GONDWANA UNIVERSITY, GADCHIROLI

BOARD OF STUDIES IN ZOOLOGY

SUBMISSION OF

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR UNDER GRADUATE (B. Sc.) PROGRAMME

FROM SESSION 2017 - 18

Discipline Core Courses: Zoology

1. Animal Diversity
2. Cell Biology, Genetics and Evolutionary Biology
3. Comparative Anatomy and Developmental Biology of Vertebrates
4. Physiology and Biochemistry

Discipline Specific Electives (DSE): Zoology (Any two)

1. Applied Zoology
2. Animal Biotechnology
3. Aquatic Biology
4. Immunology
5. Reproductive Biology
6. Insect,Vector and Diseases

Skill Enhancement Courses (SEC): Zoology

1. Apiculture
2. Aquarium Fish Keeping
3. Aquatic Biology
4. Medical Diagnostics
5. Public Health and Hygiene
5. Sericulture

SCHEME AND SYLLABUS UNDER

CHOICE BASED CREDIT SYSTEM

B.Sc. WITH ZOOLOGY

Sem	Core Course (12)	Ability Enhancement Compulsory Courses AEC(2)	Skill Enhancement (Foundation) Courses SEC(4)	Discipline Specific Elective
I	CC - Chemistry P -I CC - Chemistry P -II CC - Botany P -I CC - Botany P -II CC - Zoology P -I CC - Zoology P -II	English (1) Marathi (1)		
II	CC - Chemistry P -III CC - Chemistry P -IV CC - Botany P -III CC - Botany P -IV CC - Zoology P -III CC - Zoology P -IV	English (1) Marathi (1)		
III	CC - Chemistry P -V CC - Chemistry P -VI CC - Botany P -V CC - Botany P -VI CC - Zoology P -V CC -Zoology P -VI		Environmental Studies	
IV	CC - Chemistry P -VII CC - Chemistry P -VIII CC - Botany P -VII CC - Botany P -VIII CC - Zoology P -VII CC - Zoology P -VIII		Environmental Studies	

V			(Any one) 1.Apiculture 2. Sericulture 3.Vermiculture andLac Culture 4.Aquarium fish Culture	**DSE-Chem I** **DSE - Bot I** **DSE - Zoo I** (Any One) 1.Parasitology 2.Applied Zoology 3. Insect Vectors and disease 4 Aquatic Biology
VI			1.Medical diagnosis 2.Public Health & Hygiene 3.Research Methodology and Instrumentation	**DSE- Chem II** **DSE - Bot II** **DSE - Zoo II** (Any One) 1. Immunology 2.Animal Biotechnology 3.Micro-technique, Bioinformatics and Biostatistics

CBCS Syllabus in Zoology

Gondwana University, Gadchiroli

Sem - I

Paper: I - Nonchordate - Protozoa to Annelida (Core Paper - I)

Paper : II - Cell biology(Core Paper - II)

Sem - II

Paper : I - Nonchordate - Arthopoda to Hemichordate(Core Paper - III)

Paper : II- Genetics & Evolution (Core Paper - IV)

Sem- III		**SEC**
Paper : I	Chordata (Core Paper – V))	Environmental Studies
Paper : II	Embryology (Core Paper - VI)	

Sem- IV		**SEC**
Paper : I	Physiology (Core Paper - VII)	Environmental Studies
Paper : II	Biochemistry(Core Paper -VIII)	

Sem -V Skill Paper(SEC)	**DSE Paper**
1. Apiculture	1. Parasitology
2. Sericulture	2.Applied Zoology
3.Vermiculture and Lac Culture	3. Insect Vectors and disease
4. Aquarium fish Culture	4. Aquatic Biology

Sem- VI Skill Paper	**DSE Paper**
1. Medical diagnostics	1.Immunology
2. Public Health and Hygiene	2. Animal Biotechnology.
3. Research Methodology and	3.Microtechnique, Bioinformatics Biostatistics
4. Instrumentation	4. Reproductive Biology

GONDWANA UNIVERSITY, GADCHIROLI

C.B.C.S. SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc,), SEMESTER-I

SUBJECT- ZOOLOGY, THEORY (CREDITS 2)

CORE PAPER I

USZOT01

Paper I - ANIMAL DIVERSITY OF NON-CHORDATE (PROTOZOA TO ANNELIDA)

Unit 1: Phylum -Protozoa (12 Periods)

General characters and classification up to classes; Locomotory Organelles and locomotion inProtozoa.Nutrition and Reproduction in *Paramoecium*.

Phylum-Porifera

General characters and classification up to classes; Structure, Histology of body wall and Canal System in *Sycon*

Unit 2: Phylum-Cnidaria (12 Periods)

General characters and classification up to classes; Structure and life cycle of *Obelia*, Polymorphism in Hydrozoa, Alternation of generation, Locomotion and Nutrition in *Hydra,* Nematocyst, Coral reef.

Unit 3: Phylum-Platyhelminthes (12 Periods)

General characters and classification up to classes; Structure and Life history of *Taeniasolium*

Phylum-Nemathelminthes

General characters and classification up to classes; Structure and Life history of *Ascarislumbricoides*and its parasitic adaptations.

Unit 4: Phylum-Annelida (12 Periods)

General characters and classification up to classes; *Hirudinaria*: External morphology, Digestive, excretory, Nervous system, Reproductive system, Copulation, Fertilization and Cocoon formation

GONDWANA UNIVERSITY, GADCHIROLI

C.B.C.S. SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc,), SEMESTER-I

SUBJECT- ZOOLOGY, THEORY (CREDITS 2)

CORE PAPER II

USZOT02

Paper II - CELL BIOLOGY

Unit 1: **(12 Periods)**

Cell theory- Protoplasmic theory, Organismal theory, Prokaryotic and Eukaryotic cell,

Biological membrane-Chemical composition, Sandwich model and Fluid Mosaic Model, Osmosis, Passive and Active transport (Sodium Potassium ion pump), Exocytosis, Endocytosis (Pinocytosis &Phagosytosis)

Unit 2: **(12 Periods)**

Nucleus- Occurrence, Position and Morphology, Ultrastructure, Composition and functions of Nuclear membrane, Nuclear pore complex.

Nucleolus-Structure and Functions

Chromosome-Structure and types, Nucleosome model

Giant Chromosome- Lampbrush and Polytene Chromosome

Unit 3: **(12 Periods)**

Mitochondria- Ultrastructure, Electron transport mechanism and Oxidative Phosphorylation.

Endoplasmic reticulum-Structure, Type and Function

Golgi Complex-Structure and Function

Unit 4: **(12 Periods)**

Lysosome-Structure,Function and Polymorphism

Ribosome-Structure (Lake's Model),types, Biogenesis of ribosome, Function and Polyribosome

Cell cycle,Mitosis, Meiosis, Significance.

GONDWANA UNIVERSITY, GADCHIROLI

C.B.C.S. SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc,), SEMESTER-I

SUBJECT- ZOOLOGY, PRACTICAL I (CREDITS 2)

USZOP01

I. Classification of Specimen (uptoclass)

Protozoa – *Enamoeba, Euglena, Paramoecium*

Porifera – *Leucosolenia, Euplectella, Spongilla*

Coelenterata - *Aurelia, Tubipora, Adamsia.*

Platyhelminthes - *Planaria, Fasciola, Taenia*.

Aschelminthes- *Ascaris, Ancylostoma, Wuchereria*

Annelida – *Aphrodite, Neries, Pheretima, Hirudinaria*

II. Study of Slides:

Entamoeba, *Plasmodium*, Sponge gemmule, L.S. *Sycon*, *Obelia*medusa, Miracidium, Cercaria larva of*Fasciola*, T.S. *Ascaris*(male and female) , T.S. of Leech through crop.

III. Anatomical Observations

Anatomical observations, demonstration and detailed explanation of the following with the help of ICT tools/ models/ charts/ photographs etc.

a. Leech – Digestive – Excretory and reproductive system

b. Earthworm – Nervous system, Reproductive system

IV. Study of permanent Preparation of the following with the help of already available material (Any three)

*Obelia*colony, sponge gemmules, sponge spicules, *Nereis*parapodia, Jaws of Leech, Nerve ring of earthworm

V. Practicals in cell Biology

1. Study of compound and dissecting microscope

2. Ultramicroscopic structure of Prokaryotic cell, Animal cell, Plant cell. (pictures)

3. Study of osmosis in Eukaryotic cell.(Human RBCs)

4. Demonstration of mitotic cell division in onion root tip by squash method

5. Demonstration of polytene chromosome in dipteran larvae with the help of already available material

6. Demonstration of mitochondria in buccal epithelium by Janus Green- B method.

7. Use of ocular micrometer and measurement of micro objects.

Distribution of Marks -

Total Marks - 30

Practical examination - 30 **Duration - 4 Hours**

I.	Anatomical observations	05
II.	Identification and comment on spot (3 specimen & 2 slides)	10
III.	Practical from Cell Biology	05
IV.	Permanent stained micro-preparation (Comment + Diagram)	04
V.	Viva - Voce	03
VI.	Class record	03

		30

Format for the internal assessment

For Theory

Sr.No	Evaluation type	Marks P-I	Marks P-II
01	One assignment	2.5	2.5
02	One class test	5	5
03	Active participation in routine class activities / seminars etc.	2.5	2.5

GONDWANA UNIVERSITY, GADCHIROLI

C.B.C.S. SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc,), SEMESTER-II

SUBJECT- ZOOLOGY,THEORY (CREDITS 2)

CORE PAPERIII

USZOT03

Paper I - ANIMAL DIVERSITY OF NON-CHORDATE (ARTHROPODA TO HEMICHORDATA)

Unit 1: Phylum-Arthropoda (12 Periods)

General characters and classification up to classes

Periplaneta - External Morphology, Digestive system, Circulatory system, Nervous system, Reproductive system and Sense organs.

Unit 2: Phylum-Mollusca (12 Periods)

General characters and classification up to classes

Pila- External Morphology, Digestive system, Nervous system, Reproductive system, Copulation and Fertilization.

Pearl formation.

Unit 3: Phylum-Echinodermata (12 Periods)

General characters and classification up to classes

Asterias -External Morphology, Endoskeleton, Digestive system, Water vascular system,Bipinnaria and Brachiolaria larva.

Regeneration and Autotomy in Echinoderm.

Unit 4: Phylum Hemichordata (12 Periods)

General characters and classification up to classes

Balanoglossus -External Morphology, Coelom, Digestive system, Nervous system, Sense organs, Reproductive system, Tornaria larva

Affinities of Balanoglossus.

