Anekant Education Society's

TULJARAM CHATURCHAND COLLEGE

OF ARTS, SCIENCE & COMMERCE, BARAMATI.

(AUTONOMOUS INSTITUTE)

SYLLABUS

FIRST YEAR B. Sc. Zoology

ACADEMIC YEAR 2019-2020

SEMESTER-I

Anekant Education Society's
TULJARAM CHATURCHAND COLLEGE
OF ARTS, SCIENCE & COMMERCE, BARAMATI.
AUTONOMOUS

Scheme of Course Structure (CBCS) Faculty of Science
Department of Zoology

Class: F.Y.B.Sc. **Pattern: 40 (IA) + 60 (EA)**

Semester	Paper Code	Title of Paper	No. of Credits
Semester I	ZOO: 1101	Animal Systematics and Diversity - I	**2**
	ZOO: 1102	Fundamentals of Cell Biology	**2**
	ZOO: 1103	**Zoology Practical-I**	**2**
Semester II	ZOO: 1201	Animal Systematics and Diversity - II	**2**
	ZOO: 1202	Genetics	**2**
	ZOO: 1203	**Zoology Practical-II**	**2**

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: ZOO: 1101
Paper: I **Title of Paper: Animal Systematics and Diversity – I**
Credit: 2 **No. of Lectures: 36**

Learning Objectives:-

- Understand the fundamental principles of biological classification
- Identify, explain the levels of the Linnaean hierarchy and apply the rules of binomial nomenclature in naming organisms.
- Analyse Diversity in Biological Classification and compare traditional and modern six kingdom classification system
- Investigate the salient features of Various Phyla such as of Protozoa, Porifera, Coelenterata, Platyhelminthes, Aschelminthes and Annelida up to the class level
- Investigate unique aspects such as bioluminescence, sponge fishery, and specialized stinging cells
- Understand the systematic position, habits, and habitat of earthworms. Examine the morphology and systems (digestive, circulatory, excretory, reproductive, nervous) of earthworms
- Introduce the concept of Vermitechnology and evaluate the economical, ecological significance of vermiculture and analyse the importance of key species in vermiculture and examine the processes involved in both small and large-scale vermiculture.

Learning Outcomes:-

After completion of this course, students will be able to-

CO 1: Demonstrate a thorough understanding of the fundamental principles of biological classification, including the ability to define and explain key concepts
CO 2: Describe the historical context of biological classification and recognize its significance in shaping the field of biology
CO 3: Identify and explain the levels of the Linnaean hierarchy and apply the rules of binomial nomenclature in the accurate naming of organisms
CO 4: Compare and contrast the traditional Linnaean classification system with the modern three-domain and six-kingdom classification system
CO 5: Investigate and articulate the salient features of Protozoa, Porifera, Coelenterata, Platyhelminthes, Aschelminthes, and Annelida.
CO 6: Explore specific topics related to Protozoa, Porifera, and Cnidaria, such as bioluminescence, sponge fishery, and specialized stinging cells.
CO 7: Understand the systematic position, habits, and habitat of earthworms and gain insight into Vermi technology, Vermiculture, and the economic and ecological significance of Vermiculture practices.

TOPICS / CONTENTS:

CONTENT	NO. OF LECTURES
Unit 1: Principles of classification: 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	4
Unit 2: Classification with salient features of the following phyla: (Up to class with minimum one example)	6

2.1 Protozoa 2.2 Porifera 2.3 Coelenterata (Cnidaria) 2.4 Platyhelminthes 2.5 Aschelminthes 2.6 Annelida	
Unit 3: General topics:	6
3.1 Protozoa: Bioluminescence. 3.2 Porifera: Sponge fishery and its importance. 3.3 Cnidaria: Specialized Stinging Cells.	
Unit 4: Study of Earthworm:	10
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.	
Unit 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., New Delhi.
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.

Course Articulation Matrix of ZOO: 1101 Animal Systematics and Diversity – I
Weightage: 1: Partially related, 2: Moderately related, 3: Strongly related

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	1	2	2	2	1	3	3
CO2	2	3	1	2	1	2	2	2	2
CO3	1	1	1	1	2	1	1	1	1
CO4	3	3	1	3	2	2	2	2	2
CO5	3	2	2	2	2	2	1	3	2
CO6	2	2	3	2	1	2	2	2	3
CO7	3	2	2	2	2	3	2	2	2

PO1: Disciplinary Knowledge
CO1 aligns with PO1 as it focuses on acquiring in-depth knowledge in the discipline of biological classification.

