Syllabus
for
Four-Years Undergraduate Programme (FYUGP)
As per Provisions of NEP-2020

ZOOLOGY

(Major, Associated Core and MDC Papers)

(for Semester-1 & Semester-2 only)

Effective from Session 2025-29 onwards

for

All Constituents / Affiliated Colleges Under the

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

JHARKHAND

MEMBERS OF BOARD OF STUDIES (BOS) OF UNDERGRADUATE (FYUGP)-NEP 2020 SYLLABUS OF BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBARD

(Effective from Session 2025-29 and onwards)

Sl. No	Designation	Name & Affiliation	Signature
1	Chairman	Dr. Navita Gupta *Associate Professor & Head* Department of Zoology, Binod Bihari Mahto Koyalanchal University, Dhanbad	Recommended 18/7/2025
2	Member	Dr. Rupam Mallik *Assistant Professor* Department of Zoology, Binod Bihari Mahto Koyalanchal University, Dhanbad	Recommended 26/7/2025
3	Member	Dr. Sarita Murmu *Assistant Professor* Department of Zoology, Binod Bihari Mahto Koyalanchal University, Dhanbad	20/07/25
4	Member	*Mr. Narendra Kumar Lal* *Assistant Professor* Department of Zoology, B. S. K. College, Maithan, Dhanbad	Recommended 26/7/25
5	Member	*Ms. Sharmila Kumari* *Assistant Professor* Department of Zoology, P. K. Roy Memmorial College, Dhanbad	Recommended 26/7/25
6	Member	*Ms. Cecilia Khushboo Barla* *Assistant Professor* Department of Zoology, B. S. City College, Bokaro	Recommended 26/7/25

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PART-I

Summary of Curriculum and Credit Framework for Four-Year Undergraduate Programme (FYUGP) under NEP-2020

Table 1: Credit Framework for first three years of FYUGP

Academic level	Level of Courses	Semester	**MJ:** Discipline specific courses- Core or Major (20)	**AC:** Associate Core Courses from (Discipline/ Interdisciplinary/ Vocational (8)		**ELC:** Elective courses opted in semester III from four paths of table from 4,5 &6 (8)	**MDC:** Multidisciplinary courses (from a pool of courses) (0)	**AEC:** Ability Enhancement courses (Modern Indian languages and English) (0)	**SEC:** Skill enhancement courses (0)	**VAC:** Value added courses (0)	**IKS:** (i) Indian Knowledge systems (ii) Social Awareness (0)	**RC:** Research Courses (12)	**AMJ:** Advance courses in place of Research (12)	Total Credits	**IAP:** Internship/Apprenticeship/ Project/ Vocational courses/ Dissertation (4)
	1	2	3 (80)	4 (32)			5	6	7	8	9	10	11	12	13
Level 4.5	Level 100-199: **Foundation or Introductory courses**	I	4	4	-	-	3	2	3	2	2	-	-	**20**	4
		II	4	-	4	-	3	2	3	2	2	-	-	**20**	
		Exit Point: Undergraduate Certificate provided with Summer Internship/ Project/ Vocational course/ Dissertation (4 Credits)												**OR**	
Level 5	Level 200-299: **Intermediate level courses**	III	4+4	-		4	3	2	3	-	-	-	-	**20**	
		IV	4+4+4	-		4	-	2	-	2	-	-	-	**20**	
OR		**Exit Point: Undergraduate Diploma provided with Summer Internship/ Project/ Vocational course/ Dissertation (4 Credits)**												**OR**	
Level 5.5	Level 300-399: **Higher level courses**	V	4+4+4+4	-		4	-	-	-	-	-	-	-	**20**	
		VI	4+4+4+4	-		4	-	-	-	-	-	-	-	**20**	
		Exit Point: Bachelor's Degree with Summer Internship/ Project/ Vocational courses/ Dissertation (4 Credits)												**120**	**+4**

