

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY



CIRCULAR NO.SU./B.Sc.CBC & GS/11/2022

It is hereby inform to all concerned that, on the recommendation of Faculty of Science & Technology Meeting dated 24.08.2022, **the Academic Council at its meeting held on 29 August 2022 has accepted the following Syllabi of B.Sc. Degree under the Choice Based Credit & Grading System along with Rules and Regulation** as appended herewith:-

1.	B.Sc.Computer Science (Optional)	Ist and IInd semester
2.	B.Sc.Computer Application (Optional)	Ist and IInd semester
3.	B.Sc.Computer Application (Degree)	Ist and IInd semester
4.	B.Sc.Computer Science (Degree)	Ist and IInd semester
5.	B.Sc.Horticulture (Optional)	Ist to VIth semester
6.	B.Sc.Botany (Optional)	Ist to VIth semester
7.	B.Sc. Agrochemical & fertilizer (Optional)	Ist to VIth semester
8.	B.Sc.Home Science (Optional)	Ist and IInd semester
9.	B.Sc.Automobile Technology (Degree)	Ist and IInd semester
10.	B.Sc.Workshop Technology (Degree)	Ist and IInd semester
11.	B.Sc.Refrigeration and Air Conditioning (Degree)	Ist and IInd semester
12.	B.Sc.Environmental Science (Optional)	Ist and IInd semester
13.	B.Sc.Biotechnology (Degree)	Ist and IInd semester
14.	B.Sc.Biotechnology (Optional)	Ist and IInd semester
15.	B.Sc.Dairy Sci.& Tech (Optional)	Ist and IInd semester
16.	B.Sc.Zoology (Optional)	Ist to VIth semester
17.	B.Sc.Polymer Chemistry (Optional)	Ist and IInd semester
18.	B.Sc.Fisheries Science (Optional)	Ist and IInd semester
19.	B.Sc.Instrumentation Practice (Optional)	Ist semester
20.	B.Sc.Biochemistry (Optional)	Ist and IInd semester
21.	B.Sc.Non Conventional & Conventional Energy (Degree)	Ist and IInd semester

This is effective from the Academic Year 2022-23 and onwards.

All concerned are requested to note the contents of this circular and bring notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
Ref.No. SU/B.Sc./2022/8428-35
Date:-29.08.2022.

★
★
★
★
★

**Deputy Registrar,
Academic Section**

::2::

Copy forwarded with compliments to :-

- 1] **The Principal, concerned affiliated College,**
Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

- 1] The Director, Board of Examinations & Evaluation,
- 2] The Section Officer, [B.Sc. Unit] Examination Branch,
- 3] The Programmer [Computer Unit-1] Examinations,
- 4] The Programmer [Computer Unit-2] Examinations,
- 5] The In-charge, [E-Suvidha Kendra],
Rajarshi Shahu Maharaj Examination Branch,
- 6] The Public Relation Officer,
- 7] The Record Keeper,

JS*29082022/-

**Dr. Babasaheb Ambedkar Marathwada University,
Aurangabad**



**Syllabus for
B.Sc First Year (Semester I and II)
B.Sc Second Year (Semester III and IV)
UNDER CHOICE BASED CREDIT SYSTEM
Under
FACULTY OF SCIENCE AND TECHNOLOGY**

w.e.f Academic Year.2022-23

Yash
6/8/2022

[Signature]
8/08/22
Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
Semester Pattern Curriculum under
Choice based Credit System (CBCS)
Faculty of Science and Technology
Department of Zoology
Course Structure and Examination Scheme
B. Sc. First Year (Semester – I)

Class / Semester	Code	Course Title	Credits	Period/week	Examination Scheme			
					Maximum Marks	UA	CA	Minimum Passing
B.Sc. F.Y Semester First	ZOL- 101	Animal Diversity -I Protozoa To Echinodermata	2	(3/week)	50	40	10	20
	ZOL- 102	Cell Biology	2	(3/week)	50	40	10	20
	ZOL- 103	Practical Paper based on Paper 101 & 102	2	(3 /week Batch)	50	50 Annual Exam.	-	20

