FATIMA COLLEGE (AUTONOMOUS)

Re-Accredited with A^{++}(NAAC IV Cycle)

Maryland, Madurai- 625 018, Tamil Nadu, India

NAME OF THE DEPARTMENT: ZOOLOGY

NAME OF THE PROGRAMME :B.Sc

PROGRAMME CODE : UAZO

ACADEMIC YEAR : 2023 - 2024

I - UG (TANSCHE)

FATIMA COLLEGE (Autonomous), MADURAI - 625 018

MINUTES OF THE BOARD OF STUDIES

NAME OF THE DEPARTMENT: B.Sc Zoology

TO BE IMPLEMENTED FROM: 2023-2024 ONWARDS

VENUE: Department of Zoology

CONVENED ON: 05.04.2023 CONVENED AT: 02.00 pm

MEMBERS PRESENT

1.	Dr. A. TAMIL SELVI	Head of the Department 05/04/23
2.	Dr. V. SHANMUGAIAH Assistant Professor Department of Microbial Technology School of Biological Sciences Madurai Kamaraj University Madurai - 625 021	University Nominee 5/4/23
3.	Dr. P.J. JOSLIN Associate Professor PG & Research Department of Zoology St. Mary's college (Autonomous) Thoothukudi - 628 001	Subject Expert P. J. Joslin 5/4/2023
4.	Dr. R. UMA MAHESWARI Assistant Professor PG Department of Zoology Arulmigu Palaniandavar Arts college for Women Palani - 624 615	Subject Expert 5/4/23

5.	Dr. A. VANNIA RAJAN Scientist Aravind Medical Research Foundation Madurai - 625020	Industrialist / Scientist A. Vannia 05/04/23
6.	Miss. S. SUSARITHA Research Scholar PG & Research Department of Zoology The American College Madurai - 625020	Alumna S. Susantha 05/04/23
7.	Dr. A. RAJESWARI	Dean of Academic Affairs 05/04/2023
8.	Dr. ANTONY AMALA JAYASEELI	Staff Member Antony Amala Jayaseeli 05/04/23
9.	Dr. N. MALATHI	Staff Member N. Malathi 5/4/2023
10.	Dr. J. ASNET MARY	Staff Member Asnet Mary 5/4/2023
11.	Dr. V. BHARATHY	Staff Member V. Bharathy 5/4/23
12.	Dr. N. NAGARANI	Staff Member N. Nag 5/4/23
13.	Dr. S. BARATHY	Staff Member 5/4/23
14.	Mrs. J. THELMA	Staff Member Thelma 5/4/23
15.	Mrs. D. KAYATHRI	Staff Member D. Kayathri 5/4/23

MINUTES OF THE BOARD OF STUDIES:

CORE COURSES INTRODUCED (PART-III)

S.NO	COURSE CODE	COURSE TITLE WITH SEMESTER	RELEVANCE TO			SCOPE FOR				NEED FOR INTRODUCTION
			L	R	N	G	EMP	ENT	SD	
1.	CC1	Invertebrata Semester I	L	R	N	G	-	-	SD	As per the guidelines of TANSCHE
2.	CC2	Cell Biology Semester I	-	-	N	G	-	-	SD	
3.	CC3	Lab-Invertebrata & Cell Biology Semester I	L	R	N	G	EMP	-	SD	
4.	CC4	Chordata Semester II	L	R	N	G	-	-	SD	
5.	CC5	Genetics Semester II	-	-	N	G	-	-	SD	
6.	CC6	Lab-Chordata & Genetics Semester-II	L	R	N	G	EMP	-	SD	

ELECTIVE COURSES INTRODUCED (PART-III)

S. NO	Generic/ Discipline Specific	COURSE CODE	COURSE TITLE	RELEVANCE TO			SCOPE FOR			NEED FOR INTRODUCTION
				L	R	N	G	EMP	ENT	SD	
1.	Generic Semester I	EC1	Maternity and child Health/ Human Biology	L	R	N	G	-	-	SD	As per the guidelines of TANSCHE
				-	-	N	G	-	-	SD	
2.	Generic Semester II	EC2	Food, Nutrition & Health/ Fish Farming	L	R	N	G	-	-	SD	
				L	R	N	G	-	ENT	SD	

SKILL ENHANCEMENT/ FOUNDATION/ ABILITY ENHANCEMENT COURSES (PART-IV)

S NO	SEC/ FC/ AECC WITH SEMESTER	COURSE CODE	COURSE TITLE	RELEVANCE TO				SCOPE FOR			NEED FOR INTRODUCTION
				L	R	N	G	EMP	ENT	SD	
1.	SEC Semester I (NME)	SEC1	Aquarium Keeping	L	R	N	G	-	ENT	SD	As per the guidelines of TANSCHE
2.	FC Semester I	FC	Fundamentals of Biology	-	-	N	G	-	-	SD	
3.	SEC Semester II	SEC2	Aquarium keeping (Non-Major Elective)	L	R	N	G	-	ENT	SD	
4.	SEC Semester II	SEC3	Ornamental Fish Culture	L	R	N	G	-	ENT	SD	

1. Introduction of Value Added course – Certificate/ Diploma/ Advanced diploma

S NO	COURSE CODE	COURSE TITLE	MOU WITH INDUSTRY/ ORGANISATION	SKILLS SHARPENED	COURSE OUTCOME
-	-	NIL	-	-	-

2. Introduction of Purely Skill-Embedded certificate/ Diploma/ Advanced Diploma course

S NO	COURSE CODE	COURSE TITLE	MOU WITH INDUSTRY/ ORGANISATION	SKILLS SHARPENED	COURSE OUT COME
-	-	NIL	-	-	-

3. Approval of Ph.D course Work Syllabus: NIL

Details of Proposed/Signed MOUS - NIL

SUGGESTIONS	COMMENDATIONS
1. The List of Reference books may also be updated with recent editions.	1. The Non Major elective course - Aquarium keeping will pave a way for the other major students to becom entrepreneurs
2. Comma and hyphen should be used appropriately while preparing the course content.	2. Introduction of Fundamentals of Biology as Foundation course is appreciable.

1.	Dr. A. Tamil Selvi	Head of the Department 05/04/23
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4.	Dr. R. Uma Maheswari	Subject Expert, R. Uma Maheswari 5/4/23
5.	Dr. A. Vanniarajan	Industrialist/Scientist A. Vanniarajan 05/04/23
6.	Miss. S. Susaritha	Alumna S. Susaritha 05/04/23
7.	Dr. A. Rajeswari	Dean of Academic Affairs 05/04/2023

8. Dr. Antony Amala Jayaseeli	05/04/23
9. Dr. N. Malathi	5/4/2023
10. Dr. J. Asnet Mary	5/4/2023
11. Dr. V. Bharathy	5/4/23
12. Dr. N. Nagarani	5/4/23
13. Dr. S. Barathy	5/4/23
14. Mrs. J. Thelma	5/4/23
15. Mrs. D. Kayathri	5/4/23

FATIMA COLLEGE (Autonomous), MADURAI – 625018

MINUTES OF THE BOARD OF STUDIES

NAME OF THE DEPARTMENT: B.Sc ZOOLOGY

TO BE IMPLEMENTED FROM: 2023 - 2024 ONWARDS

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CONVENED ON: 05.04.2023 CONVENED AT: 02.00pm

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15. Mrs. D. Kayathri	Staff Member 5/4/23

MINUTES OF THE BOARD OF STUDIES:

1. PRESENTATION OF THE ACTION TAKEN REPORT

ACTION TAKEN REPORT FOR 2022-2023

S. NO	COMMON SUGGESTIONS OFFERED IN THE PREVIOUS BOARD	ACTION TAKEN FOR THE ACADEMIC YEAR 2022-23
1.	Hands-on training may be provided to the Students whenever possible.	Hands-on training is given to the students in all possible ways.
2.	Biostatistics problems can be given using real-time data collected from the field.	Field data is used for Biostatistical analysis.

CHANGE OF COURSE TITLE

S. NO	OLD COURSE CODE	NEW COURSE CODE	OLD COURSE CODE	NEW COURSE TITLE	NEED FOR CHANGE
–	–	NIL	–	–	–

NEW COURSES INTRODUCED

S. NO	COURSE CODE	COURSE TITLE	RELEVANCE TO				SCOPE FOR			NEED FOR INTRODUCTION
			L	R	N	G	EMP	ENT	SD	
1.	22Z6SB6	Poultry Farming	L	R	N	G	EMP	ENT	SD	To enhance the entrepreneurial aspects of the Programme
2.	21Z4SLN1	Public Health & Hygiene	L	R	N	G	EMP	–	SD	Offered to the advanced learners

REVISED COURSES

S. NO	COURSE CODE & COURSE TITLE	UNIT NO & REVISED CONTENT	% of Revision	NEED FOR REVISION	RELEVANCE TO L	R	N	G	SCOPE FOR EMP	ENT	SD
1.	19Z4CC10 Microbiology	The Following topics are included -UNIT-II -Bacteria-autotrophic & heterotrophic nutrition, aerobic & anaerobic respiration, Beneficial & harmful role of bacteria. UNIT-III viruses -Lytic & Lysogenic cycle, Transmission of viruses in plants, animals & man.	10 %	As per the guidelines of academic Deans & recommen -dation of course teachers	-	-	N	G	EMP	-	SD
2.	19Z4SB2 mushroom Cultivation	The following topic are included in Unit-III cultivation of techniques compost - materials for compost preparation - methods of composting characteristics of compost - spawning - methods, Types, Storage - Spawn running	10 %	Guidelins of Academic Deans & recommen dation of course Teachers	L	R	N	G	EMP	ENT	SD
3.	19Z5CC15 Lab - Biochemical Analysis	Sagaguchi test & separation of aminoacids by circular paper chromatography are included. Thin Layer chromatography is included as Spotter	10 %	As per the guidelines of Academic Deans	L	R	N	G	EMP	-	SD
4.	19Z5CC16 Lab - Molecular Biology	Isolation of UV mutations using - colony plate - Replica plating, setting up of Southern blotting, Chemical mutagenesis & Genotoxicity analysis are included. Agrose gel electrophoresis & SDS-PAGE are included as Spotters	10%	As per the guidelines of Academic Deans & Recomm endation of course Teachers	L	R	N	G	EMP	-	SD

5.	19Z5ME2 Animal Behaviours	The Following topics are included Unit I – Hormonal regulation of Behaviour, Ethogram, Unit – III Social & Reproductive behaviours – Strategies of mating System, Mating behaviour of Penguins	10 %	As per the guidelines of Academic Deans & Recommend ation of course Teachers	L	R	N	G	E M P	–	S D
6.	19Z6CC19 Lab – Immunology	ELISA, Western Blot, Flow cytometry are included as spotters. Amniocentesis, Pregnancy diagnostic kit, Haemocytometer, Centrifuge and Semi automated analyzer are included as spotters in Clinical Laboratory Techniques	10 %	As per the guidelines of Academic Deans & Recommen dation of course Teachers	L	R	N	G	E M P	–	S D
7.	19Z6CC20 Lab – Biotechnology	Isolation of genomic DNA from goat liver / bacteria, Isolation of genomic DNA from plants are included. Southern blotting & UV transilluminator are included as Spotters	10 %	As per the guidelines of Academic Deans & Recommen dation of course teachers	L	R	N	G	E M P	–	S D
8.	19Z6ME4 Clinical Laboratory Techniques	The following topic are included – Unit II, Analysis of urine, Benedicts test, Bence Jonse protein test, Nitroprusside test Unit III – Hematology, Erythrocyte Sedimentation Rate, Unit V – Semen analysis, Cryopreservation, chorion villus Sampling and Foetoscopy	10 %	As per the guidelins of Academic Deans & Recommen dation of course Teachers	L	R	N	G	E M P	–	S D

2. UPDATION OF OPEN EDUCATIONAL RESOURCES

S. NO	COURSE CODE	COURSE TITLE	DETAILS OF UPDATION
–	–	–	NIL

3. REVISION OF COURSES

S. NO	COURSE CODE & COURSE TITLE	UNIT NO & REVISED CONTENT	% of REVI	NEED FOR REVISION	RELEVANCE TO L	R	N	G	SCOPE FOR EMP	ENT	SD
1.	19Z3CC9 Lab - Human Physiology & Environmental Biology	Determination of BMI & Blood pressure among the Students & Estimation of Haemoglobin are included under Human Physiology experiments. Glucometer is included as Spotter. Study of diversity of flora & fauna in terrestrial using Quadrant method is included under Environmental Biology	12 %	As per the guidelines of Academic Deans & the recommendation of course teachers	-	-	N	G	EMP	-	SD
2.	19Z4CC12 Lab - Microbiology & Evolution	Preparation of different types of Media, Isolation of micro organisms from soil, air & water, Qualitative analysis of Milk - Methylene blue reductase test are included as experiments in Microbiology. Hot air oven & colony counter are included as spotters.	12 %	As per the guidelines of Academic Deans & recommendation of course teachers	-	-	N	G	EMP	-	SD
3.	21Q4ACZ4 Lab - Developmental Botany & Plant Breeding	Tranverse Sectioning of Dicot Stem Showing Secondary growth, mounting of Anisocytic, paracytic & Diacytic Stomata & Identification of Globular, Chordate & mature Stages of embryo in Tridax are included as experiments.	12 %	As per the guidelines of Academic Deans & recommendation of course teachers	-	-	N	G	EMP	-	SD