GONDWANA UNIVERSITY, GADCHIROLI

C.B.C.S. SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-II

SUBJECT- ZOOLOGY,THEORY (CREDITS 2)

CORE PAPER IV

USZOT04

PAPER -II - GENETICS AND EVOLUTION

Unit 1: Introduction to Genetics (12 Periods)

Mendelian Genetics - Mendel's work on transmission of traits, Laws of Genetics
Interaction of genes - Incomplete dominance and Codominance, Multiple alleles, Lethal alleles, Epistasis, Sex linked inheritance,extra-chromosomal inheritance (Kappa particles)

Unit 2: Linkage, Crossing Over, Syndrome and Mutation (12 Periods)

Linkage and crossing over
Down's Syndrome, Klinefelter'sSyndrome, Turner's Syndrome
Chromosomal Mutations - Deletion, Duplication,Inversion,Insertion, Translocation, Aneuploidy and Polyploidy
Gene mutations- Induced and Spontaneous mutations,

Unit 3: History of Life (12 Periods)

Major Events in History of Life - Urey-Miller Experiment, Oparin theory
Introduction to Evolutionary Theories - Lamarckism, Darwinism, Neo-Darwinism
Direct Evidences of Evolution - Types of fossils, Incompleteness of fossil record, Dating of fossils, Evolution of horse

Unit 4: Processes of Evolutionary Change (12 Periods)

Isolating Mechanisms; Natural selection (Example: Industrial melanism)
Types of natural selection (Directional, Stabilizing, Disruptive), Artificial selection
Species Concept - Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric and peripatric)
Macro-evolution - Macro-evolutionary Principles (example: Darwin's Finches)
Extinction - Mass extinction -Causes, and Role ofextinction in evolution

GONDWANA UNIVERSITY, GADCHIROLI

C.B.C.S. SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-II

SUBJECT- ZOOLOGY,PRACTICAL (CREDITS 2)

CORE COURSE II

USZOP02

I. Observation, classification (uptoclass) and sketching of the following animals (specimen/model)

Phylum Arthropoda – *Palaemon, Limulus, Scolopendra, Julus,* Moth

Phylum Mollusca – *Chiton, Pila, Dentalium, Unio, Octopus*

Phylum Echinodermata – *Antedon, Holothuria, Echinus, Asterias, Ophiothrix*

Phylum Hemichordata – *Balanoglossus*

II. Study of slides

Nauplius, Zoea, Megalopa,Glochidium, T.S. of arm of starfish, Bipinniria, Auricularia, Tornaria, T.S. of *Balanoglossus* through proboscis, collar and gonad

III. Anatomical Observations

Anatomical observations, demonstration and detailed explanation of the following with the help of ICT tools/ models/ charts/ photographs etc.

a) Digestive and Nervous system of Cockroach.

b) Digestive and Nervous system of Pila.

IV. Mounting - Study of permanent Preparation of the following with the help of already available material (Any five)

Mouth parts of Cockroach, Mosquito, Honey bee, Salivary gland and trachea of Cockroach, Redula of *Pila,* and Pedicillariae of starfish.

GENETICS & EVOLUTION

1. Identification of wild and mutant type Drosophila.
2. Demonstration of monohybrid by beads.
3. Demonstration of Dihybrid by beads.
4. Study of sickle cell anemia.
5. Study of Thalassemia.

6. Study of ABO and Rh blood groups.
7. Study of Drum stick in the human blood.
8. Study of Barr body in vaginal smear or buccal epithelium.
9. Study of human genetic trait by using Hardy-Weinberg equations- Rolling of tongue, baldness, widow peak, length of index and ring finger, attached and free ear lobe.
10. Study of pictures of human chromosome abnormalities.
11. Study of pictures of Adaptive radiations in Reptilia and Mammals.
12. Study of pictures of Parallel, Convergent and Divergent evolution.
13. Study of picture of Stabilizing, Directional and Disruptional evolution.
14. Preparation of models on genetics.

Distribution of Marks -

Total Marks - 30

Practical examination - 30 **Duration - 4 Hours**

I.	Anatomical observations	05
II.	Identification and comment on spot (3 specimen & 2 slides)	10
III.	Study of any one expt. from 1-9	04
IV.	Study of any one expt. from 10-14	03
V.	Permanent stained micro-preparation (From already available permanent slides - Comment + Diagram)	02
VI.	Viva - Voce	03
VII.	Class record	03

		30

Format for the internal assessment

For Theory

Sr.No	Evaluation type	Marks P-I	Marks P-II
01	One assignment	2.5	2.5
02	One class test	5	5
03	Active participation in routine class activities / seminars etc.	2.5	2.5

Suggested Reading -

Structure and function of Invertebrates

1.HymanL.H.The Invertebrate Vol.I, Protozoa through Ctenophora. McGraw-Hill Co., New York.
2.Barrington E.J.W. Invertebrate structure and function. Thomas Nelson and sons Ltd.,London.
3.Jagerstein G. Evolution of Metazoan life cycle .Academic press, New York and London.
4.Hyman L.H. The invertebrate vol. 2 McGraw-Hill Co., New York.
5.Hyman L.H. The invertebrate vol. 8 McGraw-Hill Co., New York.
6.Barnes R.D. Invertebrate Zoology W.B. Saunders and Co., Philadelphia
7.RussetHunterW.D.D. biology of higher invertebrate The Macmillan Co. Ltd., London.
8.Hyman L.H. The Invertebrates, smaller coelomate groups.Vol.5 McGraw-Hill Co. New York.
9.Read C.P. Animal Parasitism. Prentice Hall.New-Jersey.
10.KudoR.R.. (1966) Protozoology, Charler, C. Thomas Springfield, Illinois.
11.Barradailes L.A. and potts F.A. Invertebrates (1961) The Eastham L.E. S. Saunders, Cambridge University Press, Cambridge.
12.RusselW.D.Hunter, Biology of lower invertebrates McMillan, New York.
13.Marshall A.J. and Williams W.D. (1972) J. B. Zoology of Invertebrates ,ElBs and McMillan, London.
14.Gtryyrt V. and Graham A. AFunctional anatomy of Invertebrates. Academic press, New York.
15.Backlemiccher W.N. Principles of comparative anatomy of Invertebrates Oliver and Boyed Edinberg.
16.HadisiJ.The Evolution of Metazoa.Pergamon Press, Oxford.
17.Dales R.P. Annelids, Hutchinson, London.
18.GreenJ.Biology of Crustacea, Wither by, London.
19.Morton J. E. Mollusca, Hutchinson, London.
20.Nichols D. Echinodermata, Hutchincon, London

Cell Biology -

1. Cell and Molecular Biology by De Robertis-E. D. P., I. S. E. publication.
2. Molecular Biology by Turner P. C. and McLennan , Viva Books Pvt. Ltd.
3. Advanced Molecular Biology by Twyman R. M., Viva Books Pvt. Ltd.
4. Molecular Biology by Freifelder D., narosa publication House.
5. Gene VI by Benjamin Lewis, Oxford press.
6. Gene VIII by Benjamin Lewis, Oxford press.
7. Molecular biology of Gene by Watson J. D. et. al., Benjamin publication.
8. Molecular cell Biology by Darnell J. Scientific American Books USA.

9. Molecular Biology of the Cell by Alberts B., Bray D. Lewis J., garland publishing Inc.
10. Genetics Vol. I and II by Pawar C. B., Himalaya publication.
12. Essentials of Molecular Biology by Freifelder D., narosa publication House.
13. Molecular Cell Biology by Laodish H., Berk A., Zipursky S. L., Matsudaira P., Baltimore D. and Darnell J., W. H. Freeman and Co.
14. The Cell: Molecular Approch by Cooper G. M.
15. Molecular Biology by Upadhay A and Upadhay K. Himalaya publication.

Genetics & Evolution Biology -

1. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). *Principles of Genetics*. VIII Edition.Wiley India.
2. Snustad, D.P., Simmons, M.J. (2009). *Principles of Genetics*. V Edition. John Wiley and Sons Inc.
3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). *Concepts of Genetics*. X Edition. Benjamin Cummings.
4. Russell, P. J. (2009). *Genetics- A Molecular Approach.* III Edition. Benjamin Cummings.
5. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. *Introduction to*
6. *Genetic Analysis*. IX Edition. W. H. Freeman and Co.
7. Ridley, M. (2004). *Evolution*. III Edition. Blackwell Publishing
8. Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007).
9. *Evolution*. Cold Spring, Harbour Laboratory Press.
10. Hall, B. K. and Hallgrimsson, B. (2008). *Evolution.* IV Edition. Jones and Bartlett Publishers
11. Campbell, N. A. and Reece J. B. (2011). *Biology*. IX Edition, Pearson, Benjamin, Cummings.
12. Douglas, J. Futuyma (1997). *Evolutionary Biology*. Sinauer Associates.

GONDWANA UNIVERSITY, GADCHIROLI

PROGRAMME- BACHELOR OF SCIENCE (B.Sc,), SEMESTER-I&II

SUBJECT- ZOOLOGY,

CORE PAPER I/II/III/IV

USZOT01/02/03/04

Question Paper Pattern

Maximum Marks - 50

Time - 3 Hours

All questions carry equal marks

Q.1 (10 Marks) Unit I

OR

a. Unit I (5 Marks)

b. Unit I (5 Marks)

Q.2 (10 Marks) Unit II

OR

a. Unit II (5 Marks)

b. Unit II (5 Marks)

Q.3 (10 Marks) Unit III

OR

a. Unit III (5 Marks)

b. Unit III (5 Marks)

Q.4 (10 Marks) Unit IV

OR

a. Unit IV (5 Marks)

b. Unit IV (5 Marks)

Q.5 (10 Marks - 1Marks each)

Solve any 10 out of 12 (3 Questions from each unit)

GONDWANA UNIVERSITY, GADCHIROLI

FACULTY OF SCIENCE AND TECHNOLOGY

BOARD OF STUDIES IN ZOOLOGY

SUBMISSION OF

CHOICE BASED CREDIT SYSTEM (CBCS)

SYLLABUS OF ZOOLOGY FOR UNDER GRADUATE (B. Sc.)

PROGRAMME OF SEMESTER III AND SEMESTER IV

FROM SESSION 2018 - 19

SCHEME AND SYLLABUS UNDER CHOICE BASED CREDIT SYSTEM (CBCS) FOR B.Sc. ZOOLOGY

Semester	Core Course (12)	Ability Enhancement Compulsory Courses AEC(2)	Skill Enhancement (Foundation) Courses SEC(4)	Discipline Specific Elective (DSE)
I	CC - Chemistry P -I CC - Chemistry P -II CC - Botany P -I CC - Botany P -II CC - Zoology P -I CC - Zoology P -II	English (1) Marathi (1)		
II	CC - Chemistry P -III CC - Chemistry P -IV CC - Botany P -III CC - Botany P -IV CC - Zoology P -III CC - Zoology P -IV	English (1) Marathi (1)		
III	CC - Chemistry P -V CC - Chemistry P -VI CC - Botany P -V CC - Botany P -VI CC - Zoology P -V CC - Zoology P -VI		Environmental Studies	
IV	CC - Chemistry P -VII CC - Chemistry P -VIII CC - Botany P -VII CC - Botany P -VIII CC - Zoology P -VII CC - Zoology P -VIII		Environmental Studies	
	CC - Chemistry P -IX CC - Chemistry P -X CC - Botany P -IX CC - Botany P -X CC - Zoology P- IX CC - Zoology P -X		(Any one) 1.Apiculture 2. Sericulture 3.Vermiculture and Lac Culture 4.Aquarium fish Culture	**DSE-Chem I** **DSE - Bot I** **DSE - Zoo I** (Any One) 1.Parasitology 2.Applied Zoology 3. Insect Vectors and disease 4 Aquatic Biology

VI	CC - Chemistry P -XI CC - Chemistry P -XII CC - Botany P -XI CC - Botany P -XII CC - Zoology P -XI CC - Zoology P -XII		1.Medical diagnosis 2.Public Health & Hygiene 3.Research Methodology and Instrumentation	**DSE- Chem II** **DSE - Bot II** **DSE - Zoo II** (Any One) 1. Immunology 2.Animal Biotechnology 3.Micro-technique, Bioinformatics and Biostatistics

Discipline Core Courses (DCC) : Zoology

1. Animal Diversity
2. Cell Biology, Genetics and Evolutionary Biology
3. Comparative Anatomy and Developmental Biology of Vertebrates
4. Physiology and Biochemistry

Discipline Specific Electives (DSE): Zoology (Any two)

1. Applied Zoology
2. Animal Biotechnology
3. Aquatic Biology
4. Immunology
5. Reproductive Biology
6. Insect, Vector and Diseases

Skill Enhancement Courses (SEC): Zoology

1. Apiculture
2. Aquarium Fish Keeping
3. Aquatic Biology
4. Medical Diagnostics
5. Public Health and Hygiene
6. Sericulture

GONDWANA UNIVERSITY, GADCHIROLI

CBCS SYLLABUS IN ZOOLOGY

SEMESTER - I

PAPER CODE	CORE PAPER	TITLE OF THE PAPER	CREDIT
USCZOT01	I	NONCHORDATE - PROTOZOA TO ANNELIDA	02
USCZOT02	II	CELL BIOLOGY	02
USCZOP01	PRACTICAL	CORE COURSE I & II	02

