

Gondwana University, Gadchiroli



**DIRECTION RELATING TO THE EXAMINATION
LEADING TO THE THREE YEAR OF SCIENCE
DEGREE WITH SEMESTER PATTERN**

**SCHEME AND SYLLABUS
Under National Education Policy 2020
Faculty- Science and Technology
Subject- Zoology
B.Sc. Semester –I&II
Session 2024-25**

GONDWANA UNIVERSITY

GADCHIROLI

Subject -Zoology

Proceedings of the meeting of BOS (UG) in Zoology

Reference: National Education Policy 2020 (NEP 2020) letter date 21/04/2023 and 29/04/2023

Agenda:

Approval of syllabus for BSc in Zoology theory and Practical and Scheme of examination for I and II semesters of Gondwana University, Gadchiroli.

Several discussions were held on following dates: 16 October and also on 03 May 2023 to reach final consensus on final syllabus of B.Sc. Sem-I and II.

Resolution:

The proposed syllabus for BSc in Zoology theory and Practical and Scheme of examination for I and II semesters were scrutinized thoroughly, finalised with appropriate inclusion(s) and deletion(s) of content(s) and finally approved.

Members Participated

1. Dr. P. M. Telkhade, Dept of Zoology, Dr. Khatri Mahavidyalaya Chandrapur. Chairman
2. Dr. A.P. Sawane, Dept of Zoology, Anand Niketan College Warora. Member
3. Dr. R.R. Kulkarni, Dept of Zoology, Sardar Patel College Chandrapur. Member
4. Dr. S.R. Sitre, Dept of Zoology, N.S. College, Bhadrawati. Member
5. Dr. S.D. Misar, Dept of Zoology, Janata Mahavidyalaya . Member
6. Dr. A.S Bele, Dept of Zoology, Sardar Patel College Chandrapur. Member
7. Dr. Pankaj P. Chawahan, JSPM Arts and Science College Dhanora. Member
8. Dr. U.S. Indurkar, Dept of Zoology, Dhyanes Mahavidyalaya, Navergaon. Member
9. Dr. Amir A. Dhamani , Principal, Gramgeeta Mahavidyalaya Chimur. Member
10. Dr. Pravin P. Joshi , Dept of Zoology, Amolchand Mahavidyalaya Yeotmal. Member

The meeting concluded with the chairman thanking all members for their cooperation. The draft of new syllabus prepared submitted academic section of Gondwana University for approval and implementation.

Date:

Dr. P.M. Telkhade
CHAIRMAN BOS (UG)

Gondwana University, Gadchiroli
SCHEME AND SYLLABUS
Under National Education Policy 2020
B.Sc. Semester -I with Zoology
Program Code GUG STUGZOO

UG	Semester -I	Credit	Marks	Hours
DSC Theory Paper	Life and Diversity of Animals (Non-Chordata-Protozoa to Annelida) Course Code: UG01STZOO01	2- Theory	50	T-30 hrs
Practical	Life and Diversity of Animals (Non-Chordata-Protozoa to Annelida)	2 Practical		P-60 hrs
Open Elective (OE) Theory Paper	1.Vermiculture Course Code: UG01STZOO02 2. Poultry Farming Course Code: UG01STZOO02	2 Theory	50	L-30
VSC Practical	Advanced Laboratory Practical I Course Code: UG01STZOO03	2 Practical	50	P-60 hrs
SEC Theory Paper	Clinical Instrumentation Technology I Course Code: UG01STZOO04	2 Theory	50	T-30 hrs
VEC Theory Paper	Environmental Studies	2		
AEC Theory Paper		2		
IKS Theory Paper		2	50	

Abbreviations:

OE : Generic/ Open Electives

SEC: Skill Enhancement Courses

IKS: Indian Knowledge System

OJT: On Job Training: Internship/ Apprenticeship

CEP: Community engagement and service

RM: Research Methodology

VSEC/VSC: Vocational Skill and Skill Enhancement Courses

AEC: Ability Enhancement Courses:

VEC: Value Education Courses

FP: Field: projects,

CC: Co-curricular Courses

RP: Research Project

Gondwana University, Gadchiroli.
NEP 2020 U.G. PROGRAMME (FROM SESSION 2024-25)

Faculty Name :Science and Technology

Programme Name: UG Zoology

SEM -I

Core	Paper name	Theory / Practical	Teaching Scheme			Credit	Dur atio n of Exa m	Examination Scheme				
			Theory	Practic al	Total			Max. Marks		Total	Minimum Marks	
								UA	CA		Theory	Prac tical /CA
Major (DSC) (2x1) 2	Life and Diversity of Animal (Non- chordata- Protozoa to Annelida):	T	2		2	2	2	40	10	50	20	5
Practi cal (2x1) 2	Life and Diversity of Animal (Non- chordata- Protozoa to Annelida):	Pract		4	4	2	4	30	20	50	15	10
OE (2) (2x1) 2	1. Sericulture 2. Apiculture (Select any one)	Th Th	2		2	2	2	40	10	50	20	5
VSC (2x1) 2	Advanced Laboratory Practical-I	Pract		4	4	2	4	30	20	50	15	10
SEC (2x1)2	Clinical Instrument Technology-I	Th	2	-	2	2	2	40	10	50	20	10
VEC (2x1) 2	Environmental Studies	Th	2		2	2	2		50	50	20	10
AEC (2x1) 2		Th	2			2						
IKS (2x1) 2		Th	2		2	2		40	10	50	20	10
NSS/ NCC/ Sports		Th /Pr ac		4	4	2		50		50		

Core Course prerequisite: To study Zoology in undergraduate, student must have studied Biology or equivalent subject in Class 12.