B. Sc. First Year (Semester –II)

Class / Semester	Code	Course Title	Credits	Period/week	Examination Scheme			
					Maximum Marks	UA	CA	Minimum Passing
B.Sc. F.Y Semester Second	ZOL- 105	Animal Diversity-II (Protochordata to Mammals)	2	(3/week)	50	40	10	20
	ZOL- 106	Genetics	2	(3/week)	50	40	10	20
	ZOL- 107	Practical Paper based on Paper 105& 106	2	(3 /week Batch)	50	50 Annual Exams.	-	20

B. Sc. First Semester
Course Code - ZOL- 101
Zoology Paper: I
ANIMAL DIVERSITY- I
(PROTOZOA TO ECHINODERMATA)
Credits- 02 (1 Credit =16 Clock Hours)
Total No. of Period - 45
Evaluation - External 40, Internal 05

Learning Objective-To know the general characters and classification of non chordates and understand the diversity and complexity of life from Protista to Echinodermata.

Learning Outcome- On completion of the course the students will be able to understand the general organization, diversity and adaptation of Non Chordates. The Student will learn the importance of biodiversity conservation.

• **Protista: - 10**

General characters and classification.

- A. Animal like Protist E.g. Amoeba, Noctiluca
- B. Plant like Protist E.g. Diatoms, Stentor
- C. Fungi like E.g. Water molds, Phytophthora infestans, Yellow slime mold
- D. Euglena like E.g. Euglena
- Locomotory organelles and locomotion in Euglena and Amoeba.

Reproduction in protozoa; Asexual and Sexual conjugation

2. Porifera :- 04

- General characters and classification up to classes
- Spicule and Gemules in Porifera
- Canal system in Porifera.

3. Cnidaria:- 03

- General characters and classification up to classes
- Polymorphism in Coelenterates.

4. Platyhelminths :- 04

- General characters and classification up to classes
- *Taenia solium*- Life history, pathogenicity, Parasitic adaptation and control measures

5. Nematelminthes :- 04

- General characters and classification up to classes
- *Ascaris lumbricoides*: - Life history, Pathogenicity & control measures.

6. Annelida: - 03

- General characters and classification up to classes
- Metamerism in Annelids.

7. Arthropoda:-05

- General characters and classification up to classes
- Arthropods Eyes and Vision
- Metamerism in insects

8. Mollusca:- 03

- General characters and classification up to classes
- Torsion in Gastropods

9.Echinodermata:- 04

- General characters and classification up to classes
- Water vascular system in Star fish (Asterias)

- Tutorial **05**

B. Sc. First Semester
Course Code - ZOL- 102
Zoology Paper: II
Cell Biology
Credits- 02(1 Credit =16 Clock Hours)
Total No. of Period - 45
Evaluation - External 40 Internal 05

Learning Objective- To understand the structure and function of animal cell

Learning Outcome - The student will understand the architecture and functions of cell.

1. Introduction to cell biology- 10

- General structure of Prokaryotic cell
- General structure Eukaryotic cells
- Energy efficiency of small cell
- Cell Cycle
- Mitosis and Meiosis

2. Cell environment- 08

- Chemical bonds, Inorganic - water, salts and ions
- Organic compounds- Proteins, Carbohydrates, Lipids, Nucleic acids, Vitamins.