4.	19Z5CC14 Molecular Biology	The following topics are included in Unit-III - Transcription in Prokaryotes- Pribnow box, difference between Prokaryote and Eukaryotic transcription, Reverse transcription & inhibitors of transcription. Protein targeting to Mitochondria & other organelles, protein degradation- intein splicing & covalent modification	15 %	As per the guidelines of Academic Deans & recommend -ations of course teachers	-	-	N	G	-	-	S D
5.	19Z5SB4 Sericulture	History of Sericulture, Sericulture Research Institutes in India, Eri, Tasar & Muga silks are included in unit-I - Introduction to Sericulture Propagation - vegetative cutting, grafting & layering methods Application & significance of Biofertilizers are included in unit-II	10 %	As per the guidelines of Academic Deans & Recommen dation of course Teachers	L	R	N	G	EMP	ENT	S D
6.	19Z6ME3 Embryo- logy	In vitro fertilization - Test tube baby & Assisted Reproductive Technology ART, IUI, ICSI, GIFT, ZIFT embryo transfer & Bioethics are included in Unit V - Human Embryology	10 %	As per the guidelines of Academic Deans & Recommen dation of course teachers	-	-	N	G	-	-	S D
7.	19Z6ME6 Entomology	General structure & modifications of antennae, mouth parts, legs & wings are specified and the topic mechanism & significance of Bioluminescence is included in unit-II Morphology and Metamorphosis.	10 %	As per the guidelines of Academic Deans & recommen dation of course Teachers	-	-	N	G	-	-	S D

4. NEW COURSES INTRODUCED

NEW COURSES INTRODUCED										
S. NO	COURSE CODE	COORSE TITLE	RELEVANCE TO				SCOPE FOR			NEED FOR INTRODUCTION
			L	R	N	G	EMP	ENT	SD	
1.		Herbal cosmetics	L	R	N	G	EMP	ENT	SD	For the advanced Learners

5. INTRODUCTION OF PURELY SKILL-EMBEDDED CERTIFICATE / DIPLOMA / ADVANCED DIPLOMA: NIL

S. NO	COURSE CODE	COORSE TITLE	MOU WITH INDUSTRY/ ORGANIZATION	SKILLS SHARPENED	COURSE OUTCOME
—	—	NIL	-	—	—

6. APPROVAL OF Ph.D COURSE WORK SYLLABUS: NIL

7. RUBRICS FOR INTERNSHIP / PROJECT: NIL

S.NO	C1 20 MKS	C2 20 MKS	CIA TOTAL 40 MKS	EXTERNAL 60 MKS
—	—	—	—	—

Details of Proposed/Signed MOUs – NIL

SUGGESTIONS	COMMENDATIONS
1. In addition to the Scientific names of the organisms, their common names can also be included. 2. Field visits can be included as a part of the skill based / Lab courses.	1. Changes made in the content of all the revised courses are useful and appropriate. 2. Inclusion of new experiments in the Lab courses will improve the skills of the students.

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05/04/2023

VISION OF THE DEPARTMENT

Women Empowerment through Biological Education for the Betterment of Environment and Mankind

MISSION OF THE DEPARTMENT

- To ensure quality education offering skill based program
- To render entrepreneurial training to make students employable
- To create awareness on the conservation of Biodiversity
- To give ultimate insight into the correlation of various branches of biology that has overwhelming applications
- To facilitate Higher education & research (for the advanced learners)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 1	Our graduates will be academic, digital and information literates; creative, inquisitive, innovative and desirous for the "more" in all aspects
PEO 2	They will be efficient individual and team performers, exhibiting progress, flexibility, transparency and accountability in their professional work
PEO 3	The graduates will be effective managers of all sorts of real – life and professional circumstances, making ethical decisions, pursuing excellence within the time framework and demonstrating apt leadership skills
PEO 4	They will engage locally and globally ,evincing social and environmental stewardship demonstrating civic responsibilities and employing right skills at the right moment.

GRADUATE ATTRIBUTES (GA)

Fatima College empowers her women graduates holistically. A Fatimite achieves all-round empowerment by acquiring Social,

Professional and Ethical competencies. A graduate would sustain and nurture the following attributes:

I. SOCIAL COMPETENCE	
GA 1	Deep disciplinary expertise with a wide range of academic and digital literacy
GA 2	Hone creativity, passion for innovation and aspire excellence
GA 3	Enthusiasm towards emancipation and empowerment of humanity
GA 4	Potentials of being independent
GA 5	Intellectual competence and inquisitiveness with problem solving abilities befitting the field of research
GA 6	Effectiveness in different forms of communications to be employed in personal and professional environments through varied platforms
GA 7	Communicative competence with civic, professional and cyber dignity and decorum
GA 8	Integrity respecting the diversity and pluralism in societies, cultures and religions
GA 9	All – inclusive skill - sets to interpret, analyse and solve social and environmental issues in diverse environments
GA 10	Self-awareness that would enable them to recognise their uniqueness through continuous self-assessment in order to face and make changes building their strengths and improving on their weaknesses
GA 11	Finesse to co-operate exhibiting team-spirit while working in groups to achieve goals
GA 12	Dexterity in self-management to control their selves in attaining the kind of life that they dream for

GA 13	Resilience to rise up instantly from their intimidating setbacks
GA 14	Virtuosity to use their personal and intellectual autonomy in being life-long learners
GA 15	Digital learning and research attributes
GA 16	Cyber security competence reflecting compassion, care and concern towards the marginalised
GA 17	Rectitude to use digital technology reflecting civic and social responsibilities in local, national and global scenario
II. PROFESSIONAL COMPETENCE	
GA 18	Optimism, flexibility and diligence that would make them professionally competent
GA 19	Prowess to be successful entrepreneursandemployees of trans-national societies
GA 20	Excellence in Local and Global Job Markets
GA 21	Effectiveness in Time Management
GA 22	Efficiency in taking up Initiatives
GA 23	Eagerness to deliver excellent service
GA 24	Managerial Skills to Identify, Commend and tap Potentials
III. ETHICAL COMPETENCE	
GA 25	Integrity and disciplinein bringing stability leading a systematic life promoting good human behaviour to build better society
GA 26	Honesty in words and deeds
GA 27	Transparency revealing one's own character as well as self-esteem to lead a genuine and authentic life

GA 28	Social and Environmental Stewardship
GA 29	Readiness to make ethical decisions consistently from the galore of conflicting choices paying heed to their conscience
GA 30	Right life skills at the right moment

PROGRAMME OUTCOMES (PO)

On completion of B.Sc. ZOOLOGYprogramme, the graduates would be able to

PO 1	Apply acquired scientific knowledge to solve complex issues.
PO 2	Attain Analytical skills to solve complex cultural, societal and environmental issues.
PO 3	Employ latest and updated tools and technologies to analyse complex issue.
PO 4	Demonstrated Professional Ethics that foster community, Nation and Environment Building Initiatives.
PO 5	Apply the knowledge and skill to take up higher education, entrepreneurship and employment in government and private sectors.

PROGRAMME SPECIFIC OUTCOMES (PSO)

On completion ofB.Sc.ZOOLOGYprogramme, the graduates would be able to

PSO 1	Gain comprehensive knowledge in different branches of Zoology–Invertebrata, Chordata, Cell biology, Physiology, Environmental Biology, Biochemistry, Microbiology, Immunology, Embryology, Entomology,

	Genetics, Molecular Biology, Biotechnology, Biostatistics, Bioinformatics and Evolution.
PSO 2	Acquire technical skills in performing experiments in the field of Microbiology, Cell Biology, Biochemistry, Plant Physiology, Human Physiology, Molecular Biology, Environmental Biology, Developmental Biology, Biostatistics, Immunology, Evolution, Genetics, Clinical Laboratory Techniques, Biotechnology and Bioinformatics.
PSO 3	Develop empathy and instil love towards conserving plants and animals.
PSO 4	Express ideas and concept through seminar and assignments.
PSO 5	Solve the environmental problems by applying the biological principles for minimizing pollutants in air, water and land.
PSO 6	Develop environmental concern towards value of economically important plants, Biodiversity promote Bioremediation, Bio fertilizer and vegetative propagation.
PSO 7	Adopt Good Laboratory Practice, bioethics and biosafety guidelines to ensure minimal use of animals during experiments.
PSO 8	Exhibit the holistic growth by developing subject proficiency, interpersonal skills, and show vertical mobility in taking up PG courses and horizontal mobility by enrolling in B.Ed institution, clinical

	laboratory course and seek employment in schools, Medical coding and IT companies.
PSO 9	Make them self employed/ Entrepreneur in the field of Sericulture, Vermitechnology, Ornamental fish culture, Dairy farming, Apiculture, Mushroom cultivation and Horticulture.
PSO 10	Use of computers for Power point presentation, Virtual Dissection, analysis of bio- molecules using bioinformatics tools and computing biological data.
PSO 11	Healthy diet pattern for combat life style disorder.

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18

DEPARTMENT OF ZOOLOGY

For those who joined in June 2019 onwards

PROGRAMME CODE: UAZO

PART – I – TAMIL / FRENCH / HINDI– 12 CREDITS

PART – I – TAMIL

Offered by The Research Centre of Tamil

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. MKs
1.	I	23TL1C1	Pothu Tamil – I	5	3	40	60	100
2.	II	23TL2C2	Pothu Tamil – II	5	3	40	60	100
3.	III	19TL3C3	General Tamil – KaapiyaIllakiyam	5	3	40	60	100
4.	IV	19TL4C4	General Tamil - SangamIllakiyam	5	3	40	60	100
			Total	20	12			

PART – I –FRENCH

Offered by TheDepartment of French

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. MKs
1.	I	23RL1C1	PART 1 LANGUAGE INTRODUCTORY FRENCH - I	5	3	40	60	100
2.	II	23RL2C2	PART 1 LANGUAGE INTRODUCTORY	5	3	40	60	100

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CRE DITS	CIA Mks	ESE Mks	TOT. MKs
			FRENCH - II					
3.	**III**	19RL3C3	PART 1 LANGUAGE FRENCH - LE NIVEAU INTERMEDIAIRE	**5**	**3**	**40**	**60**	**100**
4.	**IV**	19RL4C4	PART 1 LANGUAGE FRENCH - LE NIVEAU DE SUIVRE	**5**	**3**	**40**	**60**	**100**
			Total	**20**	**12**			

PART – I – HINDI

Offered by TheDepartment of Hindi

S. NO	SEM.	COURSECODE	COURSE TITLE	HRS	CRE DITS	CIA Mks	ESE Mks	TOT. MKs
1.	**I**	23DL1C1	PART 1 LANGUAGE GENERAL HINDI – I	**5**	**3**	**40**	**60**	**100**
2.	**II**	23DL2C2	PART 1 LANGUAGE GENERAL HINDI - II	**5**	**3**	**40**	**60**	**100**
3.	**III**	19DL3C3	PART 1 LANGUAGE HINDI –Hindi SahithyaKaAadhikaalaur Bhakthikaal	**5**	**3**	**40**	**60**	**100**
4.	**IV**	19DL4C4	PART 1 LANGUAGE HINDI –Reetikaleen Hindi SahithyaaurAadhunikKaa	**5**	**3**	**40**	**60**	**100**

S. NO	SEM.	COURSECODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. MKs
			1					
			Total	**20**	**12**			

PART – II -ENGLISH – 12 CREDITS

Offered by The Research Centre of English

S. NO	SEM.	COURSECODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. MKs
1.	**I**	23EL1LB	BASIC COMMUNICATIVE ENGLISH	5	3	40	60	100
2.		23EL1LI	INTERMEDIATE COMMUNICATIVE ENGLISH					
3.		23EL1LA	ADVANCED COMMUNICATIVE ENGLISH					
4.	**II**	23EL2LB	ENGLISH FOR EFFECTIVE COMMUNICATION (BASIC)	5	3	40	60	100
5.		23EL2LI	ENGLISH FOR EMPOWERMENT (INTERMEDIATE)					
6.		23EL2LA	ENGLISH FOR CREATIVE WRITING (ADVANCED)					
7.	**III**	19EL3LN	ENGLISH FOR THE DIGITAL ERA	5	3	40	60	100
8.	**IV**	19EL4LN	ENGLISH FOR INTEGRATED DEVELOPMENT	5	3	40	60	100

S. NO	SEM.	COURSECODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. MKs
			Total	**20**	**12**			

PART – III -MAJOR, ALLIED & ELECTIVES – 95 CREDITS

MAJOR CORE COURSES INCLUDING PRACTICALS : 60 CREDITS

S.NO	SEM.	COURSECODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. Mks
1.	I	23Z1CC1	INVERTEBRATA	5	4	40	60	100
2.		23Z1CC2	INVERTEBRATE LAB COURSE	4	4	40	60	100
3.	II	23Z2CC3	CHORDATA	5	3	40	60	100
4.		23Z2CC4	CHORDATA LAB COURSE	4	3	40	60	100
5.	III	19Z3CC7	HUMAN PHYSIOLOGY	5	4	40	60	100
6.		19Z3CC8	ENVIRONMENTAL BIOLOGY	4	3	40	60	100
7.		19Z3CC9	LAB - HUMAN PHYSIOLOGY &ENVIRONMENTAL BIOLOGY	3	2	40	60	100
8.	IV	19Z4CC10	MICROBIOLOGY	5	4	40	60	100
9.		19Z4CC11	EVOLUTION	4	3	40	60	100
10.		19Z4CC12	LAB - MICROBIOLOGY& EVOLUTION	3	2	40	60	100
11.	V	19Z5CC13	FUNDAMENTALS OF BIOCHEMISTRY	6	4	40	60	100
12.		19Z5CC14	MOLECULAR BIOLOGY	6	4	40	60	100
13.		19Z5CC15	LAB - BIOCHEMICAL ANALYSIS	4	2	40	60	100

S.NO	SEM.	COURSECODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. Mks
14.		19Z5CC16	LAB - MOLECULAR BIOLOGY	4	2	40	60	100
15.	VI	19Z6CC17	BASIC IMMUNOLOGY	5	4	40	60	100
16.		19Z6CC18	PRINCIPLES OF BIOTECHNOLOGY	5	4	40	60	100
17.		19Z6CC19	LAB - IMMUNOLOGY	3	2	40	60	100
18.		19Z6CC20	LAB - BIOTECHNOLOGY	3	2	40	60	100
			Total	**84**	**60**			