GONDWANA UNIVERSITY, GADCHIROLI
NEP 2020 SYLLABUS
PROGRAMME- BACHELOR OF SCIENCE (B.Sc), SEMESTER-I
SUBJECT- ZOOLOGY, THEORY (CREDITS 2)
DISCIPLINE CORE (DSC) PAPER I

Semester- I, BSc Zoology
Core Course Content

Course Title/Code: ANIMAL DIVERSITY OF NON-CHORDATE (PROTOZOA TO ANNELIDA)	Course Credits: 2/ 50 Marks
Course Code: UG01STZOO01	T-per week: 2
Total Contact Hours: 30 for Theory	Duration of Theory Exam: 2 Hour
Theory Marks :40	Assessment Marks: 10

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

Unit 1: A) Phylum -Protozoa (8 Periods)

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

B) Phylum-Porifera

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

Unit 2: C) Phylum-Cnidaria (8 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: D) Phylum-Platyhelminthes (8 Periods)

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

E) Phylum-Nemathelminthes

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

Unit 4: F) Phylum-Annelida (8 Periods)

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

Recommended Books -

Structure and function of Invertebrates

1. Hyman L.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. Russet Hunter W.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. Kudo R.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. Russel W.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. Gtryrt V. and Graham A. A Functional anatomy of Invertebrates. Academic press, New York.
15. Backlemiccher W.N. Principles of comparative anatomy of Invertebrates Oliver and Boyed Edinberg.
16. Hadisi J. The Evolution of Metazoa. Pergamon Press, Oxford.
17. Dales R.P. Annelids, Hutchinson, London.
18. Green J. Biology of Crustacea, Wither by, London.
19. Morton J. E. Mollusca, Hutchinson, London.
20. Nichols D. Echinodermata, Hutchincon, London

GONDWANA UNIVERSITY, GADCHIROLI

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

SUBJECT- ZOOLOGY, PRACTICAL I (CREDITS 2)

Course Title/Code: ANIMAL DIVERSITY OF NON-CHORDATE (PROTOZOA TO ANNELIDA)	Course Credits: 2/ 50 Marks
Course Code: UG01STZ001	P---per week: 4
Total Contact Hours: 60 for Practical	Duration of Theory Exam: 5 Hour
Practical Marks :30	Assessment Marks: 20

I. Classification of Specimen (uptoclass)

Protozoa – *Entamoeba*, *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, Nerving of earthworm

Distribution of Marks - Total Marks - 30

	Practical examination - 30	Duration - 4 Hours
I.	Anatomical observation	05
II.	Identification and comment on spot (3 specimen & 2 slides)	10
III.	Field work (Submission)	05
IV.	Permanent stained micro-preparation (Comment + Diagram)	05
V.	Viva - Voce	03
VI.	Class record	02
		Total-----30

Scheme for Practical Assignment Marks - 20

Que. 1. General Characters, Classification and Life cycle -----	10
Que 2. Preparation of model or Chart or Poster -----	05
Que 3. Submission of Tour diary -----	05

Web References: Anatomy of earthworm: The dissection works (CD);
www.scienceclass.com, www.neosci.com Cockroach dissection- www.ento.vt.edu

Pedagogy: Lectures, Presentations, videos, Labs, Assignments, Tests, Individual or group
Field oriented Project Report on, Visit to one research institute/ one wild life sanctuary /
museum / zoo.

GONDWANA UNIVERSITY, GADCHIROLI
NEP SYLLABUS
PROGRAMME- BACHELOR OF SCIENCE (B.Sc), SEMESTER-I
SUBJECT- ZOOLOGY, THEORY (CREDITS 2)
I Semester BSc Zoology
OE

Course Title/Code: 1) Vermiculture	Course Credits: 2 each / 50 Marks each
Course Code: UG01STZOO02	T- per week: 2
Total Contact Hours: 30 for Theory	Duration of TH Exam: 2 Hour
Theory papers Marks 40	Internal Assessment: 10 each

Name of Paper- VERMICULTURE

Unit – I **(8 Periods)**

- Introduction Vermiculture, Vermicompost and Vermiwash
- Earthworm species for vermicompost production
- Identification of earthworms species
- Worm related opportunities for farmers – Potential income diversification – sale of vermicompost, sale of worms.

