

॥ सा विद्या या विमुक्तये ॥



स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

“ज्ञानतीर्थ” परिसर, विष्णुपुरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

“Dnyanteerth”, Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade



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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील प्रथम वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९-२० पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक ०८ जून २०१९ रोजी संपन्न झालेल्या ४४व्या मा. विद्या परिषद बैठकीतील ऐनवेळचा विषय क्र.११/४४-२०१९ च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील प्रथम वर्षाचे खालील विषयांचे C.B.C.S. (Choice Based Credit System) Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९-२० पासून लागू करण्यात येत आहेत.

- | | |
|---|---------------------------------------|
| 1. Agricultural Microbiology | 18. Dyes and Drugs |
| 2. Agrochemicals & Fertilizers | 19. Electronics |
| 3. Analytical Chemistry | 20. Environmental Science |
| 4. B.C.A. | 21. Fishery Science |
| 5. B.Voc. (Food Processing, Preservation and Storage) | 22. Food Science |
| 6. B.Voc. (Web Printing Technology) | 23. Geology |
| 7. Biochemistry | 24. Horticulture |
| 8. Bioinformatics | 25. Industrial Chemistry |
| 9. Biophysics | 26. Information Technology (Optional) |
| 10. Biotechnology (Vocational) | 27. Mathematics |
| 11. Biotechnonology | 28. Microbiology |
| 12. Botany | 29. Network Technology |
| 13. Chemistry | 30. Physics |
| 14. Computer Application (Optional) | 31. Software Engineering |
| 15. Computer Science (Optional) | 32. Statistics |
| 16. Computer Science | 33. Zoology |
| 17. Dairy Science | |

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या www.srtmun.ac.in या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

‘ज्ञानतीर्थ’ परिसर,
विष्णुपुरी, नांदेड - ४३१ ६०६.
जा.क्र.: शैक्षणिक-०१/परिपत्रक/पदवी-सीबीसीएस अभ्यासक्रम/
२०१९-२०/२९२

दिनांक : ०३.०७.२०१९.

प्रत माहिती व पुढील कार्यवाहीस्तव :

- १) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
- २) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
- ३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
- ४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
- ५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
- ६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

स्वाक्षरित / -

उपकुलसचिव

शैक्षणिक (१-अभ्यासमंडळ) विभाग

**Swami Ramanand Teerth Marathwada University,
Nanded**

FACULTY OF SCIENCE & TECHNOLOGY



**B.Sc. First Year
Zoology
(Structure and Syllabus)**

**Choice Based Credit System (CBCS) Course Structure
Semester Pattern Syllabus
Effective from June, 2019**

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure

Faculty of Science & Technology

B.Sc. First Year (Semester I & Semester II) Syllabus w.e.f. June, 2019

Semester Pattern; Subject: Zoology

NEWLY DESIGNED CBCS CURRICULA OF B.Sc. FIRST YEAR ZOOLOGY

Zoology deals with study of the **animals**. It embodies study of the structure, embryonic development, classification, habits, distribution and evolution of all animals, both living and extinct. There are several specializations available to students pursuing this field. There are several groups of animals studied in Zoology like Invertebrates, Vertebrates and others. In the study of zoology, there are many options to choose from depending on individual capabilities and interests.

The University has introduced the Choice Based Credit System (CBCS) in its curricula. Following is a briefing about CBCS as envisaged by the UGC.

CHOICE BASED CREDIT SYSTEM (CBCS):

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions to begin with. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

CORE COURSES:

The Core Courses (CC) offered to students of B.Sc. I Year Zoology are aimed at preparing the students for their future study and career. The students are prepared for pursuing their post-graduate studies. They would also be able to take up entrepreneurship related to biological sciences. Additionally, the students could choose to take up positions in public or private sectors like fishery, forestry, wildlife conservation, agricultural research, health services, environmental management and restoration.

