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
<table>
<thead>
<tr>
<th>Sem</th>
<th>Core Course (12)</th>
<th>Ability Enhancement Compulsory Courses AEC(2)</th>
<th>Skill Enhancement (Foundation) Courses SEC(4)</th>
<th>Discipline Specific Elective</th>
</tr>
</thead>
</table>
| 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 | |
|---|---|---|
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
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
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
7. Use of ocular micrometer and measurement of micro objects.

**Distribution of Marks -**

**Total Marks - 30**

<table>
<thead>
<tr>
<th>Practical examination - 30</th>
<th>Duration - 4 Hours</th>
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<tbody>
<tr>
<td>I. Anatomical observations</td>
<td>05</td>
</tr>
<tr>
<td>II. Identification and comment on spot (3 specimen &amp; 2 slides)</td>
<td>10</td>
</tr>
<tr>
<td>III. Practical from Cell Biology</td>
<td>05</td>
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<tr>
<td>IV. Permanent stained micro-preparation (Comment + Diagram)</td>
<td>04</td>
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<td>V. Viva - Voce</td>
<td>03</td>
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<tr>
<td>VI. Class record</td>
<td>03</td>
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30

**Format for the internal assessment**

**For Theory**

<table>
<thead>
<tr>
<th>Sr. No</th>
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<th>Marks</th>
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<td>P-I</td>
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<tr>
<td>01</td>
<td>One assignment</td>
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<td>02</td>
<td>One class test</td>
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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’s Syndrome, 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 of extinction in evolution
I. Observation, classification (upto class) 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**

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**Format for the internal assessment – 20 marks for Theory**

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Suggested Reading for Semester I and II -

Structure and function of Invertebrates

Cell Biology -
1. Cell and Molecular Biology by De Robertis-E. D. P., I. S. E. publication.
5. Gene VI by Benjamin Lewis, Oxford press.
8. Molecular cell Biology by Darnell J. Scientific American Books USA.
12. Essentials of Molecular Biology by Freifelder D., narosa publication House.
14. The Cell: Molecular Approach by Cooper G. M.

Genetics & Evolution Biology -
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 - 1 Marks each)
Solve any 10 out of 12 (3 Questions from each unit)