

DEPARTMENT OF ZOOLOGY

COURSE CURRICULUM & MARKING SCHEME

M.Sc. ZOOLOGY

Semester - I

SESSION : 2022-23



ESTD: 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A⁺, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

Phone : 0788-2212030

Website - www.govtsciencecollegedurg.ac.in, Email – autonomousdurg2013@gmail.com

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M. Sc. ZOOLOGY

Semester – I

SESSION: 2022-23



GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Grade- 'A+', CPE Phase-III, DBT-Star College

Ph./ Fax: 0788-2359688,

Website: www.govtsciencecollegedurg.ac.in

Department of Zoology
Govt. V.Y.T. PG Autonomous College, Durg (C.G.)
Session 2022-24

Learning Outcome Based curriculum for M. Sc. Zoology

Program Specific Outcome (PSO): M. Sc. Zoology

The programme enables the students:

- To comprehend knowledge of biology in a diversity of organisms encompassing different ecosystem levels
- To develop practical skills and ability to perform experiments and analysis through appropriate application of statistical tools and technologies to obtain accurate results and thus gain the ability to solve problems.
- To develop cognitive and hands-on skills in advanced scientific methods and their uses in applied and advanced zoological sciences
- To connect, comprehend and apply the value of the diversity and complexity of animal life as revealed through studies on morphology, physiology, cellular and molecular biology and biochemistry.
- Acquire knowledge and critical analytical skills on different scientific arenas such as immunology, endocrinology, microbiology and genetics
- Be proficient at critical thinking, annotation and communication of scientific information and able to succeed in competitive examinations and interviews.

Name and Signatures

Chairperson /H.O.D University Nominee Subject Expert Subject Expert Representative from Industry/entrepreneur Student representative Other Prof. from Science faculty	Departmental members 1. 2. 3. 4. 5. 6. 7. 8.
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Syllabus for M. Sc. Zoology by the Members of Board of Studies for session 2022 -23 and 2023-24

Semester I

(MZO 101) Paper I: Biosystematics and Taxonomy	(MZO 102) Paper II: Structure and Functions in Invertebrates
(MZO 103) Paper III: Endocrinology	(MZO 104) Paper IV: Cell and Molecular Biology
MZOL 01, Lab Course I: Based on Paper I and II	MZOL 02, Lab Course II: Based on Paper II I and IV

Semester II

(MZO 201) Paper I: Population Genetics and Evolution	(MZO 202) Paper II: Reproductive Biology
(MZO 203) Paper III: Tools and Techniques in Biology	(MZO 204) Paper IV: Environmental Physiology
MZOL 03, Lab Course I: based on paper I and II	MZOL 04, Lab Course II: Based on paper III and IV

Semester III:

(MZO 301) Paper I: Comparative Anatomy of Vertebrates	(MZO 302) Paper II: Biostatistics
(MZO 303) Paper III: Ichthyology	(MZO 304) Paper III B: Animal Behaviour
MZOL 05, Lab Course I: Based on Paper I and II	MZOL 06, Lab Course II: Based on Paper III and IV

Semester IV:

(MZO 401) Paper I: Insect Biology	(MZO 402) Paper II: Animal Physiology
(MZO 403) Paper III : Population Ecology	(MZO 404A) Paper IV A: Fisheries and Aquaculture (Elective)
(MZO 404B) Paper IV B: Parasitology (Elective)	(MZO 404C) Paper IV C: Economic Zoology (Elective)
(MZO 404D) Paper IV C: Sericulture (Elective)	
MZOL 07, Lab Course I: Based on Paper I, II and III	MZOL 08, Lab Course II: Project Work
Any one elective course to be selected as paper IV	

Project Work: A project work to be done by each student based on theoretical and experimental works under allotted supervisor from the department. The project work shall be initiated at the beginning of semester IV.

Evaluation of Project work: The project report shall be submitted to the department with duly signed by the supervisor and the Head of the institution within stipulated time. Evaluation of the projects shall be done by external examiner through power point presentation by the students.