SEMESTER - II

PAPER CODE	CORE PAPER	TITLE OF THE PAPER	CREDIT
USCZOT03	III	NONCHORDATE - ARTHOPODA TO HEMICHORDATA	02
USCZOT04	IV	GENETICS & EVOLUTION	02
USCZOP02	PRACTICAL	CORE COURSE III & IV	02

SEMESTER- III

PAPER CODE	CORE PAPER	TITLE OF THE PAPER	CREDIT	SEC
USCZOT05	V	ANIMAL DIVERSITY (CHORDATES) and COMPARATIVE ANATOMY	02	ENVIRONMENTAL STUDIES
USCZOT06	VI	PHYSIOLOGY & BIOCHEMISTRY - I	02	
USCZOP03	PRACTICAL	CORE COURSE V & VI	02	

SEMESTER- IV

PAPER CODE	CORE PAPER	TITLE OF THE PAPER	CREDIT	SEC
USCZOT07	VII	DEVELOPMENTAL BIOLOGY	02	ENVIRONMENTAL STUDIES
USCZOT08	VIII	PHYSIOLOGY & BIOCHEMISTRY - II	02	
USCZOP04	PRACTICAL	CORE COURSE VII & VIII	02	

SEMESTER -V

SEC (ANY ONE)	DSE (ANY ONE)
1. APICULTURE	1. PARASITOLOGY
2. SERICULTURE	2. APPLIED ZOOLOGY
3. VERMICULTURE & LAC CULTURE	3. INSECT VECTOR & DISEASE
4. AQUARIUM FISH CULTURE	4. AQUATIC BIOLOGY

SEMESTER- VI

SEC (ANY ONE)	DSE (ANY ONE)
1. MEDICAL DIGNOSTICS	1. IMMUNOLOGY
2. PUBLIC HEALTH AND HYGIENE	2. ANIMAL BIOTECHNOLOGY
3. RESEARCH METHODOLOGY	3. MICROTECHNIQUE, BIOINFORMATICS & BIOSTATISTICS
4. INSTRUMENTATION	4. REPRODUCTIVE BIOLOGY

Scheme of Marks of Theory and Practical

Semester	Paper	Title	Marks		Total
			Theory	Internal Assessment	
III	I	Animal Diversity(Chordate) and Comparative Anatomy	50	10	150
	II	Physiology and Biochemistry - I	50	10	
	Practical	Animal Diversity, Comparative Anatomy, Physiology and Biochemistry-I	30	-	
IV	I	Developmental Biology	50	10	150
	II	Physiology and Biochemistry - II	50	10	
	Practical	Developmental Biology, Physiology and Biochemistry - II	30	-	

GONDWANA UNIVERSITY, GADCHIROLI

CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-III

SUBJECT- ZOOLOGY, THEORY (CREDITS 2)

CORE PAPER V

USCZOT05

Paper I - ANIMAL DIVERSITY (CHORDATES) AND COMPARATIVE ANATOMY

Unit- I **(12 periods)**

1. Urochordata- General characters, Ascidian tadpole and retrogressive metamorphosis
2. Cephoalochordata**-** General characters, Amphioxus - External morphology and digestive system.
3. Cyclostomata**-** General characters, external morphology of-Petromyzon and Myxine.
4. Pisces**-** General characters and Classification up to order; Osmoregulation in Fishes, Accessory respiratory organs.

Unit-II **(12 periods)**

1. Amphibia– General characters and Classification up to order, Parental care and Neoteny.
2. Reptilia**-** General characters and Classification based on temporal vacuities. Snake venom, Poison apparatus & biting mechanism, Poisonous and non poisonous snake

Unit-III **(12 periods)**

1. Aves **–** General characters and classification up to order. Flight adaptations (Morphological, Anatomical and Physiological), Birds migration and its significance
2. Mammals **–** General characters and classification up to order. Prototheria, Metatheria and Eutheria.

Unit-IV : Comparative anatomy **(12 periods)**

1. Comparative account of derivatives of integuments (Scale and horn).
2. Comparative account of aortic arches and heart.
3. Types of receptors (General cutaneous receptors and chemoreceptor).
4. Comparative account of Urinogenital system.

Suggested Readings : Animal Diversity

1) Invertebrate Zoology- Ruppert and Barnes, R.D. (2006) VIII Edition. Holt Saunders International Edition.

2) The Invertebrates - A New Synthesis Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). III Edition, Blackwell Science

3) The Life of Vertebrates - Young, J. Z. (2004) III Edition. Oxford University Press.

4) Vertebrate life - Pough H. (2007) VIII Edition, Pearson International.

5) Strickberger's Evolution - Hall B.K. and Hallgrimsson B. (2008) IV Edition. Jones and Bartlett Publishers Inc.

6. Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.

7. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The

8. Invertebrates: A New Synthesis, III Edition, Blackwell Science

9. Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.

10. Pough H. Vertebrate life, VIII Edition, Pearson International.

11. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.

Suggested Readings : Comparative anatomy

1) Vertebrates' Comparative Anatomy, Function and Evolution - Kardong, K.V. (2005). IV Edition. McGraw-Hill Higher Education.

2) Comparative Anatomy of the Vertebrates - Kent, G.C. and Carr R.K. (2000).. IX Edition. The McGraw- Hill Companies.

3) Analysis of Vertebrate Structure - Hilderbrand, M and Gaslow G.E., John Wiley and Sons.

4) Biology of Vertebrates - Walter, H.E. and Sayles, L.P; Khosla Publishing House.

5. Kardong, K.V. (2005) Vertebrates' Comparative Anatomy, Function and Evolution. IV Edition. McGraw-Hill Higher Education.

6. Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-Hill Companies.

7. Hilderbrand, M and Gaslow G.E. Analysis of Vertebrate Structure, John Wiley and Sons.

8. Walter, H.E. and Sayles, L.P; Biology of Vertebrates, Khosla Publishing House.

GONDWANA UNIVERSITY, GADCHIROLI

CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-III

SUBJECT- ZOOLOGY, THEORY (CREDITS 2)

CORE PAPER VI

USCZOT06

Paper - II: PHYSIOLOGY AND BIOCHEMISTRY - I

Unit I: Metabolism **(12 periods)**

1. Carbohydrates- Glycolysis, gluconeogenesis, glycogen metabolism,
2. Protein- Transamination , deamination and urea cycle
3. Lipid- Biosynthesis of triglycerides

Unit – II: Enzymes **(12 periods)**

1. General properties of enzymes
2. Classification of enzymes
3. Enzymes –Distribution and chemical nature of enzymes
4. Factors affecting enzyme activity

Unit-III: Nutrition and Digestion **(12 periods)**

1. Structure and functions of digestive glands - (Salivary, Gastric, Intestinal, Liver and Pancreas)
2. Gastro-intestinal hormones
3. Digestion and absorption of proteins, carbohydrates and lipids.
4. Vitamins- Sources, types, deficiency and diseases

Unit-IV: **(12 periods)**

1. Mechanism of Respiration
2. Transport of O_2 and CO_2
3. Respiratory pigments - Types, distribution and properties
4. Respiratory disorders and effects of smoking

Suggested Readings : Animal Physiology

1. Human Physiology – Chatterjee, A. G. Vol. I & II
2. Medical Physiology – Gyton
3. T. B. of Animal Physiology – Berry
4. Introduction to Animal Physiology and Related Biotechnology – H. R. Singh
5. Animal Physiology – Arora, M.P.
6. General and Comparative Physiology – Hoar, W. S.
7. T. B. of Animal Physiology – Hurkat and Mathur
8. Animal Physiology – Naghbhushanam and Kodarkar
9. T. B. of Animal Physiology & General Biology – Thakur &Puranik
10. General Endrocrinology – Turner Bagnaro
11. Reproduction and Human welfare – Greep and Koblinsky
12. Animal Physiology – Shastri&Goel
13. Animal Physiology – Verma &Tyagi
14. Human Physiology - Vander and Sheman
15. Applied Physiology – Keels, Neils and Joels
16. Animal Physiology – Rastogi, S. C.
17. Animal Physiology – VeerbalaRastogi
18. Comparative Vertebrate Endocrinology – Beutley
19. S.Y. B. Sc. Zoology Sem-V- Dhamani, Bakare, Harney & Bhute

Suggested Readings : Biochemistry

1. Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H Freeman and Co.
2. Nelson, D. L., Cox, M. M. and Lehninger, A.L. (2009). Principles of Biochemistry. IV Edition. W.H. Freeman and Co.
3. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009). Harper's Illustrated Biochemistry. XXVIII Edition. Lange Medical Books/Mc Graw3Hill.
4. Fundamental of Biochemistry- Jain and Jain
5. Principals of Biochemistry -White, Handler and Smith
6. Biochemistry - Stryer

GONDWANA UNIVERSITY, GADCHIROLI

CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-III

SUBJECT- ZOOLOGY, PRACTICAL (CREDITS 2)

CORE COURSE-V & VI

USZOP03

PRACTICAL

B.Sc. II (Zoology), Semester-III

(Animal Diversity, Comparative Anatomy & Physiology and Biochemistry-I)

Section A - Animal Diversity, Comparative Anatomy

1. Identification and Classification of museum specimens

a. Urochordates : Herdmania, Salpa, Doliolum
b. Cephalochordate : Amphioxus
c. Cyclostomata: Myxine, Petromyzon
d. Pisces : Pristis, Torpedo, Notopterus, Exocoetus, Clarius, Ophiocephalus, Catla, Labeo, Mrigal
e. Amphibia : Bufo, Salamandra, Ichthyophis
f. Reptilia : Chameleon, Varanus, Phrynosoma, Draco, Tortoise, Naja , Bungarus, Hydrophis.
g. Aves : Owl, Woodpecker, Kingfisher, Kite, Duck, Parrot
h. Mammals: Squirrel, Mongoose, Bat, Loris, Rabbit

2. Anatomical Observations

Anatomical observations, demonstration and detailed explanation of the following with the help of ICT tools/ models/ charts/ photographs etc. (Any locally available fish)

a) Digestive system
b) Reproductive system
c) Brain and Cranial Nerves

3. Study of skeleton of Rabbit or Fowl

(Loose bones of skull not to be studied)

5. Study of permanent slides-

Fish scales - Placoid, Cycloid and Ctenoid, V.S. Skin of Frog and Mammal.

6. **Permanent stained micro preparation** of the following

Fish scales – Placoid, Cycloid and Ctenoid, Hyaline cartilage and Striated muscle

Section B – Physiology and Biochemistry

7. Physiology and Biochemistry

1. Study of histological slides of Mammal– Duodenum, Liver, Lung, Bone and Cartilage.
2. Demonstration of carbohydrates, proteins and lipids by histochemical methods (Source of tissue: Animal wastes from local recognized slaughter houses/ poultry farms/ fish markets etc.)
3. Estimation of total protein in given solution by Lowry's method
4. Study of activity of salivary amylase under optimal condition.
5. Qualitative test to identify functional group carbohydrate in given solution (glucose, fructose, sucrose, lactose).

8. Submission of slides and study tour report

Practical Question Paper and Distribution of Marks

Practical - Distribution of Marks	**Total marks – 30 (Time – 4 hours duration)**
1. Anatomical observation	05
2. Spotting- (4 specimens, 4 slides, 2 bones).	10
3. Physiology/Biochemistry experiment	05
4. Permanent stained micro preparation	03
5. Class record and submission of slides and study tour report	03
6. Viva-voce	04

GONDWANA UNIVERSITY, GADCHIROLI

CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-III

SUBJECT- ZOOLOGY – THEORY INTERNAL ASSESSMENT

Theory Internal Assessment (Paper I and Paper II) – 20 Marks (Assignment, class test, curricular and co-curricular activities, seminar, field work, tour etc.)

