3rd edition, Monroe W. Strickberger, Publisher - Macmillan Publishing Co.
12. Benjamin Lewin. (2008) Genes IX, Jones and Barlett Publishers Inc.
13. James D. Watson, Molecular Biology of the Gene, Fifth Edition, Pearson Education, Inc. and Dorling Kindersley Publishing, Inc.
14. Gardner E.J. 8th edition Principle of Genetics, John Wiley & Sons Publ.
15. Stachan T. & Read A.P. 4th edition Human Molecular Genetics. Garland Publishers.
16. *i* Genetics- Molecular Approach, 3rd Ed. by Peter J. Russell, Pearson.

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SYLLABUS (CBCS) FOR F.Y.B.Sc. ZOOLOGY (w. e. f. June, 2019)

Academic Year 2019 - 2020

Class: **F.Y.B.Sc. (ANNUAL)**
Paper Code: **ZY: 123**
Paper: **III** **Title of Paper: ZOOLOGY PRACTICAL**
Credit: **4** **No. of Practicals:** Any 20

PRACTICAL NO. / TITLE OF PRACTICAL

1. To study the classification with reasons of the following: **(D)**
Phylum Protozoa- *Paramecium, Euglena.*
Phylum Porifera- *Spongilla, Sycon.*
Phylum Coelenterata (Cnidaria) –*Hydra, Aurelia*
Phylum Platyhelminthes- *Taenia, Planaria.*

2. To study the classification with reasons of the following: **(D)**
Phylum Aschelminthes- *Ascaris, Wuchereria bancrofti. (Filarial worm)*
Phylum Annelida- *Nereis, Leech.*
Phylum Arthropoda – *Scorpion, Crab.*
Phylum Mollusca- *Chiton, Octopus*
Phylum Echinodermata- *Antedon, sea urchin*

3. Preparation of Culture media & Culturing of Animals:
Study of Culture & regeneration in Hydra **(E)**

OR

Preparation of Paramoecium culture & observation of live Paramecium (Cyclosis and Trichocysts)

4. Vermiculture: **(E)**
Preparation of small scale Vermiculture bed for vermicomposting from domestic wastes. (**Activity based learning**)

5 Study ofEarthworm(*Pheretima posthuma)*: **(D/E)**
Morphology, Digestive and Nervous system of Earthworm

6. Temporary Preparations from Earthworm: **(D/E)**
Septal nephridia, Spermatheca & setae of Earthworm**.**

7 Microscopy:
Study of Standard Operating Procedure of a Simple and Compound Microscope. **(E)**
(**Activity based Learning**)

8 Mountings from Cell Biology: **(E)**
Temporary preparation and observation of Prokaryotic and Eukaryotic cell in a suitable material.

9 Study of different Cell Organelles: **(D)**
Mitochondria, Nucleus, Endoplasmic Reticulum, Golgi complex. With Picture/Model/Chart

10 Study of Cell Division: **(E)**
Study of Mitosis in onion root tip cells

11 Demonstrations from cells: **(E)**
Demonstration of Mitochondria by Janus green B

OR

Demonstration of Barr Body**.**

12 **To study the classification with reasons of the following:** **(D)**

Hemichordata- *Balanoglossus*
Urochordata- *Hardmania*
Cephalochordata- *Amphioxus*
Cartilaginous fish- *Scoliodon*
Bony fish- *Seahorse*

13 **Study of Morphology & Anatomy of Frog (*Hoplobatrachustigerinus*):** **(D)**

Study of external characters, sexual dimorphism, digestive
System and brain of Frog with the help of model/ charts

14 **Temporary preparation of scales from Fishes:** **(E)**

Placoid and Cycloid Scales from preserved fishes.

15 **Morphometric study of any freshwater fish:** **(E)**

Measurements of Body length, Standard Length, Weight,Depth etc.

16 **Animals Album :**

Collection ofAny five Animals photographs with Identification, External Characters of the above mentioned taxa. **(Activity based learning)** **(E)**

17 **Study of Human Genetical Disorders:**

Study of Any two hereditary Disorders / Inborn errors of metabolism from human population. **(D)**

18 Profile of Any two Geneticists. (**Activity based learning**) **(E)**

19 **Study of human blood groups:** **(E)**

ABO and Rh- factor.

20 **Study of Karyotype:** **(E)**

Study of normal human karyotype from metaphase chromosomalspread picture

21 **Study of Human Genetical traits:** **(E)**

Tongue rolling, widow'speak, ear lobes, colour blindness and PTC tasters/ non tasters.

22 **Genetical Problems**: **(E)**

Based on Monohybrid, Dihybrid Cross & ABO Blood Group system.

23 **Study of *Drosophila*:**

A) Culture of Drosophila **(E)**
B) External Characters, Sexual Dimorphism and Life Cycle, **(E)**
C) Mutants: Eye and wing mutants **(any two of each)** **(D)**

24 **Identification of Fish/Frog Specimen based on Taxonomic Identification Key** **(E)**

(E)

25* **Compulsory Zoological Study Tour:**

A Compulsory Visit to biodiversity spot / water body / Research institute / Vermicomposting unit and submission of report.

***D=Demonstration, E=Experiment.**

- **Maintenance of good laboratory record along with visit report by the student is mandatory.**

References:

1. Practical Zoology of Invertebrates by S. S. Lal.
2. Practical Zoology of Vertebrates by S. S. Lal.
3. Practical Zoology Vol-3 by N Arumugamm and A. Mani.
4. Practical Zoology of Invertebrates by Jordan and Verma.
5. Practical Zoology of Vertebrates by Jordan and Verma.
6. Practical Zoology of Cell Biology by S. S. Lal.
7. *i* Genetics- Molecular Approach, 3rd Ed. by Peter J. Russell, Pearson.

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