The Syllabus for M. Sc. Zoology is hereby approved for the sessions 2022 -23 and 2023-24

Name and Signatures

Chairperson /H.O.D <i>[Signature]</i>	Departmental members 1. <i>[Signature]</i> 25/7/22 2. <i>[Signature]</i> 3. 4. <i>[Signature]</i> 5. 6. 7. 8.
University Nominee <i>[Signature]</i>	
Subject Expert R-P- <i>[Signature]</i>	
Subject Expert <i>[Signature]</i> 25/7/22	
Representative from Industry/entrepreneur	
Student representative <i>[Signature]</i>	
Other Prof. from Science faculty <i>[Signature]</i>	

GENERAL INSTRUCTIONS FOR STUDENTS

1. The candidate has to obtain minimum 20% marks in each theory paper and internal assessment separately.
2. The candidate has to secure minimum 36% marks as an aggregate in order to pass that semester examination.
3. The internal assessment shall include class test, home assignment and seminar presentation.
4. In internal assessment, the marks taken into consideration will be the average of two tests (i.e. the class test and the home assignment) for each paper and shall of 20 marks.
 - a. The seminar shall be in lieu of class test and home assignment combined and shall be of 20 marks.
 - b. There shall be one seminar in each semester.
 - c. The marking of seminar shall be in terms of hard copy submission (10 marks) and presentation and open discussion (10 marks).

DIRECTIVES FOR STUDENTS, FACULTY AND EXAMINERS

1. There shall be three sections (Section A, B, and C) in each theory paper.
2. Section A shall contain very short answer type questions (One or two line answer) or objective type questions (fill in the blank, **not multiple choice questions**).
3. Section B shall contain short answer type questions with the limit of 250 words.
4. Section C shall contain long answer/ descriptive type questions. The students are required to answer precisely and the answer should not exceed the limit of 450 words.
5. The students are required to study the content mentioned in the curriculum exhaustively.

EVALUATION PATTERN

➤ **Theory 80 marks = 04 Credits**

Question Pattern	Unit I	Unit II	Unit III	Unit IV
Very short answer type questions. (2 Questions from each Unit without internal choice). Maximum in two sentences.	2X2 = 4 Marks	2X2 = 4 Marks	2X2 = 4 Marks	2X2 = 4 Marks
Short answer type question. Attempt one question from each unit with internal choice Word limit 200-250	1X4 = 4 Marks	1X4 = 4 Marks	1X4 = 4 Marks	1X4 = 4 Marks
Long answer type question. Attempt one question from each unit with internal choice. Word limit 400-450	1X12 = 12 Marks	1X12 = 12 Marks	1X12 = 12 Marks	1X12 = 12 Marks

Internal Assessment 20 marks = 01 credit

- Unit test – One class test in each theory paper comprising 20 marks. (containing two short answer type questions of 05 marks each and 05 objective type questions of 10 marks).
- Home assignments – Two long answer type questions from each theory paper containing 10 marks each. The answer should be prepared with the help of standard reference books. (The titles of those books, authors, year of publication and publishers details should be mentioned in an appropriate way, at the end of each assignment).
- Seminar presentations (Power point) – Comprising 20 marks.
Each student has to be prepare one seminar in each semester. The marking of seminar shall be in terms of hard copy submission (10 marks) and presentation and open discussion (10 marks).

➤ **Practical 200 marks = 08 credits**

Two practicals of 100 marks each

CREDIT ALLOTMENTS

- Theory Paper = 05 credits (04+01)
- Practical = 04/ 08 credits

TOTAL CREDITS/ SEMESTER

- Science Subjects with 04 theory papers (100 each) and one /two practical (100 each) – 20 + 08 = 28 credits
- Science Subjects with 05 theory papers (no practical-Maths) – 25 credits
- Arts Subjects with 04 theory papers – 20 credits
- Arts Subjects with 05 theory papers – 25 credits
- Commerce subject with 05 theory papers – 25 credits

TOTAL CREDITS / PROGRAMME

- 16 Theory + 08 Practical + Project work – 80 + 32 + 08 = 120 credits
- 20 Theory – 100 credits (Maths)
- 20 Theory – 100 credits (Arts and Commerce)
- 16 Theory – 80 credits (Arts)

Name and Signatures

Chairperson /H.O.D	Departmental members
University Nominee	1.
Subject Expert	2.
Subject Expert	3.
Representative from Industry/entrepreneur	4.
Student representative	5.
Other Prof. from Science faculty	6.
	7.
	8.

