KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE - 641 029

DEPARTMENT OF ZOOLOGY

(UG)

CURRICULUM AND SCHEME OF EXAMINATIONS

(CBCS)

(2024- 2025)

KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE-641029

DEPARTMENT OF ZOOLOGY

VISION

To make students understand the diversity, habitat and functioning of animals in order to conserve the environment and promoting the new biology and its cutting - edge - Technology.

MISSION

Broadcasting knowledge in Animal Sciences through innovative teaching and learning and also to make awareness about problems affecting animal and human health and world challenging environmental issues.

PROGRAMME OUTCOMES (PO)

PO1	To develop scientific attitudes, which will in turn beneficial for the society because the scientific development makes the growth of the nation or society to a greater height.
PO2	To equip students to learn the different biological systems, their coordination and control.
PO3	To learn the behaviour, biological role and evolution of the animal in the ecosystem.
PO4	To familiarise the qualitative and quantitative analysis of parameters using various statistical and bioinformatics used in modern sciences.
PO5	This program is providing the platform for understanding classical genetics, cells, biotechniques.
PO6	The programme will equip the students to serve in aquaculture, apiary industries or develop their own industrial units.
PO7	Theoretical and practical skills gained will be highly helpful to design the different public health strategies for social welfare.
PO8	To provide in-depth knowledge of applied subjects which will ensure the inculcation of employment skills so that they can make a career and become an entrepreneur.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1	To gain complete knowledge of Zoology as well as allied biological sciences and able to classify the chordates and non-chordates based on their morphology, anatomy and systemic organization.
PSO2	Students will be enriched their knowledge to the level of define and explain the major concepts in animal sciences and describe the ecological, medical and economic significance of animals in day to day life of humans.
PSO3	Students will be able to use the instruments, biostatistical and bioinformatics tools and other laboratory techniques in the proper way and able to explain how the animals function at the level of the cell, tissue, organ, gene and genome.
PSO4	Skill enhancement courses like aquaculture, sericulture and apiculture and other courses will inculcate the skills which will help them to start their own venture and to generate self-employment to make them be successful entrepreneurs.
PSO5	Students will be placed as animal conservationist, zoo curator, wildlife educator, zoology faculty, forensic experts, lab technician, veterinarians, wildlife biologist etc.

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

COIMBATORE – 641 029

Programme Name : **B.Sc., ZOOLOGY**

Curriculum and Scheme of Examination under CBCS

(Applicable to the students admitted during the Academic Year 2024-2025)

Semester	Part	Subject Code	Title of the Paper	Instruction hours/cycle	Exam. Marks			Duration ofExam (hours)	Credits
					CIA	ESE	TOTAL		
I	I	24TML101	Language I@	6	25	75	100	3	3
	II	24ENG101	English -I	6	25	75	100	3	3
	III	24UZO101	Core Paper 1 - Invertebrata	5	25	75	100	3	4
	III		Core Practical 1 – Invertebrata and Chordata	4	-	-	-	-	-
	III	24UZO1I1 24UBO1A1	Allied Paper 1 – Sericulture I /Botany I	5	20	55	75	3	4
	III		Allied Practical 1- Sericulture / Botany	2	-	-	-	-	-
	IV	24EVS101	Environmental Studies **	2	-	50	50	3	2
			Total	**30**	-	-	**425**	-	**16**
II	I	24TML202	Language II@	6	25	75	100	3	3
	II	24ENG202	English –II	6	25	75	100	3	3
	III	24UZO202	Core Paper 2 - Chordata	5	25	75	100	3	5
	III	24UZO2CL	Core Practical 1 – Invertebrata and Chordata	4	40	60	100	3	2
	III	24UZO212 24UBO2A2	Allied Paper 2 - Sericulture II /Botany II	5	20	55	75	3	4
	III	24UZO2IL 24UBO2AL	Allied Practical 1- Sericulture / Botany	2	20	30	50	3	2
	IV	24VED201	Value Education- Moral and Ethics**	2	-	50	50	3	2
			Total	**30**	-	-	**575**	-	**21**
III	I	24TML303	Language III@	6	25	75	100	3	3
	II	24ENG303	English –III	6	25	75	100	3	3
	III	24UZO303	Core Paper 3 – Cell and Molecular Biology	5	25	75	100	3	5
	III		Core Practical 2 - Cell and Molecular Biology and Physiology	2	-	-	-	-	-
	III	24UBC3A3	Allied Paper 3 - Biochemistry	5	20	55	75	3	4
	III		Allied Practical 2 - Biochemistry	2	-	-	-	-	-
	IV	24UGC3S1	Skill Based subject 1- Cyber Security	2	100	-	100	3	3
	IV	24TBT301/ 24TAT301/ 24UHR3N1	Basic Tamil* / Advanced Tamil**/ Non-major elective- I**	2	-	75	75	3	2
			Total	**30**	-	-	**550**	-	**20**
IV	I	24TML404	Language IV@	6	25	75	100	3	3
	II	24ENG404	English –IV	6	25	75	100	3	3
	III	24UZO404	Core Paper 4 - Physiology	5	25	75	100	3	5
	III	24UZO4CM	Core Practical 2 - Cell and Molecular Biology and Physiology	2	40	60	100	3	2
	III	24 UBC4A4	Allied Paper 2 - Biochemistry	5	20	55	75	3	4
		24UBC4AL	Allied Practical 2 - Biochemistry	2	20	30	50	3	2
	IV	24UZO4S2	Skill Based subject 2- Health Education	2	25	75	100	3	3
	IV	24TBT402/ 24TAT402/ 24USG4N2	Basic Tamil* / Advanced Tamil**/Non-major elective- II**	2	-	75	75	3	2
			Total	**30**	-	-	**700**	-	**24**

