KRANTIGURU SHYAMJI KRISHNA VERMA KACHCHH UNIVERSITY, BHUJ.

Year: 2023-2024

B.Sc (Honours)

ZOOLOGY

(With Research /Without Research)

Semesters : I and II
(Exit option)

FACULTY OF SCIENCE

SYLLABUS

Curriculum as per UGC Guideline
Framed according to National Education Policy (NEP) - 2020
With effect from June – 2023 (and thereafter)

B.Sc. (Honours) Zoology Programme

(With Research/without Research)

NEP-2020

With effect from June – 2023 (and thereafter)

FACULTY OF SCIENCE

Subject: ZOOLOGY

B. Sc. Semesters: I & II

NATURE AND EXTENT OF BACHELOR'S DEGREE PROGRAMME IN ZOOLOGY (HONOURS)

A bachelor's degree in Zoology with Research or without Research is a 4 year degree course which is divided into 8 semesters.

Sl.No.	Type of Award	Stage of Exit	Mandatory Credits to be secured for the Award
1	Certificate in the Discipline	After successful completion of1st Year	44 + 4
2	Diploma in the Discipline	After successful completion of1st and 2nd Years	88 + 4
3	B.Sc. in Zoology	After successful completion of1st, 2nd and 3rd Years	132
4	B.Sc. (Honours with Research/without Research) in Zoology	After successful completion of1st, 2nd, 3rd and 4th Years	176

A student pursuing 4 years undergraduate programme with research in a specific discipline shall be awarded an appropriate Degree in that discipline on completion of 8th Semester if he/she secures required Credits. Similarly, for certificate, diploma and degree, a student needs to fulfill the associated credits. An illustration of credits requirements in relation to the type of award is illustrated as above.

Bachelor's Degree (Honours) is a well-recognized, structured, and specialized graduate level qualification in tertiary, collegiate education. The contents of this degree are determined in terms of knowledge, understanding, qualification, skills, and values that a student intends to acquire to look for professional avenues or move to higher education at the postgraduate level.

Thus, B.Sc. (Honours) Course in Zoology aims to prepare studentsto qualify for joining a profession or to provide development opportunities in particular employment settings.

AIMS:

1. To develop the curriculum for fostering subjective-learning.
2. To mould a responsible citizen who is aware of most basic domain-independent knowledge, including critical thinking and communication.
3. To offer an environment that guarantees intellectual development of students

in an all-inclusive manner.

4. To provide updated subject matter theoretically and practically which can enhance student's core competency and learning.
5. To enable the graduate, prepare for national as well as international competitive examinations, especially UGC-CSIR NET and UPSC Civil Services Examination.

Programme outcomes (POs):

Transformed curriculum shall develop educated outcome-oriented candidature, to develop into responsible citizen for nation-building and transforming the country towards the future with their knowledge gained in the field of animal science.

Programme specific objectives (PSOs): B.Sc. I Year Certificate Course in Zoology

- ✓ This course will enable students to learn avenues in Zoology.
- ✓ The first-year syllabus can help students to get ready for competitive exams.
- ✓ Students will be able to know about basic animal classification and cell structure.
- ✓ Certificate and diploma courses are framed to generate self- entrepreneurship and self- employability, if multi exit option is opted.
- ✓ Students will increase the ability of critical thinking, reasoning and curiosity, development of scientific attitude, problem solving, improve practical skills, enhance communication skill, social interaction, and increase awareness in animal conservation and environment.
- ✓ The training provided to the students will make them competent enough for doing jobs in Govt. and private sectors of academia, research and industry at entry level.

- The End of Semester Examination will be conducted by the University. A certified journal of the respective practical course must be produced at the time of practical examination by the student. The Field Excursion is highly essential for studying ecology and animals. There shall be at least one field Excursion (local or outstation).
- It is compulsory to record laboratory work in the Journal. Certified journal has to be produced while appearing at the time of Practical examination

1st year structure (Zoology)

Year	Semester	Course Code	Paper Title	Credits	Marks CA	Marks UA	Total
First Year	Sem-I	MAJ ZOL 101 (Theory)	Animal Diversity And Cytogenetics-I	3	35	40	75
		MAJ ZOL 102-P (Practical)	Animal Diversity And Cytogenetics-I (Practical)	1	15	10	25
		MAJ ZOL 103 (Theory)	**Animal diversity & Cytogenetic - II**	3	35	40	75
		MAJ ZOL 104-P (Practical)	**Animal diversity & Cytogenetic – II (Practical)**	1	15	10	25
		MIN ZOL 105 (Theory)	Animal Diversity And Cytogenetics-I	3	35	40	75
		MIN ZOL 106-P (Practical)	Animal Diversity And Cytogenetics-I (Practical)	1	15	10	25
		MDC ZOL 107 (Theory)	Animal Diversity And Cytogenetics-I	3	35	40	75
		MDC ZOL 108-P (Practical)	Animal Diversity And Cytogenetics-I (Practical)	1	15	10	25
			Total Credits	**16**	**Total Marks**		**400**
	Sem - II	MAJ ZOL 201 (Theory)	Animal Diversity And Ecology	3	35	40	75
		MAJ ZOL 202 - P (Practical)	Animal Diversity And Ecology (Practical)	1	15	10	25
		MAJ ZOL 203 (Theory)	Anatomy, Histology and behaviour	3	35	40	75
		MAJ ZOL 204 - P (Practical)	Anatomy, Histology and behaviour (Practical)	1	15	10	25
		MIN ZOL 205 (Theory)	Animal Diversity And Ecology	3	35	40	75
		MIN ZOL 206-P (Practical)	Animal Diversity And Ecology (Practical)	1	15	10	25
		MDC ZOL 207 (Theory)	Animal Diversity And Ecology	3	35	40	75
		MDC ZOL 208-P (Practical)	Animal Diversity And Ecology (Practical)	1	15	10	25
			Total Credits	**16**	**Total Marks**		**400**

Structure of the Question Paper for the University Exam

KSKV Kachchh University: BHUJ

FIRST YEAR B.Sc.: Semester: I & II (ONE)

For Major, Minor and MDS Theory papers
(ZOL 101, 103, 105, 107 & 201, 203, 205, 207)

Total Marks: 40, Duration: _____

PATTERN OF QUESTION PAPER

FOR SEMESTER-END EXAMS (Sem I & II)

Questions	Section	Marks
Q.1	Descriptive / Essay type / Short notes (with internal options)	10 marks
Q.2	Descriptive / Essay type / Short notes (with internal options)	10 marks
Q.3	Descriptive / Essay type / Short notes (with internal options)	10 marks
Q.4	Descriptive / Essay type / Short notes (with internal options)	10 marks
Q.5	12 short questions of 01 marks each from all four units and the students have to attempt any 5	10 Marks

- The examination pattern of the university is 50% external and 50% internal.
- Types of questions for section A and Question 5 may be varied like: one line answers / two line answers / definitions / reasoning / drawing small figures/ label the figure / fill in the blanks / multiple choice question/ one word answer / match the pairs etc.
- Excursion/ Project work/ Visit/ Tour/ report and submission of specimens / Charts/ Model/ Fresh Material/ other activity (Given by teacher or as a part of Syllabus) will be mandatory for all the students.