DEPARTMENT OF ZOOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
Approved syllabus for M. Sc. ZOOLOGY by the members of Board of Studies
for the Sessions 2022 -23 and 2023-24

Syllabus and Marking Scheme for Semester - I (2022-23)

Paper No.	Course Code/Title of the Paper	Marks Allotted in Theory		Marks Allotted in Internal Assessment		Credits
		Max.	Min.	Max.	Min.	
I	MZO 101/BIOSYSTEMATICS AND TAXONOMY	80	16	20	04	05
II	MZO 102/STRUCTURE AND FUNCTIONS IN INVERTEBRATE	80	16	20	04	05
III	MZO 103/ENDOCRINOLOGY	80	16	20	04	05
IV	MZO 104/CELL AND MOLECULAR BIOLOGY	80	16	20	04	05
	MZOL 01 Lab Course I BIOSYSTEMATICS, TAXONOMY & INVERTEBRATE	100	33			04
	MZOL 02 Lab Course II ENDOCRINOLOGY AND CELL & MOLECULAR BIOLOGY	100	33			04
	Total	520		80		28

04 Theory papers	-	320
04 Internal Assessment	-	80 (20 in each paper)
02 Practical	-	200
Total Marks	-	600
Credits	-	28

GOVT. V.Y.T. PG. AUTONOMOUS COLLEGE DURG
M. Sc. ZOOLOGY
Semester - I
SESSION 2022-2023
PAPER- I
Course Code - MZO 101
BIOSYSTEMATICS AND TAXONOMY

UNIT – I

Max. M. - 80

Min. M. - 16

- Definition & basic concept of biosystematics & taxonomy.
- History, Problems, aims and tasks in taxonomy.
- Taxonomy as a profession.
- Importance & application of biosystematics in biology.
- Chemotaxonomy.
- Cytotaxonomy.

UNIT – II

- Taxonomic attributes.
- Theories of biological classification (Essentialism, Nominalism, Empirism, Cladism and evolutionary classification).
- Species Concept - Typological, Nominalistic, Biological & evolutionary species concept, difficulties in application of biological species concept.
- Polytypic species.
- Speciation –Allopatric, sympatric & parapatric speciation, factors affecting speciation.

UNIT – III

- Taxonomic procedures.
- Taxonomic collection.
- Curing of animals & Process of Identification.
- Preservation of specimens.
- Taxonomic Keys - Types, merits & demerits.
- International code of Zoological Nomenclature (ICZN).
- Interpretation of rules of nomenclature.

UNIT – IV

- Hierarchy of categories.
- Bio-geographical zones of India.
- Origin and Types of biodiversity & ecotones.
- Threats of biodiversity.
- Biodiversity conservation practices (in-situ & ex-situ & gene banks).
- Molecular perspectives on conservation of biodiversity.
- Origin of reproductive Isolation (Prezygotic & Post zygotic mechanisms).

SUGGESTED READING MATERIALS - (ALL LATEST EDITION).

1. **Biosystematics & Taxonomy:** Dr.R.C.Tripathi, University Book House, JAIPUR.
2. **Theory & Practice of Animal Taxonomy:** V.C. Kapoor, 5th Edition Oxford & IBH Publishing Co.
3. **Principle of Animal Taxonomy:** G.G. Simpson, Oxford & IBH Publishing Co.
4. **Elements of Taxonomy:** Earnst Mayer.
5. **Biodiversity:** E.O. Vilson, Acadmic Press Washington DC.
6. **The Biology of Biodiversity:**M. Kato, Springer.
7. **Molecular Markers - Natural History & Evolution:** J.C. Avise.

Course Outcomes

After successful completion of these courses the student would be able:

- To understand the relevance of Biosystematics and its importance in resolving classical and applied research problems
- To understand the importance and applications of various species concepts and speciation in systematics; they will also be able to understand the merits and demerits of various schools of biological classification
- To versed with the collection and identification techniques and use of various tools in taxonomy as well as learn to use taxonomic keys as a cognitive aid
- To understand the basic principles of ICZN and their interpretations in resolving various taxonomic problems
- To help students acquire an in-depth knowledge on the field of diversity and relationship in the animal world
- To appreciate the concept of biological conservation and the relationships between organisms and their surroundings

EVALUATION PATTERN

> Theory 80 marks = 04 Credits

Question Pattern	Unit I	Unit II	Unit III	Unit IV
Very short answer type questions. (2 Questions from each Unit without internal choice). Maximum in two sentences.	2X2 = 4 Marks	2X2 = 4 Marks	2X2 = 4 Marks	2X2 = 4 Marks
Short answer type question. Attempt one question from each unit with internal choice Word limit 200-250	1X4 = 4 Marks	1X4 = 4 Marks	1X4 = 4 Marks	1X4 = 4 Marks
Long answer type question. Attempt one question from each unit with internal choice. Word limit 400-450	1X12 = 12 Marks	1X12 = 12 Marks	1X12 = 12 Marks	1X12 = 12 Marks