ALLIEDCOURSES- 20 CREDITS

S.NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. MKs
1.	I	23C1GEZ1	CHEMISTRY FOR BIOLOGICAL SCIENCES I	2	2	40	60	100
2.		23C2GEZ2	CHEMISTRTY FOR BIOLOGICAL SCIENCES LAB I	2	1	40	60	100
3.	II	23C2GEZ3	CHEMISTRY FOR BIOLOGICAL SCIENCES II	2	2	40	60	100
4.		23C2GEZ4	CHEMISTRTY FOR BIOLOGICAL SCIENCES LAB II	2	1	40	60	100
5.	III	21Q3ACZ1	PLANT DIVERSITY &PATHOLOGY	3	3	40	60	100
6.		21Q3ACZ2	LAB - PLANT DIVERSITY &PATHOLOGY	2	2	40	60	100

S.NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. MKs
7.	IV	21Q4ACZ3	DEVELOPMENTAL BOTANY& PLANT BREEDING	3	3	40	60	100
8.		21Q4ACZ4	LAB - DEVELOPMENTAL BOTANY & PLANT BREEDING	2	2	40	60	100
			Total	**20**	**20**			

ELECTIVES-15 CREDITS

S.No	SEM.	COURSECODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. Mks
1.	V	19Z5ME1/ 19Z5ME2	BIOSTATISTICS / ANIMAL BEHAVIOUR	5	5	40	60	100
2.	VI	19Z6ME3 / 19Z6ME4	EMBRYOLOGY / CLINICAL LABORATORYTECHNIQUES	5	5	40	60	100
3.		19Z6ME5 / 19Z6ME6	BIOINFORMATICS / ENTOMOLOGY	5	5	40	60	100
			Total	**15**	**15**			

PART – IV – 20 CREDITS

- **VALUE EDUCATION**
- **ENVIRONMENTAL AWARENESS**
- **NON MAJOR ELECTIVE**
- **SKILL BASED COURSES**

S. No	SEM.	COURSECODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. Mks
1.	I	21G1VE1	Personal Values	1	1	40	60	100
2.		23Z1FC	Fundamentals of Biology	2	2	40	60	100
3.		23Z1SE1	Non-Major Elective – Ornamental Fish Farming and Management Health (Offered to other major Students)	2	2	40	60	100
4.	II	21G2VE2	Values for Life	1	1	40	60	100
5.		23Z2SE2	Non-Major Elective – Biocomposting for Entreoreneurship (Offered to other major Students)	2	2	40	60	100
6.		23Z2SE3	AQUARIUM KEEPING	2	2	40	60	100
7.	III	19G3EE1	Environmental Education	1	1	40	60	100
8.		19Z3SB1	Vermitechnology	2	2	40	60	100
9.	IV	19G4EE2	Gender Studies	1	1	40	60	100
10.		19Z4SB2	MUSHROOMCULTIVATION	2	2	40	60	100
11.	V	19Z5SB3	ORNAMENTALFISHCULTURE	2	2	40	60	100
12.		19Z5SB4	SERICULTURE	2	2	40	60	100
13.	VI	19Z6SB5	APICULTURE	2	2	40	60	100
14.		19Z6SB6	DAIRYFARMING	2	2	40	60	100
			TOTAL	**20**	**20**			

PART – V – 1 CREDIT

OFF-CLASS PROGRAMMES - ALL PART-V

SHIFT - I

S. No	SEM.	COURSECODE	COURSE TITLE	HRS	CREDIT	TOT. Mks
1.	I - IV	21A4PED	Physical Education	30/ SEM	1	100
2.		21A4NSS	NSS			
3.		21A4NCC	NCC			
4.		21A4WEC	Women Empowerment Cell			
5.		21A4ACUF	AICUF			

OFF-CLASS PROGRAMMES

ADD-ON COURSES

COURSE CODE	COURSE TITLE	HRS.	CREDITS	SEMESTER IN WHICH THE COURSE IS OFFERED	CIA Mks	ESE Mks	TOTAL Mks
21UAD1CA	**COMPUTER APPLICATIONS**(offered by the department of PGDCA for Shift I)	40	2	I&II	40	60	100
21UADFCS	**ONLINE SELF LEARNING COURSE-** Foundation Course for Science	40	2	II	40	60	100
23UAD1CA	**COMPUTER APPLICATIONS**(offered by the department of PGDCA for Shift I)	40	2	I&II	40	60	100

COURSE CODE	COURSE TITLE	HRS.	CREDITS	SEMESTER IN WHICH THE COURSE IS OFFERED	CIA Mks	ESE Mks	TOTAL Mks
23Z1FC	**ONLINE SELF LEARNING COURSE-Fundamentals of Biology**	40	2	I	40	60	100
23UAD3ES	Professional Ethics	15	1	III	40	60	100
21UAD4ES	Personality Development	15	1	IV	40	60	100
21UAD5ES	Family Life Education	15	1	V	40	60	100
21UAD6ES	Life Skills	15	1	VI	40	60	100
19UAD5HR	**HUMAN RIGHTS**	15	2	V	100	-	100
21UAD6RS	**OUTREACH PROGRAMME**- Reach Out to Society through Action**ROSA**	100	3	V & VI	100	-	100
21UAD6PR	**PROJECT**	30	4	VI	40	60	100
21UAD6RC	**READING CULTURE**	10/ Semester	1	II-VI	-	-	-
	TOTAL		**20**				

EXTRA CREDIT COURSES

COURSE CODE	COURSE	HRS.	CREDITS	SEMESTER IN WHICH	CIA MKS	ESE MK	TOTAL MARK

				THE COURSE IS OFFERED		S	S
21UG2ZSL	**SELF LEARNING COURSES for ADVANCED LEARNERS** SingleCell ProteinCulture	-	2	II	40	60	100
21UG4ZSL	**Public Health &Hygyiene**	-	2	IV	40	60	100
23UG6ZSL	**HerbalCosmetics**	-	2	VI	40	60	100
	MOOC COURSES / International Certified online Courses (Department Specific Courses/any other courses) * Students can opt other than the listed course from UGC-SWAYAM UGC / CEC	-	Minimum 2 Credits	I – VI	-	-	

OFF CLASS PROGRAMMES

19UGVACZ1 - Value Added Certificate Course (Herbalism in Health Care)

21UGVACZ1 – Skill – Embedded Value Added Certificate Course (Livestock Farming)

I B.Sc. Zoology

SEMESTER – I

For those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	23Z1CC1	Invertebrata	Theory	5	4

COURSE DESCRIPTION

This course provides an overview of the Invertebrate animals by focussing on the General characters, Classification, Special features and Biology of some selected Invertebrates.

COURSE OBJECTIVES

- To understand the basic concepts of lower animals and observe their structure and functions.
- To illustrate and examine the systemic and functional morphology of various groups of invertebrates.
- To differentiate and classify the various groups of animal modes of life and to estimate the biodiversity.
- To compare and distinguish the general and specific characteristics of reproduction in lower animals.
- To infer and integrate the parasitic and economic importance of invertebrate animals

UNITS

UNIT- IPROTOZOA&PORIFERA (15 HRS.)

Protozoa: Introduction to Classification, taxonomy and nomenclature. General characters and classification of Phylum Protozoa up to classes.Type study - Paramecium - Parasitic protozoans (Entamoeba, Trypanasoma&Leishmania) - Nutrition in protozoa.

Porifera: General characters and classification up to Classes.Type study - Ascon- Canal system in - Reproduction in sponges.

Self-study –General characters of Protozoa & Porifera

UNIT- IICOELENTERATA, PLATYHELMINTHES&ASCHELMINTHES(15 HRS.)

Coelenterata: General characters and classification up to classes – Type study - *Obelia* - Corals and coral reefs - Polymorphism in Hydrozoa.
Platyhelminthes: General characters and classification of up to classes. Type study – *Fasciola hepatica.*Nematode Parasites - *Wuchereriabancrofti*, *Ancylostomeduodenale*.
Aschelminthes: General characters and classification of up to classes - Type study - *Ascaris lumbricoide.*
Self-study –General characters of Coelenterates, Platyhelminthes and Aschelminthes
UNIT-IIIANNELIDA& ARTHROPODA (15 HRS.)
Annelida: General characters and classification up to Classes. Type study –*Nereis.*Metamerism, Nephridium and coelomoducts.

Arthropoda: General characters and classification of Phylum Arthropoda up to Classes. Detailed study: *Penaeus indicus*. Affinities of *Peripatus.*

Self-study –General characters of Annelids and Arthropods
UNIT- IV MOLLUSCA&ECHINODERMATA (15 HRS.)
Mollusca: General characters and classification of Phylum Mollusca up to Classes. Detailed study: *Pila globosa*. Foot in Mollusca – Cephalopoda as the most advanced invertebrate.
Echinodermata: General characters and classification of Phylum Echinodermata up to Classes. Detailed study: *Asterias.* Water vascular system in Echinodermata – Larval forms of Echinoderms.
Self-study –General characters of Molluscs & Echinoderms
UNIT- V INSECTS ASSOCIATED WITH HUMAN DISEASES & INSECT PEST (15 HRS.)
Insects associated with human diseases: Mosquitoes, housefly; Insects associated with household materials: Termites; Insect pests: Insect pests, life cycle and types of damage to plants. Pest of rice: Rice stem borer (*Scirpophagaincertulas*) – Pest of Sugarcane: The shoot borer (*Chilo infuscatellus*) – Pest of coconut: The rhinoceros beetle (*Oryctes rhinoceros*) Pest of cotton: The spotted bollworm (*Eariasinsulana*) –Principles of Integrated Pest Management.
Self-study –Insect associated with human diseases

REFERENCES:

Text Books
EkambaranathaIyer, 2000. A Manual of Zoology, 10th edition, Viswanathan, S., Printers & Publishers Pvt Ltd

Jordan, E.L. and Verma P.S, 1995.Invertebrate Zoology, 12th edn. S. Chand& Co.

Kotpal, R.L, 1992. Protozoa, Porifera, Coelenterata, Annelida, Arthropoda.

Ekambaranatha Ayyar, and T. N. Ananthakrishnan, 2000.A Manual of Zoology.Vol 1 (Invertebrata). Part II – Viswanathan Pvt. Ltd, 842pp

Jordan, E.L. and Verma P.S, 1995.Invertebrate Zoology, 12th edn. S. Chand& Co.

Kotpal R.L. 2019. Modern Text Book of Zoology, Invertebrtes 9th Ed., Rastogi Publications, Gangotri, Shivaji Road, Meerut, 1004 pp.

Vasantharaj David, B. 2001. Elements of Economic Entomology, Popular Book Depot, Chennai. 400pp.

Ruppert and Barnes, R.D. 2006. Invertebrate Zoology, VIII Edition. Holt Saunders International Edition, Belmont, CA : Thomson-Brooks/Cole, 928pp.

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

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

3. Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson

4.Hyman L.H, 1955. The invertebrates - Vol.I to Vol. VII – Mc Graw Hill Book Co.

5.Parker, J. and Haswell , 1978. A text book of Zoology Vol.I - Williams and Williams.

6. Barrington, E.J.W., 2012, Invertebrate structure and function. Boston – Houghton. Miffin and ELBS, London.
7. Bhamrah,H.S. and Kavitha Junea, 2002. A text book of Invertebrates. Alilnol Publications Private Limited, 4374/4B.Ansari Road, Dayaganj, New Delhi.
8. Hyman L.H, 1955. The invertebrates – Vol. I to Vol. VII – McGraw Hill Book Co.
9. Kotpal, 1992. Protozoa, Porifera, Coelenterata, Annelida, Arthropoda, Mollusca, Echinodermata, R.L- Rastogi Publication.
10. Parker, J. and Haswell , 1978. A text book of Zoology Vol. I - Williams and Williams.

11. Srivastava, M.D.L and Srivastava, 1969. A text book of Invertebrate Zoology, U.S- Central Book Depot, Allahabad.
12. Verma, A. Invertebrates: Protozoa to Echinodermata. Narosa Publishing House Private Limited.35-36 Greams Road, Thousand Lights, Chennai.