V	III	24UZO505	Core Paper 5 - Genetics	5	25	75	100	3	4
	III	24UZO506	Core Paper 6 - Evolution	5	25	75	100	3	4
	III	24UZO507	Core Paper 7 - Ecology	5	25	75	100	3	4
	III	24UZO508	Core Paper 8 – Biostatistics and Bioinformatics	5	25	75	100	3	4
	III		Core Practical 3 – Ecology,Developmental Biology and Animal Diversity	2	-	-	-	-	-
	III		Core Practical 4 – Genetics,Evolution,Biostatistics,Micribiology and Immunology and Biotechnology	2	-	-	-	-	-
	III	24U ZO5E1	Major Elective - 1	4	25	75	100	3	5
	IV	-	**EDC**	2	100	-	100	3	3
	-	**24UZO5IT**	**Internship Training ******	Grade					
			Total	**30**	-	-	**600**	-	**24**
VI	III	24UZO609	Core Paper 9 – Microbiology and Immunology	5	25	75	100	3	4
	III	24UZO610	Core Paper 10 - Biotechnology	5	25	75	100	3	4
	III	24UZO611	Core Paper 11 – Developmental Biology	5	25	75	100	3	5
	III	24UZO612	Core Paper 12 – Biodiversity and Animal Behaviour	5	25	75	100	3	4
	III	24UZO6CN	Core Practical 3 – Ecology,Developmental Biology, Biodiversity and Animal Behaviour	2	40	60	100	3	2
	III	24UZO6CO	Core Practical 4 – Genetics, Evolution, Biostatistics, Micribiology and Immunology and Biotechnology	2	40	60	100	3	2
	III	24U ZO6E2	Major Elective - 2	4	25	75	100	3	5
	III	24UZO6Z1	Project and Viva voce***	-	20	80	100	-	5
	IV	24UZO6S3	Skill Based subject 3- Basics of IPR	2	100	-	100	3	3
			Total	**30**	-	-	**900**	-	**34**
	V	24NCC **$**/NSS/YRC /PYE/ECC/RRC/ WEC101#	Cocurricular Activities*	-	50	-	50	-	1
Grand Total				**-**	**-**	**-**	**3800**	**-**	**140**

Note :

CBCS – Choice Based Credit system, CIA– Continuous Internal Assessment, ESE– End of Semester Examinations

$ For those students who opt NCC under Cocurricular activities will be studying the prescribed syllabi of the UGC which will include Theory, Practical & Camp components. Such students who qualify the prescribed requirements will earn an additional 24 credits.

@ Hindi/Malayalam/ French/ Sanskrit – 24HIN/MLM/FRN/SAN101 - 404

***** - No End-of-Semester Examinations. Only Continuous Internal Assessment (CIA)

******- No Continuous Internal Assessment (CIA). Only End-of-Semester Examinations (ESE)

*** Project Report – 60 marks; Viva voce – 20 marks; Internal-20 marks

**** The students shall undergo Internship training / field work for a minimum period of 14 working days at the end of the fourth semester during summer vacation and submit the report in the fifth semester which will be evaluated for 100 marks by the concerned guide and followed by an Internal Viva voce by the respective faculty or HOD as decided by the department. According to their marks, the grades will be awarded as given below.