DETAILED SYLLABUS OF B.Sc. I YEAR FOR CERTIFICATE COURSE IN BASIC ZOOLOGY

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER -I

MAJ ZOL101: ANIMAL DIVERSITY AND CYTOGENETICS -I

(Course code: CEZO 101) Credit: 3

	KSKV Kachchh University Bhuj - 370001		**ACADEMIC YEAR 2023-24**	
Bachelor of Science: Regular Major				
Year	**I**	**MAJ ZOL101: Animal diversity & Cytogenetic - I**	**Credit**	**3**
Semester	**I**		**Hours**	**45**
OBJECTIVES:	The course aims to 1) Develop an understanding of branches of Zoology and systematic 2). taxonomy of non-chordates from Protist to Annelida; 2) Study the body organization of each phylum; 3) Study the general biology of selected species from each Phylum.			
COURSE CONTENT / SYLLABUS				
UNIT-I	1. Introduction to Zoology: Branches and Applications 2. Career prospects in Zoology 3. Introduction to taxonomy and Scheme of Classification 4. Invertebrate body plan Salient features and classification up to classes/order of non-chordates. Phylum to study; • Protozoa • Coelenterate • Porifera • Annelida (General Classification as per Whitteker's Five Kingdom)			**1**

UNIT-II	**TYPE STUDY (NON-CHORDATES):** General structures and morphology with functional anatomy of following Type animals. • Phylum Protozoa: Type – Amoeba: Structure, Feeding methods and Locomotion theories • Detail study : Paramecium – Structure, Reproduction • Phylum Annelida: Type – Earthworm (*Pheretima posthuma*) (External character, Digestive system, Nervous system, Excretory system and Reproductive system).	**1**
UNIT-III	***Cytology & Genetics – I*** • Structure of typical animal cell • Nucleus: Position, Morphology, Ultrastructure, function • Endoplasmic Reticulum: types, structure and function • Golgi body: structure and function • Ribosome: Structure and function ***Genetics*** • Introduction to Gene • Introduction to Mendelian laws of Heredity • Incomplete dominance • Co-dominance • Multiple alleles • ABO blood groups in humans, Rh Factor- Definition, Erythroblastofoetalis	**1**

REFERENCES

1.	A Manual of Zoology Vol. I & II, Ekambarnath Ayyar and Ananthakrishnan, Viswanthan Pvt. Ltd. Madras.
2.	Biology of Animals, C. P. Hickman, L. S. Roberts, and A. Larson, McGraw Hill Company, New York.
3.	Biology of the Invertebrates, J. A. Pechenik, Tata-McGraw Hill Company, Ltd, New Delhi.
4.	Integrated principals of Zoology, C. P. Hickman, L. S. Roberts, and A. Larson, McGraw Hill Company, New York.
5.	Invertebrate Zoology Jordan, E. L. and Verma, P.S, S. Chand & Co. New Delhi
6.	Cell And Molecular Biology by De Robertis
7.	Invertebrate Zoology by P S Verma and E L Jordon
8.	Modern Text Book Of Zoology: Invertebrates By R.L. Kotpal
9.	Invertebrate Zoology by P S Verma and E L Jordon

Note: Students may refer variety of material available online and on web resources for further understanding.

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2023-24 UNDER NEP-2020)
SEMESTER 1:
Paper MAJ ZOL 102-P: ANIMAL DIVERSITY AND CYTOGENETICS -I

Practical/ Lab course (Credit- 1)

Course Outcome
After the completion of the course the students will be able to:
1. Understand and identify taught practical invertebrate animals to class level.
2. Develop skills for studying the animal characters and observational skills
3. Learn observational skills and demonstrate the same in journals and exams. The virtual look at different animal groups will help them to inculcate curiosity in their minds.

SEMESTER	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***		
			Credits	***Hours***	***Total (Internal + External)***
B.Sc -I	***MAJ ZOL-102 P***	**Animal Diversity And Cytogenetics**	**1**	**30 hrs**	***25 (10+15) Marks***

Practical 1: To study Phylum **Protozoa**: Amoeba, Paramecium, Polystomella/ Foraminifer, Euglena, Opalina, Vorticella.

Practical 2: To study Phylum **Porifera**: Sycon, Euspongia, Euplectella, spongilla, gemmule, spicules

Practical 3: To study Phylum **Coelenterata**: Hydra, Obelia, Physalia, Aurelia, Gorgonia, Coral and Sea anemone.

Practical 4: To study Phylum **Annelida**: Earthworm, Nereis, Aphrodite, Arenicola, Sabella, Leech.

Practical 5: To study external characters of Earthworm (Through chart/multimedia)

Practical 6: To study Digestive system of Earthworm & Mounting of Spermatheca, setae and Septal Nephridia (Through chart/multimedia)

Practical 7: To study Nervous system of Earthworm (Through chart/multimedia)

Practical 8: To study Reproductive system of Earthworm (Through chart/multimedia)

Practical 9: Study of Animal cell structure & cell organelles –Mitosis and Meiosis, Nucleus, Endoplasmic reticulum, golgi body (Through charts/pictures/multimedia)

Practical 10: Study of genetic problems i). Monohybrid cross ii). Dihybrid cross iii). Incomplete dominance chart iv) Co dominance v). Multiple alleles

Practical 11: To check own Blood group (Practical/Method /Demo /Problem solving)

Journal / Submission

- Note: It is compulsory to record laboratory work (all the practicals) in the journal. The journal is to be certified by the in-charge teacher and the Head of the Department within time frame. Certified journal must be produced while appearing at the time of Practical examination.
- The field observations should be recorded in the journal.

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER-I: Paper ZOL102-P: ANIMAL DIVERSITY AND CYTOGENETICS-I

INTERNAL EVALUATION: 15 Marks
EXTERNAL EVALUATION: 10 Marks

B. Sc.: SKELETAL STRUCTURE OF UNIVERSITY PRACTICAL ***MAJ ZOL-102* P**
(Structure will remain same for paper 102, 106 & 108)

Total Marks: 15

Instructions: Strictly follow the instructions given by examiner(s).	**Marks**
Exercise 1: Draw/Demonstrate & explain the _____system of Earthworm.	**03**
Exercise 2. Do as directed: Genetics problem/blood grouping as asked	**02**
Exercise 3. Identify and describe as per given instructions(1.5 marks each)	**06**
1. Identify and classify giving reasons - Phylum **2. Identify and classify giving reason - Phylum** **3. Identify and describe – Phylum** **4. Identify and do as directed - Cytology**	
Exercise 4. a. *Viva-voce*	**02**
b. Journal	**02**
TOTAL	**15**

Note:

- *Certified journal will be compulsory for appearing in Univ. Practical exam*

- Excursion/ Project work/ Visit/ Tour/ report and submission of specimens / Charts/ Model/ Fresh Material/ other activity (Given by teacher or as a part of Syllabus) will be mandatory for all the students and counted in question-4.