Web Resources

DIGITAL OPEN EDUCATIONAL RESOURCES

1. https://www.nationalgeographic.com/animals/invertebrates/
2. https://bit.ly/3kABzKa
3. https://www.nio.org/
4. https://greatbarrierreef.org/
5. https://bit.ly/3lJdUX0

COURSE CONTENTS & LECTURE SCHEDULE:

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**PROTOZOA&PORIFERA**			
1.1	Introduction to Classification, taxonomy and nomenclature.	1	Chalk & Talk	Black Board
1.2	General characters and classification of Phylum Protozoa up to classes.	2	Chalk & Talk	LCD
1.3	Type study - Paramecium	2	Lecture	PPT
1.4	Parasitic protozoans (Entamoeba, Trypanasoma&Leishmania)	2	Lecture	Smart Board
1.5	Nutrition in protozoa	1	Lecture	Black Board
1.6	General characters and classification up to Classes	1	Chalk & Talk	Black Board
1.7	Type study - Ascon	3	Chalk & Talk	Black Board
1.8	Canal system in sponges	1	Lecture	PPT
1.9	Reproduction in sponges.	1	Lecture	PPT

1.10	**Self-study –General characters of Protozoa & Porifera**	-	Discussion	-
UNIT -IICOELENTERATA, PLATYHELMINTHES& ASCHELMINTHES				
2.1	**Coelenterata:** General characters and classification up to classes	2	Chalk & Talk	Black Board
2.2	Type study - *Obelia*	2	Chalk & Talk	LCD
2.3	Polymorphism in Hydrozoa.	1	Chalk & Talk	Black Board
2.4	**Platyhelminthes:** General characters and classification of up to classes..	2	Chalk &Talk	LCD
2.5	Type study – *Fasciola hepatica*	2	Chalk & Talk	Black Board
2.6	Nematode Parasites - *Wuchereriabancrofti*, *Ancylostomeduodenale.*	2	Chalk & Talk	LCD
2.7	**Aschelminthes:** General characters and classification of up to classes -	2	Chalk & Talk	Black Board
2.8	Type study - *Ascaris lumbricoid.*	2	Chalk & Talk	Black Board
2.9	**Self-study – General characters of Coelenterates, Platyhelminthes and Aschelminthes**	-	Discussion	-
UNIT -III ANNELIDA& ARTHROPODA				
3.1	General characters and classification up to Classes.,	2	Lecture	PPT
3.2	Type study –*Nereis.*	3	Lecture	PPT
3.3	Metamerism	2	Lecture	PPT & Videos
3.4	Nephridium and coelomoducts	2	Lecture	PPT & Videos
3.5	**Arthropoda:** General characters and classification of Phylum Arthropoda up to Classes.	2	Lecture	PPT
3.6	Detailed study: *Penaeus indicus.*	3	Chalk & Talk	Black Board

3.7	Affinities of *Peripatus.*	1	Chalk & Talk	Black Board
3.8	**Self-study - General characters of Annelids and Arthropods**	-	Discussion	-
UNIT -IV MOLLUSCA &ECHINODERMATA				
4.1	**Mollusca:** General characters and classification of Phylum Mollusca up to Classes.	2	Lecture	PPT & Videos
4.2	Detailed study: *Pila globosa.*	3	Lecture	PPT &Videos
4.3	Foot in Mollusca	1	Lecture	PPT & Videos
4.4	Cephalopoda as the most advanced invertebrate.	2	Lecture	PPT & Videos
4.5	**Echinodermata:** General characters and classification of Phylum Echinodermata up to Classes.	2	Lecture	PPT & Videos
4.6	Detailed study: *Asterias.*	3	Lecture	PPT & Videos
4.7	Water vascular system in Echinodermata	1	Chalk &Talk	Black Board
4.8	Larval forms of Echinoderms.	1	Chalk & Talk	Black Board
4.9	**Self-study –General characters of Molluscs & Echinoderms**	-	Discussion	-
UNIT -V INSECTS ASSOCIATED WITH HUMAN DISEASES & INSECT PEST				
5.1	Insects associated with human diseases: Mosquitoes, housefly.	2	Chalk & Talk	Black Board
5.2	Insects associated with household materials: Termites	2	Chalk & Talk	LCD
5.3	Pest of rice: Rice stem borer (*Scirpophagaincertulas*) —	2	Lecture	PPT
5.4	Pest of Sugarcane: The shoot borer (*Chilo infuscatellus*)	2	Chalk & Talk	LCD
5.5	Pest of coconut: The rhinoceros beetle (*Oryctes rhinoceros*)	2	Lecture	PPT
5.5	Pest of cotton: The spotted	2	Chalk & Talk	LCD

	bollworm (*Eariasinsulana*			
5.6	Principles of Integrated Pest Management.	3	Lecture	PPT
5.7	**Self-study – Insect associated with human diseases**	-	Discussion	-

Components	**Marks**	**Converted Marks**
T1	**30**	**15**
T2	**30**	
Assignment		**3**
Quiz / Seminar		**5**
Attendance		**2**
	Total	**25 Marks**

EVALUATION PATTERN

MARKS		
CIA	**ESE**	**Total**
40	60	**100**

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	**COURSE OUTCOMES**	**KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)**	**PSOs ADDRESSED**
CO 1	Understand the basic concepts of invertebrate animals and recall its structure and functions.	**K2**	PO1

CO 2	Illustrate and examine the systemic and functional morphology of various groups of invertebrata.	**K2**	PO1, PO2
CO 3	Differentiate and classify the animal's mode of life in various taxa and estimate the biodiversity.	**K1 & K3**	PO4, PO6
CO 4	To compare and distinguish the various physiological processes and organ systems in lower animals.	**K2 & K3**	PO4, PO5, PO6
CO 5	Infer and integrate the parasitic and economic importance of invertebrate animals.	**K3**	PO3, PO8

Mapping COs Consistency with PSOs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	S							
CO2	M	S						
CO3				S		S		
CO4				S	S	M		
CO5			S					S

S-Strong(3) M-Medium (2) L-Low (1) B N

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	1	1
CO2	3	2	1	1
CO3	3	2	1	1
CO4	3	2	1	1
CO5	3	2	1	1

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:
Forwarded By

HOD'S Signature & Name

I B.Sc. Zoology

SEMESTER – I

For those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	23Z1CC1	INVERTEBRATA LAB COURSE	Practical	4	4

COURSE DESCRIPTION

This course provides an overview of Invertebrate animals by focussing on the General characters, Classification, Special features and Biology of some selected Invertebrates.

COURSE OBJECTIVES

CO1	To identify the different groups of invertebrate animals by observing their external characteristics.
CO2	To understand the organs, organ system and their functions in lower animals.
CO3	To get knowledge about the different modes of life and their adaptation based on the environment.
CO4	Able to dissect and display the internal organs and mount the mouthparts and scales of invertebrates.

MAJOR DISSECTION (Virtual/Demo)

Cockroach: Circulatorysystem,Nervoussystem, Reproductive system. Leech: Nervous System, Reproductive system

Earthworm: Nervous System,Reproductivesystem.

Pila globosa: Nervous system. Prawn: Nervous system (including appendages).

MINOR DISSECTION (Virtual/Demo)

Cockroach: Digestive system. Earthworm: Viscera, Lateral hearts.

Pila globosa: Digestive system (Including radula).
Freshwater Mussel: Digestive system.

MOUNTING

Mounting: Earthworm: Body setae; Pineal setae.
Cockroach: Salivary apparatus
Mouth parts - Honey Bee, House fly and Mosquito

SPOTTERS

Spotters :

(i) Protozoa: Amoeba, Paramoecium, Paramoecium Binary fission and Conjugation.

(ii) Porifera: Ascon, Spicules, Gemmule

(iii) Coelenterata: Obelia – Colony & Medusa, Physalia, Velella

(iv) Platyhelminthes: Fasciola hepatica, Fasciola larval forms – Miracidium, Redia, Cercaria, *Taenia solium*

(v) Nemathelminthes: Ascaris(Male & Female), Ancylostoma, Wuchereria

(vi) Annelida: Nereis, Chaetopteurs, Hirudinaria, Trochophore larva

(vii) Arthropoda: Palaemon, Scorpion, Sacculina, Limulus, Peripatus, Larvae - Nauplius, Mysis, Zoea, Mouthparts of Housefly and Butterfly.

(viii) Mollusca: Pila, Sepia, Loligo, Octopus, Nautilus, Glochidium larva

(ix) Echinodermata: Asterias, Bipinnaria larva

REFERENCES:

Text Books

1. Ekambaranatha Iyyar and T. N. Ananthakrishnan, 1995 A manual of Zoology Vol.I (Part 1, 2) S. Viswanathan, Chennai
2. Ganguly, Sinha and Adhikari , 2011. Biology of Animals: Volume I, New Central Book Agency; 3rd revised edition. 1008 pp.
3. Sinha, Chatterjee and Chattopadhyay, 2 0 1 4. Advanced Practical Zoology, Books & Allied Ltd; 3rd Revised edition, 1 07 0 pp.
4. Lal ,S. S, 2016 . Practical Zoology Invertebrate, Rastogi Publications.
5. Verma, P. S. 2010. A Manual of Practical Zoology: Invertebrates, S Chand, 4 97pp.

References Books

1. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science.
2. Barnes, R.D. (1982). Invertebrate Zoology, V Edition. Holt Saunders International Edition.
3. Barrington, E.J.W. (1979). Invertebrate Structure and

Functions. II Edition, E.L.B.S. and Nelson
4. Boradale, L.A. and Potts, E.A. (1961). Invertebrates: A Manual for the use of Students. Asia Publishing Home.
5. Lal, S.S. 2005. A text Book of Practical Zoology: Invertebrate, Rastogi, Meerut

Web Resources

DIGITAL OPEN EDUCATIONAL RESOURCES

https://nbb.gov.in/
http://www.agshoney.com/training.htm
https://icar.org.in/
http://www.csrtimys.res.in/
http://csb.gov.in/
https://iinrg.icar.gov.in/
Https://www.nationalgeographic.com/animals/invertebrates/

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**MAJOR DISSECTION**			
1.1	Cockroach: Circulatory system, Nervous system, Reproductive system	3	Demonstration	Virtual software
1.2	Leech : Nervous System, Reproductive system	3	Demonstration	Virtual software
1.3	Earthworm: Nervous System, Reproductive system.	3	Demonstration	Virtual software
1.4	*Pila globosa*: Nervous system. Prawn: Nervous system (including Appendages).	3	Demonstration	Virtual software
UNIT -II	**MINOR DISSCECTION**			
2.1	Cockroach: Digestive system. Earthworm: Viscera, Lateral hearts.	6	Demonstration	Virtual software
2.2	*Pila globosa*: Digestive system (Including radula).	3	Demonstration	Virtual software
2.3	Freshwater Mussel: Digestive system.	3	Demonstration	Virtual software
UNIT -III	**MOUNTING**			
3.1	Earthworm: Body setae; Pineal setae.	3	Demonstration	Earthworm

			and Hands on training	
3.2	Cockroach: Salivary apparatus	3	Demonstration and Hands on training	Cockroach
3.3	Mouth parts - Honey Bee	2	Demonstration and Hands on training	Honey bee
3.4	Mouth parts - House fly	2	Demonstration and Hands on training	House fly
3.5	Mouth parts - Mosquito	2	Demonstration and Hands on training	Mosquito
SPOTTERS				
5.1	**Protozoa:** Amoeba, Paramoecium, Paramoecium Binary fission and Conjugation.	2	Explanation	Spotters
5.2	**Porifera:**Ascon, Spicules, Gemmule	1	Explanation	Spotters
5.3	**Coelenterata:** Obelia – Colony & Medusa, Physalia, Velella	1	Explanation	Spotters
5.4	**Platyhelminthes:** Fasciola hepatica, Fasciola larval forms – Miracidium, Redia, Cercaria, *Taenia solium*	2	Explanation	Spotters
5.5	**Nemathelminthes:** Ascaris(Male & Female), Ancylostoma, Wuchereria	1	Explanation	Spotters

5.5	**Annelida:**Nereis, Chaetopteurs, Hirudinaria, Trochophore larva	1	Explanation	Spotters
5.6	**Arthropoda:** Palaemon, Scorpion, Sacculina, Limulus, Peripatus, Larvae - Nauplius, Mysis, Zoea, Mouthparts of Housefly and Butterfly.	2	Explanation	Spotters
5.7	**Mollusca:** Pila, Sepia, Loligo, Octopus, Nautilus, Glochidium larva	1	Explanation	Spotters
5.8	**Echinodermata:** Asterias, Bipinnaria larva	1	Explanation	Spotters

Components	**Marks**	**Converted Marks**
T1	**30**	**15**
T2	**30**	
Assignment		**3**
Quiz / Seminar		**5**
Attendance		**2**
	Total	**25 Marks**

EVALUATION PATTERN

MARKS		
CIA	**ESE**	**Total**
40	60	**100**

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify and label the external features of different groups of invertebrate animals.	**K2**	PO1
CO 2	Illustrate and examine the circulatory system, nervous system and reproductive system of invertebrate animals.	**K2**	PO1, PO2
CO 3	Differentiate and compare the structure, function and mode of life of various groups of animals.	**K1 & K3**	PO4, PO6
CO 4	To compare and distinguish the dissected internal organs of lower animals.	**K2 & K3**	PO4, PO5, PO6
CO 5	Prepare and develop the mounting procedure of economically important invertebrates.	**K3**	PO3, PO8

Mapping COs Consistency with PSOs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	**S**							
CO2	**M**	**S**						
CO3				**S**		**S**		
CO4				**S**	**S**	**M**		
CO5			**S**					**S**

S-Strong(3) M-Medium (2) L-Low (1) B N

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	**3**	**2**	**1**	**1**
CO2	**3**	**2**	**1**	**1**
CO3	**3**	**2**	**1**	**1**

CO4	**3**	**2**	**1**	**1**
CO5	**3**	**2**	**1**	**1**

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:

Forwarded By

HOD'S Signature
& Name

SEMESTER – I

For those who joined in 2023 onwards

(Offered to I B. Sc Chemistry Students)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	23Z1EC1	Allied Zoology -I	Theory	3	2

COURSE DESCRIPTION

It emphasises the identification and taxonomy of animals, as well as the current diversity in animal form and function, within an evolutionary context.

COURSE OBJECTIVES

- To acquire a basic knowledge of diversity and organization of Protozoa, Coelenterata, Helminthes and Annelida
- To acquire a basic knowledge of diversity and organization of Arthropoda, Mollusca and Echinodermata
- To comprehend the taxonomic position and diversity among Protochordata, Pisces and Amphibia
- To comprehend the taxonomic position and diversity among Reptilia, Aves and Mammalia
- To acquire detailed knowledge of select invertebrate and chordate forms

UNITS

UNIT-I : Diversity of Invertebrates–I **(9 Hrs.)**

Principles of taxonomy. Criteria for classification–Symmetry andCoelom–Binomial nomenclature.Classification of Protozoa, Coelenterata,HelminthesandAnnelidauptoclasseswithtwoexamples.