Marks %	Grade
85 – 100	O
70 – 84	D
60 – 69	A
50 – 59	B
40 – 49	C
< 40	U (Reappear)

Major Elective Papers (2 papers are to be chosen from the following 6 papers)

1. Economic Zoology
2. Pests and their Management
3. Wild Life Ecology amd Management
4. Poultry Science and Management
5. Vermitechnology
6. Human Genetics and Counseling

Non-Major Elective Papers

1. Human Rights
2. SOGIESC Studies
3. Consumer Affairs

Sub. Code & Title of the Extra Departmental Course (EDC) :

24UZO5X1 – Human Anatomy

 # List of Cocurricular Activities:

1. National Cadet Corps (NCC)
2. National Service Scheme (NSS)
3. Youth Red Cross (YRC)
4. Physical Education (PYE)
5. Eco Club (ECC)
6. Red Ribbon Club (RRC)
7. Women Empowerment Cell (WEC)

Note: In core/ allied subjects, no. of papers both theory and practical are included wherever applicable.However, the total credits and marks for core/allied subjects remain the same as stated below.

Tally Table:

S.No.	Part	Subject	Marks	Credits
1.	I	Language – Tamil/Hindi/Malayalam/ French/ Sanskrit	400	12
2.	II	English	400	12
3.	III	Core – Theory/Practical	1600	60
	III	Allied	400	20
		Electives/Project	300	15
4.	IV	Basic Tamil / Advanced Tamil (OR) Non-major electives	150	4
		Skill Based subject	300	9
		EDC	100	3
		Environmental Studies	50	2
		Value Education	50	2
5.	V	Cocurricular Activities	50	1
		Total	**3800**	**140**

- 25 % CIA is applicable to all subjects except JOC, COP and SWAYAM courses which are considered as extra credit courses.
- 100 % CIA for Cyber Security and EDC paper.
- The students to complete any **MOOC On learning platforms like SWAYAM, NPTEL, Course era, IIT Bombay Spoken Tutorial etc.,** before the completion of the 5th semester and the course completion certificate should be submitted through the HOD to the Controller of Examinations. Extra credits will be given to the candidates who have successfully completed.
- An **Onsite Training** preferably relevant to the course may be undertaken as per the discretion of the HOD.
- Students who successfully complete **Naan Mudhalvan** courses in 3rd and 5th semester will be given 2 extra credits for each course. They are asked to submit the marks to Controller of Examinations through and undersigned by the HOD.

Semester	Naan Mudhalvan Course Title
III	Clinical Trials and Data Management
V	BVERSITY'S PCR TECHNOLOGY COURSE

Components of Continuous Internal Assessment

Components		Marks	Total
Theory			
CIA I	75	(75+75=150/10) Converted to 15	25
CIA II	75		
Assignment/Seminar		5	
Attendance		5	
Practical			
CIA Practical		25	40
Observation Notebook		10	
Attendance		5	
Project/Case study			
Review		15	20
Regularity		5	
Theory (Allied)(External: 55 marks)			
CIA I	55	(55+55) Converted to 10	20
CIA II	55		
Assignment/Seminar		5	
Attendance		5	
Practical (Allied) (External: 30 marks)			
CIA Practical		10	20
Observation Notebook		5	
Attendance		5	

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remembering; **K2**-Understanding; **K3**-Applying; **K4**-Analyzing; **K5**-Evaluating

1. Theory Examination:

(i) CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	10 x 1 = 10	MCQ	75
K1 – K5 Q11 to 15	B (Either or pattern)	5 x 5 = 25	Short Answers	
K2 – K5 Q16 to 20	C (Either or pattern)	5 x 8 = 40	Descriptive / Detailed	

(ii) CIA I & II and ESE: 55 Marks (Allied)

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	10 x 1 = 10	MCQ	55
K1 – K5 Q11 to 15	B (Either or pattern)	5 x 3 = 15	Short Answers	
K2 – K5 Q16 to 20	C (Either or pattern)	5 x 6 = 30	Descriptive / Detailed	

2. ESE Practical Examination:

Knowledge Level	Section	Marks	Total
K3	Experiments	50	60
K4	Record Work	10	
K5			

(For Allied papers)			
Knowledge Level	**Section**	**Marks**	**Total**
K3	Experiments	25	30
K4	Record Work	05	
K5			

3. ESE Project Viva Voce:

Knowledge Level	Section	Marks	Total
K3	Project Report	60	80
K4	Viva voce	20	
K5			

CIA Practical Examination (40 Marks)

Knowledge Level	Component	Marks	Total
K3 to K5	CIA Practical	(60) converted to 25	40
	Observation Notebook	10	
	Attendance	05	

CIA Practical Examination Mark Breakup

Knowledge level	Section
K3 to K5	**Major Experiments:25**
	Protocol - 5
	Experimentation - 10
	Results - 10
	Minor Experiments:15
	Protocol - 5
	Experimentation- 5
	Results - 5
	Spotters - 10
	Record Work - 10

CIA Practical Examination (20 Marks):