Table 3: Credit Framework for various pathways in fourth year of FYUGP

Academic level	Level of Courses	Semester	**MJ:** Discipline specific courses- Core or Major (20)	**AC:** Associate Core Courses from Discipline/ Interdisciplinary/ Vocational (8)	**ELC:** Elective courses opted in semester III from four paths of table from 4,5 &6 (8)	**MDC:** Multidisciplinary courses (from a pool of courses) (0)	**AEC:** Ability Enhancement courses (Modern Indian languages and English) (0)	**SEC:** Skill enhancement courses (0)	**VAC:** Value added courses (0)	**IKS:** (i) Indian Knowledge systems (ii) Social Awareness (0)	**RC:** Research Courses (12)	**AMJ:** Advance courses in place of Research (12)	Total Credits	**IAP:** Internship/Apprenticeship/ Project/ Vocational courses/ Dissertation (4)
	1	2	3 (80)	4 (32)		5	6	7	8	9	10	11	12	13
	Honours with Reserach													
Level 6	Level 400-499: Advance courses	VII	4+4+4	-	4	-	-	-	-	-	4	-	**20**	--
		VIII	4+4	-	4	-	-	-	-	-	8	-	**20**	
		Exit Point: Bachelor's Degree with Honours with Research											**OR**	
OR	**Honours**													
Level 6	Level 400-499: Advance courses	VII	4+4+4	-	4	-	-	-	-	-	-	4	**20**	--
		VIII	4+4	-	4	-	-	-	-	-	-	4+4	**20**	
OR		Exit Point: Bachelor's Degree with Honours											**OR**	
	P.G. Diploma													
Level 6	Level 400-499: Advance courses	VII	4+4+4	-	4	-	-	-	-	-	-	4	**20**	--
		VIII	4+4	-	4	-	-	-	-	-	-	4+4	**20**	
		Exit Point: P. G. Diploma Degree											**160**	**+4**

Table 3: Semester-wise title of the Discipline Specific Papers in Four Year Undergraduate (FYUGP-NEP) Honours/ Honours with Research/ PG Diploma Program in Zoology (Effective from Academic Year 2025 onwards)

Year	Semester	Code	Paper	Credit (Theory + Practical)	Full Marks (Theory + Practical)
FIRST YEAR	First Semester	MJ-1	Systematic & Diversity of Non-Chordates	3 +1=4	75 + 25=100
		AC-1	Associated Course-1	3 +1=4	75 + 25=100
		MDC-1	Multidisciplinary Course-1	3	75
		AEC-1	Ability Enhancement Course-1	2	50
		SEC-1	Skill Enhancement Course -1	3	75
		VAC-1	Value Added Course -1	2	50
		IKS-1	Indian Knowledge Sustem-1/Social Awareness Activity	2	50
	Second Semester	MJ-2	Systematic & Diversity of Chordates	3 +1=4	75 + 25=100
		AC-2	Associated Course-2	3 +1=4	75 + 25=100
		MDC-2	Multidisciplinary Course-2	3	75
		AEC-2	Ability Enhancement Course-2	2	50
		SEC-2	Skill Enhancement Course -2	3	75
		VAC-2	Value Added Course -2	2	50
		IKS-2	Indian Knowledge Sustem-2/Social Awareness Activity	2	50
SECOND YEAR	Third Semester	MJ-3	Biochemistry & Basics of Biomolecules	3 +1=4	75 + 25=100
		MJ-4	Cell Biology	3 +1=4	75 + 25=100
		ELC-1	Elective Course (from discipline/interdisciplinary Course)	3 +1=4	75 + 25=100
		MDC-3	Multidisciplinary Course-2	3	75
		AEC-3	Ability Enhancement Course-2	2	50
		SEC-3	Skill Enhancement Course -2	3	75
	Fourth Semester	MJ-5	Mammalian Physiology	3 +1=4	75 + 25=100
		MJ-6	Genetics	3 +1=4	75 + 25=100
		MJ-7	Endocrinology	3 +1=4	75 + 25=100
		ELC-2	Elective Course (from discipline/interdisciplinary Course)	3 +1=4	75 + 25=100
		AEC-4	Ability Enhancement Course-2	2	50
		VAC-2	Value Added Course -2	2	50