	KSKV Kachchh University Bhuj - 370001	ACADEMIC YEAR 2023-24

Bachelor of Science:
Regular Major (Core)

Year	I	**MAJ ZOL103 : Animal diversity & Cytogenetic - II**	Credit	3
Semester	I		Hours	45

OBJECTIVES:	The course aims to 1) Develop an understanding of taxonomy of non-chordates from Protist to Nematodes; 2) Study the body organization of each phylum; 3) Study the general biology of selected species from each Phylum.

COURSE CONTENT / SYLLABUS

UNIT-I	Salient features and classification up to classes of non-chordates (excluding minor phylum) with suitable example (See list in practical paper). Phylum to study; • Platyhelminthes: General characters, classification and parasitic adaptations • Nemathelminthes: General characters, classification and parasitic adaptations • Mollusc : general characters, classification, torsion in mollusc (General Classification as per Whitteker's Five Kingdom Classification and Phylum Classification as per adapted in invertebrate Series by R. L. Kotpal, Rastogi Publication Meerut)	1 Credit
UNIT-II	**TYPE STUDY (NON-CHORDATES):** General structures and morphology with functional anatomy of following Type animals. • Phylum Porifera: Canal system • Detailed study (Structure, Locomotion types, reproduction): Hydra • Detailed study (General structure & Lifecycle): *Fasciola hepatica* • Detailed study - Pila (External morphology, Digestive system, Nervous system & radula):	1 Credit

UNIT-III	**Cytology & Genetics – I** • Cell Orgenelles (Ultra structure, occurrence, types and function) • Plasma membrane: Structure and function, Sandwich model • Lysosomes – Structure and function • Mitochondria: Structure and function • Cell cycle • Mitosis and Meiosis (with stages) **Genetics** • DNA: Types and structure • Cytoplasmic inheritance in Paramecium	1 Credit

REFERENCES

1.	A Manual of Zoology Vol. I & II, Ekambarnath Ayyar and Ananthakrishnan, Viswanthan Pvt. Ltd. Madras.
2.	Biology of Animals, C. P. Hickman, L. S. Roberts, and A. Larson, McGraw Hill Company, New York.
3.	Biology of the Invertebrates, J. A. Pechenik, Tata-McGraw Hill Company, Ltd, New Delhi.
4.	Integrated principals of Zoology, C. P. Hickman, L. S. Roberts, and A. Larson, McGraw Hill Company, New York.
5.	Invertebrate Zoology Jordan, E. L. and Verma, P.S, S. Chand & Co. New Delhi

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER - I

MAJ ZOL 104-P: ANIMAL DIVERSITY AND CYTOGENETICS -I

Practical/ Lab course (Course code: MAJ ZOL 104 P) Credit: 1

Course Outcome

After the completion of the course the students will be able to:

1. Understand and identify taught practical invertebrate animals to class level.
2. Learn observational skills and demonstrate the same in journals and exams. The virtual look at different animal groups will help them to inculcate curiosity in their minds.

DISCIPLINE SPECIFIC CORE COURSE						
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*PRACTICAL*		
				Credits	*Lectures*	*Total (Internal + External)*
Certificate Course	**B.SC -I**	**MAJ ZOL 104-P**	**Animal Diversity And Cytogenetics -II**	**1**	**30 hrs**	***25 (10+15) Marks***

Practical 1: To study Phylum Platyhelminthes: Planaria, Liverfluke, Tape worm.

Practical 2: : To study Phylum Nematoda: Enterobius, Ascaris.

Practical 3: To study Phylum Mollusca: Chiton, Dentalium, Pila, Aplysia, Unio, Octopus, Sepia, Cowry, Oyster

Practical 4: To study life cycle stages of Liver fluke (using permanent slides and slide preparations)

Practical 4: To study external characters of Pila (body with and without shell)

Practical 5: To study Digestive system of Pila (Through chart/multimedia)

Practical 6: To study Nervous system of Pila (Through chart/multimedia)

Practical 7: To study Radula (Through chart/multimedia)

Practical 8: Study of different stages of Mitosis and Meiosis using permanent slides/multimedia

Journal / Submission

- Note: It is compulsory to record laboratory work (all the practical) in the journal. The journal is to be certified by the incharge teacher and the Head of the Department within time frame. Certified journal must be produced while appearing at the time of Practical examination.
- The field observations (if any) should be recorded in the journal.

SEM-I MINOR AND MULTI DISCIPLINARY COURSE (MDC) ZOOLOGY

	KSKV Kachchh University Bhuj - 370001		**ACADEMIC YEAR 2023-24**	
Bachelor of Science: (MINOR)				
Year	**I**	**MIN ZOL105: Animal diversity & Cytogenetic - I**	**Credit**	**3**
Semester	**I**		**Hours**	**45**
OBJECTIVES:	The course aims to 1) Develop an understanding of branches of Zoology and systematic 2). taxonomy of non-chordates from Protist to Annelida; 2) Study the body organization of each phylum; 3) Study the general biology of selected species from each Phylum.			
COURSE CONTENT / SYLLABUS				
UNIT-I	• Introduction to Zoology: Branches and Applications • Career prospects in Zoology • Introduction to taxonomy and Scheme of Classification • Invertebrate body plan Salient features and classification up to classes/order of non-chordates. Phylum to study; • Protozoa • Coelenterate • Porifera • Annelida (General Classification as per Whitteker's Five Kingdom)			**1**
UNIT-II	**TYPE STUDY (NON-CHORDATES):** General structures and morphology with functional anatomy of following Type animals. • Phylum Protozoa: Type – Amoeba: Structure, Feeding methods and Locomotion theories • Detail study : Paramecium – Structure, Reproduction • Phylum Annelida: Type – Earthworm (*Pheretima posthuma*) (External character, Digestive system, Nervous system, Excretory system and Reproductive system).			**1**

UNIT-III	***Cytology & Genetics – I*** • Structure of typical animal cell • Nucleus: Position, Morphology, Ultrastructure, function • Endoplasmic Reticulum: types, structure and function • Golgi body: structure and function • Ribosome: Structure and function ***Genetics*** • Introduction to Gene • Introduction to Mendelian laws of Heredity • Incomplete dominance • Co-dominance • Multiple alleles • ABO blood groups in humans, Rh Factor- Definition, Erythroblastofoetalis	**1**

REFERENCES

1.	A Manual of Zoology Vol. I & II, Ekambarnath Ayyar and Ananthakrishnan, Viswanthan Pvt. Ltd. Madras.
2.	Biology of Animals, C. P. Hickman, L. S. Roberts, and A. Larson, McGraw Hill Company, New York.
3.	Biology of the Invertebrates, J. A. Pechenik, Tata-McGraw Hill Company, Ltd, New Delhi.
4.	Integrated principals of Zoology, C. P. Hickman, L. S. Roberts, and A. Larson, McGraw Hill Company, New York.
5.	Invertebrate Zoology Jordan, E. L. and Verma, P.S, S. Chand & Co. New Delhi
6.	Cell And Molecular Biology by De Robertis
7.	Invertebrate Zoology by P S Verma and E L Jordon
8.	Modern Text Book Of Zoology: Invertebrates By R.L. Kotpal
9.	Invertebrate Zoology by P S Verma and E L Jordon

Note: Students may refer variety of material available online and on web resources for further understanding.