PO2: Critical Thinking and Problem Solving
CO2 and CO4 involve critical thinking by requiring students to analyze historical developments and compare complex classification systems.

PO3: Social Competence
CO6 involves exploring and understanding the social and economic aspects related to specific phyla, contributing to social competence.

PO4: Research-related Skills and Scientific Temper
CO5 involves research-related skills as students delve into the characteristics of different phyla, enhancing their scientific temper.

PO5: Trans-disciplinary Knowledge
CO3 involves understanding classification principles, bridging disciplinary boundaries in biological sciences.

PO6: Personal and Professional Competence
CO7 contributes to personal and professional competence by providing knowledge about the systematic position of organisms and practical applications in Vermiculture.

PO7: Effective Citizenship and Ethics
CO5 involves understanding the ethical and economic aspects of Vermiculture, aligning with effective citizenship.

PO8: Environment and Sustainability
CO1and CO7 contribute to environmental awareness and sustainability by emphasizing the importance of classification and sustainable practices in Vermiculture.

PO9: Self-directed and Life-long Learning
CO6 encourages self-directed learning through exploration of diverse topics within the course.

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: ZOO: 1102
Paper: II **Title of Paper: Fundamentals of Cell Biology**
Credit: 2 **No. of Lectures: 36**

Learning Objectives:-

- Recognize the broad scope of Cell Biology, understanding its applications in various scientific disciplines.
- Investigate the size, shape, volume, number, and overall structure of both prokaryotic (E. coli) and eukaryotic (plant and animal) cells.
- Analyse the chemical composition of the cell membrane and understand the Fluid Mosaic Model.
- Explain the functions of the plasma membrane, emphasizing its role in cellular processes.
- Examine the structure and functions of endoplasmic reticulum, Golgi complex, lysosomes, peroxisomes, glyoxysomes, ribosomes, mitochondria, and chloroplasts.
- Explore the ultrastructure of the nucleus, including the Nuclear-Pore complex, and understand the functions of the nucleus
- Summarize the cell cycle, mitosis, and meiosis, emphasizing their significance in growth, development, and reproduction.

Learning Outcomes:-

After completion of this course, students will be able to-

CO 1: Understand the historical development of cell biology, including key definitions and milestones.
CO 2: Exhibit a thorough grasp of cell theory, recognizing its core principles and its significance in the biological sciences.
CO 3: Appreciate the diverse applications and relevance of cell biology across scientific disciplines.
CO 4: Understand the cell structure, comparing and contrasting prokaryotic and eukaryotic cells in terms of size, shape, volume, number, and overall structure.
CO 5: Demonstrate proficiency in understanding the chemical composition, Fluid Mosaic Model, and functions of the cell membrane.
CO 6: Exhibit competence in studying the structure and functions of major cell organelles, including the endoplasmic reticulum, Golgi complex, lysosomes, peroxisomes, glyoxysomes, ribosomes, mitochondria, chloroplasts, and nucleus
CO 7: Understand the cell cycle, mitosis, and meiosis and their significance in cellular processes, growth, development, and reproduction

TOPICS:

CONTENTS	NO. OF LECTURES
Unit 1: Introduction to Cell Biology:	2
1.1 Definition and brief history 1.2 Introduction to cell theory. 1.3 Scope of Cell Biology.	
Unit 2: Study of Prokaryotic (*E. coli*) and Eukaryotic (Plant and Animal) cell	3
2.1 Size, Shape, Volume, Number, Structure.	
Unit 3: Structure and functions of cell membrane:	4
3.1 Chemical composition 3.2 Fluid mosaic model 3.3 Functions of plasma membrane	

Unit 4: Cytoplasm:	2
4.1 Physical Organization. 4.2 Chemical composition and Biological properties.	
Unit 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	
Unit 6: Nucleus:	4
6.1 Shape, size, number and position 6.2 Ultra structure of nucleus, and Nuclear - Pore complex 6.3 Functions of nucleus	
Unit 7: Cell division and its significance:	6
7.1 Cell cycle in brief 7.2 Mitosis 7.3 Meiosis	
Unit 8: General Topics:	3
8.1 Introduction to Techniques in Cell Biology in brief such as -Centrifugation, Chromatography, Electrophoresis	

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.