3. Cell organelles- 12

- Plasma Membrane: - Structure, function and Fluid mosaic model
- Mitochondria: - Structure, function and Electron Transport Chain
- Structure and function of Endoplasmic reticulum, Ribosomes, Golgi Bodies and Lysosomes, Microtubules, microfilaments and centrioles

4. Nucleus:- 04

- Structure and Function of Nucleus
- Structure of DNA and Types of RNA

5. Cancer biology and Ageing:- 06

- Characteristics of cancer cell
- Types of Cancer:-Carcinomas, Sarcomas, Lymphomas, Leukemia etc.
- Introduction to cell ageing
- Effect of radiations on cells (UV radiations, photodynamic sensitization)

- Tutorial 05

B. Sc. First Semester

Credit: 02

Zoo-103

Paper-III PRACTICAL

PROTOZOA TO ECHINODERMATA & Cell Biology

1. **Study of animals belonging to** Protozoa, Porifera, Cnidaria, Ctenophora, Platyhelminthes, Aschelminthes and Annelida with special reference to systematic position up to class level, habit, habitat, characteristic features and economic importance (one example of each class and Local examples are to be given more emphasis) with the help of Museum specimens, models, charts, Microslides, Photographs and Digital sources.

2. **Study of animals belonging to** - Onychophora, Arthropoda, Mollusca, Echinodermata with special reference to systematic position up to class level, habit, habitat, characteristic features and economic importance. (one example of each class and Local examples are to be given more emphasis) with the help of Museum specimens, Models, Charts, Microslides, Photographs and Digital sources.

3. Method of protozoan culture (Any one)

4. Identification of Protozoan's and Coelenterates in pond water sample

5. Temporary mounting of :-

- Gemules and Spicules of sycon
- Obelia colony
- Parapodium of Neries

6. Study of diversity of mouth parts in insect:- Mosquito, Housefly, Honey bee, Cockroach, Butterfly

7. Digestive and Nervous system of Earthworm (Museum specimen/Charts/digital sources)

8. Digestive system of Cockroach (Museum specimen/digital sources)

9. Study of Prokaryotic cells –Grams staining technique

10. Study of Eukaryotic cells using suitable staining technique (Buccal epithelial cells)

11. Study of cytoplasmic movements in paramecium

12. Localization of Mitochondria by Janus Green stain

13. Study of cancer cells through permanent slides

14. Study of cell organelles through electron micrographs/charts

15. Study of Mitosis using suitable material /Meiosis using permanent slides.

Note: Demonstration of animal dissections through Computer Aided

Techniques as per U.G.C Guidelines.

Suggested Readings:

1. Jordan E.L., Verma P. S. (1987) *Invertebrate Zoology*. S. Chand and Company Pvt. Ltd. New Delhi.
2. Kotpal R.L. (2000) *Invertebrates*. Rastogi Publi. Meerut
3. EkambaranathaAyyar, M. Ananthkrishnan, T N. *Outlines of Zoology*, S. Vishwanathan, Madras
4. Prasad S.N. (Reprint 1992) *Life of Invertebrates*. VikasPublishing House Pvt. Ltd.
5. Dhami P.S., Dhami J.K. *Invertebrate Zoology*. S. Chand and Company Pvt. Ltd. New Delhi.
6. Parker A.J., Haswell W. A. A. (2002) *Textbook of Zoology Vol. I*. Mc millan
7. Ganguly B. B., Sinha A.K. and Adhikari S. (2000) *Introduction to biology of Animals*. New Central Book Agency, Calcutta
8. Barnes R.D. (2000) *Invertebrate Zoology*. Saunders College Publishing
9. Karp, G. (2010). *Cell and Molecular Biology: Concepts and Experiments*. VI Edition. John Wiley and Sons. Inc.
10. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). *Cell and Molecular Biology*. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
11. Cooper, G.M. and Hausman, R.E. (2009). *The Cell: A Molecular Approach*. V Edition.
12. S.V. Nikam and T.T. Shaikh *Protozoology 2011*, Oxford Publication house ,Jaipur
13. Kotpal, R.L. *Modern Text Book of Zoology Invertebrates*, Rastogi Publication, Meerut.
14. Parker & Hashwell, *Textbook of Zoology Vol. I (Invertebrates)* A.Z.T.B.S. Publishers & Distributors. New Delhi.
15. E.L. JORDEN & P.S. VERMA, *Invertebrate Zoology*, S. Chand & Co. Ltd. New Delhi
16. *Cytology, Genetics and Evolution* – P.K. Gupta (Rastogi Publications, Delhi)
17. *Cytology and genetics* – Dyansagar V. R. (Tata McGraw Hill Pub. 1992 Reprint)
18. *Manual of Practical Zoology* – P. K. G. Nair and K. P. Achar (Himalaya Publication)