THE SALIENT FEATURES:

Biodiversity of Invertebrates & Chordates and **Comparative Anatomy of Vertebrates & Developmental Biology of Vertebrates** are the two papers offered to the B.Sc. I year students in I & II semesters respectively. “Biodiversity of Invertebrates & Chordates” attempts to dwell into the study of extant groups of invertebrate and vertebrate animals. A good understanding of the relationship, environmental and evolutionary, is the core of the first paper. Added to it is also an aspect on the developmental aspects of different species of animals. The paper on “Comparative Anatomy of Vertebrates & Developmental Biology of Vertebrates” is the second paper that deals with the different forms of animal anatomy and different developmental processes. An understanding of animal structure is important to experimentation, farming or management of animals.

UTILITY OF THE COURSE:

Study of the fields of Biodiversity of Invertebrates & Chordates and Comparative Anatomy of Vertebrates & Developmental Biology of Vertebrates equips students to pursue further study in a wide variety of subjects. It also prepares the students for future research in any of the related fields. Such a broad coverage of topics in the first year of the course also helps in widening their perspective of biological sciences. The course contents offered are related to Animal Morphology, Taxonomy, Anatomy and Development. These courses would induce understanding of the subject so that the student could later take up specialized post-graduate courses and also pursue research in the relevant field. The students could also explore possibilities in developing themselves in such specialized fields to fit in the competitive environment.

**Chairman,
Board of Studies in Zoology,
Faculty of Science & Technology,
Swami Ramanand Teerth Marathwada University,
Nanded-431606**

Swami Ramanand Teerth Marathwada University, Nanded
Choice Based Credit System (CBCS) Course Structure
Faculty of Science & Technology
B. Sc. First Year (Semester I & Semester II) Syllabus w.e.f. June, 2019
Semester Pattern; Subject: Zoology

Class/ Semester	Course Number		Name of the Course/ Paper	Instruction Hrs/Week	Total Periods/ Practicals	Marks for		Total Marks	Credits
						Internal (CA)	External (ESE)		
B.Sc. F.Y. Semester I	CCZ-I Biodiversity of Invertebrates and Chordates	Section -A	PAPER I: Biodiversity of Invertebrates	03	45	10	40	50	Credit:02
		Section-B	PAPER II: Biodiversity of Chordates	03	45	10	40	50	Credit:02
B.Sc. F.Y. Semester II	CCZ-II Comparative Anatomy and Developmental Biology of Vertebrates	Section -A	PAPER III: Comparative Anatomy of Vertebrates	03	45	10	40	50	Credit:02
		Section-B	PAPER IV: Developmental Biology of Vertebrates	03	45	10	40	50	Credit:02
B.Sc. F.Y. Semester I & II	CCZP-I	Section -A & Section- B	Practical Paper- V: Biodiversity of Invertebrates and Chordates & Comparative Anatomy and Developmental Biology of Vertebrates (Practical based on P-I,II,III & IV)	03	30	20	80	100	Credit:04
Total Credit for Semester I & II						60	240	300	Credit:12

CCZ: Core Course Zoology, **CCZP:** Core Course Zoology Practical, **CA:** Continuous Assessment;

ESE: End of Semester Examination,

Practical Paper CCZP-I for both semesters I & II respectively will be at the end of Academic Year in Annual Pattern.

Practical Internal Evaluation (Continuous Assessment CA)= 20 Marks

Submission of Record book, Excursion Report & slides =10 Marks; Internal Test on Practical=10 Marks

Swami Ramanand Teerth Marathwada University, Nanded
Choice Based Credit System (CBCS) Course Structure
Faculty of Science & Technology
B. Sc. Second Year (Semester III & Semester IV) Syllabus w.e.f. June, 2020
Semester Pattern; Subject: Zoology

Class/ Semester	Course Number		Name of the Course/ Paper	Instruction Hrs/Week	Total Periods/ Practicals	Marks for		Total Marks	Credits
						Internal (CA)	External (ESE)		
B.Sc. S.Y. Semester III	CCZ-III Physiology and Biochemistry	Section –A	PAPER VI: Physiology	03	45	10	40	50	Credit:02
		Section-B	PAPER VII: Biochemistry	03	45	10	40	50	Credit:02
	CCZP-II	[CCZ III (Section A & Section B)	Practical Paper- X: Physiology and Biochemistry (Practical based on P-VI & VII)	03	30	10	40	50	Credit:02
	SECZ-I		SEC-I Any one Skill to be chosen out of Two SECZ –I (A) : Haematology SECZ –I (B) : Urinology	03	45	25	25	50	Credit:02
B.Sc. S.Y. Semester IV	CCZ-IV Cell Biology, Genetics and Evolutionary Biology	Section –A	PAPER VIII: Cell Biology and Genetics	03	45	10	40	50	Credit:02
		Section-B	PAPER IX: Evolutionary Biology	03	45	10	40	50	Credit:02
	CCZP-II	[CCZ IV (Section A & Section B)	Practical Paper- XI: Cell Biology, Genetics and Evolutionary Biology (Practical based on P-VIII & IX)	03	30	10	40	50	Credit:02
	SECZ-II		SEC-II Any one Skill to be chosen out of Two SECZ –II (C): Histotechnology SECZ –II (D): Apiculture	03	45	25	25	50	Credit:02
Total Credit for Semester III & IV						110	290	400	Credit:16

CCZ: Core Course Zoology, **CCZP:** Core Course Zoology Practical, **CA:** Continuous Assessment;

ESE: End of Semester Examination, **SECZ:** Skill Enhancement Course Zoology

SECZ: **CA-25:** Seminar-15 & Test-10 **ESE-25:** Report Submission-10; Overall Skill Judgment-10 and Presentation-05

ESE for SECs SECZ-I & SECZ-II and Practical Papers CCZP-II & CCZP-III for both semesters III & IV respectively will be at the end of Academic Year in Annual Pattern.

Practical Internal Evaluation (Continuous Assessment CA)= 10 Marks

Submission of Record book & Excursion Report =05 Marks; Internal Test on Practicals=05 Marks

Swami Ramanand Teerth Marathwada University, Nanded
Choice Based Credit System (CBCS) Course Structure
Faculty of Science & Technology
B. Sc. Third Year (Semester V & Semester VI) Syllabus w.e.f. June, 2021
Semester Pattern; Subject: Zoology

Class/ Semester	Course Number		Name of the Course/ Paper	Instruction Hrs/Week	Total Periods/ Practicals	Marks for		Total Marks	Credits
						Internal (CA)	External (ESE)		
B.Sc. T.Y. Semester V	DSEZ-I	Section -A	PAPER-XII- Ecology and Zoogeography	03	45	10	40	50	Credit:02
		Section-B (Select Any one paper from A/B/C/D)	PAPER-XIII (A): Pisciculture	03	45	10	40	50	Credit:02
			PAPER-XIII (B): Applied Parasitology - I						
			PAPER-XIII (C): Entomology- I						
			PAPER-XIII (D): Environmental Biology - I						
	DSEZP-I	[DSEZ I & II] (Section A)	Practical Paper- XVI-Ecology, Zoogeography, Ethology, Biometry and Bioinformatics (Practical based on P-XII & XIV)	03	30	10	40	50	Credit:02
	SECZ-III		SEC-III Any one Skill to be chosen out of Two SECZ -III (E) : Parasites of Public Health Importance SECZ -III (F) : Vermiculture and Vermicomposting	03	45	25	25	50	Credit:02
B.Sc. T.Y. Semester VI	DSEZ-II	Section -A	PAPER-XIV-Ethology, Biometry and Bioinformatics	03	45	10	40	50	Credit:02
		Section-B (Select Any one paper from A/B/C/D)	PAPER-XV (A): Aquaculture	03	45	10	40	50	Credit:02
			PAPER-XV (B): Applied Parasitology - II						
			PAPER-XV (C): Entomology- II						
		PAPER-XV (D): Environmental Biology - II							
	DSEZP-II	[DSEZ I & II] (Section B) {Select Any one paper from A/B/C/D}	Practical Paper- XVII (A): Pisciculture and Aquaculture (Practical based on P-XIII(A)& XV (A))	03	30	10	40	50	Credit:02
			Practical Paper- XVII (B): Applied Parasitology – I & II (Practical based on P-XIII(B)& XV (B))						
Practical Paper- XVII (C): Entomology – I & II (Practical based on P-XIII(C)& XV (C))									
Practical Paper- XVII (D): Environmental Biology – I & II (Practical based on P-XIII(D)& XV (D))									
	SECZ-IV		SEC-IV Any one Skill to be chosen out of Two SECZ -IV (G): Aquarium Keeping SECZ -IV (H): Sericulture	03	45	25	25	50	Credit:02
Total Credit for Semester V & VI						110	290	400	Credit:16

DSEZ: Discipline Specific Elective Course Zoology, **DSEZP:** Discipline Specific Elective Course Zoology Practical, **CA:** Continuous Assessment;

ESE: End of Semester Examination, **SECZ:** Skill Enhancement Course Zoology

SECZ: CA-25: Seminar-15 & Test-10 ESE-25: Report Submission-10; Overall Skill Judgment-10 and Presentation-05

ESE for SECs SECZ-III & SECZ-IV and Practical Papers DSEZP-I & DSEZP-II(A/B/C/D) for both semesters V & VI respectively will be at the end of Academic Year in Annual Pattern.

Practical Internal Evaluation (Continuous Assessment CA)= 10 Marks

Submission of Record book & Excursion Report =05 Marks; Internal Test on Practicals=05 Marks

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Choice Based Credit System (CBCS) Course Structure
Faculty of Science & Technology
B. Sc. First Year Syllabus w.e.f. June, 2019

Zoology
Semester -I

Paper: CCZ-I: Biodiversity of Invertebrates and Chordates

Section –A

Periods : 45

Title of Paper: Paper-I : Biodiversity of Invertebrates

Credits: 02 (Marks: 50)

Objectives:

1. To broadly understand Biodiversity, Habitat, Adaptation, Anatomical organization and taxonomic status of invertebrates phyla in relation to other animal taxa.
2. Understanding the basis of biological classification and its conceptual framework.
3. Appreciating the structural and functional correlation between different invertebrate groups.

UNIT – I

11

1. **Introduction of Non-chordates**
2. **Protozoa:** General characters and classification up to class level with suitable examples; Locomotory Organelles and locomotion in Protozoa.
Brief account of each of Structure, Life Cycle, Pathogenicity and Control Measures of *Plasmodium vivax*.
3. **Porifera:**-General characters and classification up to class level with suitable examples; Canal System in *Sycon*; Economic importance of Porifera.

UNIT – II

12

1. **Coelenterata:** General characters and classification up to class level with suitable examples; Polymorphism in Hydrozoa.
2. **Platyhelminthes:** General characters and classification up to class level with suitable examples; Brief account of each of Structure, Life Cycle, Pathogenicity and Control Measures of *Taenia solium*.
3. **Nemathelminthes:** General characters and classification up to class level with suitable examples; Brief account of each of Structure, Life Cycle, Pathogenicity and Control Measures of *Ascaris lumbricoides*.

UNIT – III

11

1. **Annelida:** General characters and classification up to class level with suitable examples; Metamerism in Annelida; vermiculture and vermicomposting.
2. **Arthropoda:** General characters and classification up to class level with suitable examples; Metamorphosis in Insects.
Cockroach- External Morphology, Digestive system, Respiratory system, Nervous system.
Economic importance of insects.

UNIT – IV

11

1. **Mollusca:** General characters and classification up to class level with suitable examples; Economic importance of mollusca.
2. **Echinodermata:** General characters and classification up to class level with suitable examples; Star Fish- External Morphology, Larval forms in Echinoderms.
3. **Hemichordata:** General Characters and Affinities.

Outcome of the Course:

1. The student will be able to identify a given invertebrate upto class level.
2. Ability to understand the contribution of Invertebrates in the biodiversity index of any given habitat.
3. Ability to understand and appreciate the ecological and economic importance of invertebrates and vertebrates.
4. Ability to identify and describe external morphology and internal anatomical features of representative invertebrate species.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Choice Based Credit System (CBCS) Course Structure
Faculty of Science & Technology
B. Sc. First Year Syllabus w.e.f. June, 2019
Zoology
Semester -I

Paper: CCZ-I: Biodiversity of Invertebrates and Chordates

Section –B

Periods : 45

Title of Paper: Paper-II : Biodiversity of Chordates

Credits: 02 (Marks: 50)

Objectives:

1. To understand Biodiversity, Habitat, Adaptation organization and taxonomic status of Chordates.
2. Explaining the basic aspects of classification of chordates.
3. Develop the ability to understand structural and functional details of Chordates.
4. Develop a broad and correlated view of all chordate groups: extinct and living.
5. Acquire the skill to correlate anatomical and morphological aspects of different chordate groups.

UNIT – I

11

1. Introduction of Chordates

Salient features and classification of chordates up to class level.
Origin and Ancestry of Chordata

2. Protochordata: Urochordata-General features and Phylogeny of Urochordata;

Cephalochordata- General features and Phylogeny of Cephalochordata.

3. Agnatha : General characters and classification of Agnatha with suitable examples.

Cyclostomata: General characters with suitable examples.

UNIT – II

12

1. Pisces: General characters and classification up to order level with suitable examples;

Scoliodon (Dogfish): External morphology, Digestive system, Respiratory system, Circulatory System, Nervous system, Urinogenital system.
Economic importance of Fishes.

2. Amphibia: General characters and classification up to order level with suitable examples;
Parental care in Amphibians; Hibernation and aestivation in Frog.

UNIT – III

11

1. Reptiles: General characters and classification up to order level with suitable examples;
Poisonous and non-poisonous snakes; Biting mechanism in snakes; Importance of snake Venom.

2. Aves: General characters and classification up to order level with suitable examples;
Flight adaptations in birds; Migration in birds.

UNIT – IV

11

1. Mammals: General characters and classification up to order level with suitable examples.

Rat- External characters, Digestive system, Respiratory system, Circulatory system, Nervous system - Brain and spinal cord, Eye and Ear.

Outcome of the Course:

1. The student will be able to identify and understand the Biodiversity of Chordates.
2. Ability to understand anatomical relation between different vertebrate classes.
3. The learner will be able to understand the economic importance of Chordates.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Choice Based Credit System (CBCS) Course Structure
Faculty of Science & Technology
B. Sc. First Year Syllabus w.e.f. June, 2019
Zoology
Semester –II

Paper: CCZ-II: Comparative Anatomy and Developmental Biology of Vertebrates

Section –A

Title of Paper: Paper-III: Comparative Anatomy of Vertebrates

Periods : 45

Credits: 02 (Marks: 50)

Objectives:

1. To understand Anatomical structure of Vertebrates.
2. Explaining the basic aspects of evolution of various organs of vertebrates.
3. Understand the phylogenetic progression in vertebrate body and its systems.
4. To know about the extreme specialization in different organ systems in vertebrate groups in response to the environment.

UNIT – I

11

1. General characters, origin and Ancestry of Vertebrates.
2. **Integumentary System:**
Development, General structure and function of integument;
Derivatives of integument- Epidermal and Dermal derivatives;
3. **Skeletal System-** Evolution of visceral arches; Comparative account of Limbs and girdles.

UNIT – II

12

1. **Digestive System:**
Brief account of alimentary canal and digestive glands.
2. **Respiratory System:** Brief account of different respiratory organs in vertebrates- Gills, lungs, skin, air sacs and Accessory respiratory organs.

UNIT – III

11

1. **Circulatory System:** Brief account of Evolution of heart in vertebrates.
Modifications of aortic arches in vertebrates;
Blood circulation in various vertebrate groups- Single and Double circulation
2. **Urinogenital System:** Developmental Succession of kidney, Evolution of urinogenital system in vertebrates.

UNIT – IV

11

1. **Nervous System:** Structure of Neuron; Comparative account of Brain of Vertebrates.
2. **Sense Organs -** Types of receptors- Mechanoreceptors; Photoreceptors; Phonoreceptors.

Outcome of the Course:

1. The student will be able to identify and understand comparative anatomical structure of vertebrate organ systems.
2. The learner will be able to understand the evolution of various organs and systems in the vertebrate body according to its environment.
3. Understand the plasticity of organ systems to adapt to the environment and acquire different novel forms.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Choice Based Credit System (CBCS) Course Structure
Faculty of Science & Technology
B. Sc. First Year Syllabus w.e.f. June, 2019
Zoology
Semester –II

Paper: CCZ-II: Comparative Anatomy and Developmental Biology of Vertebrates

Section –B

Title of Paper: Paper-IV :Developmental Biology of Vertebrates

Periods : 45

Credits: 02 (Marks: 50)

Objectives:

1. To get an insight into embryonic development of vertebrates.
2. To correlate developmental stages of different vertebrate groups.
3. To identify and describe the different embryonic structures of vertebrates.
4. To grasp the basic processes of human development.

UNIT – I

11

1. **Introduction of Developmental Biology**
2. **Early Embryonic Development:** Gametogenesis: Spermatogenesis and oogenesis in mammals; vitellogenesis in birds;
3. **Types of eggs:**
 - a) On the basis of amount of yolk
 - b) On the basis of distribution of yolk

UNIT – II

11

1. **Gametes of Frog:** a) Structure of sperm; b) Structure of ovum;
2. **Frog Embryology:** a) Fertilization; b) Cleavage; c) Blastulation; d) Gastrulation; e) Formation of three germinal layers;
3. **Regeneration in chordates.**

UNIT – III

11

1. **Chick Embryology:** (Extra-embryonic membranes) -
Structure and functions of- Amnion; Chorion; Yolk sac; Allantois
2. **Placentation in mammals:** Classification on the basis of- Origin; Histology; Distribution of villi. Functions of Placenta.

UNIT – IV

12

1. **Stem Cell:** a) Sources; b) Types – Embryonic, Haemopoietic, Adult, Nervous; c) Role of stem cells in human health.
2. Infertility in Humans-Causes, diagnosis and treatment.
3. **Assisted Reproduction Technologies-** a) In-Vitro Fertilization (IVF) b) Gamete Intra-Fallopian Transfer (GIFT); c) Intra cytoplasmic Sperm injection (ICSI); d) Zygote Intrafallopian transfer (ZIFT); e) Intrauterine Insemination (IUI)
4. **Parthenogenesis:** a) Natural; b) Artificial.

Outcome of the Course:

1. The student will be able to explain the basic processes of vertebrate embryonic development.
2. Ability to describe the various steps in vertebrate development.
3. Identify and explain about the different embryonic structures.
4. Describe the functions of different extra-embryonic structures.
5. Understanding of the Assisted Reproductive Technologies.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Choice Based Credit System (CBCS) Course Structure
Faculty of Science & Technology
B. Sc. First Year Syllabus w.e.f. June, 2019

Zoology

Semester –I &II

Section –A&B

Paper: CCZP-I

Title of Paper: Practical Paper V: Biodiversity of Invertebrates and Chordates & Comparative Anatomy and Developmental Biology of Vertebrates (Based on P-I, II, III & IV)

Practicals : 30

Credits: 04 (Marks: 100)

Objectives:

1. To understand the anatomical organization of any species.
2. To identify and handle different body parts of invertebrates and vertebrates.
3. To understand and perform temporary and permanent mountings.
4. To identify and describe structure and functions of different bones.
1. Study of at least two museum specimens from Invertebrate Phyla. (Protozoa to Echinodermata and Hemichordata).
2. Study of at least two museum specimens from Protochordata to Mammalia.
3. **Demonstration based on Models, Charts and Computer Aided Techniques:** i) Cockroach: Digestive system, Nervous system. ii) Scoliodon: Digestive system, Heart and ventral Aorta, Afferent arteries, Brain.
4. Key for Identification of poisonous and non-poisonous snakes.
5. **Permanent Mountings** - i) Mouth parts of Cockroach; ii) Trachea of Cockroach; iii) Salivary glands of Cockroach; iv) Nereis Parapodia; v) Mounting of different types Scales (From Locally Available Fishes): Cycloid, Ctenoid and Placoid.
6. **Osteology:** a) Disarticulated skeleton of fowl and rabbit/rat; b) Carapace and plastron of turtle /tortoise; c) Mammalian skulls: One herbivorous and one carnivorous animal. (Models / Charts); d) preparation of articulated complete skeleton of any locally available animal.
7. **Frog Embryology: Study of developmental stages, whole mounts and sections by permanent slides** – cleavage stages, blastula, gastrula, neurula, tail bud stage, tadpole, external and internal gill stages.
8. Study of the different types of placenta- histological sections using permanent slides or photomicrographs.
9. Study of placental development in humans by using ultrasound scan images.
10. Examination of gametes - frog/rat - sperm and ova using permanent slides or photomicrographs.
11. **Study of permanent slides of Chick Embryology:** 18 hrs.; 24 hrs.; 36 hrs.; 48 hrs.; 72 hrs. Stages
12. Demonstration of rat so as to expose its reproductive system.
13. An “**Animal Album**” containing photographs, cut outs, with appropriate write up about the different taxa. Different taxa/ topics may be given to different sets of students for this purpose.
14. **Short excursion/ study Tour is compulsory.**
15. **Submission:**
 - i) Practical record book duly signed by the teacher in charge/Head of the Department.
 - ii) Five permanent stained micro preparations.
 - iii) Animal Album *or* Articulated complete skeleton of any locally available animal
 - iv) Excursion report.

Outcomes:

1. Ability to understand the anatomical organization of organs and systems in representative species.
2. Ability to identify and describe structure and functions of different body parts of invertebrates and vertebrates.
3. Students would be able to prepare temporary and permanent mountings of biological material.
4. Students would be able to relate different bones and be able to articulate them to form an skeleton.
5. Students would make observations of organisms in their natural environment and document them.

(Demonstration of animal Dissections through Models, Charts or Computer Aided Techniques as per U.G.C Guidelines.)

REFERENCE BOOKS BASED ON PAPER: CCZ-I& II (SECTION A (P-I & P-III) & SECTION B (P-II & P-IV)), PAPER: CCZZP-I (P-V)

1. Hyman L.H. 'The Invertebrates. Vol I-Protozoa through Ctenophora', McGraw Hill Co, New York.
2. Hyman, L.H. 'The Invertebrates Vol-II', McGraw Hill Co., New York.
3. Hyman, L.H. 'The Invertebrates. Vol-VIII', McGraw Hill Co., New York and London.
4. Barnes, R.D. 'Invertebrate Zoology, 3rd edition', W.B. Saunders Co., Philadelphia.
5. Barrington, E.J.W. 'Invertebrate Structure and Function', Thomas Nelson and Sons Ltd., London.
6. Sedgwick, A.A. 'Students Text Book of Zoology', Vol. I, II and III. Central Book Depot, Allahabad.
7. Parker, T.J., Haswell, W.A. 'Text Book of Zoology', Macmillan Co., London.
8. R.L. Kotpal, Modern text Book of Zoology vertebrates, Rastogi publications Meerut 10th revised edition.
9. E.L.Jordan and P.S.Verma, Chordate Zoology. S.Chand Publication
10. Boume, G.H., The Structure and functions of nervous tissue academic Press, New York.
11. Carter, G.S., Structure and habit in vertebrate evolution, Sedgwick and Jackson, London.
12. Eccles, J.C., The understanding of the brain, McGraw Hill CO., New York and London.
13. Kent, C.G., Comparative anatomy of vertebrates.
14. Malcom Jollie, Chordata morphology, East-West press Ltd., New Delhi.
15. Milton Hilderbrand, Analysis of vertebrate structure-IV, Ed. Johan Wiley and Sons Inc., New York.
16. Smith, H.S., Evolution of chordata structure, Hold Rinehart and Winstoin Inc, New York.
17. Sedgwick, A.A., Students Text Book of Zoology, Vol.II
18. Torrey, T.W., Morphogenesis of earthates, John Wiley & Sons Inc., New York.
19. Walters, H.E. and Sayles, L.D., Ecology of vertebrates, Machillan and Co., New York.
20. Eolstenhoint, E.W. and Knight J. (Ed), Taste and smell in vertebrates, J & A, Churchill, London.
21. Romer, A.S., Vertebrate Body, IInd Edition, W.B. Saunders CO., Philadelphia.
22. Young, J.Z., Life of mammals, Oxford University press, London.
23. Colbert, E.H., Evolution of the vertebrates, Johan Wiley and Sons Inc., New York.
24. Balinsky, B.I. 'Introduction to Embryology', Saunders, Philadelphia
25. Beril, N.J. and Karp, G 'Developmental Biology' Tata McGraw Hill, New Delhi
26. Davidson, E.H. 'Gene activity during early development' Academic press, New York
27. Gilibert, S.F. 'Developmental Biology', Sinaver Associated IAC; Massachusetts
28. Muthukaruppam 'Animal Development' A laboratory Guide 1979 MKV Madurai.
29. Patten Foundation of Embryology
30. Suresh. C. Goel 'Principles of Animal Developmental Biology' Himalaya Publishing House,
31. Vasudeo Rao 'Developmental Biology – A Modern Synthesis' Oxford & IBH Pub. Co. Pvt Ltd.
32. Verma & Agarwal 'Chordate Embryology'.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Choice Based Credit System (CBCS) Course Structure
Faculty of Science & Technology
B. Sc. First Year Syllabus w.e.f. June, 2019
PRACTICAL QUESTION PAPER

Zoology

Semester –I &II

Section –A&B

Paper: CCZP-I

Title of Paper: Practical Paper V: Biodiversity of Invertebrates and Chordates & Comparative Anatomy and Developmental Biology of Vertebrates (Based on P-I,II,III&IV)

Centre :

Date:

Batch No.:

Session:

Marks:80

Time:04 Hrs.

Q.1) Spotting: Identify, classify and describe as per instructions.(1-10 Spots)
(Five Invertebrates and Five Vertebrates) 30

OR

- a) Demonstrate **Cockroach** so as to explain its Digestive System *or* Nervous System and leave a labeled diagram.
b) Demonstrate **Scoliodon** so as to explain its Digestive System *or* Heart & Ventral Aorta *or* Afferent arteries *or* Brain and leave a labeled diagram.

Q.2) Prepare Permanent Stained Micro Preparation of material provided (Identify, draw labeled diagram and comment). 08
(Mounting of Mouth parts/Trachea/ Salivary glands of Cockroach/
Nereis Parapodia/ Scales of locally available fishes)

OR

To Identify poisonous and non-poisonous snakes by using Key.

Q.3) Spotting: Identify and describe as per instructions.(1-10 Spots) 30
(3- Bones (Fowl); 3 Bones (Rabbit/Rat); 2- Frog Embryological Slide; 2-Chick Embryological slide)

Q.4) Demonstrate rat so as to expose its reproductive system and leave a well labeled diagram. 08

Q.5) Viva-Voce 04

Note: 1. Practical Internal Evaluation (Continuous Assessment CA) = 20 Marks

Submission of Record book & Excursion Report=05 Marks;

Animal Album *or* Articulated complete skeleton & permanent slides =05 Marks;

Internal Test on Practical=10 Marks

2. Demonstration of animal Dissections through Models, Charts or Computer Aided Techniques as per U.G.C Guidelines.

Name & Signature
Examiner – 1

Name & Signature
Examiner – 2

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based Credit System (CBCS) Course Structure

Faculty of Science & Technology

B. Sc. First Year Syllabus w.e.f. June, 2019

PRACTICAL PAPER

CONTINUOUS ASSESSMENT (CA)

Zoology

Semester –I & II

Paper: CCZP-I

Sections –A & B

Title of Paper: Practical Paper V: Biodiversity of Invertebrates and Chordates & Comparative Anatomy and Developmental Biology of Vertebrates (Based on P-I,II,III&IV)

Centre :

Date:

Marks:20

SEAT NUMBER:

Sr. No.	Continuous Assessment (CA)	Maximum Marks	Marks Obtained
1.	Submission of Record book & Excursion Report	05	
2.	Submission of Animal Album <i>or</i> Articulated complete skeleton & permanent slides	05	
3.	Internal Test on Practicals	10	
	Total Marks	20	