Format for the theory internal assessment

Sr.No	Evaluation type	Marks	Marks
		P-I	P-II
01	One assignment	2	2
02	One class test	5	5
03	Active participation in routine class activities / seminars etc.	3	3

GONDWANA UNIVERSITY, GADCHIROLI

CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-III

SUBJECT- ZOOLOGY – THEORY QUESTION PAPER PATTERN

Maximum Marks – 50 **Time – 3 Hours**

Note : 1) All questions are compulsory

2) All questions carry equal marks

3) Draw well labeled diagram wherever necessary

Q1) Unit I – Long question – 10 Marks

Or

a. Short question – 05 Marks

b. Short question – 05 Marks

Q2) Unit II – Long question – 10 Marks

Or

a. Short question – 05 Marks

b. Short question – 05 Marks

Q3) Unit III – Long question – 10 Marks

Or

a. Short question – 05 Marks

b. Short question – 05 Marks

Q4) Unit IV – Long question – 10 Marks

Or

a. Short question – 05 Marks

b. Short question – 05 Marks

Q5) Write short notes on any 10 out of 12(3 questions from each units) – 10 Marks

GONDWANA UNIVERSITY, GADCHIROLI

CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-IV

SUBJECT- ZOOLOGY, THEORY (CREDITS 2)

CORE PAPER VII

USCZOT07

Paper - I : DEVELOPMENTAL BIOLOGY

Unit-I : Early development **(12 periods)**

1. Types of eggs- Classification on the basis of amount and distribution of yolk. Chemical composition of yolk.
2. Fertilization**-**Mechanism and significance.
3. Cleavage- Types of cleavages
4. Blastulation- Definition and types.

Unit-II : Frog and Chick embryology **(12 periods)**

1. Morphogenetic movements in the early development of Frog (Invagination, Epiboly and Emboly).
2. Development of Chick up to the formation of primitive streak.
3. Development of extra embryonic membranes in Chick and their significance.

Unit-III : Mammalian development **(12 periods)**

1. Gametogenesis- (Spermatogenesis and Oogenesis).
2. Structure of a Sperm and Ovum.
3. Implantation- Definition and types.
4. Placentation- Definition, types and functions of placenta.

Unit –IV **(12 periods)**

1. Apoptosis –Mechanism and significance.
2. Stem Cells- Sources, types and their use in human welfare.
3. In Vitro fertilization- Technique, advantages and disadvantages, Test tube Baby.
4. Semen bank, Artificial inseminations and Contraceptives.

Suggested Readings: Developmental Biology

1) Developmental Biology - Gilbert, S. F. (2006) VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.

2) An introduction to Embryology - Balinsky, B.I. (2008) International Thomson Computer Press.

3) Patten's Foundations of Embryology - Carlson, Bruce M (1996) McGraw Hill, Inc.

4) Biology - Campbell, N. A. and Reece J. B. (2011) IX Edition, Pearson, Benjamin, Cummings.

5) Evolutionary Biology - Douglas, J. Futuyma (1997) Sinauer Associates.

6. Gilbert, S. F. (2006). Developmental Biology, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.

7. Balinsky, B.I. (2008). An introduction to Embryology, International Thomson Computer Press.

8. Carlson, Bruce M (1996). Patten's Foundations of Embryology, McGraw Hill, Inc.

GONDWANA UNIVERSITY, GADCHIROLI

CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-IV

SUBJECT- ZOOLOGY, THEORY (CREDITS 2)

CORE PAPER VIII

USCZOT08

Paper - II: PHYSIOLOGY AND BIOCHEMISTRY-II

Unit-I : Excretion **(12 periods)**

1. Structure of uriniferous tubule
2. Mechanism of urine formation
3. Counter – current mechanism
4. Normal and abnormal constituents of urine. Elementary idea of dialysis

Unit-II : Endocrinology and Reproduction **(12 periods)**

1. Structure and functions of pituitary gland
2. Structure and functions of thyroid and adrenal gland
3. Oestrous and menstrual cycle
4. Male and female sex hormones

Unit–III : Nerve and Muscle Physiology **(12 periods)**

1. Types of neurons, E.M. structure of neuron
2. Conduction of nerve impulse
3. Ultra-structure of striated muscle, Sliding filament theory of muscle contraction
4. Properties of muscles (Twitch, Tetanus, Tonus, Summation, All or None Principle, Muscle fatigue)

Unit-IV : Circulation **(12 periods)**

1. Composition and functions of blood
2. Blood clotting – Intrinsic and extrinsic factors, blood groups and Rh factor
3. Cardiac cycle
4. E.C.G. and Blood pressure

Suggested Readings : Animal Physiology

1. Human Physiology – Chatterjee, A. G. Vol. I & II
2. Medical Physiology – Gyton
3. T. B. of Animal Physiology – Berry
4. Introduction to Animal Physiology and Related Biotechnology – H. R. Singh
5. Animal Physiology – Arora, M.P.
6. General and Comparative Physiology – Hoar, W. S.
7. T. B. of Animal Physiology – Hurkat and Mathur
8. Animal Physiology – Naghbhushanam and Kodarkar
9. T. B. of Animal Physiology & General Biology – Thakur & Puranik
10. General Endrocrinology – Turner Bagnaro
11. Reproduction and Human welfare – Greep and Koblinsky
12. Animal Physiology – Shastri & Goel
13. Animal Physiology – Verma & Tyagi
14. Human Physiology - Vander and Sheman
15. Applied Physiology – Keels, Neils and Joels
16. Animal Physiology – Rastogi, S. C.
17. Animal Physiology – Veerbala Rastogi
18. Comparative Vertebrate Endocrinology – Beutley
19. S.Y. B. Sc. Zoology Sem-V- Dhamani, Bakare, Harney & Bhute

Suggested Readings : Biochemistry

1. Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H Freeman and Co.
2. Nelson, D. L., Cox, M. M. and Lehninger, A.L. (2009). Principles of Biochemistry. IV Edition. W.H. Freeman and Co.
3. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009). Harper's Illustrated Biochemistry. XXVIII Edition. Lange Medical Books/Mc Graw3Hill.
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5. Principals of Biochemistry -White, Handler and Smith
6. Biochemistry - Stryer

GONDWANA UNIVERSITY, GADCHIROLI

CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER - IV

SUBJECT- ZOOLOGY, PRACTICAL (CREDITS 2)

CORE COURSE-VII & VIII

USZOP04

PRACTICAL

B.Sc. II (Zoology), Semester-IV

DEVELOPMENTAL BIOLOGY & PHYSIOLOGY AND BIOCHEMISTRY-II

Section A: Developmental Biology

Study of the following slides-

1. Frog embryology: T.S. of Tadpole through internal and external gills, V.S. of Blastula, Gastrula and Neurula,
2. Study of permanent slide of Chick embryology : Whole mount of 18 hrs, 24 hrs, 30 hrs, 36 hrs and 72 hrs.

Section B: Physiology experiment

1. Detection of urea, albumin, sugar and creatin in urine
2. Sperm count of any domestic animal (Source of semen: Government artificial insemination centre).
3. Study of histological slides of Mammal– T.S. of Kidney, Pituitary, Thyroid and Adrenal glands, Testis, Ovary, Uterus, Placenta, Medulated and Non medulated nerve fibres, Smooth and Striated muscle, Spinal cord.

Section C: Biochemistry experiment

1. Preparation of haemin and haemochromogen crystal
2. Quantitative estimation of amino acids using ninhydrin reaction
3. Estimation of glycin by Sorenson formal titration

Section D : Permanent stained micro preparation

1. Examination of gametes of Frog – Sperm and Ova through permanent slide or microphotograph

Section E : Submission of slides and study tour report

Practical Question Paper and Distribution of Marks

Practical - Distribution of Marks **Total marks – 30 (Time – 4 hours duration)**

1. Physiology experiment..... 05
2. Identification and comments on spots …… 10
   (Mammalian histology-3, Frog embryology-1 and Chick embryology-1 spots)
3. Biochemistry experiment ……. 05
4. Submission of slides or microphotograph and study tour report..... 02
5. Submission of certified practical record..... 03
6. Viva- voce..... 05

GONDWANA UNIVERSITY, GADCHIROLI

CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-IV

SUBJECT- ZOOLOGY – THEORY INTERNAL ASSESSMENT

Theory Internal Assessment (Paper I and Paper II) – 20 Marks(Assignment, class test, curricular and co-curricular activities, seminar, field work, tour etc.)

Format for the theory internal assessment

Sr.No	Evaluation type	Marks P-I	Marks P-II
01	One assignment	2	2
02	One class test	5	5
03	Active participation in routine class activities / seminars etc.	3	3

GONDWANA UNIVERSITY, GADCHIROLI

CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER- IV

SUBJECT- ZOOLOGY – THEORY QUESTION PAPER PATTERN

Maximum Marks – 50 **Time – 3 Hours**

Note : 1) All questions are compulsory

2) All questions carry equal marks

3) Draw well labeled diagram wherever necessary

Q1) Unit I – Long question – 10 Marks

Or

a. Short question – 05 Marks

b. Short question – 05 Marks

Q2) Unit II – Long question – 10 Marks

Or

a. Short question – 05 Marks

b. Short question – 05 Marks

Q3) Unit III – Long question – 10 Marks

Or

a. Short question – 05 Marks

b. Short question – 05 Marks

Q4) Unit IV – Long question – 10 Marks

Or

a. Short question – 05 Marks

b. Short question – 05 Marks

Q5) Write short notes on any 10 out of 12(3 questions from each units) – 10 Marks

GONDWANA UNIVERSITY, GADCHIROLI

FACULTY OF SCIENCE AND TECHNOLOGY

BOARD OF STUDIES IN ZOOLOGY

SUBMISSION OF

CHOICE BASED CREDIT SYSTEM (CBCS)

SYLLABUS OF ZOOLOGY FOR UNDER GRADUATE (B.Sc.)

PROGRAMME OF SEMESTER V AND SEMESTER VI

FROM SESSION 2019 - 2020

SCHEME AND SYLLABUS UNDERCHOICE BASED CREDIT SYSTEM (CBCS)FOR B.Sc. ZOOLOGY

Semester	Core Course (12)	Ability Enhancement Compulsory Courses AEC(2)	Skill Enhancement (Foundation) Courses SEC(4)	Discipline Specific Elective (DSE)
I	CC - Chemistry P -I CC - Chemistry P -II CC - Botany P -I CC - Botany P -II CC - Zoology P -I CC - Zoology P -II	English (1) Marathi (1)		
II	CC - Chemistry P -III CC - Chemistry P -IV CC - Botany P -III CC - Botany P -IV CC - Zoology P -III CC - Zoology P -IV	English (1) Marathi (1)		
III	CC - Chemistry P -V CC - Chemistry P -VI CC - Botany P -V CC - Botany P -VI CC - Zoology P -V CC -Zoology P -VI		Environmental Studies	
IV	CC - Chemistry P -VII CC - Chemistry P -VIII CC - Botany P -VII CC - Botany P -VIII CC - Zoology P -VII CC - Zoology P -VIII		Democracy, Elections and Good Governance	
V	CC - Chemistry P -IX CC - Chemistry P -X CC - Botany P -IX CC - Botany P -X CC - Zoology P- IX CC - Zoology P -X		(Any one) 1.Apiculture 2. Sericulture	DSE-Chem I DSE - Bot I DSE - Zoo I (Any Two) 1.Parasitology 2.Applied Zoology 3. Insect Vectors and disease 4 Aquatic Biology
VI	CC - Chemistry P -XI CC - Chemistry P -XII		(Any one) 1.Medical	DSE- Chem II DSE - Bot II