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER 1: MINOR

MIN ZOL 106-P: ANIMAL DIVERSITY AND CYTOGENETICS -I

Practical/ Lab course (Credit- 1)

Course Outcome

After the completion of the course the students will be able to:

1. Understand and identify taught practical invertebrate animals to class level.
2. Develop skills for studying the animal characters and observational skills
3. Learn observational skills and demonstrate the same in journals and exams. The virtual look at different animal groups will help them to inculcate curiosity in their minds.

SEMESTER	*COURSE CODE*	*COURSE TITLE*	*PRACTICAL*		
			Credits	*Hours*	*Total (Internal + External)*
B.Sc -I	***MIN ZOL-106 P***	**Animal Diversity And Cytogenetics**	**1**	**30 hrs**	***25 (15+10) Marks***

Practical 1: To study Phylum **Protozoa**: Amoeba, Paramecium, Polystomella/ Foraminifer, Euglena, Opalina, Vorticella.

Practical 2: To study Phylum **Porifera**: Sycon, Euspongia, Euplectella, spongilla, gemmule, spicules

Practical 3: To study Phylum **Coelenterata**: Hydra, Obelia, Physalia, Aurelia, Gorgonia, Coral and Sea anemone.

Practical 4: To study Phylum **Annelida**: Earthworm, Nereis, Aphrodite, Arenicola, Sabella, Leech.

Practical 5: To study external characters of Earthworm (Through chart/multimedia)

Practical 6: To study Digestive system of Earthworm & Mounting of Spermatheca, setae and Septal Nephridia (Through chart/multimedia)

Practical 7: To study Nervous system of Earthworm (Through chart/multimedia)

Practical 8: To study Reproductive system of Earthworm (Through chart/multimedia)

Practical 9: Study of Animal cell structure & cell organelles –Mitosis and Meiosis, Nucleus, Endoplasmic reticulum, golgi body (Through charts/pictures/multimedia)

Practical 10: Study of genetic problems i). Monohybrid cross ii). Dihybrid cross iii). Incomplete dominance chart iv) Co dominance v). Multiple alleles

Practical 11: To check own Blood group (Practical/Method /Demo /Problem solving)

Journal / Submission

- Note: It is compulsory to record laboratory work (all the practicals) in the journal. The journal is to be certified by the in-charge teacher and the Head of the Department within time frame. Certified journal must be produced while appearing at the time of Practical examination.
- The field observations should be recorded in the journal.

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER-I: (MINOR)

MIN ZOL106-P: ANIMAL DIVERSITY AND CYTOGENETICS-I

INTERNAL EVALUATION: 15 Marks
EXTERNAL EVALUATION: 10 Marks

B. Sc.: SKELETAL STRUCTURE OF UNIVERSITY PRACTICAL ***MIN ZOL-102*** **P**

Total Marks: 15

Instructions: Strictly follow the instructions given by examiner(s).	**Marks**
Exercise 1: Draw/Demonstrate & explain the _____system of Earthworm.	**03**
Exercise 2. Do as directed: Genetics problem/blood grouping as asked	**02**
Exercise 3. Identify and describe as per given instructions(1.5 marks each)	**06**
5. Identify and classify giving reasons - Phylum **6. Identify and classify giving reason - Phylum** **7. Identify and describe – Phylum** **8. Identify and do as directed - Cytology**	
Exercise 4. a. *Viva-voce*	**02**
b. Journal	**02**
TOTAL	**15**

Note:

- *Certified journal will be compulsory for appearing in Univ. Practical exam*

- Excursion/ Project work/ Visit/ Tour/ report and submission of specimens / Charts/ Model/ Fresh Material/ other activity (Given by teacher or as a part of Syllabus) will be mandatory for all the students and counted in question-4.

	KSKV Kachchh University **Bhuj - 370001**	**ACADEMIC YEAR 2023-24**

Bachelor of Science:
(MDC)

Year	**I**	**MDC ZOL107: Animal diversity & Cytogenetic - I**	**Credit**	**3**
Semester	**I**		**Hours**	**45**

OBJECTIVES:	The course aims to 1) Develop an understanding of branches of Zoology and systematic 2). taxonomy of non-chordates from Protist to Annelida; 2) Study the body organization of each phylum; 3) Study the general biology of selected species from each Phylum.	
COURSE CONTENT / SYLLABUS		
UNIT-I	• Introduction to Zoology: Branches and Applications • Career prospects in Zoology • Introduction to taxonomy and Scheme of Classification • Invertebrate body plan Salient features and classification up to classes/order of non-chordates. Phylum to study; • Protozoa • Coelenterate • Porifera • Annelida (General Classification as per Whitteker's Five Kingdom)	**1**
UNIT-II	**TYPE STUDY (NON-CHORDATES):** General structures and morphology with functional anatomy of following Type animals. • Phylum Protozoa: Type – Amoeba: Structure, Feeding methods and Locomotion theories • Detail study : Paramecium – Structure, Reproduction • Phylum Annelida: Type – Earthworm (*Pheretima posthuma*) (External character, Digestive system, Nervous system, Excretory system and Reproductive system).	**1**

UNIT-III	***Cytology & Genetics – I*** • Structure of typical animal cell • Nucleus: Position, Morphology, Ultrastructure, function • Endoplasmic Reticulum: types, structure and function • Golgi body: structure and function • Ribosome: Structure and function ***Genetics*** • Introduction to Gene • Introduction to Mendelian laws of Heredity • Incomplete dominance • Co-dominance • Multiple alleles • ABO blood groups in humans, Rh Factor- Definition, Erythroblastofoetalis	**1**

REFERENCES

1.	A Manual of Zoology Vol. I & II, Ekambarnath Ayyar and Ananthakrishnan, Viswanthan Pvt. Ltd. Madras.
2.	Biology of Animals, C. P. Hickman, L. S. Roberts, and A. Larson, McGraw Hill Company, New York.
3.	Biology of the Invertebrates, J. A. Pechenik, Tata-McGraw Hill Company, Ltd, New Delhi.
4.	Integrated principals of Zoology, C. P. Hickman, L. S. Roberts, and A. Larson, McGraw Hill Company, New York.
5.	Invertebrate Zoology Jordan, E. L. and Verma, P.S, S. Chand & Co. New Delhi
6.	Cell And Molecular Biology by De Robertis
7.	Invertebrate Zoology by P S Verma and E L Jordon
8.	Modern Text Book Of Zoology: Invertebrates By R.L. Kotpal
9.	Invertebrate Zoology by P S Verma and E L Jordon

Note: Students may refer variety of material available online and on web resources for further understanding.