Course Articulation Matrix of ZOO: 1102 Fundamentals of Cell Biology
Weightage: 1: Partially related, 2: Moderately related, 3: Strongly related

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	1	3	2	2	1	1	3
CO2	3	3	1	3	2	2	1	1	2
CO3	3	3	1	3	2	2	1	1	3
CO4	3	2	1	3	2	2	2	1	1
CO5	3	3	1	3	2	2	1	1	2
CO6	3	3	1	3	2	2	1	1	3
CO7	3	3	1	3	2	2	1	1	3

PO1: Disciplinary Knowledge
All course outcomes contribute significantly to the development of disciplinary knowledge in cell biology. Each CO focuses on a specific aspect of cell biology, such as historical understanding, comparative analysis, mastery of concepts, and application of knowledge.

PO2: Critical Thinking and Problem Solving

Each CO requires critical thinking and problem-solving skills. Students need to critically analyze historical perspectives, compare cell structures, understand complex concepts, and apply knowledge to solve problems related to cell biology.

PO3: Social Competence

The primary focus of the course is on biological and cellular aspects rather than on social competence. The course aims to provide a deep understanding of cell biology rather than emphasizing social aspects.

PO4: Research-related skills and Scientific temper

Each CO involves research-related skills, from understanding historical contexts to comparative analysis and application of cell cycle knowledge. The course promotes a scientific temper by requiring students to approach cell biology topics with systematic and evidence-based methods.

PO5: Trans-disciplinary knowledge

While the primary focus is on cell biology, the comparative analysis of cell structures (CO2) could involve knowledge from other disciplines, making it moderately related to trans-disciplinary knowledge.

PO6: Personal and professional competence

Understanding historical context (CO1) and applying knowledge (CO7) indirectly contribute to personal and professional competence. Students develop competence in understanding and applying cell biology concepts.

PO7: Effective Citizenship and Ethics

The course outcomes are primarily focused on cellular biology, and the direct link to effective citizenship and ethics is limited. The emphasis is on scientific understanding rather than societal implications.

PO8: Environment and Sustainability

Similar to effective citizenship and ethics, the course outcomes are not directly related to environmental and sustainability aspects. The primary focus is on cellular and biological processes rather than environmental considerations.

PO9: Self-directed and Life-long learning

All course outcomes contribute to the development of skills necessary for self-directed and life-long learning in the field of cell biology. The diverse topics covered in the course encourage students to continue learning beyond the classroom setting.

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: ZOO: 1103
Paper: II **Title of Paper: ZOOLOGY PRACTICAL-I**

Credit: 2 **No. of Practicals: Any 10**

Learning Objectives:-

- Develop the ability to systematically classify organisms based on morphological characteristics.
- Acquire skills to observe and analyse morphological features critical for taxonomic classification and identify distinct morphological traits.
- Understand the ecological roles of organisms within Phylum Protozoa, Porifera, and Coelenterata and evolutionary context of each phylum.
- Analyse similarities and differences in the anatomy of organisms within each studied phylum
- Develop scientific reasoning skills to justify the taxonomic placement of organisms.
- Understand the implications of taxonomic classification for ecological studies and conservation efforts.
- Explore the interconnectedness of taxonomy, ecology, and evolution in the context of these diverse phyla and appreciate the significance of biodiversity within these phyla in various ecosystems.

Learning Outcomes:-

After completion of this course, students will be able to-

CO 1: demonstrate the ability to systematically classify organisms based on morphological characteristics, showcasing a comprehensive understanding of taxonomic principles.

CO 2: acquire advanced skills in observing and analyzing morphological features crucial for taxonomic classification. They will be able to identify distinct morphological traits efficiently.

CO 3: develop a profound understanding of the ecological roles of organisms within Phylum Protozoa, Porifera, and Coelenterata.

CO 4: analyze similarities and differences in the anatomy of organisms within Phylum Protozoa, Porifera, and Coelenterata.

CO 5: develop strong scientific reasoning skills to justify the taxonomic placement of organisms, incorporating morphological, ecological, and evolutionary evidence in their justifications.