UNIT-II : Diversity of Invertebrates–II **(9 Hrs.)**

Classification of Arthropoda,Mollusca and Echinodermata upto class level withexamples.

UNIT-III : Diversity of Chordates–I **(9 Hrs.)**

Classification of Prochordata, Pisces and Amphibiaupto orders giving two examples.

UNIT-IV : Diversityof Chordates–II **(9 Hrs.)**

Classification of Reptilia, Aves and Mammalia upto orders giving two examples.

UNIT- V : Animalorganisation **(9 Hrs.)**

Structure and organization of (i).Earthworm (ii)Rabbit/Rat(iii)Prawn/Fish

REFERENCES:

Text Books

1. EkambaranathaIyer,- Outlines of Zoology, Viswanathan Publication

References Books

1. Ekambaranatha Iyar and T.N.Ananthakrishnian - A Manual of Zoology Invertebrata Vol I,ViswanathanPublishers.

2.Ekambaranatha Iyar and T.N.Ananthakrishnan,-A Manual of Zoology – Invertebrata Vol - II: ViswanathanPublishors.

3. Ekambaranatha Iyar and T.N.Ananthakrishnan, - A Manual of Zoology Chordata, Viswanathan Publishers.

4. JordanE.L .and P.S. Verma - Invertebrate Zoology, S.Chand& Co.

Web Resources

DIGITAL OPEN EDUCATIONAL RESOURCES

1. www.sanctuaryasia.com
2. www.iaszoology.com

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 DiversityofInvertebrates–I				
1.1	Principlesof taxonomy. Criteriaforclassification	3	Chalk & talk	Black board
1.2	SymmetryandCoelom–Binomial nomenclature.	2	Chalk & talk	Black board

1.3	Classification ofProtozoa and Coelenterata,uptoclasseswithtwoexamples.	2	Lecture	LCD
1.4	Classification of HelminthesandAnnelidauptoclasses withtwoexamples.	2	Chalk & talk	Black board
UNIT -2 DiversityofInvertebrates–II				
2.1	ClassificationofArthropoda,uptoclasslevel with examples.	3	Chalk & talk	Black board
2.2	Classification of Mollusca upto class levelwith examples.	3	Lecture	PPT & White board
2.3	Classification of Echinodermata upto class level withexamples.	3	Chalk & talk	Black board
UNIT - 3 DiversityofChordates–I				
3.1	ClassificationofProchordatauptoordersgivingtwoexamples.	3	Chalk & talk	Black board
3.2	ClassificationofPiscesuptoordersgivingtwoexamples.	3	Lecture	PPT & White board
3.3	ClassificationofAmphibiauptoordersgivingtwoexamples.	3	Chalk & talk	Black board
UNIT - 4 DiversityofChordates–II				
4.1	ClassificationofReptiliauptoordersgivingtwoexamples.	3	Chalk & talk	Black board
4.2	ClassificationofAvesuptoordersgivingtwoexamples.	3	Lecture	PPT & White board
4.3	ClassificationofMammaliauptoordersgivingtwoexamples.	3	Chalk & talk	Black board
UNIT 5 Animal organization				
5.1	Structureandorganizationof(i).Earthworm	3	lecture	PPT & White board
5.2	Structureandorganizationof(ii)Rabbit/Rat	3	lecture	PPT & White

				board
5.3	Structureandorganizationof(iii)Prawn/Fish	3	lecture	PPT & White board

EVALUATION PATTERN

MARKS		
CIA	**ESE**	**Total**
40	60	**100**

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Recall the characteristic features invertebrates . and chordates.	**K1**	PO1
CO 2	Classify invertebrates up to class level and chordates up to order level	**K3**	PO1, PO2
CO 3	Explain and discuss the structural and functional organisation of some invertebrates and chordates	**K2**	PO4, PO6
CO 4	Relate the adaptations and habits of animals to their habitat	**K1**	PO4, PO5, PO6
CO 5	Analyse the taxonomic position of animals.	**K4**	PO3, PO8

Mapping COs Consistency with PSOs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	**S**							
CO2	**M**	**S**						
CO3				**S**		**S**		

CO4				**S**	**S**	**M**		
CO5			**S**					**S**

S-Strong(3) M-Medium (2) L-Low (1) B N

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	S	M	M	M
CO2	S	M	M	M
CO3	S	M	M	M
CO4	S	M	M	M
CO5	S	M	M	M

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:

Forwarded By

HOD'S Signature & Name

I B.Sc. Zoology

SEMESTER –I

For I B.Sc Chemistry those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAZO	**23Z1EC2**	**ALLIED ZOOLOGY LAB - 1**	**Practical**	**2**	**1**

OURSE DESCRIPTION

Students develop laboratory skills with identification of preserved specimen, manipulation of prepared slides, dissections and display under the microscope

COURSE OBJECTIVES

To study the diversity of animals and to understand the fundamental organization of cells.

INVERTEBRATA

1. Laboratory biosafety guidelines and Regulations of Animal Ethics
2. Examination of pond water for Protists.
3. Mounting of Body setae of Earthworm. (Collected from Vermiculture Centres)
4. Mounting of Mouth Partsof Honey Bee.

CHORDATA

1. Mounting of Ctenoid or Placoid scale.
2. Dissection of Frog Viscera using Virtual or Online Software.
3. Visit to Coastal Area.
4. Study of different types of Feathers of Birds.

SPOTTERS:

Preserved Museum Specimens

1. Invertebrata - *Amoeba*, Ascon Sponge. Obelia Colony, *Taenia solium,Ascaris* (Male & Female), Nereis, Peripatus, Limulus,

Octopus, Starfish (Oral & Aboral view).

2. Chordata – *Anguilla* (Eel), Toad (Bufo),*Naja*, Viper, Chamaeleon, Pigeon, Manis

REFERENCES

1. Rajan S., Christy, S.R., (2011) *Experimental procedures in Life Sciences*, Anjana Book House, Chennai.
2. Sinha J., Chatterjee A.K., Chattopadhyay P., (2015) *Advanced Practical Zoology*, Books and Allied (P) Ltd., Calcutta.
3. Tembhare D.B., (2008) *Techniques in Life Sciences*, 1st ed., Himalaya Publishing House Pvt. Ltd., Mumbai.
4. Dutta A., (2009) *Experimental Biology Lab manual*, Narosa Publishing House, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. https://www.uwlax.edu/biology/zoo-lab/
2. http://virtualbiologylab.org/
3. https://www.labster.com/simulations/animal-genetics/
4. https://libguides.mines.edu/oer/simulationslabs
5. https://www.biodiversitylibrary.org/item/29076#page/5/mode/1up

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
INVERTEBRATA				
1.1	Laboratory biosafety guidelines and Regulations of Animal Ethics	2	Hands on Training	Specimen

1.2	Mounting of Mouth Partsof Honey Bee.	4	Hands on Training	Specimen
1.3	Mounting of Body setae of Earthworm. (Collected from Vermiculture Centres)	4	Hands on Training	Specimen
1.4	Examination of pond water for Protists.	2	Hands on Training	Specimen
CHORDATA				
2.1	Mounting of Ctenoid or Placoid scale.	4	Hands on Training	Specimen
2.2	Dissection of Frog Viscera using Virtual or Online Software.	4	Demo	Virutal Software/ Online
2.3	Study of different types of Feathers of Birds.	2		
SPOTTERS				

3.1	Invertebrata - *Amoeba*, Ascon Sponge. Obelia Colony, *Taenia solium,Ascaris* (Male & Female), Nereis, Peripatus, Limulus, Octopus, Starfish (Oral & Aboral view).	6	Hands on Training	Specimen
3.2	Chordata – *Anguilla* (Eel), Toad (Bufo),*Naja*, Viper, Chamaeleon, Pigeon, Manis	2	Hands on Training	Specimen

CIA	
Scholastic	**35**
Non Scholastic	**5**
	40

EVALUATION PATTERN

MARKS		
CIA	**ESE**	**Total**
40	**60**	**100**

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Outline the Laboratory biosafety guidelines and good laboratory practices.	**K1**	PSO1, PSO2 & PSO7
CO 2	Dissect and mount the Body setae of Earthworm	**K4**	PSO1, PSO2,PSO4& PSO7
CO 3	List out the features of the Invertebrata specimens.	**K1**	PSO1, PSO7 & PSO8
CO 4	Identify and explain the features of vertebrate specimens.	**K3**	PSO2 &PSO4
CO 5	Explain the type of feathers.	**K2**	PSO1 & PSO4

Mapping of COs with PSOs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	3	2	2	2	2	3	2	2	2	2	2
CO2	3	3	2	2	2	2	2	2	2	2	2	2
CO3	3	3	2	2	2	2	3	2	2	2	2	2
CO4	3	2	2	3	2	2	3	2	2	2	2	2
CO5	2	3	2	3	2	2	2	2	2	2	2	2

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	1
CO2	3	2	2	1
CO3	3	2	2	1
CO4	3	2	2	1
CO5	3	2	2	1

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:Forwarded By

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& Name

I B.Sc. Zoology

SEMESTER – I

For those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	23Z1SE1	Ornamental Fish Farming & Management	Theory	2	2

COURSE DESCRIPTION

This course familiarizes basic principles, themes and steps needed to set-up and maintain an aquarium.

COURSE OBJECTIVES

- To understand the basic concepts, Scope and importance of ornamental fish culture
- The students will be able to identify, culture, maintain and market the commercially important ornamental fishes.
- Explain the process of food preparation.
- Identify the symptoms of various diseases prevalent in aquarium fishes.
- To analyze the knowledge and skills gained on the different aspects of ornamental fish keeping will enable the students to develop entrepreneurship potential and help in self employment.

UNITS

UNIT I **(6 Hrs)**

Introduction to ornamental fish keeping.

Scope and importance of ornamental fish culture.

Domestic and global scenario of ornamental fish trade and export potential.

Commercially important ornamental fishes - Indigenous and exotic varieties.

UNIT II **(6 Hrs)**

Biology of egg layers and live bearers.

Food and feeding in ornamental fishes. Formulated feed and Live feed; Live feed culture.

Breeding, hatchery andnursery management of egg layers (eg. Goldfish) and live bearers (eg.Guppy).

UNIT III **(6 Hrs)**

Aquarium design and construction; Accessories - aerators, filters and lighting.

Aquarium plants and their propagation.

Maintenance of aquarium and water quality management.

Ornamental fish diseases, their prevention, control and treatment methods.

UNIT IV **(6 Hrs)**

Conditioning, packing, transport and quarantine methods.

Economics, trade regulations, domestic and export marketing strategies.

Practical **(6 Hrs)**

1) Identification of locally available ornamental fishes - Egg layers and live bearers.

2) Identification of locally available live feed organisms.

REFERENCES:

Text Books

1. Thara Devi, C.S and Jayashree, K.V., (2009) *Aquarium*. Saras Publication, Nagercoil,

Reference Books

1. Swain SK., Sarangi N. and Ayyappan S. 2010. Ornamental fish farming. ICAR, New Delhi.
2. Living Jewels – A handbook on freshwater ornamental fish, MPEDA, Kochi.
3. Dey V.K.A. 1997. A handbook on aquafarming ornamental fishes. MPEDA, Kochi.
4. Ahilan, B., Felix N. and Santhanam R. 2008. Text book of aquariculture. Daya Publishing House, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. **http://ecoursesonline.iasri.res.in/course/view.php?id=297**
2. **https://www.ofish.org/**
3. **https://krishijagran.com/agripedia/income-generation-by-ornamental-fish-culture/**
4. https://99businessideas.com/ornamental-fish-farming/

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1				
1.1	Introduction to ornamental fish keeping. Scope and importance of ornamental fish culture.	2	Chalk & Talk	Black Board
1.2	Domestic and global scenario of ornamental fish trade and export potential.	2	Chalk & Talk	LCD
1.3	Commercially important ornamental fishes - Indigenous and exotic varieties.	2	Lecture	PPT & White board
UNIT -2				
2.1	Biology of egg layers and live bearers.	2	Chalk & Talk	Black Board
2.2	Food and feeding in ornamental fishes. Formulated feed and Live feed; Live feed culture.	2	Chalk & Talk	Black Board
2.3	Breeding, hatchery and nursery management of egg layers (eg. Goldfish) and live	2	Chalk & Talk	Black Board

	bearers (eg.Guppy).			
UNIT -3				
3.1	Aquarium design and construction; Accessories - aerators, filters and lighting.	2	Chalk & Talk	Black Board
3.2	Aquarium plants and their propagation. Maintenance of aquarium and water quality management.	2	Chalk & Talk	LCD
3.3	Ornamental fish diseases, their prevention, control and treatment methods.	2	Lecture	PPT & White board
UNIT -4				
4.1	Conditioning, packing, transport and quarantine methods.	3	Chalk & Talk	LCD
4.2	Economics, trade regulations, domestic and export marketing strategies.	3	Chalk & Talk	LCD
Practical				
1	Identification of locally available ornamental fishes - Egg layers and live bearers.	3	Hands on training	
2	Identification of locally available live feed organisms.	3	Hands on training	

Components	Marks	Converted Marks
T1	30	15
T2	30	
Assignment		3
Quiz / Seminar		5
Attendance		2
	Total	25 Marks

EVALUATION PATTERN

MARKS		
CIA	ESE	Total
40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	To recall the basic concepts, Scope and importance of ornamental fish culture	K1	PSO1
CO 2	The students will be able to identify, culture, maintain and market the commercially important ornamental fishes.	K3	PSO1, PSO2

CO 3	Explain the process of food preparation.	**K2**	PSO1, PSO2
CO 4	Identify the symptoms of various diseases prevalent in aquarium fishes.	**K1**	PSO2, PSO3
CO 5	To analyze the knowledge and skills gained on the different aspects of ornamental fish keeping will enable the students to develop entrepreneurship potential and help in self employment.	**K4**	PSO1, PSO4

Mapping COs Consistency with PSOs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	S							
CO2	S	S						
CO3				S				
CO4				S	S			
CO5			S					

S-Strong(3) M-Medium (2) L-Low (1) B N

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	S	M	M	M
CO2	S	S	M	M
CO3	S	S	M	M
CO4	M	S	S	M
CO5	S	M	M	S

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

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I B.Sc. Zoology

SEMESTER –II

For those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	23Z1FC	Fundamentals of Biology	Foundation Course	2	2

COURSE DESCRIPTION

This course aimsto create interest for the subject and instill confidence among students.