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER 1: Multidisciplinary Subjects (MDC)

MDC ZOL 108-P: ANIMAL DIVERSITY AND CYTOGENETICS -I

Practical/ Lab course (Credit- 1)

Course Outcome

After the completion of the course the students will be able to:

1. Understand and identify taught practical invertebrate animals to class level.
2. Develop skills for studying the animal characters and observational skills
3. Learn observational skills and demonstrate the same in journals and exams. The virtual look at different animal groups will help them to inculcate curiosity in their minds.

SEMESTER	*COURSE CODE*	*COURSE TITLE*	*PRACTICAL*		
			Credits	*Hours*	*Total (Internal + External)*
B.Sc -I	***MDC ZOL-108 P***	**Animal Diversity And Cytogenetics**	**1**	**30 hrs**	***25 (15+10) Marks***

Practical 1: To study Phylum **Protozoa**: Amoeba, Paramecium, Polystomella/ Foraminifer, Euglena, Opalina, Vorticella.

Practical 2: To study Phylum **Porifera**: Sycon, Euspongia, Euplectella, spongilla, gemmule, spicules

Practical 3: To study Phylum **Coelenterata**: Hydra, Obelia, Physalia, Aurelia, Gorgonia, Coral and Sea anemone.

Practical 4: To study Phylum **Annelida**: Earthworm, Nereis, Aphrodite, Arenicola, Sabella, Leech.

Practical 5: To study external characters of Earthworm (Through chart/multimedia)

Practical 6: To study Digestive system of Earthworm & Mounting of Spermatheca, setae and Septal Nephridia (Through chart/multimedia)

Practical 7: To study Nervous system of Earthworm (Through chart/multimedia)

Practical 8: To study Reproductive system of Earthworm (Through chart/multimedia)

Practical 9: Study of Animal cell structure & cell organelles –Mitosis and Meiosis,

Nucleus, Endoplasmic reticulum, golgi body (Through charts/pictures/multimedia)

Practical 10: Study of genetic problems i). Monohybrid cross ii). Dihybrid cross iii). Incomplete dominance chart iv) Co dominance v). Multiple alleles

Practical 11: To check own Blood group (Practical/Method /Demo /Problem solving)

Journal / Submission

- Note: It is compulsory to record laboratory work (all the practicals) in the journal. The journal is to be certified by the in-charge teacher and the Head of the Department within time frame. Certified journal must be produced while appearing at the time of Practical examination.
- The field observations should be recorded in the journal.

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER-I: (MDC)

MDC ZOL108-P: ANIMAL DIVERSITY AND CYTOGENETICS-I

INTERNAL EVALUATION: 15 Marks
EXTERNAL EVALUATION: 10 Marks

B. Sc.: SKELETAL STRUCTURE OF UNIVERSITY PRACTICAL **MDC *ZOL-102* P**

Total Marks: 15

Instructions: Strictly follow the instructions given by examiner(s).	**Marks**
Exercise 1: Draw/Demonstrate & explain the _____system of Earthworm.	**03**
Exercise 2. Do as directed: Genetics problem/blood grouping as asked	**02**
Exercise 3. Identify and describe as per given instructions (1.5 marks each)	**06**
9. Identify and classify giving reasons - Phylum **10. Identify and classify giving reason - Phylum** **11. Identify and describe – Phylum** **12. Identify and do as directed - Cytology**	
Exercise 4. a. *Viva-voce*	**02**
b. Journal	**02**
TOTAL	**15**

Note:

- *Certified journal will be compulsory for appearing in Univ. Practical exam*

- Excursion/ Project work/ Visit/ Tour/ report and submission of specimens / Charts/ Model/ Fresh Material/ other activity (Given by teacher or as a part of Syllabus) will be mandatory for all the students and counted in question-4.

SYLLABUS OF B.Sc. Ist YEAR ZOOLOGY

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER-II (Zoology Major)

Paper MAJ ZOL 201: *ANIMAL DIVERSITY AND ECOLOGY*

<table>
<tr><td colspan="8">THEORY (Credit 3)</td></tr>
<tr><td colspan="8">Course Outcome (Objectives)
After the completion of the course the students will be able to: Develop understanding about the classification and diversity of different invertebrate phylum and classification system. Learn basic principles of ecology. Develop skills of presentations and narration using computer & multimedia.</td></tr>
<tr><td colspan="8">DISCIPLINE SPECIFIC CORE COURSES (MAJOR)</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">SEMESTER</td><td rowspan="2">COURSE CODE</td><td rowspan="2">COURSE TITLE</td><td colspan="4">THEORY</td></tr>
<tr><td>Credits</td><td>Lectures</td><td>Internal</td><td>External</td></tr>
<tr><td></td><td>B.Sc. II</td><td>ZOO-201</td><td>ANIMAL DIVERSITY AND ECOLOGY</td><td>3</td><td>45</td><td>35 Marks</td><td>40 Marks</td></tr>
<tr><td>UNIT</td><td colspan="5">TOPIC</td><td colspan="2">No.Of Credits/Lectures (45hrs)</td></tr>
<tr><td>UNIT-1</td><td colspan="5">ANIMAL DIVERSITY – SYSTEMATIC
Systematics: Salient features and classification up to class of given non chordates (exclude minor phyla) with suitable examples (See list in practical paper). Phylum to study;
1. Arthropoda: General characters and classification,
• Type study: Scorpion: External characters, digestive system, Circulatory system
• Different types of mouth parts in insects.
2. Echinodermata
3. Hemichordata
(General Classification as per Whitteker’s Five Kingdom Classification and Phylum Classification as per adapted in invertebrate Series by R. L. Kotpal, Rastogi Publication Meerut)</td><td colspan="2">1 credit</td></tr>
</table>

UNIT 2	**ANIMAL DIVERSITY (CHORDATES)** Salient features and classification of chordates from upto order 1. Class Amphibia: Characters and Classification upto Order • Heterochrony (Neoteny) • Reproduction and life stages 2. Super class Pisces: Characters and classification upto Order • External characters of fishes • Difference between Cartilagenous and bony bony fishes (The specimens should be taught in practical through chart/model/multimedia)	1 credit
Unit 3	**ECOLOGY** • Abiotic and Biotic factor of Ecosystem • Food Chain, Food web, Energy flow • Trophic levels and Ecological pyramids • Types of Ecology: Global ecology, Landscape ecology, Ecosystem ecology, Community ecology (Synecology), Population ecology, Organism ecology, Synecology and Autecology. Study of different ecosystems; (Characteristics, zonations, flora and fauna, community pattern, trophic levels) - Forest ecosystem - Grassland ecosystem - Aquatic ecosystem (Lentic and Lotic) - Marine ecosystem	1 credit

Suggested readings

1	Biology of the Invertebrates, J. A. Pechenik, Tata-McGraw Hill Company, Ltd, New Delhi.
2	Integrated principals of Zoology, C. P. Hickman, L. S. Roberts, and A. Larson, McGraw Hill Company, New York.
3	Modern Text Book Of Zoology: Invertebrates By R.L. Kotpal
4	Modern Text Book of Zoology: Vertebrates By R. R. Kotpal
5	Cell Biology, Genetics, Evolution & Ecology: Evolution And Ecology by Verma P.S. and Agarwal
6	Cell And Molecular Biology by De Robertis
7	Fundaments of Ecology by E P Odum

Note: Students may refer variety of material available online and on webresources for further understanding.