Knowledge Level	Component	Marks	Total
K3 to K5	CIA Practical	(30) converted to 10	20
	Observation Notebook	05	
	Attendance	05	

CIA Practical Examination Mark Breakup:

Knowledge level	Section
K3 to K5	**Major Experiments: 10**
	Protocol - 2
	Experimentation - 6
	Results - 2
	Minor Experiments: 5
	Protocol - 1
	Experimentation - 2
	Results – 2
	Spotters - 10
	Record Work - 5

ESE Practical Examination (60 Marks)

Knowledge Level	Component	Marks	Total
K3 to K5	Experiments	50	60
	Record Work	10	

ESE Practical Examination Mark Breakup:

Knowledge level	Section
K3 to K5	**Major Experiments:25**
	Protocol - 5
	Experimentation - 10
	Results - 10
	Minor Experiments:15
	Protocol - 5
	Experimentation- 5
	Results - 5
	Spotters - 10
	Record Work - 10

ESE Practical Examination (30 Marks):

Knowledge Level	Component	Marks	Total
K3 to K5	Experiments	25	30
	Record Work	05	

ESE Practical Examination Mark Breakup (30 Marks):

Knowledge level	Section
K3 to K5	**Major Experiments: 10**
	Protocol - 2
	Experimentation - 6
	Results - 2
	Minor Experiments: 5
	Protocol - 1
	Experimentation - 2
	Results – 2
	Spotters - 10
	Record Work - 5

Project Viva voce Internal Assessment (20 Marks)

Knowledge Level	Component	Marks	Total
K3 to K5	Review	10	20
	Regularity	10	

Project Viva voce Internal Assessment Mark Breakup:

Knowledge level	Break up of marks		
K3 to K5	Review I	Identification of Problem	2.5 marks
		Defining Objective	2.5 marks
	Review II	Designing methodology	2.5 marks
		Work progress according toObjective of the study	2.5 marks
	Regularity		10 marks
	Total		20 Marks

ESE Project Viva Voce (80 Marks):

Knowledge Level	Component	Marks	Total
K3 to K5	Project Report	60	80
	Viva voce	20	

Project Viva voce Mark Breakup:

Knowledge level	Section	Marks
K3 to K5	Review of Literature	10
	Methodology	10
	Results	20
	Discussion	10
	Summary and Conclusion	10
	Viva voce	20

Sub.Code: 24UZO101

Programme Code:06		B.Sc., Zoology		
Core Paper 1 – Invertebrata				
Batch 2024-2025	Hour/Week 5	Total Hours 75	Credits 4	Employability

Course Objectives

1. To obtain the knowledge of taxonomy and general characteristics of invertebrates.
2. To understand the morphological and anatomical features of selected invertebrates.
3. To create awareness about the harmful parasites and the economic importance of invertebrates.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Identify the systematic position of various organisms in the phylum invertebrates.
	CO2	Understand the structure and its functions of the invertebrates.
	CO3	Apply the knowledge to study the important parasites and their control measures.
	CO4	Analyze the economic importance of invertebrate organisms.
	CO5	Evaluate the impact of beneficial and harmful invertebrate animals on human health and other animal health.

Syllabus

Unit I: Phylum Protozoa and Porifera (15 Hours)

Phylum Protozoa

General characters and Classification up to Classes with suitable examples.

Type study : *Paramecium caudatum*

General Topic : Nutrition and Locomotion in Protozoa

Phylum Porifera

Type study : *Leucosolenia*

General Topic : Canal system in sponges

Unit II: Phylum Coelenterata and Aschelminthes (15 Hours)

Phylum Coelenterata

General characters and Classification up to Classes with suitable examples.

Type Study : *Obelia*

General Topic : Coral reefs

Phylum Aschelminthes

General characters and Classification up to Classes with suitable examples.

Type Study : *Ascaris lumbricoides*
General topic : Diseases caused, Symptoms and Control measures of parasitic Worms- *Wuchereria bancrofti*

Unit III: Phylum Platyhelminthes and Annelida (15 Hours)

Phylum Platyhelminthes

General characters and Classification up to Classes with suitable examples.
Type study : *Taenia solium*
General topic : Parasitic adaptations

Phylum Annelida

General characters and Classification up to Classes with suitable examples.
Type Study : *Hirudinaria granulosa*
General topics : Metamerism in Annelids

Unit IV: Phylum Arthropoda (15 Hours)

General characters and Classification up to Classes with suitable examples.
Type study : *Penaeus indicus*

Unit V: Phylum Mollusca and Echinodermata (15 Hours)

Phylum Mollusca

General characters and Classification up to Classes with suitable examples.
Type study : *Pila globosa*
General topics : Economic importance of Gastropods*****

Phylum Echinodermata

General characters and Classification up to Classes with suitable examples.
Type study : *Asterias rubens*
General topic : Salient Features and affinity of Balanoglossus.

