GONDWANA UNIVERSITY, GADCHIROLI

FACUTY OF SCIENCE AND TECHNOLOGY
BOARD OF STUDIES IN ZOOLOGY

SUBMISSION OF

CHOICE BASED CREDIT SYSTEM (CBCS)

SYLLABUS FOR UNDER GRADUATE (B. Sc.)

PROGRAMME OF SEMESTER I AND SEMESTER II

FROM SESSION 2017 - 18

Discipline Core Courses

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

Discipline Specific Electives (DSE) (Any two)

1. Parasitology
2. Applied Zoology
3. Insect, Vector and Diseases
4. Aquatic Biology
5. Immunology
6. Animal Biotechnology
7. Microtechnique, Bioinformatics and Biostatistics
8. Reproductive Biology

Skill Enhancement Courses (SEC)

1. Apiculture
2. Sericulture
3. Medical Diagnostics
4. Public Health and Hygiene

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			**SEC(Any one)** 1. Apiculture 2. Sericulture	**DSE (Any Two)** 1.Parasitology 2.Applied Zoology 3. Insect Vectors and disease 4 Aquatic Biology
VI			**SEC(Any One)** 1. Medical diagnosis 2. Public Health & Hygiene	**DSE (Any Two)** 1. Immunology 2.Animal Biotechnology 3.Micro-technique, Bioinformatics and Biostatistics 4.Reproductive Biology

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 - Arthropoda to Hemichordate(Core Paper - III)
Paper : II- Genetics & Evolution (Core Paper - IV)

Sem- III

Paper : I Animal Diversity (Chordata) and Comparative Anatomy (Core Paper – V)
Paper : II Physiology and Biochemistry – I (Core Paper - VI)

Sem- IV

Paper : I Developmental Biology (Core Paper - VII)
Paper : II Physiology and Biochemistry – II (Core Paper -VIII)

Sem -V Skill Enhancement Course(SEC) Paper (Any One)

1. Apiculture
2. Sericulture

Sem -V Discipline Specific Elective (DSE) Paper (Any Two)

1. Parasitology
2. Applied Zoology
3. Insect, Vector and Diseases
4. Aquatic Biology

Sem- VI Skill Enhancement Course(SEC) Paper (Any One)

1. Medical Diagnosis
2. Public Health and Hygiene

Sem -VI Discipline Specific Elective (DSE) Paper (Any Two)

1. Immunology
2. Animal Biotechnology
3. Microtechnique, Bioinformatics and Biostatistics
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

USCZOT01

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 in Protozoa. 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 – Coelenterata (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 *Taenia solium*

Phylum - Nemathelminthes

General characters and classification up to classes; Structure and Life history of *Ascaris lumbricoides* 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 & Phagocytosis)

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 and its significance**,** Mitosis and Meiosis

GONDWANA UNIVERSITY, GADCHIROLI

C.B.C.S. SYLLABUS

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

SUBJECT- ZOOLOGY, PRACTICAL I (CREDITS 2)

USCZOP01

I. Classification of Specimen (up to class)

Protozoa – *Amoeba, 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:

Amoeba, *Plasmodium*, Sponge gemmule, L.S. *Sycon*, *Obelia* medusa, Miracidium larva, 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

USCZOT03

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

USCZOT04

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 – Complimentary Epistasis (9:7), Supplementary Epistasis (9:3:4), Sex linked inheritance,extra-chromosomal inheritance (Kappa particles)

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

Linkage and crossing over

Chromosomal Mutations - Deletion, Duplication, Inversion, Insertion, Translocation, Aneuploidy, Down's Syndrome, Klinefelter'sSyndrome, Turner's Syndrome

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

USCZOP02

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 ratio by beads.
3. Demonstration of Dihybrid ratio 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 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 – 20 marks 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 for Semester I and II -

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 ofcomparative 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., garl and 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.
16. F.Y B. Sc. Zoology Sem-I - Dhamani, Bakare, Harney & Bhute

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.
13. S.Y B. Sc. Zoology Sem-II - Dhamani, Bakare, Harney & Bhute

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)