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER II:

Paper MAJ ZOL 202-P: ***ANIMAL DIVERSITY AND ECOLOGY***

PRACTICAL (Credit- 1)						
Course Outcome After the completion of the course the students will be able to: Develop skills for studying the animal characters, observational skills and field learning. They will learn preparing small reports and field observations at first year basic level.						
DISCIPLINE SPECIFIC CORE COURSE						
	SEMESTER	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***		
				Credits	***Lectures***	***INTERNAL/ External***
Practical	B.Sc	*MAJ ZOL 202- P*	*ANIMAL DIVERSITY AND ECOLOGY*	1	30 hrs	*25 (10+15) Marks*

The basic aim to introduce the animal diversity and identification skill of student.

Practical 1: Classification of Class Arthropoda: Cyclops, Balanus, Sacculina, Shrimp, Crab, Lobster, Scorpion, Daphnia, Spider, Rat-flea.

Practical 2: To study Phylum Echinodermata: Brittle star, Sea urchin, Sea cucumber, Feather star, Starfish, sand dollar

Practical 3: To study Phylum Hemichordata: Balanoglosus

Practical 4: To study super class Pisces: Saw fish, (Pristis), Shark, Mudskipper, Cat fish, Catla, Common Sting ray, Hippocampus (Sea horse), Suckerfish, Eel, Chimera, Ppprotopterus (African lungfish), Rohu, Exocoetus (flying fish)

Practical 5: To study Class Amphibian: Frog, Toad, Hyla, Salamander, Icthyophis, Axolotal larva

Practical 6: Study of different types of mouth parts in insects. Chewing and biting type (Cockroach), 2. Chewing and lapping type – Honey bee 3. Piercing and sucking type – Mosquito 4. Sponging type – house fly 5. Siphoning type – butterfly.

Practical 7: Study of Forest ecosystem.

Practical 8: Study of Wetland ecosystem

Practical 9: Study of Grassland ecosystem

Practical 10: Study of Marine Ecosystem.

(Study of ecosystems will be using chart/multimedia and /or field visits)

Note: Documentation of practical and field reports in journals is must.

KSKV Kachchh University, Bhuj - Kachchh
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SEMESTER-II: MAJ ZOL 202-P: ANIMAL DIVERSITY AND ECOLOGY

INTERNAL EVALUATION: 15 Marks
EXTERNAL EVALUATION: 10 Marks

B. Sc.: SKELETAL STRUCTURE OF EXTRENAL PRACTICAL
***(MAJZOL-202* P, MIN ZOL 206-P & MDC ZOL 208 P)**

Total Marks: 15

Instructions: Strictly follow the instructions given by examiner(s).	**Marks**
Exercise 1: Draw/Demonstrate Given ecosystem.	**02**
Exercise 2. Do as directed (1.5 marks each)	**09**
13. Identify and classify giving reasons – from Prac. 1-5 **14. Identify and classify giving reason – from Prac. 1-5** **15. Identify and describe – from Prac. 1-5** **16. Identify and describe - from Prac. 1-5** **17. Identify and do as directed – Mouth parts** **18. Identify and describe**	
Exercise 4. a. *Viva-voce*	**02**
b. Journal	**02**
TOTAL	**15**

Note:

- *Certified journal will be compulsory for appearing in Univ. Practical exam*

- Excursion/ Project work/ Visit/ Tour/ report and submission of specimens / Charts/ Model/ Fresh Material/ other activity (Given by teacher or as a part of Syllabus) will be mandatory for all the students and counted in question-4.

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER-II (Zoology Major)

Paper MAJ ZOL 203: ***ANATOMY, HISTOLOGY AND BEHAVIOUR***

<table>
<tr><td colspan="8">THEORY (Credit 3)</td></tr>
<tr><td colspan="8">Course Outcome (Objectives)
After the completion of the course the students will be able to: Develop understanding about the classification and diversity of different invertebrate phylum and classification system. Learn basic principles of ecology. Develop skills of presentations and narration using computer & multimedia.</td></tr>
<tr><td colspan="8">DISCIPLINE SPECIFIC CORE COURSES (MAJOR)</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">SEMESTER</td><td rowspan="2">COURSE CODE</td><td rowspan="2">COURSE TITLE</td><td colspan="4">THEORY</td></tr>
<tr><td>Credits</td><td>Lectures</td><td>Internal</td><td>External</td></tr>
<tr><td></td><td>B.Sc. II</td><td>MAJ ZOL 203</td><td>Anatomy, Histology and Behaviour</td><td>3</td><td>45</td><td>35 Marks</td><td>40 Marks</td></tr>
<tr><td>UNIT</td><td colspan="5">TOPIC</td><td colspan="2">No.Of Credits/Lectures (45hrs)</td></tr>
<tr><td>UNIT-1</td><td colspan="5">ANATOMY AND HISTOLOGY
1. Dentition in mammals.
• Structure of teeth, Type of teeth
• Dental formula (e.g. Man, Rabbit, Cow, Dog, Elephant, Horse)
2. Mammalian Skin and its derivatives:
• Structure of Skin (V.S).
• Histology of Mammalian Organs:
• Types of tissues: Epithelial, Connective, Muscle and Nervous tissues and categories and examples of each in detail.
• Mammalian stomach
• Mammalian Intestine
• Mammalian Liver
• Mammalian Pancreas</td><td colspan="2">1 credit</td></tr>
</table>

UNIT 2	**PHYSIOLOGY** **Nutrition** • Major and minor nutrients, • Vitamins : Sources and importance • Definition, Types & mode of Nutrition- Autotrophic and Heterotrophic (Holozoic, Saprozoic, and Parasitic) • Digestive system: Process and regulation • Digestion and Absorption of carbohydrates, • Digestion and absorption of Proteins and • Digestion and absorption of lipids • Common disorder: Hyperacidity, Ulcer, Amoebic dysentery, Lactose intolerance.	1 credit
Unit 3	**ANIMAL BEHAVIOUR** • Define Behaviour • Types of behaviour (Innate, Learning, Imprinting, Habituation, Conditioning, • Social Behaviour: Importance, group structure, Territory marking, Division of work, Altruism, Group protection, Group hunting, communication in group (Calls, alarms, displays, pheromones). *(Includes suitable examples)* • Reproductive Behaviour: Need of Reproductive behavior, Methods of courtship behvaiour (Calls, displays, colouration, Luring, Pheromones), Territory marking, Fights. *(Includes suitable examples)*	1 credit

Suggested readings

1	Biology of the Invertebrates, J. A. Pechenik, Tata-McGraw Hill Company, Ltd, New Delhi.
2	Integrated principals of Zoology, C. P. Hickman, L. S. Roberts, and A. Larson, McGraw Hill Company, New York.
3	Textbook of Medical Physiology by Guyton and Hall
4	Cell Biology, Genetics, Evolution & Ecology: Evolution And Ecology by Verma P.S. and Agarwal
5	Animal behavior by V. K. Agrawal
6	Animal behavior by Reena Mathur
7	Fundaments of Ecology by E P Odum

Note: Students may refer variety of material available online and on webresources for further understanding.