COURSE OBJECTIVES

- To understand the biological significance of biomolecules
- To illustrate the structure and functions of cell and its organelles
- To determine the concept of molecular biology and heredity.
- To correlate various functions and activities of living things
- Infer the concepts of ecology and origin of new life

Units

UNIT –I CHEMICAL COMPOSITION OF LIVING ORGANISM(6 HRS.)

The water and its properties. Biological molecules: proteins, nucleic acids, lipids, carbohydrates.

UNIT –II THE CELL (6 HRS.)

Prokaryotic and eukaryotic cells. Cell membranes and organelles: structure and function.

UNIT –III MOLECULAR BIOLOGY & GENETICS (6 HRS.)

DNA and genes - Central Dogma of Molecular Biology -DNA as the genetic material.Heredity – Inherited traits - Mendelian Inheritance – sex determination.

UNIT –IV PHYSIOLOGY ` (6 HRS.)

Life Processes – Nutrition: Autotrophic and Heterotrophic nutrition – Digestion – Respiration – Transportation – Excretion – Neuronal control & Coordination – Reproduction in animals.

UNIT –V ECOLOGY AND EVOLUTION (6 HRS.)

Population interactions - Ecosystem–Structureand Function –Decomposition - Energy Flow– Origin of Life - Evolution of Life Forms – Evidences of Evolution.

TEXT BOOKS:

1. Biology Textbook for Class XII, Revised edition, 2022, National Council of Educational Research and Training, New Delhi, India.
2. Biology Textbook for Class XI, Revised edition, 2022, National Council of Educational Research and Training, New Delhi, India.

REFERENCES:

1. P. Raven and G. Johnson, “Biology,” 6th Edition, Mc-Graw-Hill Companies, New York, 2002.
2. Urry, Lisa A.,, et al. Campbell Biology. Eleventh edition. New York, NY, Pearson Education, Inc, 2017.
3. Taylor, O.J., Green, N.P.O. and Stout, G.W. (1997) Biological Science. Cambridge University Press, Cambridge, UK.
4. Biology, Coursebook. Cambridge IGCSE. Jones and Jones. Cambridge University press, Cambridge, UK.

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER)

1. https://ncert.nic.in/textbook.php
2. https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/
3. https://www.queensu.ca/artsci_online/courses/fundamentals-of-biology-molecular-and-cell-biology
4. https://www.illuminalearning.org/register/general-sciences/fundamentals-of-biology

5. https://mitocw.ups.edu.ec/courses/biology/7-01sc-fundamentals-of-biology-fall-2011/

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 CHEMICAL COMPOSITION OF LIVING ORGANISM				
1.1	The water and its properties	1	Chalk & Talk	Black Board
1.2	Biological molecules: proteins	2	Chalk & Talk	LCD
1.3	Biological molecules: Nucleic Acids	1		PPT & White board
1.4	Biological molecules: Lipids and Carbohydrates	2	Lecture	Black Board
UNIT – 2THE CELL				
2.1	Prokaryotic and eukaryotic cells.	1	Lecture	Black Board
2.2	Cell membranes	2	Chalk & Talk	Black Board
2.3	Organelles: structure and function.	3	Chalk & Talk	Black Board
UNIT – 3 MOLECULAR BIOLOGY & GENETICS				
3.1	DNA and genes - Central Dogma of Molecular Biology	1	Chalk & Talk	Black Board
3.2	DNA as the genetic material	2	Lecture	PPT & White board
3.3	Heredity – Inherited traits - Mendelian Inheritance – sex determination.	3	Chalk & Talk	LCD
UNIT – 4 PHYSIOLOGY				
4.1	Nutrition: Autotrophic and Heterotrophic nutrition	1	Lecture	Black Board
4.2	Digestion – Respiration – Circulation	2	Chalk & Talk	Black Board
4.3	Excretion – Neuronal control & Coordination – Reproduction in animals.	3	Chalk &Talk	Black Board
UNIT – 5 ECOLOGY AND EVOLUTION				
5.1	Population interactions	1	Lecture	Black Board

5.2	Ecosystem–Structureand Function	2	Chalk & Talk	Black Board
5.3	Decomposition - Energy Flow	1	Chalk & Talk	Black Board
5.4	Origin of Life - Evolution of Life Forms – Evidences of Evolution.	2	Lecture	Black Board

INTERNAL - UG

Components	**Marks**	**Converted Marks**
T1	**30**	**15**
T2	**30**	
Assignment		**3**
Quiz / Seminar		**5**
Attendance		**2**
	Total	**25 Marks**

EVALUATION PATTERN

MARKS		
CIA	**ESE**	**Total**
40	60	**100**

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	**COURSE OUTCOMES**	**KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)**	**PSOs ADDRESSED**
CO 1	Recall the biological significance of	**K1**	PSO1, PSO2,

	biomolecules		PSO4 & PSO8
CO 2	Illustrate the structure and functions of cell and its organelles	**K2**	PSO1, PSO2, PSO4 & PSO8
CO 3	Determine the concept of molecular biology and heredity.	**K3**	PSO1, PSO2, PSO4 & PSO8
CO 4	Correlate the different life processes of human	**K3**	PSO1, PSO2, PSO4 & PSO8
CO 5	Infer the concepts of ecology and evolution	**K2**	PSO1, PSO2, PSO4 & PSO8

Mapping COs Consistency with PSOs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	S							
CO2	M	S						
CO3				S		S		
CO4				S	S	M		
CO5			S					S

S-Strong(3) M-Medium (2) L-Low (1) B N

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	S	M	M	M
CO2	S	M	M	M
CO3	S	M	M	M
CO4	S	M	M	M
CO5	S	M	M	M

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**

♦ Weakly Correlated -**1**

COURSE DESIGNER: **Forwarded By**

HOD'S Signature
& Name

I B.Sc. Zoology

SEMESTER – II

For those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	23Z2CC3	Chordata	Theory	5	5

COURSE DESCRIPTION

This course imparts knowledge on the salient features, classification and uniqueness of the Classes of Phylum Chordata.

COURSE OBJECTIVES

- To understand the structures and distinct features of Phylum Chordata.
- To understand and able to distinguish the characteristic features of each subphylum and class.
- To understand the economic importance of vertebrates
- To know about the adaptations of vertebrates
- To understand the evolutionary position of different groups of vertebrates

UNITS

UNIT I **(12 Hrs)**

General Characters and Classification of Phylum Chordata: Origin of Chordata, Differences between non-chordates and chordates, General characters, Affinities and Systematic position of Hemichordata (*Balanoglossus*), Urochordata (*Ascidia*), Cephalochordata (*Amphioxus*).

UNIT II **(12 Hrs)**

Prochordates and Agnatha: Characteristics of subphylum vertebrata, Classification of Vertebrata upto Class level, Agnatha (*Petromyzon*), - Pisces (*Scoliodonsorrakowah*) General characters and classification, Origin of fishes, Affinities of Dipnoi - Types of scales and fins - Accessory respiratory organs - Air bladder - Parental care - Migration - Economic importance.

UNIT III **(12 Hrs)**

Amphibia : General characters and classification - Origin of Amphibia - Type study - *Rana hexadactyla* - Adaptive features of Anura, Urodela and Apoda - Neoteny in Urodela - Parental care in Amphibia.

UNIT IV **(12 Hrs)**

Reptilia : General characters and classification - Type study – (*Calotes versicolor (endoskeleton of Varanus*) - Origin of reptiles and effects of terrestrialisation, Extinct reptiles. Snakes of India. Poison apparatus and biting mechanism of poisonous snakes - Skull in reptiles as basis of classification

UNIT V **(12 Hrs)**

Aves and Mammalia : Ayes: General characters and classification – Type study - *Columba livia* - Origin of birds, Flight adaptations, Migration. Mammalia: General characters and classification - Type study - Rabbit - Adaptive radiation in mammals - Egg laying mammals, Marsupials, Flying mammals, Aquatic mammals, Dentition in mammals.

REFERENCES:

Text Books

1. Ayyar, E.K. and T.N. Ananthakrishnan, 1992. Manual of Zoology Vol. II (Chordata), S. Viswanathan (Printers and Publishers) Pvt Ltd., Madras, 891p.
2. Jordan, E.K. and P.S. Verma, 1995. Chordate Zoology and Elements of Animal
Physiology, 10th edition, S. Chand & Co Ltd., Ram Nagar, New Delhi, 1151 pp.
3. Nigam, H.C., 1983. Zoology of Chordates, Vishal Publications, Jalandhar - 144008, 942.
4. Ganguly, Sinha,.BharatiGoswami and Adhikari, 2004. Biology of animals Vol.II - New central book Agency (p) Ltd.
5. Kotpal. R.L.A, Modern text book of Zoology Vertebrates- Rastogi publications. 2009

References Books

1. Darlington P.J. The Geographical Distribution of Animals, R.E. Krieger Pub. Co.
2. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.
3. Hickman, C.P. Jr., F.M.Hickman and L.S. Roberts, 1984. Integrated Principles of Zoology, 7th Edition, Times Merror/Mosby College Publication. St. Louis. 1065 pp.
4. Newman, H.H., 1981. The Phylum Chordata, Satish Book Enterprise, Agra – 282 003, 477 pp.
5. Parker and Haswell, 1964. Text Book of Zoology, Vol II (Chordata), A.Z.T,B.S.

Publishers and Distributors, New Delhi - 110 051, 952 pp.
6. Pough H. Vertebrate life, VIII Edition, Pearson International.
7. Waterman, Allyn J. et al., 1971. Chordate Structure and Function, Mac Millan &Co., New York, 587 pp.
8. Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.

Web Resources

DIGITAL OPEN EDUCATIONAL RESOURCES

3. http://tolweb.org/Chordata/2499https://bit.ly/3kABzKa
4. https://www.nhm.ac.uk/
5. https://bit.ly/3Av1Ejg
6. https://bit.ly/3kqTfYz
7. https://biologyeducare.com/aves/
8. https://www.vedantu.com/biology/mammalia

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1				
1.1	General Characters and Classification of Phylum Chordata: Origin of Chordata,	2	Chalk & Talk	PPT
1.2	Differences between non-chordates and chordates	2	Chalk & Talk	LCD
1.3	General characters, Affinities and Systematic position of Hemichordata (*Balanoglossus*)	2	Lecture	PPT
1.4	Urochordata (*Ascidia*)	3	Chalk & Talk	Black Board
1.5	Cephalochordata (*Amphioxus*).	3	Chalk & Talk	Black Board

UNIT -2				
2.1	Prochordates and Agnatha: Characteristics of subphylum vertebrata, Classification of Vertebrata upto Class level	3	Chalk & Talk	Black Board
2.2	Agnatha (*Petromyzon*), - Pisces (*Scoliodonsorrakowah*) General characters and classification	2	Chalk & Talk	Black Board
2.3	Origin of fishes, Affinities of Dipnoi	2	Chalk & Talk	LCD
2.4	Types of scales and fins - Accessory respiratory organs - Air bladder	3	Lecture	PPT
2.5	Parental care - Migration - Economic importance.	2	Chalk & Talk	Black Board
UNIT -3				
3.1	Amphibia : General characters and classification	3	Chalk & Talk	Black Board
3.2	Origin of Amphibia - Type study - *Rana hexadactyla*	3	Chalk & Talk	Black Board
3.3	Adaptive features of Anura, Urodela and Apoda	3	Chalk & Talk	LCD
3.4	Neoteny in Urodela - Parental care in Amphibia.	3	Lecture	PPT
UNIT -4				
4.1	Reptilia : General characters and classification	2	Chalk & Talk	Black Board

4.2	Type study – (*Calotes versicolor (endoskeleton of Varanus*)	3	Chalk & Talk	Black Board
4.3	Origin of reptiles and effects of terrestrialisation, Extinct reptiles.	2	Chalk & Talk	LCD
4.4	Snakes of India. Poison apparatus and biting mechanism of poisonous snakes	3	Lecture	PPT
4.5	Skull in reptiles as basis of classification	2	Chalk & Talk	LCD
UNIT - 5				
5.1	Aves and Mammalia : Ayes: General characters and classification	2	Chalk & Talk	Black Board
5.2	Type study - *Columba livia* - Origin of birds, Flight adaptations, Migration.	3	Chalk & Talk	Black Board
5.3	Mammalia: General characters and classification - Type study - Rabbit - Adaptive radiation in mammals	3	Chalk & Talk	LCD
5.4	Egg laying mammals, Marsupials, Flying mammals,	2	Lecture	PPT
5.5	Aquatic mammals, Dentition in mammals.	2	Chalk & Talk	LCD

Components	**Marks**	**Converted Marks**
T1	**30**	**15**

T2	**30**	
Assignment		**3**
Quiz / Seminar		**5**
Attendance		**2**
	Total	**25 Marks**

EVALUATION PATTERN

MARKS		
CIA	**ESE**	**Total**
40	60	**100**

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Classify, Identify and recall the name and distinct features of different subphylum belonging to phylum Chordata.	**K3**	PSO1
CO 2	Explain, and relate the origin, structural organization and evolutionary aspects of vertebrates.	**K2**	PSO1, PSO2
CO 3	Analyze, compare and distinguish the developmental stages and describe the important biological process.	**K4**	PSO3, PSO4, PSO5

CO 4	Correlate the different modes of life and parental care among different vertebrates.	**K4**	PSO3, PSO5,
CO 5	Summarise the morphology and ecological adaptations in vertebrates and list out the economic importance.	**K2**	PSO2, PSO3, PSO5

Mapping COs Consistency with PSOs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	S							
CO2	M	S						
CO3				S		S		
CO4				S	S	M		
CO5			S					S

S-Strong(3) M-Medium (2) L-Low (1) B N

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	S	M	M	M
CO2	M	S	M	M
CO3	M	S	S	S
CO4	M	M	S	S
CO5	M	M	S	M

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

COURSE DESIGNER:
Dr. S. Barathy
Forwarded By

HOD'S Signature

& Name

I B.Sc. Zoology

SEMESTER – II

For those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	23Z2CC4	CHORDATA LAB COURSE	Practical	4	3

COURSE DESCRIPTION

This Course aims to develop the ability to Identify the salient features of Chordates.

COURSE OBJECTIVES

- To identify the different groups of Chordates by observing their external characteristics.
- To understand and compare the structure of various internal organs of Chordates
- To get knowledge about the different modes of life and their adaptation based on the environment.
- Able to mount and display the internal organs and scales of Chordates

CHORDATA

Dissections (Virtual/ Demo only): Frog (Virtual/Demo)/Fish:Externalfeatures,Digestivesystem, Arterialsystem,Venoussystem,5thCranialnerve,9thand10thcranial nerves, Male and female urinogenital system.

Mounting: Fish: Placoid and Ctenoid scale

Osteology: Frog: Skull and lower jaw, Vertebral

column,Pectoralgirdle,Pelvicgirdle,Forelimb,Hindlimb. Pigeon - synsacrum.

SpecimenandSlides:**(i) Hemichordata:**Balanoglossus, Tornaria larva **(ii). Protochordata:** Amphioxus, **(iii). Cyclostomata:** Petromyzon, Ammocoetus larva **(iv). Pisces:** Hippocampus, Exocoetus, Echieneis, Auguilla, Scales: Placoid, Cycloid, Ctenoid**(v). Amphibia:**Ichthyophis, Hyla,Bufo, Axolotal larva **(vi). Reptilia :** Draco, Chemaeleon, Viperarusselli, Naja, Enhydrina , **(vii). Aves:** Archaeopteryx, Passer, Columba,; Collection and study of different types of feathers: Quill, Contour, Filoplume, Down **(viii). Mammalia:**Ornithorhynchus, Manis, Loris.

Embryology:Stages in the development of Frog and – Placenta in mammals.

REFERENCES:

1. Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science
3. Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson
4. Boradale, L.A. and Potts, E.A. (1961). *Invertebrates: A Manual for the use of Students*. Asia Publishing Home.
5. Lal, S.S. 2005. A text Book of Practical Zoology: Invertebrate, Rastogi, Meerut
6. Darlington P.J. The Geographical Distribution of Animals, R.E. Krieger Pub. Co.
7. Newman, H.H., 1981. The Phylum Chordata, Satish Book Enterprise, Agra – 282 003, 477 pp.
8. Parker and Haswell, 1964. Text Book of Zoology, Vol II (Chordata), A.Z.T,B.S. Publishers and Distributors, New Delhi - 110 051, 952 pp.
9. Pough H. Vertebrate life, VIII Edition, Pearson International.
10. Waterman, Allyn J. et al., 1971. Chordate Structure and Function, Mac Millan &Co., New York, 587 pp.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. https://bit.ly/3kABzKa
2. https://www.nio.org/

3. https://greatbarrierreef.org/
4. http://tolweb.org/Chordata/2499
5. https://www.nhm.ac.uk/
6. https://bit.ly/3Av1Ejg
7. https://bit.ly/3kqTfYz
8. https://biologyeducare.com/aves/
9. https://www.vedantu.com/biology/mammalia

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
1.1	**Dissections (Demo only)**: Frog (Demo)/Fish:Externalfeatures,Digestivesystem,	4	Demo/Virual Dissection	specimen
1.2	Arterialsystem,Venoussystem,5thCranialnerve,9thand10thcranial nerves, Male and female urinogenital system.	2	Demonstration	**SpecimenandSlides**
1.3	**Mounting**: Fish: Placoid and Ctenoid scale	6	Demonstration	**SpecimenandSlides**
Osteology				
2.1	**Osteology**: Frog: Skull and lower jaw, Vertebral column,Pectoralgirdle,Pelvicgirdle, Forelimb,Hindlimb. Pigeon - synsacrum. Manis, Loris.	3	Demonstration	**SpecimenandSlides**

2.2	**SpecimenandSlides**:**(i) Hemichordata:**Balanoglossus, Tornaria larva **(ii). Protochordata:** Amphioxus, **(iii). Cyclostomata:** Petromyzon, Ammocoetus larva **(iv). Pisces:** Hippocampus, Exocoetus, Echieneis, Auguilla, Scales: Placoid, Cycloid, Ctenoid**(v). Amphibia:**Ichthyophis, Hyla,Bufo, Axolotal larva **(vi). Reptilia :** Draco, Chemaeleon, Viperarusselli, Naja, Enhydrina , **(vii). Aves:** Archaeopteryx, Passer, Columba,; Collection and study of different types of feathers: Quill, Contour, Filoplume, Down **(viii). Mammalia:**Ornithorhynchus,	6	Demonstration	**SpecimenandSlides**
2.3	**Embryology**:Stages in the development of Frog and – Placenta in mammals.	3	Demonstration	**SpecimenandSlides**

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Identify and label the external features of different groups Chordate animals.	**K3**	PO1
CO 2	Illustrate and examine the circulatory system, nervous system and reproductive system of Chordate animals.	**K2**	PO1, PO2
CO 3	Differentiate and compare the structure, function and mode of life of various	**K2**	PO4, PO6

	groups of animals.		
CO 4	To compare and distinguish the dissected internal organs of lower animals.	**K2**	PO4, PO5, PO6
CO 5	Prepare and develop the mounting procedure of economically important Chordate	**K3**	PO3, PO8

SEMESTER – II

For those who joined in 2023 onwards

(Offered to I B. Sc Chemistry Students)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	23Z2SE3	ALLIED ZOOLOGY -II	Theory	3	2

COURSE DESCRIPTION

This course is designed for the chemistry student which discusses the branch of Zoology that deals with structure and function of various systems, development, inheritance in manand behaviour of animals.

COURSE OBJECTIVES

- To enable students to learn basic concepts relating to aspects of respiratory, circulatory, excretory nervous and sensory physiology.
- To enable students to comprehend the processes involved during development.
- To enable students to learn basic concepts of immunity and the working of immune organs and familiarize them with the recommended vaccination schedule.
- To enable students to comprehend the basic concepts of human genetics and patterns of inheritance.
- To enable students to learn about aspects of animal behaviour such as foraging, courtship, nest construction, parental care and learning.

UNITS

UNIT I **(9 Hrs)**

Respiration - Respiratory pigments and transport of gases. Mechanism of blood clotting.Types of excretory products – Ornithine cycle.Structure of neuron–Conduction of nerve impulse, Mechanism of vision andhearing.

UNIT II **(9 Hrs)**

Fertilization, Cleavage, Gastrulation and Organogenesis of Frog; Placentation in mammals

UNIT III **(9 Hrs)**

Immunity Innate and Acquired - Active and Passive; Antigens and Antibodies; Immunologicalorgans–responsesinhumans; Vaccination schedule

UNIT IV **(9 Hrs)**

Human Genetics: Human Chromosomes – Sex Determination in Humans; Patterns of Inheritance: Autosomal Dominant, Autosomal Recessive, X-linked, Y-linked, Mitochondrial, Multiple Allelic and Polygenic; Genetic Counselling

UNIT V **(9 Hrs)**

Animal Behaviour: Foraging, Courtship Behaviour, Shelter and Nest Construction, Parental Care, Learning Behaviour

REFERENCES:

Text Books

1. Verma P.S. & Agarwal - Developmental Biology, Chordata embryology S. Chand & Co.

References Books

1. Owen, J. A., Punt, J. &Stranford, S. A. - Kuby Immunology. New York: W.H. Freeman & Company

2. Klug, W. S., Cummings, M. R. & Spencer, C - Concepts of Genetics. (12th ed.). New Jersey: Pearson Education

3. Mathur, R.- Animal Behaviour. Meerut: Rastogi.

4. Verma P.S.& Agarwal DevelopmentalBiology,ChordataembryologyS.Chand&Co.

Web Resources

DIGITAL OPEN EDUCATIONAL RESOURCES

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 RESPIRATION				
1.1	Respiration - Respiratory pigments	1	Chalk & Talk	Black Board
1.2	Transport of gases	1	Discussion	Google classroom
1.3	Mechanism of blood clotting	2	Lecture	PPT & White board
1.4	Types of excretory products – Ornithine cycle.	2	Lecture	Smart Board
1.5	Structure of neuron	1	Lecture	Black Board
1.6	Conduction of nerve impulse,	1	Lecture	Black Board
1.7	Mechanism of vision	2	Lecture	LCD
1.8	Mechanism of hearing.	2	Discussion	Black Board
UNIT -2 DEVELOPMENTAL BIOLOGY				
2.1	Fertilization	2	Lecture	Green Board Charts
2.2	Cleavage	2	Chalk & Talk	Black Board
2.2	Gastrulation	3	Chalk & Talk	Green Board
2.3	Organogenesis of Frog	3	Lecture	LCD
2.4	Placentation in mammals	2	Chalk & Talk	Black Board

UNIT – 3 IMMUNOLOGY				
3.1	Immunity	1	Chalk & Talk	Black Board
3.3	Innate and Acquired	3	Chalk & Talk	Black Board
3.4	Active and Passive	1	Lecture	PPT/LCD
3.5	Antigens and Antibodies	3	Lecture	PPT/LCD
3.6	Immunological organs	2	Chalk & Talk	Black Board
3.7	Responses in humans	3	Lecture	PPT/LCD
3.8	Vaccination schedule	1	Chalk & Talk	Black Board
UNIT – 4 HUMAN GENETICS				
4.1	Human Genetics – Introduction	1	Lecture	PPT/LCD
4.2	Human Chromosomes	1	Group Discussion	Smart Board
4.3	Sex Determination in Humans	1	Group Discussion	Smart Board
4.4	Patterns of Inheritance: Autosomal Dominant, Autosomal Recessive,	3	Lecture	LCD
4.5	X-linked, Y-linked, Mitochondrial,	2	Chalk & Talk	Black Board

4.6	Multiple Allelic and Polygenic Inheritance	3	Chalk & Talk	Black Board
4.7	Genetic Counselling	1		
UNIT – 5ANIMAL BEHAVIOUR				
5.1	Animal Behaviour	2	Chalk & Talk	Black Board
5.2	Foraging, Courtship Behaviour,	3	Chalk & Talk	Black Board
5.3	Shelter and Nest Construction,	2	Lecture	LCD
5.4	Parental Care	3	Chalk & Talk	Green Board
5.5	Learning Behaviour	2	Chalk & Talk	White board

CIA	
Scholastic	
Non Scholastic	

2. EVALUATION PATTERN

MARKS		
CIA	**ESE**	**Total**
40	60	**100**

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL	PSOs ADDRESSE

		(ACCORDING TO REVISED BLOOM'S TAXONOMY)	D
CO1	Recall the parts and working of body organs and developmental stages, name the patterns of inheritance and list different types of animal behaviour	K1	PO1
CO2	Analyse the different developmental stages	K4	PO1, PO2
CO3	Analyse the working of body and immune systems	K4	PO4, PO6
CO4	Analyse the different patterns of inheritance	K4	PO4, PO5, PO6
CO5	Relate the behaviour of animals to physiology. Analyse the different types of behaviour	K2	PO3, PO8

Mapping COs Consistency with PSOs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	**S**	**S**						
CO2	**S**		**S**		**S**			
CO3	**S**						**S**	
CO4	**S**	**M**		**S**		**M**		
CO5	**S**							**S**

S-Strong(3) M-Medium (2) L-Low (1) B N

Mapping of COs with POs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S							
CO 2	M	S						
CO 3				S		S		
CO 4				S	S	S		
CO 5			S					M

S-Strong (3) M-Medium (2) L-Low (1)

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

Forwarded By

HOD'S Signature

& Name

I B.Sc.

SEMESTER –I

For I B.Sc Chemistry those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAZO	**23Z1EC4**	**ALLIED ZOOLOGY LAB – II**	**Practical**	**2**	**1**

COURSE DESCRIPTION

Students develop laboratory skills with identification of preserved specimen, manipulation of prepared slides, dissections and display under the microscope

COURSE OBJECTIVES

To study the Physiology and Behaviour of animals.

1. Laboratory biosafety guidelines and Regulations of Animal Ethics.
2. Qualitative analysis of urea and ammonia
3. Qualitative analysis of Uric Acid
4. Identification of Barr Bodies from Cheek Cells.
5. Observation of Mendelian traits in Man.
6. Demonstration of ABO Blood grouping.

7. Observation and recording of behaviour in various animals.

SPOTTER

Eye. Ear, Developmental stages of Frog, Ig A, Ig G, Ig M, Ig D, Placenta in Goat.

REFERENCES

5. Rajan S., Christy, S.R., (2011) *Experimental procedures in Life Sciences*, Anjana Book House, Chennai.
6. Sinha J., Chatterjee A.K., Chattopadhyay P., (2015) *Advanced Practical Zoology*, Books and Allied (P) Ltd., Calcutta.
7. Tembhare D.B., (2008) *Techniques in Life Sciences*, 1st ed., Himalaya Publishing House Pvt. Ltd., Mumbai.
8. Dutta A., (2009) *Experimental Biology Lab manual*, Narosa Publishing House, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES

6. https://www.uwlax.edu/biology/zoo-lab/
7. http://virtualbiologylab.org/
8. https://www.labster.com/simulations/animal-genetics/
9. https://libguides.mines.edu/oer/simulationslabs
10. https://www.biodiversitylibrary.org/item/29076#page/5/mode/1up

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
INVERTEBRATA				
1.1	Laboratory biosafety guidelines and Regulations of Animal Ethics.	1	Hands on Training	Specimen

1.2	Qualitative analysis of urea and ammonia	2	Hands on Training	Specimen
1.3	Qualitative analysis of Uric Acid	2	Hands on Training	Specimen
1.4	Identification of Barr Bodies from Cheek Cells.	4	Hands on Training	Specimen
1.5	Observation of Mendelian traits in Man.	1	Hands on Training	Specimen
1.6	Demonstration of ABO Blood grouping.	4	Hands on Training	Specimen
1.7	Observation and recording of behaviour in various animals.	4	Hands on Training	Specimen
SPOTTERS				

2.1	Eye. Ear, Developmental stages of Frog, Ig A, Ig G, Ig M, Ig D, Placenta in Goat.	10	Specimen	Specimen/ Model

CIA	
Scholastic	**35**
Non Scholastic	**5**
	40

EVALUATION PATTERN

MARKS		
CIA	**ESE**	**Total**
40	**60**	**100**

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Outline the Laboratory biosafety guidelines and good laboratory practices.	**K1**	PSO1, PSO2 & PSO7
CO 2	Identification of Barr Bodies from Cheek Cells.	**K3**	PSO1, PSO2,PSO4& PSO7
CO 3	Examine the presence of excretory products in the samples.	**K4**	PSO1, PSO7 & PSO8
CO 4	Identify and explain the features of Eye and Ear.	**K3**	PSO2 &PSO4
CO 5	Explain the type of Immunoglobulins.	**K2**	PSO1 & PSO4

Mapping of COs with PSOs

/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	3	2	2	2	2	3	2	2	2	2	2
CO2	3	3	2	2	2	2	2	2	2	2	2	2
CO3	3	3	2	2	2	2	3	2	2	2	2	2
CO4	3	2	2	3	2	2	3	2	2	2	2	2
CO5	2	3	2	3	2	2	2	2	2	2	2	2

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	3	2	2	1
CO2	3	2	2	1
CO3	3	2	2	1
CO4	3	2	2	1
CO5	3	2	2	1

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**

♦ Weakly Correlated -**1**

COURSE DESIGNER:

Forwarded By

HOD'S Signature & Name

I B.Sc. Zoology

SEMESTER – II

For those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	23Z2SE2	BIOCOMPOSTING FOR ENTREPRENEURSHIP	Theory	2	2

COURSE DESCRIPTION

This course imparts knowledge on biocomposting methods and hands on experience on the preparation of biocompostand its applications in solid waste management and motivate the learners to become an entrepreneur

COURSE OBJECTIVES

CO1	To understand the basic concepts and process of biocomposting
CO2	To analyze the various biocomposting methods
CO3	To foster the skills on the preparation of quality biocompost by recycling the waste
CO4	To infer and integrate the applications of biocompost
CO5	To design and estimate the economic cost of establishing small Biocompost units as a cottage industry.

UNITS

UNIT - I INTRODUCTION TO BIOCOMPOSTING (6HRS.)

Biocomposting – Definition, types and ecological importance.

UNIT – II BIOCOMPOSTING TECHNOLOGY (6HRS.)

Types of Biocomposting technology– Field pits/ground heaps/ tank/large-scale/batch and continuous methods.

UNIT – III PREPARATION OF BIOCOMPOST (6HRS.)

Preparation of Biocompost pit and bed using different amendments.

UNIT –IV APPLICATIONS OF BIOCOMPOST (6HRS.)

Applications of Biocompost in soil fertility maintenance, promotion of plant growth, value added products, waste reduction, etc.

UNIT – V ESTABLISHMENT OF SMALL BIOCOMPOST UNIT (6HRS.)

Economics of establishment of a small biocompost unit – project report proposal for Self Help Group (Income and employment generation).

PRACTICAL

- Preparation procedures for Biocompost pit.
- Selection of Biocompost material, separation of Compostable and Non-compostable materials.
- Packing and marketing of Biocompost.
- Field visit to Biocomposting unit.

REFERENCES:

Text Books

1. Christy, A.M.V. *Vermitechnology*, MJP publishers, Chennai, 1976.

References Books

1. Bikas R. Pati& Santi M. Mandal (2016). *Recent trends in composting technology*, I K International Publishing House Pvt.Ltd India, 2019.
2. Van der Wurff, A.W.G., Fuchs, J.G., Raviv, M., Termorshuizen, A.J. (Editors) 2016. *Handbook for Composting and Compost Use in Organic Horticulture*. BioGreenhouse COST Action FA 1105, www.biogreenhouse.org.
3. Sultan A I. *The Earthworm*Bo.Second Revised Edition .Other India Press, Mapusa - 403 507, Goa, 2005.
4. Bhatnagar R.K. &PaltaR.K. "*Earthworm Vermiculture and Vermicomposting*", Kalyani Publishers, Chennai
5. Gupta P.K. *Vermi Composting for Sustainable Agriculture*, AGROBIOS (India), Jodhpur.

Web Resources

DIGITAL OPEN EDUCATIONAL RESOURCES

1. www.biogreenhouse.org.
2. https://pubmed.ncbi.nlm.nih.gov/21628345/
3. https://pubmed.ncbi.nlm.nih.gov/18515003/
4. https://www.brainkart.com/article/Vermitechnology_39993/
5. https://technology4agri.wordpress.com/2013/02/12/vermitechnology-an-introuction/
6. https://agritech.tnau.ac.in/org_farm/orgfarm_vermicompost.html

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION TO BIOCOMPOSTING				

1.1	Biocomposting – Definition	2	Chalk & Talk	Black Board
1.2	Types and	2	Chalk & Talk	Black Board
1.3	Ecological importance.	2	Lecture	PPT
UNIT -2 BIOCOMPOSTING TECHNOLOGHY				
2.1	Types of Biocomposting technology	1	Chalk & Talk	Black Board
2.2	Field pits/ground heaps/ tank	1	Chalk & Talk	Black Board
2.3	Large-scale/batch and continuous methods.	1	Chalk & Talk	Black Board
UNIT - 3PREPARATION OF BIOCOMPOST				
3.1	Preparation of Biocompost pit	3	Chalk & Talk	Black Board
3.2	Preparation of Biocompost bed using different amendments.	3	Lecture	PPT & White board
UNIT - 4 PROPERTIES OF VERMICOMPOST				
4.1	Applications of Biocompost in soil fertility maintenance	2	Chalk & Talk	Black Board
4.2	Applications of Biocompost for the promotion of plant growth, value added products	2	Lecture	LCD
4.3	Applications of Biocompost in waste reduction, etc.	2	PPT	LCD &White Board
UNIT - 5 ECONOMICS AND PROSPECTS				
5.1	Economics of establishment of a small biocompost unit	3	Chalk & Talk	Black Board
5.2	Project report proposal for Self Help Group (Income and employment generation)	3	Chalk & Talk	Black Board

Components	Marks	Converted Marks
T1	30	15
T2	30	
Assignment		3
Quiz / Seminar		5
Attendance		2
	Total	25 Marks

EVALUATION PATTERN

MARKS		
CIA	ESE	Total
40	60	100

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	To understand the basic concepts and process of biocomposting		PO1
CO 2	To demonstrate biocomposting techniques for various end applications like solid waste management, industrial waste recycling using sugarcane bagasse, etc..		PO1, PO2

CO 3	To foster the skills on the preparation of quality biocompost by recycling the waste		PO4, PO6
CO 4	To infer and integrate the applications of biocompost		PO4, PO5, PO6
CO 5	To design and estimate the economic cost of establishing small Biocompost units as a cottage industry.		PO3, PO8

Mapping COs Consistency with PSOs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	S							
CO2	M	S						
CO3				S		S		
CO4				S	S	M		
CO5			S					S

S-Strong(3) M-Medium (2) L-Low (1) B N

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	2	3	2	2
CO2	2	3	2	2
CO3	2	3	2	2
CO4	2	3	2	2
CO5	2	3	2	2

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

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I B.Sc. Zoology

SEMESTER – II

For those who joined in 2023 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	23Z2SE3	Aquarium Keeping	Theory	2	3

COURSE DESCRIPTION

This course familiarizes the status and the importance of ornamental fish industry

COURSE OBJECTIVES

- To create knowledge on self employment opportunity of ornamental fishes
- To provide the knowledge of ornamental fishes and their equipment
- To understand the different breeding techniques of ornamental fishes

UNITS

UNIT I **(6 Hrs)**

Introduction and scope - Aquarium fish keeping as hobby and cottage industry. Commercial aspects like national and international market. To create knowledge on self employment opportunity.

UNIT II **(6 Hrs)**

External morphology of a typical fish.Exotic and endemic varieties of ornamental fishes.

UNIT III **(6 Hrs)**

Aquarium preparation and maintenance- Kinds of tanks, tank setting, biological filter and aeration, water management, planting, lighting and feeds. Budget for setting up an Aquarium Fish Farm as a Cottage Industry

UNIT IV **(6 Hrs)**

Live fish transport- handling,feeding and forwarding techniques of fish. Fish Diseases and their control.

UNIT V **(6 Hrs)**

Breeding – Common characters and sexual dimorphism of Fresh water and Marine aquarium ornamental fish varieties such as Guppies, Mollies, Sword tails, Platy, Siamese fighters and Gold fish, Butterfly fish, Blue morph and Anemone fish.

REFERENCES:

Text Books

K. V. Jayasree, C. S. Tharadevi and N. Arumugam (2015), Home Aquarium and Ornamental Fish Culture. Saras Publication

References Books

1. Santhanam, P., Sukumaran, N. & P. Natarajan, A manual of freshwater aquaculture (1987), Reprint 1999, Oxford & IBH Publishing Company Pvt., Ltd., New Delhi.
2. Cliff Harrison, A colour guide to Tropical Fish (1980), Chartwell Books, INC, Cerkshire, printed in Hon Kong.
3. O'Connell, R. F., The freshwater aquarium (1977), Arco Publishing Company, INC New York.
4. JingranV.G., 1991: Fish and Fisheries in India – Hindustan Publ.co. New Delhi
5. Mill Dick, 1993: Aquarium Fish, Daya Pub.co., New Delhi

Web Resources

DIGITAL OPEN EDUCATIONAL RESOURCES

1. 1https://mpeda.gov.in/?page_id=791
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4952235/

3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3435374/
4. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3648355/

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4203283/

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION				
1.1	Introduction and scope	1	Chalk & Talk	Black Board
1.2	Aquarium fish keeping as hobby and cottage industry.	1	Discussion	Google classroom
1.3	Commercial aspects like national and international market.	2	Lecture	PPT & White board
1.4	knowledge on self employment opportunity.	2	Lecture	Smart Board
UNIT -2 DEVELOPMENTAL BIOLOGY				
2.1	External morphology of a typical fish.	2	Lecture	Green Board Charts
2.2	Exotic varieties of ornamental fishes.	2	Chalk & Talk	Black Board
2.2	Endemic varieties of ornamental fishes.	2	Chalk & Talk	Green Board
UNIT – 3 AQUARIUM MANAGEMENT				
3.1	Aquarium preparation and maintenance	1	Chalk & Talk	Black Board
3.3	Kinds of tanks, tank setting, biological filter and aeration,	2	Chalk & Talk	Black Board
3.4	water management, planting, lighting and feeds.	2	Lecture	PPT/LCD

3.5	Budget for setting up an Aquarium Fish Farm as a Cottage Industry	1	Lecture	PPT/LCD
UNIT – 4 TRANSPORT AND DISEASE				
4.1	Live fish transport-handling, feeding	2	Lecture	PPT/LCD
4.2	forwarding techniques of fish.	2	Group Discussion	Smart Board
4.3	Fish Diseases and their control.	2	Lecture	LCD
UNIT – 5 BREEDING				
5.1	Breeding – Common characters and sexual dimorphism of Fresh water Guppies, Mollies, Sword tails, Platy, Siamese fighters and Gold fish,	3	Chalk & Talk	Black Board
5.2	Breeding – Common characters and sexual dimorphism of Marine aquarium ornamental fish		Chalk & Talk	Black Board
5.3	Breeding – Common characters and sexual dimorphism of Fresh water and Marine aquarium ornamental fish varieties such as Butterfly fish, Blue morph and Anemone fish.		Lecture	LCD

CIA	
Scholastic	

Non Scholastic	

3. EVALUATION PATTERN

MARKS		
CIA	**ESE**	**Total**
40	60	**100**

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	List the types of aquarium.	**K1**	
CO 2	Identify the exotic and endemic varieties of ornamental fishes.	**K3**	
CO 3	Outline the physico – chemical parameters in setting and management of aquarium Farm.	**K2**	
CO 4	Explain the techniques followed in feeding, handling and transport of ornamental fish.	**K2**	
CO 5	Identify the common freshwater and marine ornamental fishes based on	**K3**	

	common characters and sexual dimorphism.		

Mapping COs Consistency with PSOs

CO/PSO	PSO1	PSO2		PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S								
CO2	S			S			M	M	
CO3	S				M				
CO4	S			S					
CO5	S								

S-Strong (3) M-Medium (2) L-Low (1) B N

Mapping of COs with POs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3							
CO 2	2	3						
CO 3				3		3		
CO 4				3	3	2		
CO 5			3					2

S-Strong (3) M-Medium (2) L-Low (1)

Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**
♦ Weakly Correlated -**1**

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