Unit – II **(8 Periods)**

- Essential things for vermicompost production
- Common bedding materials and worm feed stocks
- Method of vermiwash production and their uses
- Moisture and aeration in vermicompost production

Unit –III **(8 Periods)**

- Vermicompost pit construction, Calculating rates of reproduction of worms
- Other important parameters for vermicompost production and vermiculture- PH, Salt Content, Urine content.
- Methods of Harvesting worms – Manual methods, Self Harvesting methods
- The value of vermicompost – Ability to stimulate plant growth, level of beneficial microorganisms, level of plant available nutrients, ability to repel pests.

Unit –IV **(8 Periods)**

- Pests and diseases of worms – moles, birds, centipedes, ants, mites, protein poisoning of worms.
- Vermicompost systems – Windrows, top feed windrows, beds or bins, flow through reactors.
- Vermicomposting and water quality issues, climate change factors, nutrient profile of vermicompost.
- Micronutrients in vermicompost and Growth promoter as vermiwash

Recommended Books :

- Vermicomposting - P.K.Gupta
- Earthworm in Agriculture – Talashikar and Dsoahni
- Organic Farming - A.K.Dahama
- Organic Farming – A.K.Sharma
- Soil Management and Organic Farming – S.C.Panda
- Bio-Fertilizer – A.K.Sharma
- Vermibiotechnology – L.S.Ranganathan
- Manual on Farm Vermicomposting and Vermiculture – Glenn Munroe, Organic Agriculture Centre of Canada.
- Myers Ruth (1969). The ABC's of Earthworm Business, Shields Publication, Wisconsin, USA, 64 pp.

GONDWANA UNIVERSITY, GADCHIROLI
NEP SYLLABUS
PROGRAMME- BACHELOR OF SCIENCE (B.Sc), SEMESTER-I
SUBJECT- ZOOLOGY, THEORY (CREDITS 2)
OE

Course Title/Code: Poultry Farming	Course Credits: 2 each / 50 Marks
Course Code: UG01STZOO02	T- per week: 2
Total Contact Hours: 30 for Theory	Duration of TH Exam: 2 Hour
Theory papers Marks 40	Internal Assessment: 10 each

Name of Paper- 2) POULTRY FARMING

Unit I (Introduction to poultry)

(8 Periods)

- 1.General introduction to poultry farming – Definition of poultry, past and present scenario of poultry industry in india.
- 2.Principles of poultry housing, poultry house, system of poultry farming.
- 3.Management of chick, growers and layers, Management of Broilers.
- 4.Preparation of project report for banking and insurance.

Unit II (Feed, livestock health and harvesting eggs)

(8 Periods)

1. Poultry feed management – principles of feeding, nutrient requirement for different stages of layers and broilers, feed formulation and method of feeding.
2. Poultry of diseases – viral, bacterial, fungal and parasitic (two each) symptom, control and management, vaccination programme.
3. Selection, care and handling of hatching egg, method of hatching.
4. Brooding and rearing, sexing of chick, farm and water hygiene

Unit III (Manufacturing of Egg product)

(8 Periods)

1. Physical and chemical changes in the stored Egg.
2. Functional properties of Egg
3. Product – Egg powder, liquid egg, restaurant products.
4. Industrial use of egg and egg product.

Unit IV (Quality of Egg and Sanitation)

(8 Periods)

1. The nutritive value of Egg after cooking
2. Nutritive value of Egg, other advantage of Egg in India and developed countries
3. Types of detergent and sanitizers for controlling Egg Quality and poultry products
4. Sources of contamination of Eggs and its product and prevention method.

Reference

1. Poultry Farming (in Bengali) by Dr Nilotpal Ghosh (Kalyani Publishers, New Delhi)
2. Sahaj Kathai Vigyan Vittik Murgee Palan OSwasthya Raksha (Scientific Poultry Rearing and Health Care in Simple Language, in Bengali) by Dr Nilotpal Ghosh (Mehantati Prokashani, Hooghly)
3. 3. Poultry Production in India (in English) by R.P. Sharma, R.N. Chatterjee, S.V. Rama Rao and S.R. Sharma (Indian Council of Agricultural Research, New Delhi)
4. 4. Poultry Science and Practice: A Text Book (in English) by N. Ghosh (CBS Publishers & Distributors Pvt Ltd, New Delhi)
5. Poultry Production and Management (in English) by J. Prasad (Kalyani Publishers, New Delhi)
6. Poultry Production (in English) by R.A. Singh (Kalyani Publishers, New Delhi)
7. Poultry Diseases (in English) by J.L. Vegad (International Book Distributing Co., Lucknow)
8. Poultry Diseases, Diagnosis and Treatment (in English) by H.V.S. Chauhan (Wiley Eastern Ltd., New Delhi)

GONDWANA UNIVERSITY, GADCHIROLI

NEP SYLLABUS

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

SUBJECT- ZOOLOGY, THEORY (CREDITS 2)

VSC Vocational Skill Course

Semester-I BSc Zoology

VSC

Course Title/Code: 1. Advanced Laboratory Practical-I	Course Credits: 2/ 50 Marks
Course Code: UG01STZOO03	Practical per week: 4
Total Contact Hours: 60 period for Practical	Practical exam Duration of : 5 Hour
UA Practical Marks -30	CA Marks -20

Name of Paper- Advanced Laboratory Technology-I

Unit – I (08 Periods)

Basic Laboratory Principles and Procedures: Types of laboratories, Decontamination, Disinfection, laboratory safety, First aid measures, factors responsible for productivity.

Unit – II (08 Periods)

Instruments techniques: Types of Microscopes, Use of pH meter, Colorimeter, Plankton Counter, BOD, COD, Tissue fixation, embedding in paraffin, microtomy and slide preparation of any endocrine gland and Double Staining.

Unit – III (08 Periods)

Instruments: Balances, Hot plate and magnetic stirrer, Centrifuge, Hot air oven, colorimetry and photometry instruments. Balance (Digital and Analytical,

Unit – IV (08 Periods)

Laboratory techniques: End point reaction method, PCR, Spectrophotometry, , Immuno essay, fluorometry, flame photometry, RIA, ELISA

Practical

1. Identification and handling of Instruments
2. Identification of Instruments
3. Demonstration for decontamination and disinfection.
4. Determination of unknown concentration of colour/ions solution by using colorimeter/Flame photometer/Spectrophotometer. (Major)
5. Double Staining Process.
6. Isolation of amino acids by using Electrophoresis/ Chromatography (Major)
7. Field Visit to any laboratory

Practical Question Paper and Distribution of Marks

Time: 4 Hrs.

Max. Marks: 30

Practical Distribution of Marks

1. Identification of spots (each Spot 2 Marks).....	08
2. Major experiment.....	08
3. Minor Experiment	04
4. Field visit report	03
5. Class Record	04
6. Viva Voce	03

Scheme for Practical Assignment Marks 20

Que. 1. Laboratory safety, First aid measures -----	08
Que 2. Types of Microscopes-----	05
Que. 3 Viva voce -----	04
Que 4. Field visit report -----	03

GONDWANA UNIVERSITY, GADCHIROLI
NEP SYLLABUS
PROGRAMME- BACHELOR OF SCIENCE (B.Sc), SEMESTER-I
SUBJECT- ZOOLOGY, THEORY (CREDITS 2)
SEC Skill enhancement Course
SEC

Course Title/Code: Clinical Instrumentation Technology-I	Course Credits: 2/ 50 Marks
Course Code: UG01STZ0004	Th per week: 2
Total Contact Hours: 30 period	Exam Duration of : 2 Hour
Theory Marks -40	CA Marks -10

Name of Paper- Clinical Instrumentation Technology-1

Unit-I

(08 Periods)

1. Fundamentals of medical instrumentation. Sources of biomedical signals Generalized medical instrumentation block diagram. Medical electrodes -ECG, EEG, EMG, Defibrillator Medical transducers: Body temperature, Blood pressure, respiration rate
2. Classification of Medical instruments based on: Application - (diagnostic, therapeutic, Imaging, analytical) Physiological parameter and bio-potential Biological system Different departments in the hospital.

Unit – II**(08 Periods)**

1. Study of clinical instruments based on application - Electro-cardiograph (ECG) machine, ECG block diagram, Bipolar and unipolar leads, Phono cardiograph, Electro-encephalograph (EEG).
2. Working of clinical instruments based on application - Electro-myograph (EMG) machine. 10-20 electrode placement system, EEG readout devices,

Unit – III**(08 Periods)**

1. Fundamentals of X-ray machine, CT-Scan machine, Properties of ultrasound, Ultrasonic foetal monitors.
2. Bio-feedback Instrumentation, Echo-encephalography, Echo-cardiograph, Colour Doppler ultrasound machine, Electro-surgery machine (cautery)

Unit – IV**(08 Periods)**

1. Types of test - Blood cell, working of Blood Cell Counter, Bio chemistry analyzer.
2. Working and application of Auto analyser, Blood gas analyser, Hemo-dialysis machine, Defibrillator Machine, Muscle stimulators

Suggested List of Books

1. Handbook of biomedical instrumentation, R. S. Khandpur , Tata McGraw Hill, New Delhi
2. Introduction to biomedical equipment technology, Carr Joseph J.,Brown J.M, Pearson education,New Delhi
- 3 Biomedical instrumentation measurements . Lesli P Cromwell, Fred J. Weibell, Erich A. Pfeiffer, PHI Learning, New Delhi
4. Medical instrumentation application & design, John G. Webster, Editor, John Wiley and Sons, New Delhi
5. Medical Electronics, A. G. Patil, Excel Book, New Delhi

Scheme for Practical Assignment**Marks 10**

Que. 1. Study of structure and application of any two major instruments --	06
Que 2. Viva voce -----	02
Que 3. Submission -----	02

Gondwana University, Gadchiroli
SCHEME AND SYLLABUS
Under National Education Policy 2020
Faculty- Science and Technology
Subject- Zoology
B.Sc. Semester –II
Session 2024-25