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER II:

Paper MAJ ZOL 204-P: *ANATOMY, HISTOLOGY AND BEHAVIOUR*

PRACTICAL (Credit- 1)						
Course Outcome After the completion of the course the students will be able to: Develop skills for studying physiology and bodily process basics, observational skills and field learning. Also they will be able to understand the digestive mechanism and histology. They will learn preparing small reports and field observations at first year basic level.						
DISCIPLINE SPECIFIC CORE COURSE						
	SEMESTER	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***		
				Credits	***Practical***	***INTERNAL/ External***
Practical	B.Sc	*MAJ ZOL 204- P*	***ANATOMY, HISTOLOGY AND BEHAVIOUR***	1	30 hrs	*25 (15+10) Marks*

The basic aim to introduce the animal diversity and identification skill of student.

Practical 1: Structure of Human Tooth (V.S. Molar)

Practical 2: To study type of teeth (Incisor, Canine, Premolar, molar) & Dental formulae (eg. Man Rabit, Dog, Elephant, Horse)

Practical 3: Mammalian Skin and its derivatives (eg. Sweat gland, Claw, Nail, Hoof, Horn and Hair)

Practical 4: To study human digestive system using model/chart/multimedia

Practical 5: To study histological permanent slides/sections (Through charts/slides)
T.S. mammalian Stomach, Intestine, Liver, Pancreas

Practical 6: To study various tissues using permanent slides.

Practical 7: Study of behavior of any social animal (Field observation based)

Practical 8: Study of reproductive behavior of birds (field study)

Practical 9: Documentation of any animal behavior (Self study by student)

Practical 10: Other field study as suggested in class
(Study of ecosystems will be using chart/multimedia and /or field visits)

Note: Documentation of practical and field reports in journals is must.

KSKV Kachchh University, Bhuj - Kachchh
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SEMESTER-II: MAJ ZOL 204-P: *ANATOMY, HISTOLOGY AND BEHAVIOUR*

INTERNAL EVALUATION: 15 Marks
EXTERNAL EVALUATION: 10 Marks

B. Sc.: SKELETAL STRUCTURE OF EXTRENAL PRACTICAL –*MAJ ZOL-204* P

Total Marks: 15

Instructions: Strictly follow the instructions given by examiner(s).	**Marks**
Exercise 1: Identify and draw the labeled T.S of histological section.	**03**
Exercise 2. Do as directed (1.5 marks each)	**09**
1. Identify and describe – Skin derivative from Prac. 1-5 **2. Do as directed – Dental formula** **3. Do as directed - Tissues** **4. Do as directed - Tissues** **5. Do as directed – Animal behaviour** **6. Do as directed**	
Exercise 4. a. *Viva-voce*	**1.5**
b. Journal	**1.5**
TOTAL	**15**

Note:

- *Certified journal will be compulsory for appearing in Univ. Practical exam*

- Excursion/ Project work/ Visit/ Tour/ report and submission of specimens / Charts/ Model/ Fresh Material/ other activity (Given by teacher or as a part of Syllabus) will be mandatory for all the students and counted in question-4.

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER-II (Zoology MINOR)

MIN ZOL 205: ANIMAL DIVERSITY AND ECOLOGY

<table>
<tr><td colspan="8">THEORY (Credit 3)</td></tr>
<tr><td colspan="8">Course Outcome (Objectives)
After the completion of the course the students will be able to: Develop understanding about the classification and diversity of different invertebrate phylum and classification system. Learn basic principles of ecology. Develop skills of presentations and narration using computer & multimedia.</td></tr>
<tr><td colspan="8">DISCIPLINE SPECIFIC CORE COURSES (MAJOR)</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">SEMESTER</td><td rowspan="2">COURSE CODE</td><td rowspan="2">COURSE TITLE</td><td colspan="4">THEORY</td></tr>
<tr><td>Credits</td><td>Lectures</td><td>Internal</td><td>External</td></tr>
<tr><td></td><td>B.Sc. II</td><td>MIN ZOL 205</td><td>ANIMAL DIVERSITY AND ECOLOGY</td><td>3</td><td>45</td><td>35 Marks</td><td>40 Marks</td></tr>
<tr><td>UNIT</td><td colspan="5">TOPIC</td><td colspan="2">No.Of Credits/Lectures (45hrs)</td></tr>
<tr><td>UNIT-1</td><td colspan="5">ANIMAL DIVERSITY – SYSTEMATIC
Systematics: Salient features and classification up to class of given non chordates (exclude minor phyla) with suitable examples (See list in practical paper). Phylum to study;
4. Arthropoda: General characters and classification,
• Type study: Scorpion: External characters, digestive system, Circulatory system
• Different types of mouth parts in insects.
5. Echinodermata
6. Hemichordata
(General Classification as per Whitteker’s Five Kingdom Classification and Phylum Classification as per adapted in invertebrate Series by R. L. Kotpal, Rastogi Publication Meerut)</td><td colspan="2">1 credit</td></tr>
</table>

UNIT 2	**ANIMAL DIVERSITY (CHORDATES)** Salient features and classification of chordates from upto order 3. Class Amphibia: Characters and Classification upto Order • Heterochrony (Neoteny) • Reproduction and life stages 4. Super class Pisces: Characters and classification upto Order • External characters of fishes • Difference between Cartilagenous and bony bony fishes (The specimens should be taught in practical through chart/model/multimedia)	1 credit
Unit 3	**ECOLOGY** • Abiotic and Biotic factor of Ecosystem • Food Chain, Food web, Energy flow • Trophic levels and Ecological pyramids • Types of Ecology: Global ecology, Landscape ecology, Ecosystem ecology, Community ecology (Synecology), Population ecology, Organism ecology, Synecology and Autecology. Study of different ecosystems; (Characteristics, zonations, flora and fauna, community pattern, trophic levels) - Forest ecosystem - Grassland ecosystem - Aquatic ecosystem (Lentic and Lotic) - Marine ecosystem	1 credit

Suggested readings

1	Biology of the Invertebrates, J. A. Pechenik, Tata-McGraw Hill Company, Ltd, New Delhi.
2	Integrated principals of Zoology, C. P. Hickman, L. S. Roberts, and A. Larson, McGraw Hill Company, New York.
3	Modern Text Book Of Zoology: Invertebrates By R.L. Kotpal
4	Modern Text Book of Zoology: Vertebrates By R. R. Kotpal
5	Cell Biology, Genetics, Evolution & Ecology: Evolution And Ecology by Verma P.S. and Agarwal
6	Cell And Molecular Biology by De Robertis
7	Fundaments of Ecology by E P Odum

Note: Students may refer variety of material available online and on webresources for further understanding.