B. Sc. Second Semester
Course Code - ZOL- 104
Zoology Paper: IV
DIVERSITY OF CHORDATA-II
Protochordata to Mammals
Credits- 02(1 Credit =16 Clock Hours)
Total No. of Period - 45
Evaluation - External 40, Internal 05

Learning Objective: To know the general characters and classification of Chordates and Understand the increasing complexity of organization of life from lower to higher chordates.

Learning Outcome: On completion of the course the student should be able to know the General organization of Chordates as a group and know the taxonomy and characteristic features of the various Chordate phyla.

Unit 1: Protochordata	04
General features and Phylogeny of Protochordata	
Unit 1: Agnatha	04
General features of Agnatha, classification and affinities of cyclostomata up to classes	
Unit 2: Introduction to Chordates	06
General features and classification of phylum Chordates upto classes	
Unit 3: Pisces	04
General features, Migration and Parental care in Fishes.	
Unit 4: Amphibia	04
General features and classification up to order, Parental care in Amphibia,	
Unit 5: Reptilia	10
General features and classification up to order; Identification of poisonous and non- poisonous snakes.	
Snake venom, symptoms, effect, and first aid treatment of snakebite.	
Unit 6: Aves	06
General features and classification up to order, volant adaptations in Birds; Migration in birds	
Adaptation in feet of birds.	
Unit 7 : Mammals	05
General features and classification up to order; Origin of Mammals (Prototheria, Metatheria and Eutheria), Adaptive radiation in mammals	

B. Sc. Second Semester
Course Code - ZOL- 105
Zoology Paper: V
GENETICS
Credits- 02 (1 Credit =16 Clock Hours)
Total No. of Period - 38
Evaluation - External 40, Internal 10

Learning Objective: To study the hereditary biology and mechanism involved in hereditary diseases and disorders.

Learning Outcome - The student will understand genetics and heredity.

- Unit 1: Mendelian Genetics and its extensions** **06**
- Overview of Mendelian genetics; - Epistasis and Hypostasis, multiple gene and multiple alleles

- Sex linked, Sex limited and Sex influence inheritance, Linkage – definition, types and significance
- Unit 2: Chromosome structure** **06**
- Eukaryotic chromosomes; -Types of Eukaryotic chromosomes (based on centromere position), Eukaryotic & Prokaryotic organization, giant chromosomes.
- Unit 3: Gene mutation** **05**
-Natural and induced mutation;- Types of gene mutation (base pair substitution and frame shift)

-Types of chromosomal aberrations, spontaneous and induced mutations (chemical mutagen and radiations)
- Unit 4: Sex determination:** **06**
- Chromosome theory in sex determination;- Genic balance theory of sex determination

-Triploid inter sexes & Gynandromorphs in Drosophila;-Sex linked inheritance: X linked and Y linked
- Unit 5: Inheritance of human traits** **06**
-Human karyotype; -Pedigree analysis; -Inheritance of human traits: Brown eyes, Polydactyl, Diabetes insipidus, Sickle cell anemia PKU
- Unit 6: Human Genetics:** **05**
Dizygotic Twins and Monozygotic Twins, Use of human genetics in medical science, Gene Therapy and DNA Fingerprinting
- Unit: 7 Population Genetics :-** **04**
Gene Pool., Gene Frequency.

Hardy-Weinberg's Law.