CO 6: Recognize the role of taxonomy in shaping conservation strategies and biodiversity preservation.

CO 7: explore the interconnectedness of taxonomy, ecology, and evolution within the context of Phylum Protozoa, Porifera, and Coelenterata. They will appreciate the significance of biodiversity in various ecosystems, fostering a holistic understanding of biological concepts

PRACTICALS:

Sr. No.	Name of the Practical	E / D
1.	**To study the classification with reasons of the following:** Phylum Protozoa- *Paramecium, Euglena.* Phylum Porifera- *Spongilla, Sycon.* Phylum Coelenterata (Cnidaria) *–Hydra, Aurelia*	**(D)**
2.	**To study the classification with reasons of the following:** Phylum Platyhelminthes- *Taenia, Planaria.* Phylum Aschelminthes- *Ascaris, Wuchereria bancrofti. (Filarial worm)* Phylum Annelida- *Nereis, Leech.*	**(D)**
3.	**Preparation of Culture media & Culturing of Animals:** Study of Culture & regeneration in Hydra **OR** Preparation of Paramoecium culture & observation of live Paramecium (Cyclosis and Trichocysts)	**(E)**

4.	**Vermiculture:** Preparation of small scale Vermiculture bed for vermicomposting from domestic wastes. (**Activity based learning**)	**(E)**
5	**Study of Earthworm(*Pheretima posthuma)*:** Morphology, Digestive and Nervous system of Earthworm	**(D/E)**
6.	**Temporary Preparations from Earthworm:** Septal nephridia, Spermatheca & setae of Earthworm**.**	**(D/E)**
7	**Microscopy:** Study of Standard Operating Procedure of a Simple and Compound Microscope. (**Activity based Learning**)	**(E)**
8	**Mountings from Cell Biology:** Temporary preparation and observation of Prokaryotic and Eukaryotic cell in a suitable material.	**(E)**
9	**Study of different Cell Organelles**: Mitochondria, Nucleus, Endoplasmic Reticulum, Golgi complex. With (Picture/Model/Chart)	**(D)**
10	**Study of Cell Division:** Study of Mitosis in onion root tip cells	**(E)**
11	**Demonstrations from cells:** Demonstration of Mitochondria by Janus green B **OR** Demonstration of Barr Body**.**	**(E)**
12	**Compulsory Zoological Study Tour:** A Compulsory Visit to water body / Vermicomposting unit and submission of report	-

***E=Experiment D=Demonstration**

Course Articulation Matrix of ZOO: 1103 ZOOLOGY PRACTICAL-1
Weightage: 1: Partially related, 2: Moderately related, 3: Strongly related

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	**3**	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**2**
CO2	**3**	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**2**
CO3	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**2**	**2**
CO4	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**2**
CO5	**2**	**3**	**2**	**3**	**3**	**2**	**2**	**2**	**2**
CO6	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**2**
CO7	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**2**

PO1: Disciplinary Knowledge
CO 1 aligns with the acquisition of disciplinary knowledge by demonstrating expertise in the field of taxonomy and biological classification.

PO2: Critical Thinking and Problem Solving
CO 2 involves advanced observational and analytical skills contribute to critical thinking, fostering the ability to solve complex problems related to taxonomy and classification.

PO3: Social Competence
CO 3 involves understanding ecological roles enhances social competence by recognizing the interconnectedness of organisms in ecosystems and their impact on society.

PO4: Research-related Skills and Scientific Temper
CO 4 align with comparative anatomy analysis requires research skills and a scientific temper, contributing to a deeper understanding of organismal structures.

PO5: Trans-disciplinary Knowledge
CO 5 involves Integration of morphological, ecological, and evolutionary evidence transcends disciplinary boundaries, showcasing trans-disciplinary knowledge.

PO6: Personal and Professional Competence
CO 6 involves recognizing the role of taxonomy in conservation demonstrates personal and professional competence in environmental stewardship.

PO7: Effective Citizenship and Ethic
CO 7 involves understanding interconnected biological concepts promotes effective citizenship, ethical considerations.

PO8: Environment and Sustainability
CO5 and CO 7 involves environmental sustainability, contributing to responsible and informed citizenship.

PO9: Self-directed and Life-long learning
CO 1 encourages self-directed learning through exploration of diverse topics within the course.