***denotes Self-study**

Teaching Methods

Smart ClassRoom / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class.

Text Books

1. R.L. Kotpal, (2016 Edition), Modern Text Book of Zoology – Invertebrate, Rastogi publication, Meerut.
2. E.L. Jordan, P.S. Verma, (2009), Fifteenth Edition, Invertebrate Zoology. S. Chand & Co. new Delhi.
3. M. EkambaranathaAyyar, T.N. Ananthakrishnan, S. Visvanathan, (1981), Manual of ZoologyVol.1&2 Printers & Publishers Pvt. Ltd, Chennai.

Reference Books

1. D.T. Anderson, (2006), Invertebrate Zoology Oxford University Press.
2. P.S. Dhami, J.K. Dhami (2009), Invertebrate Zoology, S. Chand & Co., New Delhi.
3. V.K. Agarwal, (2003), Invertebrate Zoology. S.Chand & Company Ltd., New Delhi.
4. Ruppert, Edward E., Fox, Richard S. and Barnes, D Robert. (2009). Invertebrate Zoology: A Functional Evolutionary Approach. 7th edition. Thomson Brooks / Cole Publishers, USA.
5. N.C.Nair, S.Leelavathi, N.Soundrapandian, T.Murugan, N.Arumugam,(2013), A Textbook of Invertebrates, Saras Publication, Nagercoil, Tamil Nadu, India.
6. T.A. Anderson, (2001), Invertebrate Zoology (2nd edn), Oxford University Press, New Delhi.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	S	H	H
CO2	H	H	S	H	S
CO3	S	S	H	S	S
CO4	H	M	H	M	H
CO5	H	M	H	M	H

S-Strong **H**- High **M**-Medium **L**-Low

Sub.Code:24UZO1I1

Programme Code :06	**B. Sc., Zoology**			
Allied A Paper -I Sericulture - I				
Batch 2024-2025	Hour/Week 5	Total Hours 75	Credits 4	Entrepreneurship

Course Objectives

1. To create a self-employment opportunity among students
2. To equip the skills of rearing of silkworms
3. To create better breeding and Grainage techniques of silkworms

Course Outcomes

On successful completion of course the students will be able to

K1 to K5	CO1	Get the knowledge about the mulberry and non-mulberry silkworms.
	CO2	Understand the various silkworm rearing techniques
	CO3	Apply knowledge on control measures of silkworm diseases
	CO4	Analyze silkworm breeding and various breeding techniques of silkworm
	CO5	Evaluate the various techniques of grainage operations of silkworms

Syllabus

Unit I : Introduction to Sericulture (15 Hours)

Bombyx mori : Systematics, lifecycle, Silk gland and silk formation, Origin and economic importance of sericulture industry, Uses of silk, Role of Central silk board and CSRTI, Mulberry and non-mulberry (Tasar, Eri & Muga) silk producing species, their distribution and food plants (Primary, Secondary & Tertiary).

Unit II : Silkworm rearing (15 Hours)

Selection, location and orientation of rearing houses*****. Environmental conditions essential for rearing - temperature, humidity, ventilation and light - methods for providing optimum conditions, Different methods of rearing, quality of leaf required for different stages, Cleaning, spacing and frequency of feeding, Mounting of worms, Harvesting of cocoons.

Sub.Code:24UZO1I1

Unit III : Silkworm Pathology (15 Hours)

Disinfection of rearing rooms and equipments - control and prevention of a. Flacherie, b. Muscardine, c. Grasserie and d. Pebrine, Insects injurious to silkworm larva, pupa and cocoons.

Unit IV: Silkworm Genetics (15 Hours)

Genetic basis of variation in silkworm - multiple alleles in *Bombyx mori,* Sex-linked inheritance and mutation in *Bombyx mori.*

Breeding: Aims of silkworm breeding-Inbreeding and cross breeding - combining various qualities of races, maternal inheritance and its consideration in breeding.

Unit V: Grainage techniques (15 Hours)

Grainage techniques: various grainage techniques – Types of Eggs - Diapausing and non-diapausing eggs- selection of seed cocoons - emergence of moths - preparation and treatment of layings - refrigeration of over -wintered eggs.

***denotes Self-study**

Teaching Methods

Smart Class Room / Powerpoint presentation / Seminar/Quiz / Discussion /Flipped Class.

Text Books

1. M. Madan Mohan Rao, (2019), An Introduction to Sericulture. Second Edition, B.S publications Hyderabad, ISBN No.9789387593978.
2. G. Ganga, J. Sulochana Chetty, (2020), Second Edition, An introduction to sericulture. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
3. N. Thammanna Sonwalkar, (2001), Handbook of Silk Technology. New Age International (P) Limited, Publishers, New Delhi.