**B. Sc. Second Semester
Course Code - ZOL- 106
Zoology Paper: VI**

DIVERSITY OF CHORDATA-II

Based on Protochordata to Mammals&Genetics

PRACTICALS

Credits 02

1. **Protochordata:** Study of specimens: *Balanoglossus, Herdmania, Branchiostoma, Salpa, Doliolum, Oikopleura, Botryllus*
2. **Agnatha:** Study of specimens: *Petromyzon, Myxine*
3. **Fishes:** Study of specimens: *Scoliodon, Sphyrna, Pristis, Torpedo, Chimaera, Mystus, Heteropneustes, Labeo, Exocoetus, Echeneis, Anguilla, Hippocampus, Tetradon/ Diodon, Anabas, Cyannoglossus.*
4. **Amphibia:** Study of specimens: *Ichthyophis/Ureotyphlus, Necturus, Bufo, Hyla, Alytes, Salamandra*
5. **Reptilia:** Study of specimens: *Chelone, Trionyx, Hemidactylus, Varanus, Uromastix, Chamaeleon, Ophiosaurus, Draco, Bungarus, Vipera, Naja, Hydrophis, Zamenis, Crocodylus.* Key for Identification of poisonous and non-poisonous snakes
6. **Aves:** Study of six common birds from different orders. Types of beaks and claws
7. **Mammalia:** *Sorex, Bat (Insectivorous and Frugivorous), Funambulus, Loris, Herpestes, Erinaceus.*
8. Visit to Zoological survey of India/ Museum/National Park.
9. Observation of common mutants of *Drosophila*
10. Determination of human blood groups A, B, AB, and O, Rh factor.
11. Major and minor problems in genetics
12. Study of preparation of Normal Karyotype of human.

13. Karyotypic study of Down's syndrome, Turner's syndrome,

14. Klinefelter's syndrome with the help of photograph.

14. Detection of Barr body from epithelial cell.

15. Problems on sex linked inheritance.

16.. Study of gene frequency and mutants of man

➤ Attached and free ear lobe.

➤ Colour of eye.

➤ Rolling of tongue.

➤ Blood group frequency.

17. Human pedigree analysis- various symbols used.

18. Study of permanent slide of sickle cell anemia

Reference Books:

1. Young, J. Z. (2004). *The Life of Vertebrates. III Edition. Oxford university press.*
2. Pough H. *Vertebrate life, VIII Edition, Pearson International.*
3. Darlington P.J. *The Geographical Distribution of Animals, R.E. Krieger Pub Co.*
4. *Strickberger s Evolution. IV Edition. Jones and Bartlett*
5. A life of Vertebrate – K.Z.Young, ELBS Oxford University Press.
6. Modern Text Book of Zoology Vertebrate – R.L.Kotpal, Rastogi Publication Meerut.
7. A Text Book of Chordate Zoology – R.C.Dalela –Jaiprakashnath Publication Meerut.
8. Chordate Zoology – E.L.Jordan and P.S.Verma, S.Chand and Company New Delhi.
9. Kotpal R L (2009): *Modern textbook of Zoology Vertebrates*, Rastogi Publication .
10. Lal S.S. (1996): *Textbook of Practical Zoology Vertebrates*, Rastogi Publications
11. *Manual of Practical Zoology – P. K. G. Nair and K. P. Achar (Himalaya Publication)*

REFERENCES BOOKS

1. Genetics – P.K. Gupta (Rastogi Pub. Meerut)
2. Genetics – Verma P.S. and Agarwal V.K. (S. Chand Pub. Delhi.)
3. Cytology, Genetics and Evolution – P.K. Gupta (Rastogi Pub. Delhi)
4. Elementary Genetics – Single tone
5. Genetics – Winchester (Oxford LBH Pub.)
6. Genetics and Evolution – A.P. Jha (Macmillon India)
7. Concepts of Genetics – W.S. Clug (Pearson Education ISBN)
8. Genetics – Strickberger (Prentice – Hall)
9. Principle of Genetics – R.H. Tamarin (Tata Mc Graw Hill Pub. India)
10. Concepts of Genetics – R. L. Kotpal (Rastogi Pub.)
11. Foundations of Genetics – Pai A.C. (Mc Graw Hill Pub.)
12. *Manual of Practical Zoology – P. K. G. Nair and K. P. Achar (Himalaya Publication)*