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Year	Semester	Code	Paper	Credit (Theory + Practical)	Full Marks (Theory + Practical)
THIRD YEAR	Fifth Semester	MJ-8	Ecology	3 +1=4	75 + 25=100
		MJ-9	Evolution & Population Genetics	3 +1=4	75 + 25=100
		MJ-10	Animal Behaviour	3 +1=4	75 + 25=100
		MJ-11	Economic Zoology	3 +1=4	75 + 25=100
		ELC-3	Elective Course (from discipline/interdisciplinary Course)	3 +1=4	75 + 25=100
	Sixth Semester	MJ-12	Immunology	3 +1=4	75 + 25=100
		MJ-13	Comparative Anatomy &Histology of Vertebrates	3 +1=4	75 + 25=100
		MJ-14	Human Reproductive system & Reproductive Technology	3 +1=4	75 + 25=100
		MJ-15	Developmental Biology	3 +1=4	75 + 25=100
		ELC-4	Elective Course (from discipline/interdisciplinary Course)	3 +1=4	75 + 25=100
FOURTH YEAR		FOR BACHELOR'S DEGREE (HONOURS WITH RESEARCH)			
	Seventh Semester	MJ-16	Wildlife and Biodiversity Conservation	3 +1=4	75 + 25=100
		MJ-17	Biostatistics & Introductory Bioinformatics	3 +1=4	75 + 25=100
		MJ-18	Environment and Sustainable Development	3 +1=4	75 + 25=100
		ELC-5	Elective Course (from discipline/interdisciplinary Course)	3 +1=4	75 + 25=100
		RC-1	Research Course-1	3 +1=4	75 + 25=100
		FOR BACHELOR'S DEGREE (HONOURS)			
	Seventh Semester	MJ-16	Wildlife and Biodiversity Conservation	3 +1=4	75 + 25=100
		MJ-17	Biostatistics & Introductory Bioinformatics	3 +1=4	75 + 25=100
		MJ-18	Environment and Sustainable Development	3 +1=4	75 + 25=100
		ELC-5	Elective Course (from discipline/interdisciplinary Course)	3 +1=4	75 + 25=100
		AMJ-1	Microbiology	3 +1=4	75 + 25=100

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Undergraduate Programme for Zoology

Year	Semester	Code	Paper	Credit (Theory + Practical)	Full Marks (Theory + Practical)
FOURTH YEAR		FOR BACHELOR'S DEGREE (With POST GRADUATE DIPLOMA)			
	Seventh Semester	MJ-16	Wildlife and Biodiversity Conservation	3 +1=4	75 + 25=100
		MJ-17	Biostatistics & Introductory Bioinformatics	3 +1=4	75 + 25=100
		MJ-18	Environment and Sustainable Development	3 +1=4	75 + 25=100
		ELC-5	Elective Course (from discipline/interdisciplinary Course)	3 +1=4	75 + 25=100
		JOS-1	To be updated	3 +1=4	75 + 25=100
FOURTH YEAR		FOR BACHELOR'S DEGREE (HONOURS WITH RESEARCH)			
	Eighth Semester	MJ-19	Molecular Biology	3 +1=4	75 + 25=100
		MJ-20	Tools and Techniques in Biological Science	3 +1=4	75 + 25=100
		ELC-6	Elective Course (from discipline/interdisciplinary Course)	3 +1=4	75 + 25=100
		RC-2	Research Course-2	8	100
		FOR BACHELOR'S DEGREE (HONOURS)			
	Eighth Semester	MJ-19	Molecular Biology	3 +1=4	75 + 25=100
		MJ-20	Tools and Techniques in Biological Science	3 +1=4	75 + 25=100
		ELC-6	Elective Course (from discipline/interdisciplinary Course)	3 +1=4	75 + 25=100
		AMJ-2	Genetic Engineering & Biotechnology	3 +1=4	75 + 25=100
		AMJ-3	Applied Medical Zoology (with reference to Human Diseases)	3 +1=4	75 + 25=100
		FOR BACHELOR'S DEGREE (With POST GRADUATE DIPLOMA)			
	Eighth Semester	MJ-19	Molecular Biology	3 +1=4	75 + 25=100
		MJ-20	Tools and Techniques in Biological Science	3 +1=4	75 + 25=100
		ELC-6	Elective Course (from discipline/interdisciplinary Course)	3 +1=4	75 + 25=100
		JOS-2	To be updated	3 +1=4	75 + 25=100
		JOS-3	To be updated	3 +1=4	75 + 25=100