The syllabus for Paper Ist (M. Sc. ZOOLOGY, Sem. - I) is hereby approved for the Session 2022-23

Name and Signatures

Chairperson /H.O.D	
University Nominee	Departmental members
Subject Expert	1.
Subject Expert	2.
Representative from Industry/entrepreneur	3.
Student representative	4.
Other Prof. from Science faculty	5.
	6.
	7.
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GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
M. Sc. ZOOLOGY
Semester - I
SESSION 2022-2023
PAPER- II
Course Code – MZO 102
STRUCTURE & FUNCTION IN INVERTEBRATES

UNIT – I

Max. M. - 80

Min. M. - 16

Coelom

- Organization of Coelom: Origin and development.
- Acoelomate, Pseudocoelomate and Coelomate
- Protostomia and Deuterostomia.

Locomotion

- Origin of Locomotion: Types and structure of cilia and flagella.
- Flagellar and ciliary movements in Protozoa.
- Hydrostatic movement in coelentrata, annelid and echinodermata.

UNIT –II

Nutrition

- Lower Metazoa - Patterns of feeding and digestion in Porifera and Coelentrata
- Filter feeding - in Polychaeta and Mollusca.

Respiration

- Organs of Respiration: Structure and function of gills, buck lungs and trachea in Invertebrates.
- Respiratory Pigments and their function.
- Mechanism of Respiration and transport of gases.

UNIT -III

Excretion

- Organs of excretion: Coelom, Coelomoduct, nephridia and malpighian tubules.
- Mechanism of Excretion in invertebrate.
- Osmoregulation in invertebrate.

Nervous System

- Structure of Primitive Nervous system in Coelenterate and Echinodermata.
- Advanced Nervous system in Annelida, Arthropoda (Crustacea and Insecta), and Mollusca (CEPHALOPODA)

UNIT -IV

Invertebrate Larva

- Free living larvae of Invertebrates.
- Study of larval forms of parasitic invertebrates.
- Larval forms of Crustacea, Mollusca and Echinodermata.
- Survival strategies and evolutionary significance of larval forms.

Minor Phyla

- Organization and General Characters of Rotifera.
- Organization and General Characters of Ectoprocta.
- Organization and General Characters of Endoprocta.
- Organization and General Characters of Nemertina.

SUGGESTED READING MATERIALS (ALL LATEST EDITION).

1. **Invertebrate Structure and function:** E.J.W. Barrigton, English language Book society UK.
2. **Invertebrate Zoology:** Robert Barnes IVth Edition, Holt Saunders International Edition Japan.
3. **The Cambridge Natural History Vol 1 – 9:** S. F. Harmer, A.E. Shipley, Todays & Tomorrows Book agency, N Delhi India.
4. **A Text book of Zoology, Invertebrate:** Parker Hasvell, Marshall & Williams. AITBS Publishing & Distributers, Delhi.
5. **The Invertebrates Vol. 1 – 9:** Libbic Henrietta, Hyman, Mc Gawhill Book Company.
6. **A text book of Invertebrates:** by N C Nair (Author), N Arumugam, Saras Publication.

Course Outcomes

After successful completion of these courses the student would be able:

- To understand the development of organisms through presence or absence of coelomic cavity and describe different types of evolutionary development along with and account of locomotion
- To explain the types of nutrition and digestive system of organisms
- To relate the structure, function and mechanisms of respiration and excretion of the organisms.
- To appreciate the advanced nervous coordination in higher phyla of invertebrates
- To acquire knowledge about life cycle, larval forms of invertebrates and understand the significance of minor phyla
- To acquire skills in teaching the structural and functional features of invertebrate and vertebrate life forms
- To become very competent in research or teaching fields

EVALUATION PATTERN

➤ Theory 80 marks = 04 Credits

Question Pattern	Unit I	Unit II	Unit III	Unit IV
Very short answer type questions. (2 Questions from each Unit without internal choice). Maximum in two sentences.	2X2 = 4 Marks	2X2 = 4 Marks	2X2 = 4 Marks	2X2 = 4 Marks
Short answer type question. Attempt one question from each unit with internal choice Word limit 200-250	1X4 = 4 Marks	1X4 = 4 Marks	1X4 = 4 Marks	1X4 = 4 Marks
Long answer type question. Attempt one question from each unit with internal choice. Word limit 400-450	1X12 = 12 Marks	1X12 = 12 Marks	1X12 = 12 Marks	1X12 = 12 Marks