Reference Books

1. G. Ganga, (2017), Comprehensive Sericulture, Volume 2, Silkworm Rearing & Silk Reeling Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
2. M. Johnson, M. Kesari, (2019), Saras publications, Fifth Edition, Biosciences Book Publisher.
3. Sunil P. Triveni, (2009), Indian Sericulture Past, Present and Future, (First Edition), Alfa Publications.

4. Tribhuvan Singh and Pramod Kumar Singh, (2013), Mulberry Crop Protection. Discovery Publishing House Pvt. Ltd., New Delhi.
5. Kamal Jaiswal, P. Sunil, B.N. Trivedi, Pandey and R.K. Khatri, (2009), Moriculture, APH Publishing Corporation, Ansari Road, Daryakanj. New Delhi.
6. Singh, T., Bhat, M.M., Khan, M.A. (2009). Sericulture Extension – Principles and Management, Motilal Banarsidas Publishers Private Limited.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	M	M
CO2	S	M	H	M	H
CO3	H	M	M	H	M
CO4	S	H	H	M	M
CO5	S	H	M	H	M

S - Strong **H** - High **M** - Medium **L** - Low

Sub. Code: 24EVS101

For B.A., BBA, B.Com, BCA and B.Sc., Degree Students				
PART IV – ENVIRONMENTAL STUDIES				
Batch	Hours / Week	Total Hours	Credits	Skill Development
2024-2025	2	30	2	

COURSE OBJECTIVES

1. The course will provide students with an understanding and appreciation of the complex interactions of man, health and the environment. It will expose students to the multi-disciplinary nature of environmental health sciences
2. To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
3. To shape students into good "Ecocitizens" thereby catering to global environmental needs.
4. This course is designed to study about the types of pollutants including gases, chemicals petroleum, noise, light, global warming and radiation as well as pollutant flow and recycling and principles of environmental pollution such as air, water and soil
5. The course will address environmental stress and pollution, their sources in natural and workplace environments, their modes of transport and transformation, their ecological and public health effects, and existing methods for environmental disease prevention and remediation.

24EVS101

COURSE OUTCOMES

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

K1 to K5	CO1	Understand how interactions between organisms and their environments drive the dynamics of individuals, populations, communities and ecosystems
	CO2	Develop an in depth knowledge on the interdisciplinary relationship of cultural, ethical and social aspects of global environmental issues
	CO3	Acquiring values and attitudes towards complex environmental socio-economic challenges and providing participatory role in solving current environmental problems and preventing the future ones
	CO4	To gain inherent knowledge on basic concepts of biodiversity in an ecological context and about the current threats of biodiversity
	CO5	To appraise the major concepts and terminology in the field of environmental pollutants, its interconnections and direct damage to the wildlife, in addition to human communities and ecosystems

Syllabus

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONME (6 Hours)

Definition : scope and importance – Need for public awareness - Natural resources – Types of resources – Forest Resources – Water Resources – Mineral Resources – Food Resources – Energy Resources – Land Resources.

UNIT II ECOSYSTEMS (6 Hours)

Concept of an ecosystem – Structure and functions of an ecosystem – Procedures, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food web and ecological pyramids – Structure and function of the following ecosystem – Forest Ecosystem – Grassland Ecosystem – Desert Ecosystem – Aquatic Ecosystem.

UNIT III BIODIVERSITY AND ITS CONSERVATION (6 Hours)

Introduction – Definition – Genetic – Species and ecosystem diversity- Bio geographical classification of India – Value of biodiversity – Biodiversity at global, national and local levels – India as a mega - diversity Nation - Hot spot of biodiversity – Threats to biodiversity - Endangered and endemic species of

India – Conservation of Biodiversity – *In situ* Conservation of Biodiversity – *Ex situ* Conservation of Biodiversity

UNIT IV ENVIRONMENTAL POLLUTION (6 Hours)

Definition - Causes, effects and control measures of : Air Pollution – Water Pollution – Soil Pollution – Marine Pollution – Noise Pollution – Thermal Pollution – Nuclear Pollution – Solid Waste Management: Causes, effects, control measures of urban and industrial wastes – Role of individual in prevention of pollution – Pollution case studies – domestic waste water, effluent from paper mill and dyeing, cement pollution – Disaster Management – Food, Drought, Earthquake, Tsunami, Cyclone and Landslide.