PART-II

SYLLABUS

FOR

MAJOR (MJ) PAPER

SEMESTER I

MAJOR-1 (MJ-1): SYSTEMATICS AND DIVERSITY OF NON-CHORDATES

Credit – 3 **Lectures – 45 Hours**

Full Marks = 75 [End Semester = **60**] + [Internal Examination = **15** (Written Examination = **10** + Class Performance & Attendance = **05**)]

Pass Marks = [End Semester = **24**] [Internal Examination = 0**6**]

Instructions:

- In all **9 questions** to be set there shall be two groups – **Group A and Group B**.
- **Group A** is compulsory which shall contain **three** questions.
- **Question no. 1** will be a very short answer type consisting of **six questions** of **1 mark** each in the form of MCQ/Fill in the blanks/True or False etc.
- **Question no. 2 & 3** will be of short answer type carrying **3 marks** each.
- **Group B** will contain **6 subjective/descriptive** questions* out of which the examinees are required to answer **any 4** carrying **12 marks** each.

***Question no. 9** will be short answer type. There will be **four options** of which **any two** to be answered, each carrying equal marks covering the whole syllabus.

Learning outcomes:

- Develop understanding on the diversity of life with regard to protists, non-chordates and chordates.
- Group animals on the basis of their morphological characteristics/ structures.
- Develop critical understanding how animals changed from a primitive cell to a collection of simple cells to form a complex body plan.
- Examine the diversity and evolutionary history of a taxon through the construction of a basic phylogenetic/ cladistics tree.
- Understand how morphological change due to change in environment helps drive evolution over a long period of time.

THEORY

Units	Topics	No. of Periods
1	**Systematics (Animal taxonomy)**	
1.1	Acoelomate and Coelomate	2
1.2	Protostomes and Deuterostomes	
1.3	Bilateria and Radiata	
2	**Characters and classification of different phyla of non-chordates up to classes with examples.**	

Units	Topics	No. of Periods
2.1	Protozoa, Porifera, Coelenterata, Platyhelminthes, Annelida, Arthropoda, Mollusca and Echinodermata.	5
3	**Non chordates: Protista to Pseudocoelomates**	
3.1 3.1.1 3.1.2	**Protozoa** Locomotion Reproduction	5
3.2 3.2.1	**Porifera** Canal system in Sponges	4
3.3 3.3.1 3.3.2 3.3.3	**Coelenterata** Structure, Life cycle and Metagenesis in *Obelia* Polymorphism in *Siphonophora* Coral reefs and their formation	6
3.4 3.4.1	**Platyhelminthes** Life history of *Taenia solium,* its pathogenicity, parasitic adaptation.	3
3.5 3.5.1	**Nemathelminths** Life history, parasitic adaptations in *Ascaris*.	3
4	**Eucoelomates**	
4.1 4.1.1 4.1.2	**Annelida** *Pheretima*: Coelom and metamerism Life History of Earthworm	3
4.2 4.2.1 4.2.2	**Arthropoda** Respiration in Prawn Larval forms of Crustacea	6
4.3 4.3.1 4.3.2	**Mollusca** Respiration in *Pila* Torsion & Detorsion in Gastropods.	4
4.4 4.4.1 4.4.2	**Echinodermata** Water Vascular System in *Asterias* Larval forms of Echinodermata	3
4.5	**Hemichordata- Characters and affinities**	1
	Total Lectures/Hours/Periods	**45**

Books Recommended

Systematics (Animal taxonomy):

1. Dalela & Sharma: Animal Taxonomy and Museology (1976, Jai Prakash Nath).
2. Kapoor: Theory and Practicals of Animal Taxonomy (1988, Oxford & IBH).
3. Simpson: Principles of Animal Taxonomy (1962, Oxford).

Non-Chordates:

2. R.L. Kotpal: Modern Textbook of Zoology Invertebrates (12th edition).
3. P.S. Verma & E.L. Jordan: Invertebrate Zoology (S. Chand Publication).
4. Nigam: Biology of non-chordates (1997, S. Chand).
5. Rupert and Barnes, RD (2006) Invertebrate Zoology (8th edition).

Online tools and web resources:

- Swayam (MHRD) Portal.
- https://microbenotes.com/
- ePGPathshala (MHRD)Module 10, 18, 10 of the paper P-08 (Biology of Parasitism). https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2rAs1Puvga4LW93zMe83aA==

SEMESTER I

MAJOR-1 (MJ-1): SYSTEMATICS AND DIVERSITY OF NON-CHORDATES (PRACTICAL)

Credit–1 **Lectures–30 hours**
Full Marks= 25 (There is no internal examination in practical)
Pass Marks= [End Semester=10] **Time: 3 Hours**

Sl. No	Practical	Marks distribution
1.	Dissection	5
2.	Slide preparation (Mounting with procedure & comments)	4
3.	Spotting: a) Museum specimen (2) b) Slides (1)	2 x 3=6
4.	Class record	5
5.	Viva voce & Project/Model	5
	Total marks	**25**

Suggested practical

1. **Study of available museum specimens of Non-chordates:** *Sycon, Physalia, Metridium, Fasciola, Taenia solium, Nereis, Aphrodite, Pheretima, Lingula, Chiton, Pila, Unio, Sepia, Loligo,* Octopus, *Limbus,* Millipedes, Centipedes, *Palaemon, Antedon, Asterias, Echinus, Holothuria, Balanoglossus.*
2. **Study of the following through permanent slides:** *Paramecium* (W.M), Conjugation of *Paramecium, Obelia* colony, Medusa, Gemmules of sponges, T.S of earthworm through various region, Ovary of earthworm, Miracidium larva, Sporocyst larva, Redia larva, Cercaria larva, Trocophore larva, Glochidium larva, Nauplius, Zoea larva, Megalopa larva, Bipinnaria larva.
3. **Dissection:** Earthworm (Alimentary canal, reproductive system, nerve ring), Prawn (nervous system), Cockroach (Alimentary system).
4. **Mounting:** Mounting of nephridia & ovary of earthworm, Trachea and salivary gland of *Periplaneta americana.*

SEMESTER II

MAJOR-2 (MJ-2): SYSTEMATICS AND DIVERSITY OF CHORDATES

Credit – 3 **Lectures – 45 Hours**
Full Marks = 75 [End Semester = **60**] + [Internal Examination = **15** (Written Examination = **10** + Class Performance & Attendance = **05**)]
Pass Marks = [End Semester = **24**] [Internal Examination = 06]

Instructions:

- In all **9 questions** to be set there shall be two groups – **Group A and Group B**.
- **Group A** is compulsory which shall contain **three** questions.
- **Question no. 1** will be a very short answer type consisting of **six questions** of **1 mark** each in the form of MCQ/Fill in the blanks/True or False etc.
- **Question no. 2 & 3** will be of short answer type carrying **3 marks** each.
- **Group B** will contain **6 subjective/descriptive** questions* out of which the examinees are required to answer **any 4** carrying **12 marks** each.
  ***Question no. 9** will be short answer type. There will be **four options** of which **any two** to be answered, each carrying equal marks covering the whole syllabus.

Learning Outcomes
After successfully completing this course, the students will be able to:

- Develop understanding on the diversity of life with regards to chordates.
- Group animals on the basis of their morphological characteristics/ structures.
- Develop critical understanding how animals changed from a primitive cell to a collection of simple cells to form a complex body plan.
- Examine the diversity and evolutionary history of a taxon.
- Understand how morphological change due to change in environment helps drive evolution over a long period of time.
- It will further enable the students to think and interpret individually due to different animal species chosen.

THEORY

Unit	Topic	No. of periods
Unit 1: Chordates		
1.1	Fundamental and General Characters of Phylum Chordata	**01**
1.2	Brief Classification of Chordates up to class	**02**
Unit 2: Protochordates:		
1.1	General Characters of Protochordates	**01**
1.2	Life history of Herdmania; Retrogressive Metamorphosis	**05**
1.3	Filter feeding in Branchiostoma	**02**
Unit 3: Lower Vertebrates		
3.1	**Pisces**	

Unit	Topic	No. of periods
3.1.1 3.1.2 3.1.3 3.1.4	Basic organization and Diversity of Fishes Dipnoi Structure of Gills and Respiration Accessory Respiratory Organs in Teleosts	**08**
3.2	**Amphibia**	
3.2.1 3.2.2 3.2.3 3.2.4	General Characters and Adaptability to Dual Mode of Life. Amphibian's Diversity and Classification up to living Order Origin of Amphibia Neoteny in Axolotl Larva.	**08**
Unit 4: Higher Vertebrates		
4.1	**Reptilia**	
4.1.1 4.1.2 4.1.3 4.1.4	Origin of Reptiles, Skull types Difference between Poisonous and Non-poisonous Snakes Poison Apparatus and Biting Mechanism in Snakes, Types of Venom & their Toxic Effects	**08**
4.2	**Aves**	
4.2.1 4.2.2	Flight Adaptations in Birds Mechanism of Flight	**05**
4.3	**Mammalia**	
4.3.1 4.3.2	Origin, General Characters and Classification up to Order Special features & Affinities of- • Prototheria • Metatheria • Eutheria	**05**
	Total lectures	**45**

Books Recommended

Chordates:

1. Miller & Harley: Zoology (6th ed. 2005, W.C. Brown
2. Nigam: Biology of Chordates (1997, S Chand)
3. Parker & Haswell, A Text Book of Zoology Vol.II (2005, Macmillan)
4. Sinha, A.K., & Adhikari, S and Ganguli, B.B. Biology of Animals Vol.II New Central Agency, Calcutta 5. Vishwanath – vertebrate Zoology

Online Tools and Web Resources:

1. Swayam (MHRD) Portal
2. Animal Diversity https://swayam.gov.in/courses/5686-animal-diversity
3. Advances in Animal Diversity, Systematics and Evolution https://swayam.gov.in/courses/5300-zoology
4. ePGPathshala (MHRD)Module 10, 18, 19 of the paper P-08 (Biology of Parasitism) https://epgp.inflibnet.ac.in/ahl.php?csrno=35

SEMESTER II

MAJOR-2 (MJ-2): SYSTEMATICS AND DIVERSITY OF CHORDATES (PRACTICAL)

Credit – 1 **Lectures – 30 Hours**
Full Marks = 25 [End Semester = **25**] [There is no internal examination in practical]
Pass Marks = [End Semester = **10**] **Time: 3 Hours**

SN	Practical	Marks
1	Dissection	5
2	Mounting / Comment on (any one)	4
3	Spotting: a. Museum specimen (2) b. Slides (1)	2x3 = 6
4	Class Record	5
5	Viva-Voce & Project / Model	5
	Total Marks	**25**

Suggested Practical

1. **Museum Specimen:**
   a) **Protochordate:** Balanoglossus, Herdmania
   b) **Agnatha:** Petromyzon and Myxine
   c) **Pisces:** *Scoliodon, Torpedo, Chimaera, Labeo rohita, Cirrhinus mrigala, Labeo bata, Hippocampus, Exocoetus, Clarias batrachus, Anabas,*
   d) **Amphibia:** *Axolotl larva, Salamandra, Alytes, Hyla, Bufo* (Toad*), Rana* (Frog)
   e) **Reptiles:** *Draco, Chameleon, Naja naja, Bungarus* (Krait), *Vipera* (Chandra bora), *Crocodylus,* Python.
   f) **Aves:** Columba livia, *Psittacula* (Parrot), *Bubo* (Great Horned owl), *Alcedo* (Kingfisher), *Passer* (House Sparrow), Ostrich model.
   g) **Mammals:** Prototheria Models of Duck-Billed Platypus, Spiny Anteater, *Pteropus* (Megachiroptera), *Manis* (Pangolin), *Funambulus* (squirrel), *Cavia* (Guinea Pig), *Rattus rattus* (rat).
2. **Slides:** Amphioxus (WM), T.S of different parts of Amphioxus
3. **Dissection:**
   a) Efferent and Afferent artery of local bony fish
4. **Mounting/ Comment on:** Placoid Scale and Cycloid Scale & Types of beaks and claws

SYLLABUS

FOR

ASSOCIATED CORE (AC) PAPER

SEMESTER I/II

ASSOCIATED CORE (AC): ZOOLOGY (THEORY)

Credit – 3 **Lectures – 45 Hours**

Full Marks = 75 [End Semester = **60**] + [Internal Examination = **15** (Written Examination = **10** + Class Performance & Attendance = **05**)]

Pass Marks = [End Semester = **24**] [Internal Examination = 0**6**]

Instructions:

- In all **9 questions** to be set there shall be two groups – **Group A and Group B**.
- **Group A** is compulsory which shall contain **three** questions.
- **Question no. 1** will be a very short answer type consisting of **six questions** of **1 mark** each in the form of MCQ/Fill in the blanks/True or False etc.
- **Question no. 2 & 3** will be of short answer type carrying **3 marks** each.
- **Group B** will contain **6 subjective/descriptive** questions* out of which the examinees are required to answer **any 4** carrying **12 marks** each.

***Question no. 9** will be short answer type. There will be **four options** of which **any two** are to be answered, each carrying equal marks covering the whole syllabus.

THEORY

Unit	Topic	No. of Periods
1	**Diversity of the Animal World**	
1.1	Character and Classification of Animals	01
1.2 1.2.1 1.2.2 1.2.3	**Non-Chordate:** Protozoa, Porifera, Coelenterate, Annelida & Arthropoda Mollusca & Echinodermata	03
1.3 1.3.1 1.3.2	**Chordate:** Fish, Amphibia & Reptile Aves and Mammalia	02
2	**Human Physiology, Developmental Biology & Endocrinology**	
2.1 2.1.1 2.1.2	**Digestion System:** Structure of Alimentary Canal & Digestion of food	02
2.2 2.2.1 2.2.2	**Respiratory System:** Structure of Lung, Transport of Gases	02
2.3 2.3.1 2.3.2	**Circulatory System:** Blood & its composition Structure of Heart & Double Circulation	02
2.4 2.4.1 2.4.2	**Excretory System:** Structure of kidney & Nephron Urine Formation	02
2.5	**Nervous System:**	02

Unit	Topic	No. of Periods
2.5.1 2.5.2	Central Nervous System Structure of Neuron	
2.6 2.6.1 2.6.2 2.6.3 2.6.4 2.6.5	**Reproduction and Development Biology:** Male Reproductive Organ, Female Reproductive Organ, Gametogenesis, Fertilization, Gastrulation	03
2.7 2.7.1 2.7.2 2.7.3	**Endocrinology:** Endocrine glands Pituitary & Thyroid, Pancreas & Adrenal, Testes and Ovary	03
3	**Cell Biology, Biochemistry and Genetics**	
3.1 3.1.1 3.1.2	**Cell & Cell Membrane:** Prokaryotic and Eukaryotic Cell, Plasma membrane Models	01
3.2 3.2.1 3.2.2 3.2.3 3.2.4	**Cell Organelle:** Structure and Function Mitochondria, Endoplasmic Reticulum & Golgi body Lysosome & Ribosome Nucleus & Chromosome	04
3.3	**Cell Division:** Mitosis and Meiosis	01
3.4 3.4.1 3.4.2 3.4.3	**Biochemistry:** Carbohydrate, Protein & Enzyme, Fatty Acid & Vitamin	03
3.5 3.5.1 3.5.2 3.5.3 3.5.4	**Genetics:** Mendel's Law of Inheritance, Sex Determination, Mutation, Structure of DNA and RNA	04
4	**Ecology, Animal Behaviour and Evolution**	
4.1 4.1.1 4.1.2 4.1.3 4.1.4	**Ecology:** Ecosystem & its type, Food Chain, Food Web and Ecological Pyramids, Ecological Succession, Pollution & its type	04
4.2 4.2.1 4.2.2	**Animal Behaviour:** Types of Behaviour, Innate and Learned Behaviour, Reflex Action, Reflex Arc and Biological Clock	03
4.3 4.3.1 4.3.2	**Evolution:** Theories of Organic Evolution Lamarckism & Darwinism	03
	Total	**45**

Semester I/II

ASSOCIATED CORE (AC): ZOOLOGY (PRACTICAL)

Credit – 1 **Lectures – 30 Hours**
Full Marks = 25 [End Semester = **25**] [There is no internal examination in practical]
Pass Marks = [End Semester = **10**] **Time: 3 Hours**

SN	Practical	Marks
1	Preparation of Temporary slides from Onion Root Tip to study various stages of Mitosis	4
2	Determination of blood pressure	3
3	Comment on Analogous/ Homologous	3
4	Spotting (Museum specimen): a. Non-Chordate (2) b. Chordate (1)	2x3 = 6
5	Class Record	4
6	Viva-Voce & Project / Model	5
	Total Marks	**25**

Suggested Practical

1. Preparation of temporary stained squash of onion root tips to study various stages of mitosis and Grasshopper testes to study stages of Meiosis.
2. Demonstration of blood pressure by Sphygmomanometer.
3. Study of Homologous and Analogous organ (wings of birds and insects, forelimbs of bat and rabbit).
4. **Study of available museum specimens**

   Non-chordates: *Sycon, Physalia, Metridium, Fasciola, Taenia solium, Nereis, Aphrodite, Pheretima, Pila, Unio, Sepia, Octopus,* Millipedes, Centipedes, *Palaemon, Asterias, Echinus.*

   Chordate: *Labeo rohita, Hippocampus, Clarias batrachus, Hyla, Bufo* (Toad*), Rana* (Frog), *Naja naja, Bungarus* (Krait), *Crocodylus,* Python, Columba livia, *Psittacula* (Parrot), *Passer* (House Sparrow), Prototheria Models of Duck-Billed Platypus, *Pteropus* (Megachiroptera), *Manis* (Pangolin), *Funambulus* (squirrel), *Rattus rattus* (rat).

SYLLABUS

FOR

MULTI-DISCIPILINARY COURSE (MDC) PAPER

SEMESTER I/II/III

MULTIDISCIPILINARY COURSE (MDC): ZOOLOGY

Credit – 3 **Lectures – 45 Hours**

Full Marks = 75 [End Semester = 75] No Internal Examination & No Practicals

Pass Marks = [End Semester = 30]

Instructions:

- In all 9 questions to be set there shall be two groups – Group A and Group B.
- Group A is compulsory which shall contain three questions.
- **Question no. 1** will be very short answer type/Objective types consisting of **five questions** of **1 mark** each.
- **Question no. 2 & 3** will be of short answer type carrying **5 marks** each.
- Group B will contain descriptive type, **six questions*** of **15 marks** each, out of which any **four questions** are to be answer.

***Question no. 9** will be short answer type. There will be **four options** of which any **two** to be answer each carrying equal marks covering the whole syllabus.

Units	Topics	No. of Periods
1	**Diversity in the Living World**	
1.1 1.1.1 1.1.2 1.1.3	Living World: Taxonomic Categories What is living? Diversity in the living world Taxonomic Categories	2
1.2 1.2.1	Biological Classification Five Kingdom Classification System	2
1.3 1.3.1	Animal Kingdom Classification of Animals	2
2	**Cell Biology**	
2.1 2.1.1 2.1.2 2.1.3	Cell: Structure & Function Cell Theory Prokaryotic Cell Eukaryotic Cell	2
2.2 2.2.1	Biomolecules: Biomacromolecules: Proteins, Carbohydrates and Lipids	3
2.3	Cell Cycle & Cell Division (Mitosis)	2
3	**Human Physiology**	

Units	Topics	No. of Periods
3.1 3.1.1 3.1.2	Digestion Alimentary Canal & Digestive Glands Digestion of Food	2
3.2 3.2.1 3.2.2	Respiration & Transport of Gases Mechanism of Breathing Transport of Gases	2
3.3 3.3.1 3.3.2 3.3.3 3.3.4	Body Fluids & Circulation Blood Lymph Structure of Human Heart Circulatory Pathways	2
3.4 3.4.1 3.4.2	Excretory System Human Excretory System Urine Formation	3
3.5 3.5.1	Nervous System Types and structure of Neuron	2
3.6 3.6.1 3.6.2 3.6.3 3.6.4	Reproductive System Male Reproductive System Female Reproductive System Gametogenesis Fertilization	5
4	**Genetics & Evolution**	
4.1 4.1.1 4.1.3	Principles of Inheritance and Variation Mendel's Law of Inheritance Mutation	6
4.2 4.2.1 4.2.2	Molecular Basis of Inheritance DNA RNA	6
4.3 4.3.1 4.3.2	Evolution: Theories Lamarckism Darwinism	4
	Total Lectures/Hours/Periods	**45**