The syllabus for Paper IInd (M. Sc. ZOOLOGY, Sem. - I) is hereby approved for the
Session 2022 - 23

Name and Signatures

Chairperson /H.O.D	
University Nominee	Departmental members
Subject Expert	1.
Subject Expert	2.
Representative from Industry/entrepreneur	3.
Student representative	4.
Other Prof. from Science faculty	5.
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GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG

M. Sc. ZOOLOGY

Semester - I

SESSION 2022-2023

PAPER- III

Course Code – MZO 103

ENDOCRINOLOGY

Max. M. - 80

Min. M. - 16

UNIT – I

- Endocrine Glands: Pituitary, adrenal, thyroid, ovary, testes and pancreas.
- Classification of Hormones.
- Hormone release and transport.
- Gastro-intestinal hormones.

UNIT – II

Mechanism of Hormone action –

- Hormones and their receptors: cell surface receptor, intra-cellular receptor.
- Signaling through G-protein linked receptor.
- Mode of action of protein hormone.
- Mode of action of steroid hormone.
- Mode of action of amino acid derivative hormone.

UNIT - III

- Hormonal regulation of Carbohydrate and lipid metabolism.
- Biosynthesis of steroid hormones.
- Biosynthesis of amino acid derivative hormones.
- Biosynthesis of catecholamine hormone.

UNIT - IV

Neuro-endocrinology

- Neuroendocrine system.
- Neural control of endocrine system.
- Endocrinal regulation of gametogenesis.
- Endocrinal regulation of lactation, pregnancy and parturition.

SUGGESTED READING MATERIALS (ALL LATEST EDITION).

1. **Comparative vertebrate Endocrinology:** Gorbman & Bern.
2. **Human Physiology:** Dr. C. C. Chatterjee.
3. **Comparative Endocrinology:** Barrington.
4. **Applied Animal Endocrinology:** Squires.
5. **Endocrinology: Basic & Clinical principles:** Melmed & Cohn.
6. **Introduction to Endocrinology:** Chandra S. Negi, Prentice Hall India Learning Private Limited (1 January 2009).
7. **The Endocrine System at a Glance:** Ben Greenstein and, Diana F. Wood, Wiley-Blackwell; 3rd edition (5 August 2011)

Course Outcomes

After successful completion of these courses the student would be able:

- To gain knowledge of the distribution, morphology/anatomy of endocrine glands and their role in chemical integration. Phyletic distribution of the hormones will be understood
- To understand the role of chemical messengers in cellular communication and signalling pathways
- To introduced to the molecular mechanisms of action of many of these mediators and will start to appreciate biochemical and signalling events at the cellular and whole animal level
- To gain informations about biosynthesis of various hormones and understand the metabolic disorders concerns with them
- To appreciate the link between nervous and endocrine system and their role in various life supporting mechanisms
- To explain consequences of the hormonal irregulations.

EVALUATION PATTERN

➤ Theory 80 marks = 04 Credits

Question Pattern	Unit I	Unit II	Unit III	Unit IV
Very short answer type questions. (2 Questions from each Unit without internal choice). Maximum in two sentences.	2X2 = 4 Marks	2X2 = 4 Marks	2X2 = 4 Marks	2X2 = 4 Marks
Short answer type question. Attempt one question from each unit with internal choice Word limit 200-250	1X4 = 4 Marks	1X4 = 4 Marks	1X4 = 4 Marks	1X4 = 4 Marks
Long answer type question. Attempt one question from each unit with internal choice. Word limit 400-450	1X12 = 12 Marks	1X12 = 12 Marks	1X12 = 12 Marks	1X12 = 12 Marks

The syllabus for Paper IIIrd (M. Sc. ZOOLOGY, Sem. - I) is hereby approved for the session 2022 - 23

Name and Signatures

Chairperson /H.O.D <i>[Signature]</i> 25/7/22	Departmental members
University Nominee <i>[Signature]</i>	1. <i>[Signature]</i> 25/7/22
Subject Expert <i>[Signature]</i>	2. <i>[Signature]</i>
.....	3. <i>[Signature]</i>
Subject Expert <i>[Signature]</i> 25/7/22	4. <i>[Signature]</i>
.....	5.
Representative from Industry/entrepreneur <i>[Signature]</i>	6.
.....	7.
Student representative <i>[Signature]</i>	8.
Other Prof. from Science faculty <i>[Signature]</i>	

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
M. Sc. ZOOLOGY
Semester - I
SESSION 2022-2023
PAPER- IV
Course Code – MZO 104
CELL AND MOLECULAR BIOLOGY

Max.M. - 80
Min. M. - 16

UNIT I

Fundamentals of molecular biology -

- Properties of cells.
- Types of cells.
- Evolution of Eukaryotic cells.