UNIT V SOCIAL ISSUES AND THE ENVIRONMENT (6 Hours)

Sustainable Development – Smart City, Urban planning, Town Planning , Urban problems related to energy – Water Conservation: Rain Water Harvesting and Watershed Management – Resettlement and rehabilitation of people, its problems and concerns, case studies Narmatha Valley Project – Environmental ethics, issues and possible solutions – Climate change, global warming, ozone layer depletion, acid rain, nuclear accidents and holocaust, case studies – Hiroshima and Nagasaki, Chernobyl – Consumerism and waste products – Environmental Protection Act – Air Pollution Act (Prevention andControl) – Water Pollution Act (Prevention and control) – Wild Life Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness – Human Population and the environment – Population Growth and Distribution – Population Explosion – Family Welfare Programme – Environment and Human Health – Human Rights – Value Education – HIV/ AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health.

Text Book

1.P.Arul, A Text Book of Environmental Studies, Environmental Agency, No 27, Nattar street, Velacherry main road, Velacheery, Chennai – 42, First Edition, Nov.2004.

References

1. Purohit Shammi Agarwal, A text Book of Environmental Sciences, Publisher Mrs. Saraswati Prohit, Student Education , Behind Naswan Cinema Chopansi Road, Jodhpur.
2. Dr.Suresh and K.Dhameja, Environmental Sciences and Engineering , Publisher S.K.Kataria & Sons, 424/6, Guru Nanak Street, Vaisarak, Delhi - 110 006.
3. J.Glynn Henry and Gary W Heinke, Environmental Science and Engineering, Prentice Hall of India Private Ltd., New Delhi – 110 001

24EVS101

Question Paper Pattern for General papers

Environmental Studies

Question Paper Pattern

(External only)

Duration: 3 hours **Total Marks : 50**

Answer all Questions (5 x 10 = 50 Marks)

Essay type, either or type questions from each unit.

Sub.Code:24UZO202

Programme Code:06	**B.Sc., Zoology**			
Core Paper- 2- Chordata				
Batch 2024-2025	Hour/Week 5	Total Hours 75	Credits 5	Employability

Course Objectives

1. To obtain the comprehensive knowledge on the taxonomy and characteristics of chordates.
2. To understand the morphological and anatomical features of chordates.
3. To acquire knowledge on the general features, distribution and economic importance of chordates.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Identify the systematic position of the various group of animals in Phylum Chordata.
	CO2	Understand the morphology and anatomy of animals in different class of Chordates.
	CO3	Apply the knowledge on the learned systematic position of various animals to study the evolutionary significance of animals.
	CO4	Analyze the different morphological and anatomical features development gradually from one class to another class on the adaptation of animals to various habitats.
	CO5	Evaluate the impact of evolved characteristics for the adaptation of different classes of animals to their habit and habitat.

Syllabus

Unit I: Outline classification of Chordata (15 Hours)

Prochordata : General characteristics and Classification and up to Classes with suitable examples

Type study : *Branchiostoma*

General topic : Salient features and affinities of Prochordata.

Pisces: General characteristics and Classification and up to Classes with suitable examples (Chondrichthyes, Osteichthyes)

Type study : *Scoliodon sorrakowah*

General topics : General characteristics of Dipnoi and Migration of Fishes.

Sub.Code:24UZO202

Unit II: Amphibians (15 Hours)

General characteristics and Classification and up to Classes with suitable examples

Type study : *Rana hexadactyla*

General topic : Parental care in Amphibians

UNIT III: Reptilia (15 Hours)

General characteristics and Classification and up to Classes with suitable examples

Type study : *Calotes versicolor*

General topics : Poisonous and non-poisonous Snakes

UNIT IV: Aves (15 Hours)

General characteristics and Classification and up to Classes with suitable examples

Type study : *Columba livia (Except Endoskeleton)*

General topic : Migration in Birds

UNIT V : Mammals (15 Hours)

General characteristics and Classification and up to Classes with suitable examples

Type study : *Oryctolagus cuniculus*

General topics : Dentition in Mammals

***denotes Self-study**

Teaching Methods

Smart ClassRoom / Powerpoint presentation / Seminar/Quiz / Discussion/ Flipped Class.

Text Books

1. E.L, Jordan and P.S Verma (2013), Chordate Zoology S Chand & Company Ltd, New Delhi.
2. R.L. Kotpal, (2012), Morden Text book of Zoology-Vertebrates Rastogi Publication. Meerut.
3. Ekambaranatha Ayyar M,T.N. Ananthakrishnan, S. Viswanathan (1981), Manual of Zoology Vol.1&2 Printers & Publishers Pvt.Ltd, Chennai.

Sub.Code:24UZO202

Reference Books:

1. Dietland Muller-Schwarze, (2006), Chemical Ecology of Vertebrates, Published in the United States of America by Cambridge University Press, New York.
2. K. Vasantika, (2020), A Text Book of Vertebrate Zoology, Kedar Nath Ram Nath publishers, Meerut.
3. J.S. Kingsley, (2010), Text book of vertebrate Zoology, New York, H.Holt.
4. L. Donald, (2000), Vertebrate biology. Mcgraw Hill Publishers, India.
5. J.Z. Young, (2004), The Life of Vertebrates. III Edition. Oxford university press. Pough H. Vertebrate life, VIII Edition, Pearson International.
6. A. Thangamani, S. Prasannakumar, L.M. Narayanan, N. Arumugam. (2009), Chordates, Saras Publication, Nagercoil, Tamil Nadu, India.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	H	S
CO2	S	H	H	S	S
CO3	H	H	H	S	H
CO4	H	S	S	H	M
CO5	H	S	H	S	M

S-Strong **H**- High **M**-Medium **L**-Low

Sub.Code:24UZO212

Programmecode :06	**B.Sc., Zoology**			
Allied A Paper 2. Sericulture-II				
Batch 2024-2025	Hour/Week 5	Total Hours 75	Credits 4	Entrepreneurship

Course Objective

1. To study the mulberry cultivation and rearing of silkworm
2. To develop skills about the quality and processing of silk
3. To know the importance of reeling and byproducts of reeling for industrial development

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Get the knowledge about the Moriculture.
	CO2	Understand the cultivation of mulberry plants, pests, diseases and control measures of mulberry plants.
	CO3	Apply knowledge on processing of cocoons and different methods of silk reeling
	CO4	Analyze the importance of sericulture in entrepreneurship development.
	CO5	Evaluate the importance of marketing of cocoons and raw silk Examinations.

Syllabus

Unit I Introduction to Mulberry Cultivation (15Hours)

Moriculture: Distribution of varieties of mulberry-Climatic and other conditions for its growth - selection of land for cultivation. Different methods of mulberry cultivation- sexual and vegetative methods - merits and demerits.

Unit II Weeding and Disease Management (15 Hours)

Weeds and weeding - pruning methods - dormancy in mulberry***** – manuring.. Organic, chemical and biofertilizers Insects injurious to the mulberry gardens - bacterial and fungal diseases of mulberry.

Sub.Code:24UZO212

Unit III Cocoon quality assessment (15 Hours)

Selection of Raw material (cocoons). Importance of quality of cocoons - physical and commercial characteristics of cocoons - – Transport of cocoons, defective cocoons. Cocoons testing and classification- price fixation of raw materials, Cocoon market.

Unit IV Silk harvesting and reeling (15 Hours)

Processing of raw materials: Stifling and condition of cocoons - storage – sorting - riddling of cocoons. Boiling of cocoons - Different methods - Brushing of cocoons - Reeling techniques: Reeling equipments. Comparative study of various equipment's - Charka, cottage basins, and multi end basins - automatic reeling machines.

Unit V By-products of sericulture (15 Hours)

Importance of water in reeling. Raw silk examination - Lacing and skeining - Byproducts of reeling. Filature management: Layout of a filature - sections of a modern filature

***denotes Self-study**

Teaching Methods

Smart ClassRoom / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class.

Text Books

1. M. Madan Mohan Rao, (2019), An Introduction to Sericulture. Second Edition, B.S publications. Hyderabad, ISBN No.9789387593978.
2. G. Ganga, J. Sulochana Chetty, (2020), Second Edition, An introduction to sericulture. Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
3. N. ThammannaSonwalkar, (2001), Handbook of Silk Technology. New Age International (P) Limited, Publishers, New Delhi.

Reference Books

1. G. Ganga, (2017), Comprehensive Sericulture, Volume 2, Silkworm Rearing & Silk Reeling Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
2. M. Johnson, M. Kesari, (2019), Saras publications, Fifth Edition, Biosciences Book Publisher.
3. Tribhuvan Singh and Pramod Kumar Singh, (2013), Mulberry Crop Protection. Discovery Publishing House Pvt. Ltd., New Delhi.

4. Kamal Jaiswal, P. Sunil, B.N. Trivedi, Pandey and R.K. Khatri, (2009), Moriculture, APH Publishing Corporation, Ansari Road, Daryakanj. New Delhi.
5. T.Singh, M.M.Bhat, M.A.Khan, (2009), Sericulture Extension – Principles and Management, Motilal Banarsidas Publishers Private Limited.
6. Sunil P. Triveni, (2009), Indian Sericulture Past, Present and Future, (First Edition), Alfa Publications.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	M	M
CO2	S	M	H	M	H
CO3	H	M	M	H	M
CO4	S	H	H	M	M
CO5	H	S	M	H	S

S-Strong **H**- High **M**-Medium **L**-Low

Sub.Code:24UZO2CL

Programme Code:06	**B.Sc., