

Dr. Babasaheb Ambedkar Marathwada
University Aurangabad.



N e w S y l l a b u s

B.Sc. (Zoology) **Semester System**

First Year

(First Semester and Second Semester 2009-2010)

Second Year

(Third Semester and Fourth Semester 2010-2011)

Third Year

(Fifth Semester and Sixth Semester 2011-2012)

Effective from June 2009-10

B. Sc. First Semester

Paper I Protozoa to Annelida
 Paper II Cell Biology
 Paper III Practical based upon Paper I
 Paper IV Practical based upon Paper II

B. Sc. Second Semester

Paper V Arthropoda to Echinodermata and Protochordata
 Paper VI Genetics
 Paper VII Practical based upon Paper V
 Paper VIII Practical based upon Paper VI

Statement showing the (Excluding Mathematics) common course structure under the Faculty of Science.

Credit System

Year	Semester	Theory paper	Paper No.	Credits	Practical paper	Paper No.	Credits	Total
1 st	1 st	Th	I	03	Pr.	III	1.5	09
		Th	II	<u>03</u>	Pr.	IV	<u>1.5</u>	
				06			03	
	2 nd	2 nd	Th	V	03	Pr.	VII	
Th			VI	<u>03</u>	Pr.	VIII	<u>1.5</u>	
				06			03	
2 nd	3 rd	Th	IX	03	Pr.	XI	1.5	09
		Th	X	<u>03</u>	Pr.	XII	<u>1.5</u>	
					06		03	
	4 th	4 th	Th	XIII	03	Pr.	XV	
Th			XIV	<u>03</u>	Pr.	XVI	<u>1.5</u>	
				06			03	
3 rd	5 th	Th	XVII	03	Pr.	XIX	1.5	09
		Th	XVIII	<u>03</u>	Pr.	XX	<u>1.5</u>	
					06		03	
	6 th	6 th	Th	XXI	03	Pr.	XXIII	
Th			XXII	<u>03</u>	Pr.	XXIV	<u>1.5</u>	
				06			03	

Note: For theory paper 1 credit = 15 periods.
 For practical paper 1 credit = 30 periods.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
B.Sc. Zoology Pattern in Semester System

B. Sc. First Year Zoology

Semester	Course Code	Paper No.	Title of Paper	Credit	Marks
I	ZOL-101	Paper – I	Protozoa to Annelida	03	50
	ZOL-102	Paper – II	Cell Biology	03	50
	ZOL-103	Paper – III	Practical based upon Paper I	1.5	50
	ZOL-104	Paper – IV	Practical based upon Paper II	1.5	50
II	ZOL-201	Paper – V	Arthropoda to Echinodermata and Protochordata	03	50
	ZOL-202	Paper – VI	Genetics - I	03	50
	ZOL-203	Paper – VII	Practical based upon Paper V	1.5	50
	ZOL-204	Paper – VIII	Practical based upon Paper VI	1.5	50

B. Sc. II Year Zoology

III	ZOL-301	Paper – IX	To be Decided	03	50
	ZOL-302	Paper – X	To be Decided	03	50
	ZOL-303	Paper – XI	Practical based upon Paper IX	1.5	50
	ZOL-304	Paper – XII	Practical based upon Paper X	1.5	50
IV	ZOL-401	Paper – XIII	To be Decided	03	50
	ZOL-402	Paper – XIV	To be Decided	03	50
	ZOL-403	Paper – XV	Practical based upon Paper XIII	1.5	50
	ZOL-404	Paper – XVI	Practical based upon Paper XIV	1.5	50

B. Sc. III Year Zoology

V	ZOL-501	Paper – XVII	To be Decided	03	50
	ZOL-502	Paper XVIII A, B, C	To be Decided	03	50
	ZOL-503	Paper – XIX	Practical based upon Paper XVII	1.5	50
	ZOL-504	Paper – XX	Practical based upon Paper XVIII	1.5	50
VI	ZOL-601	Paper – XXI	To be Decided	03	50
	ZOL-602	Paper –XXII A, B, C	To be Decided	03	50
	ZOL-603	Paper XXIII	Practical based upon Paper XXI	1.5	50
	ZOL-604	Paper XXIV	Practical based upon Paper XXII	1.5	50

B. Sc. First Semester
Course Code - ZOL-101
Zoology Paper –I
Protozoa to Annelida

1. **Introduction to animal kingdom** **03 = (0.20 credit)**
 - Definition of Zoology, Outline classification (Protozoa, Parazoa, & Metazoa), Major phyla.
 2. **Protozoa** **09 = (0.60 credit)**
 - ***Plasmodium vivax***: - Structure of sporozoite, Life cycle; pathogenecity, Control, Prevention and Treatment of Malaria.
 - ***Entamoeba histolytica***: - Structure, Life cycle and Control.
 - ***Euglena***: Morphology and Reproductive system.
 3. **Porifera** **08 = (0.54 credit)**
 - Sycon (*Scypha*): - Morphology, Different types of cells in sycon, canal system in Porifera.
 4. **Coelenterata** **06= (0.40 credit)**
 - ***Obelia***: - Morphology of Obelia colony, Development of Hydra,
 - Polymorphism in coelenterates.
 5. **Helminths**. Classification **12= (0.80 credit)**
 - ***Fasciola hepatica***: - Structure, Life cycle, Pathogenecity & Control Measures
 - ***Taenia solium***: - Structure of scolex, Mature and gravid proglottids, Life cycle, pathogenecity, and control measures.
 - ***Ascaris lumbricoides***: - Structure of male & female, Life cycle, Pathogenecity & control measures.
 6. **Annelida** Classification. **07 = (0.46 credit)**
 - Leech: - Morphology, Digestive, Excretory & Reproductive systems.
- Total = 3 credits**

Recommended Books:

1. Kotpal, R.L. **Modern Text Book of Zoology Invertebrates**, *Rastogi Publication, Meerut.*
2. Parker & Hashwell, **Textbook of Zoology Vol. I (Invertebrates)** A.Z.T.B.S. Publishers & Distributors. New Delhi.
3. E.L. JORDEN & P.S. VERMA, **Invertebrate Zoology**, S. Chand & Co. Ltd. New Delhi.
4. Hickman C. P. Jr., Hickman & L.S. Roberts. **Integrated principles of zoology**, Mosby college publication. St. Louis.
5. Ayur, E.K., And T.N. Ananthakrishnan, **Manual of zoology Vol. I, Invertebrata, Part I and II** S.Viswanathan (Printers and Publishers) Pvt. Ltd. Madras.
6. Balinsky **An Introduction to Embryology** (CBS College Publishers).
7. Grant- **Biology of Development Systems** (Holt. Reihart, Winston).
8. Dr. S.S. Lal **Practical Zoology Invertebrates 9th edition** Rastogi Publications Meerut.

B. Sc. First Semester
Course Code - ZOL-102
Zoology Paper –II
Cell Biology

1. General structure of cell.

12 = (0.8 credit)

- Structure of prokaryotic cell.
- Structure of eukaryotic cell.
- Cell Cycle, Mitosis, Meiosis

2. Organisation of cell

20 = (1.34 credit)

- **A) Study of Various cell organelles**

Endoplasmic reticulum: - Structure and function.

Golgi Bodies: - Structure and function

Mitochondria: - Morphology, Ultra-Structure and biogenesis.

Nucleus: - Structure and function.

DNA Structure.

Types of RNA

Lysosome : - Structure, function and polymorphism

Ribosomes: - Structure and function

- **B) Cytology of Cancer, Types of Cancer.**

3. Methods in Cell Biology (in brief)

13 = (0.86 credit)

A) Light Microscope

Phase contrast microscope

Electron microscope

B) Microtechniques, (Microtomy) Fixation & Staining.

Total = 3 credits

List of Recommended Books:

1. Alberts B. *et.al* - **Molecular Biology of the cell** (Sinauer)
2. Lodish H.*et.al* – **Molecular Cell Biology.**
3. Gupta P.K. **Cell and Molecular Biology** Rastogi Publication Meerut.
4. Dr. S.P. Singh, Dr. B.S. Tomar, **Cell Biology** 9th revised edition Rastogi Publication Meerut.
5. Gerald Karp **Cell and Molecular biology- Concepts and Experiments.** John Wiley, 2007.

B. Sc. First Semester
Course Code - ZOL-103
Zoology Paper –III
Practical - **Protozoa to Annelida**

1. Study of slides from Ciliates, Opalinates, and Flagellates. (any five) **01 = (0.06 credit)**
2. Study of museum specimen and slides from Porifera to Annelida.
(Three from each phyla) **02 = (0.13 credit)**

[Note, Identification, Classification, Sketch & any 3 to 4 points related to (One point) habitat (one or two point) structure & (one point from) Biological importance.]

3. **Dissection:**

- Dissection of **Leech** for Digestive, Excretory & Reproductive systems.
- Dissection of **Earthworm** for Nervous System & Reproductive system **09 = (0.6 credit)**

4. **Mounting** of any five of the following.

03 = (0.2 credit)

- Sponge spicules, Gemmule, Obelia colony, Jaws of Leech.
- Nerve ring of Earthworm, Parapodia of Neris

Total: **1.5 credits**

B. Sc. First Semester
Course Code - ZOL-104
Zoology Paper –IV
Practical – Cell Biology

1. Study of cell organelles by using Models, Charts, Slides & electron photo micrographs. **02 = (0.13 credit)**

2. Squash preparation of Onion root tip to study Mitosis. **02 = (0.13 credit)**

3. Preparation of polytene chromosome in chironomous larva/fruit fly. **02 = (0.13 credit)**

4. Microtechnique: - Fixation, dehydration, Block preparation, Microtomy and Staining of Rat tissue. **06 = (0.4 credit)**

5. Study of Microscopy: - Simple, Compound, & Phase Contrast Microscope. **03 = (0.2 credit)**

Total: 1.5 credits

Pattern of Question Paper for B.Sc. First Semester (Theory)
Course Code – ZOL-101
Zoology Paper –I
Protozoa to Annelida

Time: 2:30 hours

Max. Marks: 50

- N.B. 1) Attempt all questions.**
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.
-

- | | | |
|------------|---|---|
| Q1. | Long answer question.
OR
Long answer question. | Based on chapter 1& 2
OR
Based on chapter 1& 2 |
| Q2 | Long answer question.
OR
Long answer question. | Based on chapter 3& 4
OR
Based on chapter 3& 4 |
| Q3. | Long answer question.
OR
Long answer question. | Based on chapter 5
OR
Based on chapter 5 |
| Q4. | Long answer question.

Long answer question. | Based on chapter 6
OR
Based on chapter 6 |
| Q5. | Write short notes on any two
a)
b)
c) | Based on chapter 3, 4& 5 |

Pattern of Question Paper for B.Sc. First Semester (Theory)

Course Code – ZOL-102

Zoology Paper –II

Cell Biology

Time: 2:30 hours

Max. Marks: 50

N.B. 1) Attempt all questions.

2) All question carry equal marks.

3) Illustrate your answer with suitable labeled diagram.

- | | | |
|------------|---|---|
| Q1. | Long answer question.
OR
Long answer question. | Based on chapter 1
OR
Based on chapter 1 |
| Q2 | Long answer question.
OR
Long answer question. | Based on chapter 2
OR
Based on chapter 2 |
| Q3. | Long answer question.
OR
Long answer question. | Based on chapter 2
OR
Based on chapter 2 |
| Q4. | Long answer question.

Long answer question. | Based on chapter 3
OR
Based on chapter 3 |
| Q5. | Write short notes on any two
a)
b)
c) | Based on chapter 1, 2& 3 |

B. Sc. First Semester
Scheme of Marking of Practical Examination
Course Code - ZOL-103
Zoology Paper –III
Practical - Protozoa to Annelida

Time= 4 Hours

Marks= 50

- | | | |
|-----|--------------------------------------|----------|
| Q1. | Dissection (Any One) | 15 Marks |
| Q2. | Mounting. (Any one) | 10 Marks |
| Q3. | Identification (05 spots) | 15 Marks |
| Q4. | Record Book | 05 Marks |
| Q5. | Submission of five permanent slides. | 05 Marks |

B.Sc. First Semester
Scheme of Marking of Practical Examination
Course Code - ZOL-104
Zoology Paper –IV
Practical – Cell Biology

Time= 4 Hours

Marks= 50

Q1. Mounting of squash preparation (Onion root tip) 12 Marks

OR

Mounting of Salivary glands from chironomous larva/Fruit fly.

Q2. Identification of permanent slides/models
(Mitosis, Cell organelles- any 03) 09 Marks

Q3. Double staining of given tissue ribbon. (Identify the tissue) 13 Marks

OR

Describe the given type of Microscope in detail.

Q4. Record Book 05 Marks

Q5. Submission of permanent slide (any three) 06 Marks

Q6. Viva Voce 05 Marks

B. Sc. Second Semester
Course Code – ZOL-201
Zoology Paper –V
Arthropoda to Echinodermata and Protochordata

1. **Arthropoda:** **15 = (1 credit)**
- **Prawn:** - Structure, Digestive, Nervous, & Reproductive systems.
 - **Cockroach:** External Characters, Digestive, Respiratory and Reproductive systems.
2. **Mollusca:** **06 = (0.40 credit)**
- Pila: - External Characters, Respiratory, Circulatory, Nervous and Reproductive systems.
3. **Echinodermata** **10 = (0.67 credit)**
- Asterias (*Sea Star*): - Morphology of oral & aboral view, Water vascular system, Reproductive system including development.
4. **General characters and Classification of Protochordata** **01 = (0.06 credit)**
- **Amphioxus:** - External features, Digestive, Circulatory, Reproductive systems including development. **13 = (0.87credits)**
 - **Hemichordata :-** General characters and affinities
 - **Herdmania :-** General characters and morphology
- Total = 3 credits**

Recommended Books:

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2. Parker & Hashwell, **Textbook of Zoology Vol. I (Invertebrates)** A.Z.T.B.S. Publishers & Distributors. New Delhi.
3. E.L. JORDEN & P.S. VERMA, **Invertebrate Zoology**, S. Chand & Co. Ltd. New Delhi.
4. Hickman C. P. Jr., Hickman & L.S. Roberts. **Integrated principles of zoology**, Mosby college publication. St. Louis.
5. Ayur, E.K., And T.N. Ananthakrishnan, **Manual of zoology Vol. I, Invertebrata, Part I and II** S.Viswanathan (Printers and Publishers) Pvt. Ltd. Madras.
6. Balinsky **An Introduction to Embryology** (CBS College Publishers).
7. Grant- **Biology of Development Systems** (Holt. Reihart, Winston).
8. Dr. S.S. Lal Practical Zoology Invertebrates 9th edition Rastogi Publications Meerut.

B. Sc. Second Semester
Course Code – ZOL-202
Zoology Paper –VI
Genetics - I

- | | | |
|----|--|----------------------------|
| 1. | Elements of heredity & variation | 04 = (0.26 credit) |
| | ➤ Definition of genetics and variation | |
| | ➤ Mendel's laws of heredity in short | |
| 2. | Gene interaction | 05 = (0.34 credit) |
| | ➤ Definition- modification in Mendelian phenotypic ratio like, | |
| | ➤ Epistasis | |
| | ➤ Supplementary gene | |
| | ➤ Complementary gene | |
| 3. | Multiple Alleles | 05 = (0.34 credit) |
| | ➤ Coat colour in rabbit. | |
| | ➤ ABO Blood group in man, Rh factor | |
| 4. | Cytoplasmic inheritance. | 08 = (0.53 credit) |
| | ➤ Definition of maternal effects. coiling shell in snail (<i>Limnea peregra</i>) | |
| | ➤ Male sterility. | |
| | ➤ CO ₂ sensitivity in drosophila. | |
| | ➤ Kappa particles in Paramecia. | |
| 5. | Sex Determination | 08 = (0.53 credit) |
| | ➤ Chromosome theory in sex determination | |
| | ➤ Genic balance theory of sex determination, X/A ratio in drosophila | |
| | ➤ Triploid intersexes and Gynandromorphs in drosophila. | |
| 6. | Mutation | 15 = (1 credit) |
| | ➤ Brief introduction | |
| | ➤ Gene mutation :- Definition and classification | |
| | ➤ Chromosomal aberration (structural & numerical) | |
| | ➤ Spontaneous & induced mutation | |
| | | . Total = 3 credits |

List of Recommended Books:

1. P.K. Gupta, **Genetics**- Rastogi Publications Meerut.
2. P.K. Gupta, **Genetics Classical to Modern**- Rastogi Publications Meerut.
3. Verma P.S. and V.K. Agarwal, **Genetics**, S.Chand and Publication.
4. Lewin O.D. and Lewin R. **Biology of Gene** McGraw Hill Troppan Co.Ltd.
5. Gunther S. Stent. **Molecular Genetics** McMillan Publication Co.Inc.
6. Goodenough V. **Genetics** New York, Holt Rinchart and Winston.
7. Winchester, **Genetics** Oxford HBH Publication.
8. Stricburger, **Genetics** McMillan Publication
9. Sinnott Dunn and Dobzansky **Principles of Genetics**.

Pattern of Question Paper for B. Sc. Second Semester (Theory)

Course Code – ZOL-201

Zoology Paper –V

Arthropoda to Echinodermata and Protochordata

Time: 2:30 hours

Max. Marks: 50

- N.B.** 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.
-

- | | | |
|-----|---|---|
| Q1. | Long answer question.
OR
Long answer question. | Based on chapter 1
OR
Based on chapter 1 |
| Q2 | Long answer question.
OR
Long answer question. | Based on chapter 2&3
OR
Based on chapter 2&3 |
| Q3. | Long answer question.
OR
Long answer question. | Based on chapter 2&3
OR
Based on chapter 2&3 |
| Q4. | Long answer question.
OR
Long answer question. | Based on chapter 4&5
OR
Based on chapter 4&5 |
| Q5. | Write short notes on any two
a)
b)
c) | Based on chapter 1&5 |

Pattern of Question Paper for B. Sc. Second Semester (Theory)

Course Code – ZOL-202

Zoology Paper –VI

Genetics -I

Time: 2:30 hours

Max. Marks: 50

- N.B.** 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.
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- | | | |
|-----|---|---|
| Q1. | Long answer question.
OR
Long answer question. | Based on chapter
OR
Based on chapter |
| Q2 | Long answer question.
OR
Long answer question. | Based on chapter
OR
Based on chapter |
| Q3. | Long answer question.
OR
Long answer question. | Based on chapter
OR
Based on chapter |
| Q4. | Long answer question.
OR
Long answer question. | Based on chapter
OR
Based on chapter |
| Q5. | Write short notes on any two
a)
b)
c) | Based on chapter |

B. Sc. Second Semester
Course Code – ZOL-203
Zoology Paper –VII
Practical - Arthropoda to Echinodermata and Protochordata

1. Study of museum specimen & slides of relevant Invertebrates & Protochordates. (At least 3 form each phyla). **03 = (0.3 credit)**

2. **Dissections:** **09 =(0.9 credit)**
 - Dissection of **Prawn** for Nervous system
 - Dissection of **Cockroach** for Digestive and Nervous Systems.
 - Dissection of **Pila** for Nervous system.
 - Dissection of **Sea Star** for Water Vascular System.

3. **Mounting of any five of the following.** **03=(0.3 credit)**
 - Mouthparts of Cockroach, Mosquito, House fly, Bed bug, Honeybee.
 - Salivary glands of cockroach.
 - Redula of Pila, Pedicillaria of Star fish.

Total: 1.5 credits

B. Sc. Second Semester
Course Code – ZOL-204
Zoology Paper –VIII
Practical – Genetics –I

- | | | |
|----|---|--------------------------|
| 1. | Observation of common mutant of drosophila. | 02 = (0.2 credit) |
| 2. | Determination of human blood groups A, B, AB, O & Rh factor. | 01 = (0.1 credit) |
| 3. | Minor problems based on monohybrid ratio & human blood group and its interpretation. | 04 = (0.4 credit) |
| 4. | Major problems based on dihybrid ratio & interaction of genes. | 04 = (0.4 credit) |
| 5. | Study and preparation of normal Karyotype of male and female. | 02 = (0.2 credit) |
| 6. | Study of gene frequency and mutants of man. | 02 = (0.2 credit) |
| | a) Attached and free ear lobe. | |
| | b) Colour of eyes. | |
| | c) Rolling of tongue. | |
| | d) Study of human syndromes with help of Karyotype.
(Turner's, Down's, Klinefelter's, Cat cry) | |

Total: 1.5 credits

B. Sc. Second Semester
Scheme of Marking of Practical Examination
Course Code – ZOL-203
Zoology Paper –VII
Practical - Arthropoda to Echinodermata and Protochordata

Time= 4 Hours

Marks= 50

Q1.	Dissection (Any One)	15
Q2.	Mounting (Any one)	10
Q3.	Identification (05 spots)	15
Q4.	Record Book	05
Q5.	Submission of five permanent slides	05

B. Sc. Second Semester
Scheme of Marking of Practical Examination
Course Code – ZOL-204
Zoology Paper –VIII
Practical – Genetics -I

Time= 4 Hours

Marks= 50

- Q1. Identify the spot 1-3 based on common Mutants of Drosophila. 10
- OR
- Find out Blood group & Rh factor of the given blood sample.
- Q2. Genetics- Major Problems 15
- Q3. Genetics- Minor Problems 10
- Q4. Identify the spot 1-3 with reference to mutant of human on the basis
of Karyotype. 06
- OR
- Calculate gene frequency of given human data (attached ear lobe,
Colour of eyes, rolling of tongue)
- Q5. Record Book 05
- Q6. Viva-Voce 04