Ultra structure & function of cell organelles -

- **Mitochondria** – Biogenesis, Structure of mitochondrial membrane, cristae, Respiratory Chain complex, Energy conservation during Oxidative phosphorylation (ATP synthesis).
- **Ribosome** – Types, structure, biogenesis & functions.
- **Golgi body** – Ultra (EM) structure, fenestration, biogenesis & functions.
- **Endoplasmic reticulum** - structure & function

UNIT - II

Ultra structure and functions of cell organelles -

- **Lysosome** – structure, polymorphism in Lysosome, function.
- **Microbodies** - Microsome and Peroxisome.
- **Nucleus**: Structure and function
- **Structure of DNA & RNA**
- **Chromosomes** –Nucleosome model, Euchromatin & heterochromatin, Giant chromosomes (Polytene, Lampbrush etc.).
- **Microtubules** - Structure and function.

UNIT – III

- **Biomembranes** - Structure, Molecular composition and arrangement of bio-membranes.
- Function of Biomembranes
- **Patterns of transport** - Passive (Osmosis and Diffusion) and Active transport.
- **Membrane pumps**: Sodium potassium pump, Calcium-ATPase pump, ATP dependent proton pump.

UNIT – IV

- **Cell surface receptor:** - Membrane receptor for extracellular matrix.
- **Second messenger system-** c AMP as a second messenger, Lipid derived second messenger, Roll of Ca^{++} as second messenger.
- **Signal transduction** –Signaling through G protein coupled receptors, GTPase cycle, Protein kinase mechanism – cAMP activated Protein kinase mechanism,
- Electrical properties of cell and synaptic transmission.
- **Biology of cancer** –Oncogenes, tumor suppressor genes, cancer and cell cycle. Metastasis, interaction of cancer cells with normal cells, apoptosis and therapeutic interventions of uncontrolled cell growth.

SUGGESTED READING MATERIALS (ALL LATEST EDITION).

1. **MOLECULAR CELL BIOLOGY:** Lodish, W.H. Freeman & Co. NewYork.
2. **PRINCIPLES OF BIOCHEMISTRY:** Lehninger, Fourth Edition - David L. Nelson, Michael M. Cox.
3. **MOLECULAR CELL BIOLOGY:** Lodish M. Baltimore, Scientific American books.
4. **ESSENTIALS OF CELL & MOLECULAR BIOLOGY:** Roberties & Roberties, Halt Saunders International Edition.
5. **CELL & MOLECULAR CELL BIOLOGY:** Gerald Karp, Willey & Sons Co.
6. **MEDICAL CELL BIOLOGY:** Flickinger, E.J. Brown J.C. Halt Saunders International Edition.
7. **CELL BIOLOGY:** Powar C.B. Himalaya Publishing House.
8. **Cell Biology:** S.C. Rastogi, Wiley-Blackwell; 3rd edition (5 August 2011)

Course Outcomes

After successful completion of these courses the student would be able:

- To understand the key concepts of biology at physiological, biochemical, molecular and cellular level.
- To imparts knowledge about structural and functional organization of a typical prokaryotic and eukaryotic cell structures and evolution of eukaryotic cell.
- To understand about cell regulatory mechanisms and key concepts about signal transduction mechanisms.
- To identify link between genetics and cancer with emphasis on oncogenes, tumor suppressor genes, apoptosis, metastasis and relation of cell cycle to cancer.
- To acquire skills in teaching the structural and functional features of invertebrate life forms.

EVALUATION PATTERN

➤ Theory 80 marks = 04 Credits

Question Pattern	Unit I	Unit II	Unit III	Unit IV
Very short answer type questions. (2 Questions from each Unit without internal choice). Maximum in two sentences.	2X2 = 4 Marks	2X2 = 4 Marks	2X2 = 4 Marks	2X2 = 4 Marks
Short answer type question. Attempt one question from each unit with internal choice Word limit 200-250	1X4 = 4 Marks	1X4 = 4 Marks	1X4 = 4 Marks	1X4 = 4 Marks
Long answer type question. Attempt one question from each unit with internal choice. Word limit 400-450	1X12 = 12 Marks	1X12 = 12 Marks	1X12 = 12 Marks	1X12 = 12 Marks

The syllabus for Paper IVth (M. Sc. ZOOLOGY, Sem. - I) is hereby approved for the

Session 2022 - 23

Name and Signatures	Departmental members
Chairperson /H.O.D <i>[Signature]</i> 25/7/22	1. <i>[Signature]</i> 25/7/22
University Nominee <i>[Signature]</i>	2. <i>[Signature]</i> 25/7
Subject Expert <i>[Signature]</i>	3. <i>[Signature]</i>
Subject Expert <i>[Signature]</i> 25/7/22	4. <i>[Signature]</i>
Representative from Industry/entrepreneur <i>[Signature]</i>	5.
Student representative <i>[Signature]</i>	6.
Other Prof. from Science faculty <i>[Signature]</i>	7.
	8.

M. Sc. ZOOLOGY
SEMESTER – I (2022-23)
MZOL 01, LAB COURSE-I
(Syllabus & Scheme of Marks allotment in Practical examination)

1. Study of museum specimens from protozoa to minor phyla.
2. Study of permanent and histological slides of invertebrate (protozoa to minor phyla).
3. Collection, identification and preservation of animals.
4. Permanent slide preparation of preserved materials.
5. Alternative methods of dissection: prawn, earthworm, cockroach, snail. Leech and octopus, Sepia, Loligo and starfish.
6. Exercise from taxonomy (Taxonomical keys, index preparation).

SN.	Exersices	Marks
1.	Identification Of Fresh Water Invertebrates	05
2.	Identification Of Animals Using Taxonomic Key	10
3.	Determination of Density, Frequency and Abundance of Species	10
4.	Slide Preparation	05
5.	Spotting	20
6.	Alternative Methods Of Dissection	05
7.	Excursion For Collection Of Animals	10
8.	Sessional	20
9.	Viva	15
	Total	100

Excursion tour can be organized to study local fauna as per syllabus at adjoining areas in Chhattisgarh.

Course Outcomes

After successful completion of these courses the student would be able:

- To understand the key concepts of fresh water invertebrates with their identification and conservation methods.
- To imparts knowledge about quantitative estimation of invertebrate organisms.
- To acquire skills in explaining the structural and functional features of invertebrate life forms.
- To recognize the importance of conservation of animals.

M. Sc. ZOOLOGY
SEMESTER – I (2022-23)
MZOL 02, LAB COURSE-II
(Syllabus & Scheme of Marks allotment in Practical Examination)

1. Study of permanent slides of various endocrine glands of vertebrates.
2. Histological studies of endocrine glands of vertebrates.
3. Preparation of Permanent slides of endocrine glands of fish.
4. Hormone based diagnostic study
5. Hormone assay.
6. Alternative methods of dissection of endocrine glands of vertebrate.
7. Cytological Studies:
 - Study of various stages of mitosis & meiosis cell division.
 - Study of giant chromosomes through slide preparation.
 - Slide preparation of mitochondria/ Barr body from oral smear and blood.
 - DNA Separation.

S. No.	EXERSICES	Marks
1.	SPOTTING	20
2.	Hormone Assay/ Permanent Slide Preparation	20
3.	Hormone Based Diagnostic Studies	
4.	Slide Preparation: Mitosis/ Meiosis Polytene Chromosome Barrbody/Mitochondria	20
5.	Alternative Dissection Method	05
6.	Sessional	20
	Viva	15
	Total	100

After successful completion of these courses the student would be able:

- To understand the histological characteristics of various endocrine glands of vertebrates.
- To acquire skills in preparation of Permanent slides.
- To Hormone based diagnostic study
- To impart knowledge about hormone assay and alternative methods of dissection of vertebrates.
- To gain command on the cytological experiments.

The syllabus for lab. Course-I (M. Sc. ZOOLOGY, Sem. - I) is hereby approved for the session 2022 - 23

Name and Signatures	
Chairperson /H.O.D	Departmental members
..... <i>[Signature]</i> 25/7/22	1. <i>[Signature]</i> 25/7/22
University Nominee	2. <i>[Signature]</i> 25/7
..... <i>[Signature]</i>	3. <i>[Signature]</i>
Subject Expert	4. <i>[Signature]</i>
..... <i>[Signature]</i> 25/7/22	5.
Subject Expert	6.
..... <i>[Signature]</i>	7.
Representative from Industry/entrepreneur	8.
..... <i>[Signature]</i>	
Student representative	
..... <i>[Signature]</i>	
Other Prof. from Science faculty	
..... <i>[Signature]</i>	

GENERAL INSTRUCTIONS FOR STUDENTS

1. The candidate has to obtain minimum 20% marks in each theory paper and internal assessment separately.
2. The candidate has to secure minimum 36% marks as an aggregate in order to pass that semester examination.
3. The internal assessment shall include class test, home assignment and seminar presentation.
4. In internal assessment, the marks taken into consideration will be the average of two tests (i.e. the class test and the home assignment) for each paper and shall of 20 marks.
 - a. The seminar shall be in lieu of class test and home assignment combined and shall be of 20 marks.
 - b. There shall be one seminar in each semester.
 - c. The marking of seminar shall be in terms of hard copy submission (10 marks) and presentation and open discussion (10 marks).

DIRECTIVES FOR STUDENTS, FACULTY AND EXAMINERS

1. There shall be three sections (Section A, B, and C) in each theory paper.
2. Section A shall contain very short answer type questions (One or two line answer) or objective type questions (fill in the blank, **not multiple choice questions**).
3. Section B shall contain short answer type questions with the limit of 250 words.
4. Section C shall contain long answer/ descriptive type questions. The students are required to answer precisely and the answer should not exceed the limit of 450 words.
5. The students are required to study the content mentioned in the curriculum exhaustively.

EVALUATION PATTERN

➤ **Theory 80 marks = 04 Credits**

Question Pattern	Unit I	Unit II	Unit III	Unit IV
Very short answer type questions. (2 Questions from each Unit without internal choice). Maximum in two sentences.	2X2 = 4 Marks	2X2 = 4 Marks	2X2 = 4 Marks	2X2 = 4 Marks
Short answer type question. Attempt one question from each unit with internal choice Word limit 200-250	1X4 = 4 Marks	1X4 = 4 Marks	1X4 = 4 Marks	1X4 = 4 Marks
Long answer type question. Attempt one question from each unit with internal choice. Word limit 400-450	1X12 = 12 Marks	1X12 = 12 Marks	1X12 = 12 Marks	1X12 = 12 Marks

Internal Assessment 20 marks = 01 credit

- Unit test – One class test in each theory paper comprising 20 marks. (containing two short answer type questions of 05 marks each and 05 objective type questions of 10 marks).
- Home assignments – Two long answer type questions from each theory paper containing 10 marks each. The answer should be prepared with the help of standard reference books. (The titles of those books, authors, year of publication and publishers details should be mentioned in an appropriate way, at the end of each assignment).
- Seminar presentations (Power point) – Comprising 20 marks.
Each student has to be prepare one seminar in each semester. The marking of seminar shall be in terms of hard copy submission (10 marks) and presentation and open discussion (10 marks).

➤ Practical 200 marks = 08 credits

Two practicals of 100 marks each

CREDIT ALLOTMENTS

- Theory Paper = 05 credits (04+01)
- Practical = 04/ 08 credits

TOTAL CREDITS/ SEMESTER

- Science Subjects with 04 theory papers (100 each) and one /two practical (100 each) – $20 + 08 = 28$ credits
- Science Subjects with 05 theory papers (no practical-Maths) – 25 credits
- Arts Subjects with 04 theory papers – 20 credits
- Arts Subjects with 05 theory papers – 25 credits
- Commerce subject with 05 theory papers – 25 credits

TOTAL CREDITS / PROGRAMME

- 16 Theory + 08 Practical + Project work – $80 + 32 + 08 = 120$ credits
- 20 Theory – 100 credits (Maths)
- 20 Theory – 100 credits (Arts and Commerce)
- 16 Theory – 80 credits (Arts)

The syllabus (M. Sc. ZOOLOGY , Sem. - I) is hereby approved for the

Sessions 2022 - 23

Name and Signatures

Chairperson /H.O.D	Departmental members 1. 2. 3. 4. 5. 6. 7. 8.
University Nominee	
Subject Expert R.P. Tripathi	
Subject Expert	
Representative from Industry/entrepreneur	
Student representative	
Other Prof. from Science faculty	