Gondwana University, Gadchiroli
SCHEME AND SYLLABUS
Under National Education Policy 2020
B.Sc. Semester –II with Zoology
Program Code GUG STUGZOO

UG	Semester -I	Credit	Marks	Hours
DSC Theory Paper	Life And Diversity of Animals (Non-Chordata-Arthropoda To Hemichordata) Course Code: UG02STZOO01	2- Theory	50	L-30 hrs
Practical	Life And Diversity of Animals (Non-Chordata-Arthropoda to Hemichordata)	2 Practical	50 -	P-60 hrs -
Open Elective (OE) Theory Paper	1. Apiculture, Course Code: UG02STZOO02 2. Sericulture Course Code: UG02STZOO02 3.Environmental Science Course Code: UG02STZOO02	2 Theory	50 2	T-30 hrs
VSC Practical	Advanced Laboratory Practical-II Course Code: UG02STZOO03	2 Practical	50	P-60 hrs
SEC Theory Paper	Clinical Instrumentation Technology Practical-II Course Code: UG02STZOO04	2 Theory	50	T-30 hrs
VEC Theory Paper	Indian Democracy, Good Governance	2	-	-
AEC	-	2	-	-

GONDWANA UNIVERSITY, GADCHIROLI
NEP SYLLABUS
PROGRAMME- BACHELOR OF SCIENCE (B.Sc), SEMESTER-II
SUBJECT- ZOOLOGY, THEORY (CREDITS 2)
DISCIPLINE CORE (DSC) PAPER I

Core Course Content

Course Title/Code: ANIMAL DIVERSITY OF NON-CHORDATE (Arthropoda to hemichordate)	Course Credits: 2/ 50 Marks
Course Code: UG02STZOO01	T per week: 2
Total Contact Hours: 30 for Theory	Duration of Theory Exam: 2 Hour
Theory Marks :40	Assessment Marks: 10

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

Unit 1: Phylum-Arthropoda **(8 Periods)**

- 1.General characters and classification up to classes
- 2.Periplaneta - External Morphology, Digestive system, Circulatory system, Nervous system, Reproductive system and Sense organs.

Unit 2: Phylum-Mollusca **(8 Periods)**

- 1.General characters and classification up to classes
- 2.Pila- External Morphology, Digestive system, Nervous system, Reproductive system, Copulation and Fertilization.
- 3.Pearl formation.

Unit 3: Phylum-Echinodermata **(8 Periods)**

- 1.General characters and classification up to classes
- 2.Asterias -External Morphology, Endoskeleton, Digestive system, Water vascular system,Bipinnaria and Brachiolaria larva.
- 3.Regeneration and Autotomy in Echinoderm.

Unit 4: Phylum Hemichordata **(8 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.

Recommended Books

1. Hyman L.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. Russet Hunter W.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. Kudo R.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. Russel W.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.

GONDWANA UNIVERSITY, GADCHIROLI

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

SUBJECT- ZOOLOGY, PRACTICAL I (CREDITS 2)

I. Observation, classification (up to 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, Bipinnaria, 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, Honeybee, Salivary gland and trachea of Cockroach, Redula of Pila, and Pedicellariae of starfish.

Distribution of Marks - Total Marks - 30

Practical examination - 30	Duration - 5 Hours
1. Anatomical observation	05
2. Identification and comment on spot (3 specimen & 2 slides)	10
3. Field work (Submission)	05
4. Permanent stained micro-preparation (Comment + Diagram)	04
5. Viva - Voce	03
6. Class record	03
	Total-----30

**Scheme for Practical Assignment
Marks - 20**

- Que. 1. General Characters, Classification and Life cycle -----10
Que 2. Preparation of model or Chart or Poster ----- 05
Que 3. Visit to one research institute (Report)----- 05

Web References: Anatomy of earthworm: The dissection works (CD);
www.scienceclass.com, www.neosci.com Cockroach dissection- www.ento.vt.edu

Pedagogy: Lectures, Presentations, videos, Labs, Assignments, Tests, Individual or group
Field oriented Project Report on, Visit to one research institute/ one wild life sanctuary /
museum / zoo.

GONDWANA UNIVERSITY, GADCHIROLI
NEP SYLLABUS
PROGRAMME- BACHELOR OF SCIENCE (B.Sc), SEMESTER-II
SUBJECT- ZOOLOGY, THEORY (CREDITS 2)
Open Elective (OE)
Semester- II, BSc Zoology
OE

Course Title/Code: Apiculture	Course Credits: 2 / 50 Marks
Course Code: UG02STZOO02	T- per week: 2
Total Contact Hours: 30 for Theory	Duration of TH Exam: 2 Hour
Theory papers Marks 40	Internal Assessment: 10

Name of Paper- 1) APICULTURE

UNIT – I

(8 Periods)

1. To study the morphology of Honeybees and Identification of different species and classes of Honey bees.
2. To Study different stages in life cycle of Honey bees.
3. Identification of Queen cells, Drone cells & Brood.
4. Bee keeping: Tools and Equipment.

UNIT – II

(8 Periods)

1. Basic requirements of Tools for starting bee keeping:
2. Introduction to types of bee
3. Bee keeping unit - Handling of frames with colonies
4. Honey Processing and Bee Hive Products

UNIT – III

(8 Periods)

1. Honey extraction & handling - Quality control standards - Honey testing kit.
2. Processing of honey. Other valuable by products of honey bees Bee venom & Royal jelly extraction.
3. Economics of bee keeping.
4. Economics in small scale and large scale bee keeping.

UNIT – IV

(8 Periods)

1. Economic Value of Commercial Beekeeping.
2. Preparing bankable bee keeping project:
3. Steps involved in starting a beekeeping project
4. Funding sources for beekeeping projects.

Recommended books

1. Reeling Technology Oxford & IBH Publishing Co. Pvt. Ltd., NewDelhi.

2. Roger, M (1990). The ABC and Xyz of Bee Culture: An Encyclopedia of Beekeeping, Kindle Edition
3. Shukla and Upadhyaya (2002). Economic Zoology, Rastogi Publishers
4. Yadav Manju (2003). Economic Zoology, Discovery Publishing House.
5. Jabde Pradip V (2005). Textbook of applied Zoology, Discovery Publishing House, New Delhi.
6. Cherian & Ramachandran Bee keeping in-South Indian Govt. Press, Madras.

GONDWANA UNIVERSITY, GADCHIROLI
NEP SYLLABUS
PROGRAMME- BACHELOR OF SCIENCE (B.Sc), SEMESTER-II
SUBJECT- ZOOLOGY, THEORY (CREDITS 2)
Open Elective (OE)
Semester-II BSc Zoology
OE

Course Title/Code: Sericulture	Course Credits: 2 / 50 Marks
Course Code: UG02STZOO02	T- per week: 2
Total Contact Hours: 30 for Theory	Duration of TH Exam: 2 Hour
Theory papers Marks 40	Internal Assessment: 10

Name of Paper- 2) SERICULTURE

Unit – I

(8 Periods)

1. Types of silkworms.
2. Races & classification of silkworm
3. Sericulture industry in different states
4. Economic important of Silkworm

Unit II

(8 Periods)

1. Mulberry silkworm structure and life cycle
2. Tasar silkworm structure and life cycle
3. Eri silkworm structure and life cycle
4. Muga silkworm structure and life cycle

Unit III

(8 Periods)

1. Silkworm Rearing (C.S.B. proposed model rearing house)
2. Rearing appliances, disinfection, disinfectants, bed cleaning, feeding of worms
3. Maintaining optimum condition of rearing, brushing, frequency of spacing, care during mounting

4. Mounting and moutage, process of spinning, cocoon harvesting. Rearing method: chawki rearing or young age and late age worm rearing.

Unit IV

(8 Periods)

1. Breeding station (P4, P3, P2, P1 station) and grainage management. Diapausing and Non-diapausing eggs, methods of egg storage, incubation, embryonic incubation
2. Industrial seed, reproductive seed, certified seed. Transportation of seed eggs.
3. Cocoon stifling (sun drying, steam stifling, hot air stifling), storage of cocoon, sorting of cocoons. Concept of difference reeling machines, reeling operation, reeling end formation.
4. Degumming, bleaching, dyeing of silk yarn Twisting, Reeling, Re-reeling, lacing, skeining and testing of raw silk material. Weaving of silk.

Recommended books

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

NEP SYLLABUS

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

SUBJECT- ZOOLOGY, THEORY (CREDITS 2)

Semester-II BSc Zoology

OE

Course Title/Code: Environmental Biology	Course Credits: 2/ 50 Marks
Course Code: UG02STZOO02	T per week: 2
Total Contact Hours: 30 for Theory	Duration of Th Exam: 2 Hour
Theory Marks -40	Assignment Marks -10

Name of Paper- 3) ENVIRONMENTAL BIOLOGY

Unit I

(8 Periods)

1. Ecosystem - definition and type
2. Detailed study of pond ecosystem.
3. Producers, consumer, and decomposer.
4. Energy flow in ecosystem, food chain, food web and pyramids

Unit II**(8 Periods)**

1. Biodiversity and its conservation.
2. Genetic diversity, species diversity.
3. Causes of reduction, methods of conservation.
4. Present status of biodiversity in India, Conservation project, Project Tiger, National parks, and sanctuaries (Nagzira, Tadoba, Kaziranga).

Unit III**(8 Periods)**

1. Basic components of the Environment
Atmosphere: Major zones and importance, composition of air.
2. Hydrosphere: Global distribution of water, physicochemical characteristic of water.
3. Lithosphere: Types of rocks, formation of soil.
4. Renewable and non- renewable energy sources.

Unit IV**(8 Periods)**

1. Sources, effects of air pollution with special reference to Acid rain,
2. Global warming and Greenhouse effect, Control measures.
3. Sources, effects, and control measures of water pollution
4. Sources, effects, and control measures of Noise pollution
5. Sources, effects, and control measures of Heavy metal pollution (lead, mercury and cadmium).

Recommended Books

1. Ashthana D.K. – Environmental Problem & Solution
2. Agrawal K.C. – Environmental Biology
3. Agrawal K.C. - Biodiversity
4. Mukharjee – Environmental Biology
5. S. Arora – Fundamentals of Environmental Biology
6. Sharma – Ecology & Environmental Biology
7. Verma P.S. & Agrawal V.K. – Environmental Biology, S. Chand.
8. Trivedi & Rao – Air Pollution
9. Chapman & Reiss – Ecology-Principles and Applications, Cambridge.
10. Chatterjee B – Environmental Laws-Implementation and Problems.
11. . Sharma P.D. – Environmental Biology, Rastogi Publication, Meerut.
12. Trivedi R.K. – Hand Book of Environmental Laws, Rules, Guidelines, Compliances and Standards, Enviromedia.
13. . Odum E.P. and Barret – Fundamentals of Ecology, Thomson.
14. . Smith R.L. – Ecology and Field Biology, Harper Collins.
15. D.N. Saksena &D.M. Gaidhane – Environmental Biology, Studium Press (India)

GONDWANA UNIVERSITY, GADCHIROLI

NEP SYLLABUS

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

SUBJECT- ZOOLOGY, THEORY (CREDITS 2)

VSC Vocational Skill Course

Semester-II BSc Zoology

VSC

Course Title/Code: Advanced Laboratory Practical-II	Course Credits: 2/ 50 Marks
Course Code: UG02STZOO03	Practical per week: 4
Total Contact Hours: 60 period for Practical	Practical exam Duration of : 5 Hour
Practical Marks -30	CA Marks -20

Name of Paper- ADVANCED LABORATORY TECHNOLOGY-II

Unit -I

(8 Periods)

Basic principle, Desk top centrifuges, High Speed Centrifuges, The Ultracentrifuge, Analytical Ultracentrifuge, Rotors- Vertical tube, swinging basket, Density gradient centrifugation.

Unit- II -

(8 Periods)

Techniques of chromatography- Paper & thin layer chromatography, Column chromatography – Types of chromatography – adsorption, partition, gel filtration chromatography, ion exchange, affinity, HPLC.

Unit-III-

(8 Periods)

Basic principal of electrophoresis, types of electrophoresis- free flow, zone, cellulose acetate electrophoresis, gel electrophoresis, electrophoresis procedure, applications of gel electrophoresis, discontinuous gel electrophoresis, high voltage electrophoresis.

Unit-IV-

(8 Periods)

Determination of Gram staining, To Determination of Acid fast staining (Ziehl Neelsen staining) , Determination of Hanging drop method, Determination of Rheumatoid Arthritis (RA) test, Determination of Widal test, Determination of Rapid Plasma Reading (RPR) test. sickling test and Determination of Plasma Haemoglobin.

Recommended Books:

1. Bancroft's Theory and Practice of Histological Techniques, 7th Edition, Elsevier Publications
2. Bishop(2013), Clinical Chemistry, 7th edition, WileyPublications
3. C F A Culling,(1974), Handbook of Histopathological and Histochemical
4. Godkar.B. Praful,(2016) Textbook of MLT, 3rd edition, Bhalani Publications
5. Godkar.B. Praful,(2016) Textbook of MLT, 3rd edition,Bhalani Publications
6. Harshmohan (2017), Textbook of Pathology, 7th edition, Jaypee Publications
7. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011), 2nd edition, Elsevier
8. Mukherjee .L.K(2017), Medical Laboratory Technology,Vol.1-3, 3rd edition, Tata Mcgraw Hill
9. Ochei J & Kolhatkar A(2000), Medical Laboratory Science: Theory & Practice, 3rd edition, Mcgraw Hill Education
10. Singh & Sahni, (2008),Introductory Practical Biochemistry, 2nd edition, Alpha science
11. Singh Tejinder,(2014), Atlas & Textbook of Haematology, 3rd edition, Avichal Publications

Practical

1. Identification and handling of Instruments
2. Demonstration for decontamination and disinfection.
3. Determination of Gram staining (Major)
4. Techniques of chromatography
5. Determination of Widal test, Determination of Rapid Plasma Reading (RPR) test. sickling test and Determination of Plasma Haemoglobin. Field Visit to any laboratory
6. Electrophoresis, types of electrophoresis

Marks Distribution for Practical:

1. Major Experiment -----	10
2. Minor Experiment-----	05
3. Minor Experiment -----	05
4. Visit to Pathology laboratory -----	05
5. Class record -----	05
Total Marks	30

Scheme for Practical Assignment Marks 20

Que. 1. Study of structure and application of any two major instruments -----	10
Que 2. Viva voce -----	05
Que 3. Submission-----	05

GONDWANA UNIVERSITY, GADCHIROLI
NEP SYLLABUS
PROGRAMME- BACHELOR OF SCIENCE (B.Sc), SEMESTER-II
SUBJECT- ZOOLOGY, THEORY (CREDITS 2)
SEC

Course Title/Code: Clinical Instrumentation Technology-II	Course Credits: 2/ 50 Marks
Course Code: UG02STZ0004	Theory per week: 2
Total Contact Hours: 30 period for Theory	Exam Duration: 2 hrs
Theory Marks -40	CA Marks -10

Paper -CLINICAL LABORATORY TECHNOLOGY-II

UNIT – I

(8 Periods)

1. Definition and concepts of reference values and related terminology, safety measures
2. Procedure for specimen collection and procedure for collecting data.
3. Analytical goals. Performance criteria for laboratory tests.
4. Criteria to be used in evaluating and selecting appropriate clinical laboratory instrumentation.

UNIT – II

(8 Periods)

1. Principles and practice of - Blood Grouping, Maintenance of Blood Bank Records
2. Principles Blood Transfusion, Blood Donation, Blood Collection, Storage & Transport,
3. Hanging drop method to study bacterial motility, Introduction, Protozoan infections, Helminths
4. Identification of amoeba, Giardia, plasmodium, leishmania, trypanosome, ascaris, ancyclostoma, liver fluke, Tania solium.

UNIT – III

(8 Periods)

1. Principle and methods of staining of Blood smears and bone marrow smears.
2. Supravital stain. Reticulocyte count, Heinz bodies.
3. Thrombocytopenia, platelet function test, platelet count.
4. Clot retraction test. Platelet factor III Test. Gram staining for bacteria

UNIT- IV

(8 Periods)

1. Urine examination - Physical, Chemical & Microscopic,
2. Examination of body fluids - cell counts, Semen analysis,

3. Blood sugar and its types, Test for general sugar, protein and lipid
4. Compatibility Testing, Blood Components, Blood Transfusion Reactions. Stool Examination

Recommended Books:

1. Mukherjee K. L, 2017, Medical Laboratory Technology, Procedures Manual for Routine Diagnostic Tests, 3rd edition, McGraw Hill Education, Tennessee, United States.
2. Harold Varley, 2005, Practical Clinical Biochemistry, 4th edition, A manual of laboratory Diagnostic tests Fischback c) Practical clinical Biochemistry, CBS, Karnataka, India.
3. Burtis, 2012, Tietz's Text book of Clinical Chemistry and Molecular Diagnostics, 5th edition, Elsevier, Amsterdam, Netherlands.
4. Kalpan, 2003, Clinical chemistry – Theory, Analysis, Correlation, 4th edition, CBS Publishers and Distributors Pvt. Ltd, Bangalore, India.
1. West & Todd, 1966. Text Book of Biochemistry, 4th Edition, Macmillan, New York City, United States.
2. Sood Ramnik, 2015, Text book of Medical Laboratory Technology, 2nd edition, Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi, India.
3. Thomas M. Devlin, 2010, Text book of Biochemistry with clinical correlation, 7 Th edition, John Wiley & Sons, New Jersey, United States.
4. Harold Varley, 2005, Practical Clinical Biochemistry, 4th edition, A manual of laboratory Diagnostic tests Fischback c) Practical clinical Biochemistry, CBS, Karnataka, India.

WEB REFERENCE:

1. <https://www.studocu.com/en-gb/document/university-of-nottingham/clinical-laboratory-sciences-i/complete-lecture-notes-clinical-laboratory-sciences-cls/132920>
2. https://www.academia.edu/32040390/LECTURE_NOTES_For_Medical_Laboratory_Students
3. https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/med_lab_tech_students/medicallabtechnology.pdf
4. <https://www.studypool.com/documents/4702704/medical-laboratory-technology-lecture-notes>
5. <https://fdocuments.in/download/for-medical-laboratory-technology-students-lecture-notes-for-medical-laboratory>

**Scheme for Assignment
Marks 10**

- | | |
|---|----|
| Que. 1. Study of structure and application of any two major instruments ----- | 06 |
| Que 2. Viva voce ----- | 02 |
| Que 3. Submission----- | 02 |

B.SC. SEMESTER I &II

Model Question Paper

DSC/OE/SEC

Time: 2 Hrs

Maximum Marks: 40

Instructions to Candidates:

1. All sections/parts are compulsory.
2. Draw neat labelled diagrams wherever necessary.
3. There will be five descriptive questions, each carrying 8 marks.

Qu. I. Long Question Unit 1 (8x1= 8)

OR

A) Short Question (4x2= 8)

B) Short Question

Qu. 2. Long Question Unit II (8x1= 8)

OR

A) Short Question (4x2= 8)

B) Short Question

Qu. 3. Long Question Unit III (8x1= 8)

OR

A) Short Question (4x2= 8)

B) Short Question

Qu.4. Long Question Unit IV (8x1= 8)

OR

A) Short Question (4x2= 8)

B) Short Question

Qu. 5. Answer any Four of the following (2x4= 8)

1. Unit I
2. Unit II
3. Unit III
4. Unit IV