	CC - Botany P -XI CC - Botany P -XII CC - Zoology P -XI CC - Zoology P -XII		Diagnostics 2.Public Health & Hygiene	DSE - Zoo II (Any Two) 1. Immunology 2.Animal Biotechnology 3.Microtechnique, Bioinformatics and Biostatistics 4. Reproductive Biology

Discipline Core Courses (DCC) : Zoology

1. Animal Diversity
2. Cell Biology, Genetics and Evolutionary Biology
3. Comparative Anatomy and Developmental Biology ofVertebrates
4. Physiology and Biochemistry

Discipline Specific Electives (DSE): Zoology (Any two)

1. Applied Zoology
2. Animal Biotechnology
3. Aquatic Biology
4. Immunology
5. Reproductive Biology
6. Insect, Vector and Diseases

Skill Enhancement Courses (SEC): Zoology

1. Apiculture
2. Aquarium Fish Keeping
3. Aquatic Biology
4. Medical Diagnostics
5. Public Health and Hygiene
6. Sericulture

GONDWANA UNIVERSITY, GADCHIROLI

CBCS SYLLABUS IN ZOOLOGY

SEMESTER - I

PAPER CODE	CORE PAPER	TITLE OF THE PAPER	CREDIT
USCZOT01	I	NONCHORDATE - PROTOZOA TO ANNELIDA	02
USCZOT02	II	CELL BIOLOGY	02
USCZOP01	PRACTICAL	CORE COURSE I & II	02

SEMESTER - II

PAPER CODE	CORE PAPER	TITLE OF THE PAPER	CREDIT
USCZOT03	III	NONCHORDATE - ARTHOPODA TO HEMICHORDATA	02
USCZOT04	IV	GENETICS & EVOLUTION	02
USCZOP02	PRACTICAL	CORE COURSE III & IV	02

SEMESTER- III

PAPER CODE	CORE PAPER	TITLE OF THE PAPER	CREDIT	SEC
USCZOT05	V	ANIMAL DIVERSITY (CHORDATES) and COMPARATIVE ANATOMY	02	ENVIRONMENTAL STUDIES
USCZOT06	VI	PHYSIOLOGY& BIOCHEMISTRY - I	02	
USCZOP03	PRACTICAL	CORE COURSE V & VI	02	

SEMESTER- IV

PAPER CODE	CORE PAPER	TITLE OF THE PAPER	CREDIT	SEC
USCZOT07	VII	DEVELOPMENTAL BIOLOGY	02	DEMOCRACY, ELECTIONS AND GOOD GOVERNANCE
USCZOT08	VIII	PHYSIOLOGY& BIOCHEMISTRY - II	02	
USCZOP04	PRACTICAL	CORE COURSE VII & VIII	02	

SEMESTER- V

PAPER CODE	CORE PAPER	DSE(ANY TWO) TITLE OF PAPER	CREDIT	SEC(ANY ONE) (COLLEGE LEVEL)
USCZOT09	IX	1) PARASITOLOGY	02	1) APICULTURE
USCZOT10	X	2) APPLIED ZOOLOGY	02	2) SERICULTURE
USCZOT11	XI	3) INSECT VECTOR AND DISEASES	02	-
USCZOT12	XII	4) AQUATIC BIOLOGY	02	-
USCZOP05 USCZOP06 USCZOP07 USCZOP08	PRACTICAL	CORE COURSE - ANY TWO FORM CORE PAPER IX, X, XI, XII	02	02

DSE- Scheme of Marks of Theory and Practical of semester V

SEMESTER	PAPER	TITLE DSE(ANY TWO)	MARKS		TOTAL
			THEORY	INTERNAL ASSESSMENT (ANY TWO)	
V	I	1) PARASITOLOGY	50	10	120
	II	2) APPLIED ZOOLOGY	50	10	
	III	3) INSECT VECTOR AND DISEASES	50	10	
	IV	4) AQUATIC BIOLOGY	50	10	
	PRACTICAL	ANY TWO FROM DSE	30	-	30
					150

SEC (ANY ONE) (COLLEGE LEVEL)
Scheme of Marks of Theory and Practical of semester V

SEMESTER	PAPER	TITLE SEC(ANY ONE)	MARKS		TOTAL
			THEORY	PRACTICAL	
V	I	1) APICULTURE	15	35	50
	II	2) SERICULTURE	15	35	50

SEMESTER- VI

PAPER CODE	**CORE PAPER**	**DSE(ANY TWO) TITLE OF PAPER**	**CREDIT**	**SEC(ANY ONE) (COLLEGE LEVEL)**
USCZOT13	XIII	1) IMMUNOLOGY	02	1) MEDICAL DIAGNOSTIC
USCZOT14	XIV	2) ANIMAL BIOTECNOLOGY	02	2) PUBLIC HEALTH AND HYGIENE
USCZOT15	XV	3) MICROTECHNIQUE, BIOINFORMATICS AND BIOSTASTISTICS	02	-
USCZOT16	XVI	4) REPRODUCTIVE BIOLOGY	02	-
USCZOP09 USCZOP10 USCZOP11 USCZOP12	PRACTICAL	CORE COURSE - ANY TWO FORM CORE PAPER XIII, XIV, XV AND XVI	02	02

Scheme of Marks of Theory and Practical of semester VI

SEMESTER	PAPER	TITLE DSE(ANY TWO)	MARKS		TOTAL
			THEORY	INTERNAL ASSESSMENT (ANY TWO)	
VI	I	1) IMMUNOLOGY	50	10	120
	II	2) ANIMAL BIOTECNOLOGY	50	10	
	III	3) MICROTECHNIQUE, BIOINFORMATICS AND BIOSTASTISTICS	50	10	
	IV	4) REPRODUCTIVE BIOLOGY	50	10	
	PRACTICAL	ANY TWO FROM DSE	30	-	30
					150

SEC (ANY ONE) (COLLEGE LEVEL)
Scheme of Marks of Theory and Practical of semester VI

SEMESTER	**PAPER**	**TITLE SEC(ANY ONE)**	**MARKS**		**TOTAL**
			THEORY	**PRACTICAL**	
VI	I	1) MEDICAL DIAGNOSTICS	15	35	50
	II	2) PUBLIC HEALTH AND HYGIENE	15	35	50

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE (B.Sc.)
SEMESTER – V AND SEMESTER VI
SUBJECT – ZOOLOGY THEORY INTERNAL ASSESSMENT
FOR DSE PAPER ONLY
PAPER – I AND II (SELECTED)

Theory Internal Assessment – 20 Marks

Format for the theory internal assessment

Sr. NO.	Evaluation type	Marks for selected paper I and Paper II	Marks for selected paper I and Paper II
01	One assignment	02	02
02	One class test	05	05
03	Active participation in routine class activities/ seminars etc.	03	03
	Total	10	10

GONDWANA UNIVERSITY, GADCHIROLI

CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS

PROGRAMME - BACHELOR OF SCIENCE (B.Sc.)

SEMESTER-V AND SEMESTER VI

SUBJECT- ZOOLOGY – THEORY QUESTION PAPER PATTERN

Maximum Marks – 50 **Time – 3 Hours**

Note : 1) All questions are compulsory

2) All questions carry equal marks

3) Draw well labeled diagram wherever necessary

Q1)Unit I – Long question – 10 Marks

Or

a. Short question – 05 Marks

b. Short question – 05 Marks

Q2) Unit II – Long question – 10 Marks

Or

a. Short question – 05 Marks

b. Short question – 05 Marks

Q3) Unit III – Long question – 10 Marks

Or

a. Short question – 05 Marks

b. Short question – 05 Marks

Q4) Unit IV – Long question – 10 Marks

Or

a. Short question – 05 Marks

b. Short question – 05 Marks

Q5) Write short notes on any 10 out of 12(3 questions from each units) – 10 Marks

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE (B.Sc.), SEMESTER – V
SUBJECT – ZOOLOGY THEORY (CREDIT 2)
SKILL ENHANCEMENT COURSE (SEC)
PAPER – I – APICULTURE

MAX. MARKS - 15

UNIT – I

1. History of bee keeping: Definition, Bee keeping in worldwide and India.
2. Traditional and Modern beekeeping, Urban or backyard beekeeping.

UNIT – II

1. Types of honey bees
2. Life cycle – Queen, Drone, Worker.

Unit III

1. Basic requirements of Tools for starting bee keeping
2. Bee keeping equipment - introduction to types of bee boxes

UNIT – IV

1. Economic importance of honey.
2. Processing of honey.

Suggested Readings

1. Prospective in Indian Apiculture - R.C. Mishra
2. Rearing queen bees in India - M.C. Suryanarayanaet. al.
3. Bee Keeping in India - G. K. Ghosh • Technology and value addition of Honey - Dr. D. M. Wakhle and K. D. Kamble.
4. ABC & XYZ of Bee culture - A. I. Root
5. Indian Bee Journal - All India Bee Keeping Association • Asian Bee Journal

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE (B.Sc.), SEMESTER – V
SUBJECT – ZOOLOGY PRACTICAL (CREDIT 2)
SKILL ENHANCEMENT COURSE (SEC)
PRACTICAL

Max. Marks: 35

1. To study the identification of different species of Honey bees
2. To Study different stages in life cycle of Honey bees.
3. To study the different instruments for bee keeping
4. Visit to Apiculture industry/Local Apiculture Unit

Practical Question Paper and Distribution of Marks

Time: 4 Hrs. **Max. Marks: 35**

Practical	**Distribution of Marks**
1. Identification of Honey bees through ICT …….	10
2. Identification of instruments through ICT …….……	10
4. Visit tour report…….……..…	15

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE (B.Sc.), SEMESTER – V
SUBJECT – ZOOLOGY THEORY (CREDIT 2)
SKILL ENHANCEMENT COURSE (SEC)
PAPER – II – SERICULTURE

MAX. MARKS - 15

Unit - I

1. Types of silkworms.
2. Sericulture industry in different states

Unit II

1. Mulberry silkworm structure and life cycle
2. Tasar silkworm structure and life cycle

Unit III

1. Eri silkworm structure and life cycle
2. Muga silkworm structure and life cycle

Unit IV

1. Appliances for silkworm rearing
2. Economic importance of sericulture

Suggested Readings

1. Text Book of Tropical Sericulture. Publ., Japan Overseas Corporation volunteers – 1975.
2. Silkworm Rearing Techniques in the Tropics, Dr. S. Omura, Japan International Cooperation Agency, 1980.
3. Manual on Sericulture; Food and Agriculture Organisation Rome 1976.
4. Handbook of Practical Sericulture : S.R. Ullal and M.N. Narasimhanna CSB, Bangalore 1987.
5. Modern Entomology: D. B. Tembhare, Himalaya Publishing House, Bombay

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE (B.Sc.), SEMESTER – V
SUBJECT – ZOOLOGY PRACTICAL (CREDIT 2)
SKILL ENHANCEMENT COURSE (SEC)
PRACTICAL

Max. Marks: 35

1. To study the different varieties of silkworm
2. To study the different instruments of sericulture industry
3. Visit to Sericulture industry/Local Sericulture unit

Practical Question Paper and Distribution of Marks

Time: 3 Hrs. **Max. Marks: 35**

Practical	**Distribution of Marks**
1. Identification of Silkworm…. …….…….10	
2. Identification of instruments……10	
3. Visit tour report ……..…….……..15	

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM(CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE(B.Sc.), SEMESTER – V
SUBJECT – ZOOLOGY THEORY(CREDIT 2)
DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER – IX
USCZOT09
PAPER – I – PARASITOLOGY

Unit – I **12 Periods**

1. Introduction and History of Parasitology
2. Parasitism, Host Parasite Relationship
3. Modes of Infection
4. Structure, Life Cycle, Pathogenicity and treatment of Parasitic Protozoan (Plasmodium, Trypanosome)

Unit –II **12 Periods**

1. Structure, Life Cycle, Pathogenicity and Treatment of helminthes parasites (F. hepatica)
2. Ultrastructure of body wall of parasite
3. Respiration and excretion of helminthes
4. Parasitic adaptation

Unit -III **12 Periods**

1. Structure, Life Cycle, Pathogenicity and treatment of Nematode parasites (Wuchereria*bancrofti*)
2. Parasitic adaptations
3. Morphology of Arthropod parasite (Human lice, Sarcoptes*scabei*, X. *cheopis*)
4. Causes and treatment of Arthropod parasite.