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER II: MINOR

Paper MIN ZOL 206-P: ***ANIMAL DIVERSITY AND ECOLOGY***

PRACTICAL (Credit- 1)						
Course Outcome After the completion of the course the students will be able to: Develop skills for studying the animal characters, observational skills and field learning. They will learn preparing small reports and field observations at first year basic level.						
DISCIPLINE SPECIFIC CORE COURSE						
	SEMESTER	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***		
				Credits	***Lectures***	***INTERNAL/ External***
Practical	B.Sc	*MIN ZOL 206- P*	ANIMAL DIVERSITY AND ECOLOGY	1	30 hrs	*25 (15+10) Marks*

The basic aim to introduce the animal diversity and identification skill of student.

Practical 1: Classification of Class Arthropoda: Cyclops, Balanus, Sacculina, Shrimp, Crab, Lobster, Scorpion, Daphnia, Spider, Rat-flea.

Practical 2: To study Phylum Echinodermata: Brittle star, Sea urchin, Sea cucumber, Feather star, Starfish, sand dollar

Practical 3: To study Phylum Hemichordata: Balanoglosus

Practical 4: To study super class Pisces: Saw fish, (Pristis), Shark, Mudskipper, Cat fish, Catla, Common Sting ray, Hippocampus (Sea horse), Suckerfish, Eel, Chimera, Ppprotopterus (African lungfish), Rohu, Exocoetus (flying fish)

Practical 5: To study Class Amphibian: Frog, Toad, Hyla, Salamander, Icthyophis, Axolotal larva

Practical 6: Study of different types of mouth parts in insects. Chewing and biting type (Cockroach), 2. Chewing and lapping type – Honey bee 3. Piercing and sucking type – Mosquito 4. Sponging type – house fly 5. Siphoning type – butterfly.

Practical 7: Study of Forest ecosystem.

Practical 8: Study of Wetland ecosystem

Practical 9: Study of Grassland ecosystem

Practical 10: Study of Marine Ecosystem.

(Study of ecosystems will be using chart/multimedia and /or field visits)

Note: Documentation of practical and field reports in journals is must.

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER-II (Zoology MDC)

MDC ZOL 207: ANIMAL DIVERSITY AND ECOLOGY

<table>
<tr><td colspan="8">THEORY (Credit 3)</td></tr>
<tr><td colspan="8">Course Outcome (Objectives)
After the completion of the course the students will be able to: Develop understanding about the classification and diversity of different invertebrate phylum and classification system. Learn basic principles of ecology. Develop skills of presentations and narration using computer & multimedia.</td></tr>
<tr><td colspan="8">DISCIPLINE SPECIFIC CORE COURSES (MAJOR)</td></tr>
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<tr><td>Credits</td><td>Lectures</td><td>Internal</td><td>External</td></tr>
<tr><td></td><td>B.Sc. II</td><td>MDC ZOL 207</td><td>ANIMAL DIVERSITY AND ECOLOGY</td><td>3</td><td>45</td><td>35 Marks</td><td>40 Marks</td></tr>
<tr><td>UNIT</td><td colspan="5">TOPIC</td><td colspan="2">No.Of Credits/Lectures (45hrs)</td></tr>
<tr><td>UNIT-1</td><td colspan="5">ANIMAL DIVERSITY – SYSTEMATIC
Systematics: Salient features and classification up to class of given non chordates (exclude minor phyla) with suitable examples (See list in practical paper). Phylum to study;
7. Arthropoda: General characters and classification,
• Type study: Scorpion: External characters, digestive system, Circulatory system
• Different types of mouth parts in insects.
8. Echinodermata
9. Hemichordata
(General Classification as per Whitteker’s Five Kingdom Classification and Phylum Classification as per adapted in invertebrate Series by R. L. Kotpal, Rastogi Publication Meerut)</td><td colspan="2">1 credit</td></tr>
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UNIT 2	**ANIMAL DIVERSITY (CHORDATES)** Salient features and classification of chordates from upto order 5. Class Amphibia: Characters and Classification upto Order • Heterochrony (Neoteny) • Reproduction and life stages 6. Super class Pisces: Characters and classification upto Order • External characters of fishes • Difference between Cartilagenous and bony bony fishes (The specimens should be taught in practical through chart/model/multimedia)	1 credit
Unit 3	**ECOLOGY** • Abiotic and Biotic factor of Ecosystem • Food Chain, Food web, Energy flow • Trophic levels and Ecological pyramids • Types of Ecology: Global ecology, Landscape ecology, Ecosystem ecology, Community ecology (Synecology), Population ecology, Organism ecology, Synecology and Autecology. Study of different ecosystems; (Characteristics, zonations, flora and fauna, community pattern, trophic levels) - Forest ecosystem - Grassland ecosystem - Aquatic ecosystem (Lentic and Lotic) - Marine ecosystem	1 credit

Suggested readings

1	Biology of the Invertebrates, J. A. Pechenik, Tata-McGraw Hill Company, Ltd, New Delhi.
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6	Cell And Molecular Biology by De Robertis
7	Fundaments of Ecology by E P Odum

Note: Students may refer variety of material available online and on webresources for further understanding.

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(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER II: MDC
Paper MDC ZOL 208-P: ANIMAL DIVERSITY AND ECOLOGY

PRACTICAL (Credit- 1)						
Course Outcome After the completion of the course the students will be able to: Develop skills for studying the animal characters, observational skills and field learning. They will learn preparing small reports and field observations at first year basic level.						
DISCIPLINE SPECIFIC CORE COURSE						
	SEMESTER	***COURSE CODE***	**COURSE TITLE**	**PRACTICAL**		
				Credits	**Lectures**	**Total (Internal+ External**
Practical	B. Sc	MDC ZOL 206- P	ANIMAL DIVERSITY AND ECOLOGY	1	30 hrs	25 (15+10) Marks

The basic aim to introduce the animal diversity and identification skill of student.

Practical 1: Classification of Class Arthropoda: Cyclops, Balanus, Sacculina, Shrimp, Crab, Lobster, Scorpion, Daphnia, Spider, Rat-flea.

Practical 2: To study Phylum Echinodermata: Brittle star, Sea urchin, Sea cucumber, Feather star, Starfish, sand dollar

Practical 3: To study Phylum Hemichordata: Balanoglosus

Practical 4: To study super class Pisces: Saw fish, (Pristis), Shark, Mudskipper, Cat fish, Catla, Common Sting ray, Hippocampus (Sea horse), Suckerfish, Eel, Chimera, Ppprotopterus (African lungfish), Rohu, Exocoetus (flying fish)

Practical 5: To study Class Amphibian: Frog, Toad, Hyla, Salamander, Icthyophis, Axolotal larva

Practical 6: Study of different types of mouth parts in insects. Chewing and biting type (Cockroach), 2. Chewing and lapping type – Honey bee 3. Piercing and sucking type – Mosquito 4. Sponging type – house fly 5. Siphoning type – butterfly.

Practical 7: Study of Forest ecosystem.

Practical 8: Study of Wetland ecosystem

Practical 9: Study of Grassland ecosystem

Practical 10: Study of Marine Ecosystem.

(Study of ecosystems will be using chart/multimedia and /or field visits)

Note: Documentation of practical and field reports in journals is must.

(Univ. Practical pattern will be as per MAJ ZOL 202-P pattern)