Unit –IV **12 Periods**

1. Structure, Pathogenicity and treatment of bacterial and fungal diseases in fishes
2. Pathogenicity and treatment of (Typhoid, T.B)
3. Zoonotic diseases and pathogenicity (Swine flu, Bird Flu)
4. Study of Vectors as disease transmitters (Flea, TseTse fly)

Suggested Readings

1. Animal parasitology C.P. Read
2. Biology of Protozoa Sleials
3. Protozoology by Kudo
4. An introduction to parasitology Chandler
5. General Parasitology Cheng
6. Biology of Parasites Cheng
7. Nematode Parasites N.D. Levine
8. Structure of Nematode A.F. Bird
9. An introduction to Nematology Chitwood
10. Clinical Parasitology Faust
11. Medical Helminthology Watson
12. Parasitology K. D. Chatterji
13. Indian insect Life Lefrey
14. Hand book Entomology T.V. R Ayyar
15. Useful and destructive insect Metacalf& Flint
16. Applied Parasitology Hiware, Jadhav&Mohekar
17. Nematodes of Indian Mammals H.S. Nama , G. B. Shinde & B.V. Jadhav
18. T.Y B. Sc. Zoology Sem-V- Dhamani, Bakare, Harney & Bhute

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM(CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE(B.Sc.), SEMESTER – V
SUBJECT – ZOOLOGY PRACTICAL(CREDIT 2)
DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER – IX
USCZOP05

PRACTICAL

Section A - Study of Specimens

1. Protozoa – *Entamoeba, Trypanosoma, Plasmodium*
2. Helminths – *Fasciola hepatica, T. solium*
3. Nematodes – *Ascaris, W.bancrofti*
4. Arthropods – *Pediculushumanus, Xenopsyllacheopis*

Section B - Study of Slides:

1. T.S. of Ascaris, Mature and Gravid proglottids of *Taeniasolium,*
2. Larval Forms- Redia, Cercaria and Cysticercus
3. Study of Bacterial Slides
4. Studyof fungal slides

Section C - Haematological Study

1. Test for bilirubin
2. Smear preparation for malarial parasite examination
3. Test for T.B. and Typhoid

Section D - Case study

1. Ectoparasite in human
2. Study of parasites in poultry and fish

Practical Question Paper and Distribution of Marks

Time: 2 Hrs. **Max. Marks: 15**

Practical Distribution of Marks

1. Identification and salient features of spots: -..... 06
   (02 Specimens and 01 Slides)
2. Hematological Experiments..... 03
3. Project Work/ Case Study 02
4. Certified practical record 02
5. Viva- voce 02

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM(CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE(B.Sc.), SEMESTER – V
SUBJECT – ZOOLOGY THEORY(CREDIT 2)
DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER –X
USCZOT10
PAPER – II – APPLIED ZOOLOGY

Unit 1 **12 Periods**

1. Type of Fisheries in brief: fresh water, Brackish Water and Marine
2. Pre and Post stocking management: Fertilization, caring capacity, artificial feeding,
3. Mono and Poly culture, Fish preservation.
4. Fish Diseases: Bacterial, fungal, protozoan and arthropods

Unit II **12 Periods**

1. Life history and pathogenicity of *Ancylostoma duodenale* and *Wuchereri abancrofti*
2. Biology, Control and damage caused by *Helicoverpaarmigera, Pyrillaperpusilla* and *Papilio demoleus, Callosobruchuschinensis, Sitophilusoryzae* and *Tribolium castaneum*
3. Medical importance and control of *Pediculus humanuscorporis, Anopheles, Culex, Aedes and Xenopsylla cheopis*
4. Economic importance of Agricultural pest

Unit III **12 Periods**

1. Classification of Fowls based on their use – Broilers and Commercial layers.
2. Principles of poultry breeding, Management of breeding stock and broilers, Processing and preservation of eggs.
3. Poultry diseases - Viral, Bacterial, Fungal, Protozoan and Preventions
4. Management of a modern Poultry Farm, progressive plans to promote Poultry as a Self Employment venture.

Unit IV **12 Periods**

1. Introduction, Dairy farm and its management.
2. Preservation of semen and artificial insemination in cattle;
3. Induction of early puberty andsynchronization of estrus in cattle, Cattle diseases - Viral, Bacterial, Fungal, Protozoan and Preventions.
4. Management of a modern Dairy Farm, progressive plans to promote Dairy Farming as a Self Employment venture.

SUGGESTED READINGS

1. Park, K. (2007).*Preventive and Social Medicine*.XVI Edition.B.B Publishers.
2. Arora, D. R and Arora, B. (2001).*Medical Parasitology*.II Edition. CBS Publications and Distributors.
3. Kumar and Corton. *Pathological Basis of Diseases*.
4. Atwal, A.S. (1986).*Agricultural Pests of India and South East Asia*, Kalyani Publishers.
5. Dennis, H. (2009).*Agricultural Entomology.*Timber Press (OR).
6. Hafez, E. S. E. (1962).*Reproduction in Farm Animals*. Lea &Fabiger Publisher
7. Dunham R.A. (2004).*Aquaculture and Fisheries Biotechnology Genetic Approache*s.
8. CABI publications, U.K.
9. Pedigo, L.P. (2002).*Entomology and Pest Management*, Prentice Hall.
10. T.Y B. Sc. Zoology Sem-V- Dhamani, Bakare, Harney & Bhute

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE (B.Sc.), SEMESTER – V
SUBJECT – ZOOLOGY PRACTICAL (CREDIT 2)
DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER – X
USCZOP06
PRACTICAL

Max. Marks: 15

1. Study of insect damage to different plant parts/stored grains through damaged products/photographs.
2. Estimation of quality of milk from different dairy farm units – specific gravity, fat content, pH and viscosity.
3. Field visits to a poultry / dairy farm-submission of reports
4. Laboratory Record work shall be submitted at the time of practical examination
5. Computer aided techniques should be adopted as per UGC guide lines.

Practical Question Paper and Distribution of Marks

Time: 2 Hrs. **Max. Marks: 15**

Practical **Distribution of Marks**

1. Identification and salient features of spots: -..... 06
   (02 Specimens and 01 Slides)
2. Life cycle ……..... 03
3. Project Work/ Case Study 02
4. Certified practical record 02
5. Viva voce 02

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM(CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE(B.Sc.), SEMESTER – V
SUBJECT – ZOOLOGY THEORY(CREDIT 2)
DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER –XI
USCZOT11
PAPER – III – INSECT VECTOR AND DISEASES
Max. Marks: 50

Unit I **12 Period**

1. General Features of Insects, Head – Eyes, Types of antennae,
2. Types of Mouth parts.
3. Brief introduction of Carrier and Vectors (mechanical and biological vector)
4. Host-vector relationship, Adaptations as vectors.

Unit II: **12Period**

1. Classification of insects up to orders, detailed features of orders with insects as a Vectors – Diptera, Siphonaptera, Siphunculata, Hemiptera
2. Dipterans as important insect vectors – Mosquitoes, Houseflies;
3. Study of mosquito-borne diseases – Chickungunya, Filariasis.
4. Breeding and control of mosquitoes.

Unit III: **12Period**

1. Study of sand fly-borne diseases – Visceral Leishmaniasis, Cutaneous Leishmaniasis, Phlebotomus fever; Control of Sand fly.
2. Study of house fly as important mechanical vector, Myiasis, Control of house fly.
3. Bugs as insect vectors; Blood-sucking bugs; Chagas disease.
4. Bed bugs as mechanical vectors and control and prevention measures.

Unit IV: **12Period**

1. Fleas as important insect vectors; Host-specificity,
2. Study of Flea-borne diseases – Plague, Typhus fever; Control of fleas.
3. Human louse (Head, Body and Pubic louse) as important insect vectors.
4. Study of louse-borne diseases – Relapsing fever, Trench fever, Control of human louse.

SUGGESTED READINGS

1. D. B. Tembhare. Modern Entomology: Himalaya Publishing House
2. Imms, A. D.(1977). A General Text Book of Entomology. Chapman & Hall, UK
3. Chapman, R.F.(1988).The Insects: Structure and Function.IV Edition, Cambridge University Press, U.K.
4. Pedigo L.P. (2002).Entomology and Pest Management. Prentice Hall Publication
5. Mathews, G.(2011). Integrated Vector Management : Controlling Vectors of Malaria and Other Insect Vector Borne Diseases. Wiley-Blackwell.
6. T.Y B. Sc. Zoology Sem-V- Dhamani, Bakare, Harney &Bhute

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM(CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE(B.Sc.), SEMESTER – V
SUBJECT – ZOOLOGY PRACTICAL(CREDIT 2)
DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER – XI
USCZOP07
PRACTICAL

PRACTICAL

1. Study of Life cycle of Mosquito, house fly, bed bug through ICT tools/ models or charts.
2. Study of different kinds of mouth parts of insects.
3. Study of following insect vectors through permanent slides/ photographs: *Aedes, Culex, Anopheles, Pediculushumanuscapitis, Pediculushumanus, corporis, Phithirus pubis, Xenopsyllacheopis, Cimexlectularius, Phlebotomusargentipes, Muscadomestica.*
4. Study of types of antennae through available permanent slides, charts or photographs.
5. Study of different diseases transmitted by above insect vectors.
6. Control appliances – sprayers and dusters.
7. Submission of a project report or case study on any one of the insect vectors and disease transmitted.

Practical Question Paper and Distribution of Marks

Time: 2 Hrs. **Max. Marks: 15**

Practical	**Distribution of Marks**
1. Identification and salient features of spots: - (02 Specimens and 01 Slides)	06
2. Life cycle …….	03
3. Project Work/ Case Study	02
5. Certified practical record	02
6. Viva voce	02

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM(CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE(B.Sc.), SEMESTER – V
SUBJECT – ZOOLOGY THEORY(CREDIT 2)
DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER – XII
USCZOT12
PAPER – IV – AQUATIC BIOLOGY

Max. Marks: 50

UNIT – I **12 periods**

1. Brief introduction of the aquatic biomes
2. Freshwater ecosystem (lakes, streams and rivers),
3. Estuaries, intertidal zones,
4. Oceanic pelagic zone and benthic zone.

UNIT – II **12 periods**

1. Lakes: Origin and classification, Ecosystem and Morphometry

2.Physico–chemical Characteristics: Light, Temperature, Turbidity, Dissolved Solids, Carbonate, Bicarbonates, Phosphates and Nitrates, Dissolved gases (Oxygen, Free Carbon dioxide).

3. Nutrient Cycles in Lakes-Nitrogen, Sulphur and Phosphorous
4. Study of Zooplankton -Rotifers, Cladocera, Copepoda and Ostracoda

UNIT III **12 Periods**

1. Marine Ecosystem, Salinity and density of Sea water, Continental shelf.
2. Adaptations of deep sea organisms.
3. Coral reefs, Sea weeds.
4. Nutrient Cycles in Sea/ Ocean -Nitrogen, Sulphur and Phosphorous.

UNIT – IV **12 periods**

1. Aquatic pollution - Causes of pollution: Agricultural, Industrial, Sewage, Thermal and Oil spills.
2. Eutrophication , Management and conservation.
3. Water pollution acts of India.
4. Sewage treatment and water quality assessment - BOD and COD.

Suggested Readings –Aquatic Biology

1. Ananthakrishnan : Bioresources Ecology 3rd Edition
2. Goldman – Limnology, 2nd Edition 3. Odum and Barrett – Fundamentals of Ecology, 5th Edition\
3. Pawlowski: Physicochemical Methods for water and Wastewater Treatment, 1st Edition
4. Wetzel: Limnology, 3rd edition
5. Trivedi and Goyal: Chemical and biological methods for water pollution studies Welch: Limnology Vols.I-II
6. T.Y B. Sc. Zoology Sem-V- Dhamani, Bakare, Harney & Bhute

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM(CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE(B.Sc.), SEMESTER – V
SUBJECT – ZOOLOGY PRACTICAL(CREDIT 2)
DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER –XII
USCZOP08
PRACTICAL

Time – 2 hours Max. Marks: 15

1. Study of the topography of a lake

2. Determination of - Turbidity / Transparency, Dissolved Oxygen, Free Carbon dioxide, Alkalinity (carbonates & bicarbonates) in water collected from a nearby lake or water body.
3. Zooplankton – Identification and population density of zooplankton
4. Instruments used in limnology and their significance (Secchi disc, Van dorn bottle, Conductivity meter, Turbidity meter, PONAR grab sampler)
5. A Project Report on a visit to a Sewage treatment plant / Marine bio-reserve/Fisheries Institutes.
6. Study of Fresh water and Marine water common Fish Fauna.

Practical Question Paper and Distribution of Marks

Time: 2 Hrs. **Max. Marks: 15**

Practical **Distribution of Marks**

1. Identification and salient features of spots: -..... 06
(02 Specimens and 01 Slides)

2. Haematological Experiments..... 03

3. Project Work/ Case Study 02

4. Certified practical record 02

5. Viva voce 02

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE (B.Sc.), SEMESTER – VI
SUBJECT – ZOOLOGY THEORY (CREDIT 2)
SKILL ENHANCEMENT COURSE (SEC)
PAPER – I –MEDICAL DIAGNOSTICS

MAX. MARKS - 15

Unit I

1. Blood composition.
2. Blood group (ABO type, Rh factor)

Unit II

1. Physical characteristics of urine, Normal and abnormal constituent of urine.
2. Causes, types and symptoms of Diabetes (Type I and Type II)

Unit III

1. Causes, types, symptoms, diagnosis and prevention of Tuberculosis.
2. Causes, types, symptoms, diagnosis and prevention of Hepatitis.

Unit IV

1. Types of tumours, Benign and Malignant.
2. Medical imaging : X ray, Ultrasonography, MRI, CT Scan

Suggested Readings :

1) Text Book Of Medical Physiology by Guyton and Hall. 11th Edition W.B. Saunders and Company 2006
2) Text Book Of Medical Laboratory Technology by Godkar P. B. and Godkar D. P. II Edition Bhalani Publishing House.
3) A Laboratory Manual for Rural Tropical Hospitals A Basic for Training Courses by Chesbrought M.
4) Lab Manual on Blood Analysis and Medical Diagnostics. By Prakash G. (2012), S, Chand and Co. Ltd.
5) T.Y B. Sc. Zoology Sem-VI- Dhamani, Bakare, Harney & Bhute

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE (B.Sc.), SEMESTER – VI
SUBJECT – ZOOLOGY PRACTICAL (CREDIT 2)
SKILL ENHANCEMENT COURSE (SEC)
PRACTICAL

Max. Marks: 35

1) Study of ABO blood grouping and Rh factor through ICT/charts
2) Identified the different medical instruments through ICT/charts
3) Visit to local Govt. Hospital or Private Pathology Lab

Practical Question Paper and Distribution of Marks

Time: 4 Hrs. **Max. Marks: 35**

Practical	**Distribution of Marks**
1) To study ABO blood grouping and Rh factor through ICT/charts……..…..	10
2) Identified the different medical instruments through ICT/charts…..…….…	10
3) Visit tour report ……..…….....…….	15

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE (B.Sc.), SEMESTER – VI
SUBJECT – ZOOLOGY THEORY (CREDIT 2)
SKILL ENHANCEMENT COURSE (SEC)
PAPER –II – PUBLIC HEALTH AND HYGIENE
MAX. MARKS - 15

UNIT I

1. Personal Health, Community Health, Environmental Hygiene.
2. Government and its policies for public Health.

UNIT II

1. TB, polio, diphtheria, tetanus, MMR, Diarrhea, typhoid, worm infestations.
2. Vaccination, sterilization programmes - family planning, child obesity, malnutrition.

UNIT III

1. Environment and health Impact assessment
2. Health care legislation in India

UNIT IV

1. Hygiene education in communities.
2. Role of surveillance agency in hygiene education.

Suggested Reading

1. Oxford textbook of Public Health Ed. Roger Detels, James Mcewen, Robert Beaglehole, and Heizo Tanaka Oxford University Press (OUP) 4th Edition: 2002.
2. Public Health at the Crossroads – Achievements and Prospects. Robert Beaglehole and Ruth Bonita 2nd Edition Cambridge University Press
3. Preventive and Social Medicine, K Park, BansaridasBhanot Publishing House.
4. Health: Diseases, Programs, Systems, and Policies, Bartlett Publishers.
5. T.Y B. Sc. Zoology Sem-VI- Dhamani, Bakare, Harney & Bhute

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE (B.Sc.), SEMESTER – VI
SUBJECT – ZOOLOGY PRACTICAL (CREDIT 2)
SKILL ENHANCEMENT COURSE (SEC)
PRACTICAL

Max. Marks: 35

1. Study of TB, Polio, Malaria, Filariasis, Measles, Chickenpox, Rabies, Leprosy through ICT/charts
2. Preparation of charts or posters related to health
3. Visit to community water purification and treatment plant/ industry to study occupational health hazard and safety of industrial workers/ agricultural fields to study occupational health of farmers and agricultural laborers.

Practical Question Paper and Distribution of Marks

Time: 4 Hrs. **Max. Marks: 35**

Practical **Distribution of Marks**

1. To study of TB, Polio, Malaria, Filariasis, Measles, Chickenpox, Rabies, Leprosy through ICT/charts ……..……..10
2. To prepare the charts or posters related to health ……..…..10
3. Visit tour report …..……..……..…..…15

GONDWANA UNIVERSITY, GADCHIROLI

CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS

PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-VI

SUBJECT- ZOOLOGY, THEORY (CREDITS 2)

DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER XIII

USCZOT13

Paper I – IMMUNOLOGY

Max. Marks: 50

Unit I **12 periods**

1. A historical Perspective of Immunology
2. Introduction to basic concepts in immunology, Primary and secondary line of defense
3. Innate Immunity- Anatomical barriers to infection, Macrophages, Natural Killer (NK) Cells, Inflammatory response
4. Adaptive immunity- Cell Mediated Immunity and Humoral Immunity

Unit II **12 periods**

1. Haematopoeisis – Lymphoid and Myloid lineage
2. Primary lymphoid organs - Bone marrow, Thymus
3. Secondary lymphoid organs –Lymph node, Spleen, MALT, GALT, Peyer's patches
4. Interaction of antigen in secondary lymphoid organ

Unit III **12 periods**

1. Basic properties of antigens, Haptens and adjuvants
2. B and T cell epitopes
3. Structure, classes and functions of antibodies
4. Monoclonal antibodies

Unit IV **12 periods**

1. Structure and functions of MHC I and II
2. Exogenous and endogenous pathways of antigen presentation and processing
3. Autoimmunity - Type I Diabetes mellitus, Psoriasis, Systemic Lupus Erythematosis,
4. Vaccines: Live, killed, recombinant and toxoid

Suggested Readings – Immunology

1.Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). *Immunology*, VIEdition. W.H. Freeman and Company.

2.David, M., Jonathan, B., David, R. B. and Ivan R. (2006). *Immunology*, VII Edition,Mosby, Elsevier Publication.

3.Abbas, K. Abul and Lechtman H. Andrew (2003.) *Cellular and MolecularImmunology.*VEdition.Saunders Publication.

4. Roitt,I.M.,J. Brostoff and D.K. Male.Immunology (1993) Gower medical publishing, London

5. J. Kuby Immunology (1991) W. H. Freeman and Co.

6. Donald M.Weir, John steward, 1993.Immunology VII edition. ELBS, London.

7. Richard M.Hyde. 1995. Immunology III edition. National Medical Series, Williams and Wilkins.HarwardPublishingCo.

8. T.Y B. Sc. Zoology Sem-VI- Dhamani, Bakare, Harney &Bhute

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM(CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE(B.Sc.), SEMESTER – VI
SUBJECT – ZOOLOGY PRACTICAL(CREDIT 2)
DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER – IX
USCZOP09
PRACTICAL

1. Demonstration of lymphoid organs through ICT tools /Charts/Photographs.
2. Histological study of spleen, thymus and lymph nodes through slides/ photographs
3. Preparation of stained blood film to study various types of blood cells (Minor Expt.)
4. Ouchterlony's double immuno-diffusion method (Major Expt.).
5. ABO blood group determination (Minor Expt.).
6. Demonstration of - a) ELISA b) Immunoelectrophoresis (Major Expt.)

Practical Question Paper and Distribution of Marks

Time: 2Hrs. **Max. Marks: 15**

Practical	**Distribution of Marks**
1. Identification(05 spots) …….....	05
2. Major Experiment	04
3. Minor Experiment	02
4. Certified practical record	02
5. Viva voce	02

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM(CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE(B.Sc.), SEMESTER – VI
SUBJECT – ZOOLOGY THEORY(CREDIT 2)
DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER – XIV
USCZOT14
PAPER – II – ANIMAL BIOTECHNOLOGY

Max. Marks: 50

Unit I **12 Periods**

1. Concept and scope of biotechnology.
2. Scope of animal cell and tissue culture, Types of media for animal cell and tissue culture.
3. Sterilization techniques (chemical and physical sterilization).
4. Advantages and disadvantages of tissue culture.

Unit II **12 Periods**

1. Cloning vectors: Plasmids, Cosmids, Phagemids, Bacteriophage (λPhage, M13Phage), BAC, YAC and MAC.
2. Construction of genomic and cDNA libraries and screening by colony and plaque hybridization.
3. Southern, Northern and Western blotting; DNA sequencing: Sanger method
4. Polymerase Chain Reaction, DNA Finger Printing and DNA micro array

Unit III **12 Periods**

1. Gene transfer methods in Animals- Direct gene transfer (Microinjection, Embryonic stem cell gene transfer) and vector based gene transfer (retrovirus gene transfer).
2. Applications of transgenic animals: Production of pharmaceuticals, milk production meat production and aquaculture.

3. Animal propogation -artificial insemination, animal clones.
4. Conservation of genetic resources of economically important livestock.

Unit IV **12 Periods**

1. Animal cell culture, Molecular diagnosis of genetic diseases (Cystic fibrosis, Sickle cell anemia).
2. Recombinant DNA in medicines: Recombinant insulin and human growth hormone,
3. Gene therapy and its types.
4. Hybridoma technology and production of monoclonal antibody.

SUGGESTED READINGS

1. Brown, T.A. (1998). *Molecular Biology Labfax II: Gene Cloning and DNA Analysis*. IIEdition, Academic Press, California, USA.
2. Glick, B.R. and Pasternak, J.J. (2009). *Molecular Biotechnology - Principles andApplications of Recombinant DNA*. IV Edition, ASM press, Washington, USA.
3. Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2009).

5. Snustad, D.P. and Simmons, M.J. (2009). *Principles of Genetics.*V Edition, John Wileyand Sons Inc.

6. Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K. (2007). *Recombinant DNAGenesand Genomes- A Short Course*. III Edition, Freeman and Co., N.Y., USA.

7. Beauchamp, T.I. and Childress, J.F. (2008). *Principles of Biomedical Ethics.* VI Edition, Oxford University Press.

8. Elements of Biotechnology: P. K. Gupta; Rastogi publication.

9. Text book of Biotechnology – U Satyanarayan –Book & Allied

10. Jogdand S.N- Gene Biotechnology-Himalaya Publishing House, Delhi

11. T.Y B. Sc. Zoology Sem-VI- Dhamani, Bakare, Harney &Bhute

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM(CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE(B.Sc.), SEMESTER – VI
SUBJECT – ZOOLOGY PRACTICAL(CREDIT 2)
DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER – XIV
USCZOP10
PRACTICAL - ANIMAL BIOTECHNOLOGY

Section A

1. Genomic DNA isolation from E. coli
2. Plasmid DNA isolation (pUC 18/19) from E. coli
3. Calculation of transformation efficiency from the data provided.
4. Electrophoresis of DNA (Major)

Section B

To study following techniques through ICT tools (Video/ images)

1. Southern Blotting
2. Northern Blotting
3. Western Blotting
4. DNA Sequencing (Sanger's Method)
5. PCR
6. DNA fingerprinting

Section C

1. Submission of Project report on animal cell culture.
2. Visit to any tissue culture laboratory/ Genetic Engineering Research Laboratory.

Practical Question Paper and Distribution of Marks

Time: 2 Hrs. **Max. Marks: 15**

Practical	**Distribution of Marks**
1. Identificationof spots(05 spots) ……..	 05
2. Experiment from section A	 03
3. Experiment from section B	 03
4. Certified Practical Record	 02
5. Viva voce	 02

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM(CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE(B.Sc.), SEMESTER – VI
SUBJECT – ZOOLOGY THEORY(CREDIT 2)
DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER – XV
USCZOT15
PAPER – III – MICROTECHNIQUE, BIOINFORMATICS AND BIOSTATISTICS

Max. Marks: 50

Unit – I **12 Period**

1. Visualization of cells and sub-cellular components by light microscopy.
2. Concept of resolving powers of different microscopes, microscopy of living cells, scanning and transmission electron microscopes.
3. Different fixation and staining techniques for EM, freeze-etch (fracture) and freeze- methods for EM.
4. Image processing methods in microscopy.

Unit – II **12 Period**

1. Structure and working of microtomes (Rocking and Rotary microtomes)
2. Fixation, dehydration, clearing, embedding
3. Section cutting and problems encountered during section cutting (causes and remedies),
4. Double staining with Haematoxylin and Eosin, Histochemical staining techniques for carbohydrates (Periodic acid schiff), proteins (Mercury-bromophenol blue) and lipids (Sudan black-B).

Unit-III **12 Period**

1. General introduction, Bioinformatics tools (BLAST, FASTA, Clustal W, PFAM, SCANS).
2. Biological databases (Objectives, properties and Classification), Sequence retrieval system (SRS).
3. Structure of nucleotide sequence database, RNA databases, Protein sequence databases (TrEMBL, PIR, UniProt, PDB, MMDB, SCOP, CATH), HGP

(General information), Phylogenetic analysis (Phenetic method and Cladistic method).

4. Applications of bioinformatics.

Unit-IV **12 Period**

1. Tabulation and presentation of data, Sampling errors
2. Measures of central tendency (mean, mode, median,) SD, SE.
3. Dispersal, probability distributions (Binomial, Poisson and normal)
4. Regression and correlation; t-test; analysis of variance; Chi Square test.

Suggested Readings

Microtechnique

1. Devenport, H.A. (1960) Histological and histochemical techniques. Published by W.B. Saunders Company, Philadelphia, PA (U.S.A.).
2. Dhande, R.R., Wankhede, G.N. and Akarte. Text book of Microtechniques and Environmental Biology by Bajaj Publications, Amravati.
3. Humason, G.L. (1979) Animal Tissue Technique, 4th edition, Published by W H Freeman & Co., San Francisco.
4. Patki L.R, Bhalchandra B.L, Jeevaji I.H.(1987). An introduction to Microtechnique, S.Chand and company (Pvt)ltd, New Delhi.
5. Presnell, J.K. and Schreibman M. (1997) Humason Tissue Technique (5th edition), Published by The Johns Hopkins University Press, Baltimore, Maryland.
6. Tembhare, D.B. (2010). Techniques in Life Sciences, Published by Himalaya Publishing House, New Delhi.
7. Verma, P.S. and Agarwal, V.K. (2005). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S.Chand and Company Ltd., New Delhi.
8. **T.Y B. Sc. Zoology Sem-VI- Dhamani, Bakare, Harney &Bhute**

Bioinformatics and Biostatistics

1. Baxevanis, A.D. Ouellate, B.F.F. (2009). Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins. 2nd Edition , Published by John-Wiley and Sons Publications, New York.
2. Bergman, N.H. (2007). Comparative Genomics: Methods in Molecular Biology, Vol-1 & Vol-2, Humana Press, Totowa (NJ).
3. Campbell, A.M. and Heyer, L.J. (2007). Discovering Genomics, Proteomics and Bioinformatics, 2nd Edition. Benjamin Cummings.
4. Gibas, C. and Jambeck P. (2001). Developing Bioinformatics Computer Skills: Shroff Publisher sand Distributors Pvt. Ltd. (O'Reilly), Mumbai.
5. Higgins, D. and Taylor, W. (2000). Bioinformatics: Sequence, Structure and Databanks. Oxford University Press, UK.
6. Mahajan, B.K. (2008). Methods in Biostatistics, 8th Edition, J.P. Medical Ltd.
7. Mount, W. (2004). Bioinformatics and Sequence Genome Analysis 2nd Ed CBS, Pub. New Delhi.
8. Rashidi H. H. and Buehler (2002). Bioinformatics Basics: Applications in Biological Science and Medicine, CRC Press, London.
9. Sadguru Prasad (2013). Elements of Biostatistics, 3rd Edition, Rastogi Publication, New Delhi.
10. Suderlingam, S. And Kumaresan, V. (2013). Bioinformatics, 2nd Edition, Saras Publication, Kanyakumari, India.
11. Xhiong, J. (2006) Essential Bioinformatics, Published by Cambridge University Press, New York.

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM(CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE(B.Sc.), SEMESTER – VI
SUBJECT – ZOOLOGY PRACTICAL(CREDIT 2)
DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER – XV
USCZOP15
PRACTICAL - MICROTECHNIQUE, BIOINFORMATICS AND BIOSTATISTICS

Section A - Micro technique

1. Studies of electron microscope photographs: SEM and TEM (ICT, charts etc.)
2. Preparations-
   a. Preparation of different grades of alcohol by using rectified spirit,
   b. Preparation of Bouin's fixatives, Cornoy's fixative,
   c. Phosphate Buffer Saline (0.01 M, PBS, pH-7-45),
   d. Preparation of Eosin solution,
   e. Preparation of Hematoxylene solution (Ehrlich or Delafield),
   f. Meyer' s albumen.
3. a) Fixation of tissues of your interest procured from slaughter house or fish market. b) Paraffin block preparation for general histological study and histochemical studies.
4. Block cutting, spreading
5. Staining by haematoxylene and eosine.
6. Histochemical study for protein (Bromophenol blue), glycogen (Schiffs reagent) and lipid (Sudan black B).

Section B - Bioinformatics

1. Use of BLAST and FASTA for the retrieval of Nucleotide sequences and Protein sequences**.**
2. Preparation of phylogenetic tree by using Phenetic and Cladistic method.

Section C- Biostatistics

1. Collection of any biological information, preparation of table by using Excel,
2. Calculation of mean, mode, median, standard deviation, standard error etc.
3. Preparation of line graph, bar diagram, Pie diagram by using Excel.

Practical Question Paper and Distribution of Marks

Time: 2 Hrs. **Max. Marks: 15**

Practical **Distribution of Marks**

1. Section cutting and spreading of ribbon 02
2. Histological/ HistochemicalStaining.....03
3. One experiment from bioinformatics..... 02
3. One experiment from biostatistics 03
4. Certified practical record 03
5. Viva voce 02

GONDWANA UNIVERSITY, GADCHIROLI
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DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER – XVI
USCZOT16
PAPER – IV – REPRODUCTIVE BIOLOGY

Max. Marks: 50

Unit I **12 Period**

1. Reproductive System: Sex Differentiation (Gonadogenesis, Genital Duct and External Genitalia), Abnormalities of Human Sex Development.
2. Hypothalamo – Hypophyseal – Gonadal axis: Location, Regulation, Function and Factors affecting it.
3. Gonadal hormones: Types (steroids, glycoprotein hormones and prostaglandins) and mechanism of hormonal action.
4. Reproductive Endocrine Disorders in Male and Female: Hypogonadism, ED (Erectile Dysfunction), Gynecomastia, POS (Polycystic Ovarian Syndrome), Hirsuitism, Perimenopause.

Unit II **12 Period**

1. Histology of male reproductive system in rat and human: Testis: Structure, Cellular Function, Spermatogenesis.
2. Structure and Function of Epididymis and Sex Accessory Glands.
3. Androgen metabolism and Biochemistry of Semen.
4. Cryptorchidism and Castration.

Unit III **12 Period**

1. Histology of female reproductive system in rat and human: Ovary: Structure, folliculogenesis, ovulation, corpus luteum formation and regression.
2. Reproductive cycles in rat and human and their regulation.
3. Gestation, pregnancy diagnosis, foeto – maternal relationship; Mechanism of parturition and its hormonal regulation.
4. Lactation and its regulation.

Unit IV **12 Period**

1. Infertility in male and female: causes, diagnosis and management.
2. Assisted Reproductive Technology: sex selection, sperm banks, frozen embryos, in vitro fertilization, ET, EFT, IUT, ZIFT, GIFT, ICSI, PROST.
3. Modern contraceptive measures.
4. Demographic terminology used in family planning- birth limiting, birth spacing, contraceptive continuation rates, contraceptive prevalence, CYP, HTSP, Informed choice, unmate need, total fertility rate, method mix.

SUGGESTED READINGS

1. Austin, C.R. and Short, R.V. reproduction in Mammals. Cambridge University Press.
2. Degroot, L.J. and Jameson, J.L. (eds). Endocrinology. W.B. Saunders and Company.
3. Knobil, E. et al. (eds). The Physiology of Reproduction. Raven Press Ltd.
4. Hatcher, R.A. et al. The Essentials of Contraceptive Technology. Population Information Programme.
5. Developmental Biology by Gilbert
6. Human Physiology by Vander
7. Human Physiology by Dr. A.K. Jain
8. T.Y B. Sc. Zoology Sem-VI- Dhamani, Bakare, Harney & Bhute

GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM(CBCS) SYLLABUS
PROGRAMME – BACHLOR OF SCIENCE(B.Sc.), SEMESTER – VI
SUBJECT – ZOOLOGY PRACTICAL(CREDIT 2)
DISCIPLINE SPECIFIC ELECTIVES (DSE) CORE PAPER – XVI
USCZOP16
PRACTICAL - REPRODUCTIVE BIOLOGY

1.Observation of histological sections from photomicrographs/ charts/ permanent slides of rat/human: testis, epididymis and accessory glands of male reproductive systems; Sections of ovary, fallopian tube, uterus (proliferative and secretary stages), cervix and vagina.

2. Study of modern contraceptive devices.
3. Examination of vaginal smear of rats/ Human (Major).
4. Sperm count and sperm motility in rat/human (Major).
5. Pregnancy diagnosis by using kit(Minor).
6. Estimation of fructose in semen (Minor).
7. Surgical techniques: Principles of surgery in endocrinology. Ovarectomy, hysterectorny, castration and vasectomy in rats through ICT tools.
8. A case Study of animal house: set up and maintenance of animal house, breedingtechniques, care of normal and experimental animals.

Practical Question Paper and Distribution of Marks

Time: 2 Hrs. **Max. Marks: 15**

Practical **Distribution of Marks**

1. Spotting 06
2. One experiment Major..... 03
3. One experiment Minor 02

4. Certified practical record 02

5. Viva voce 02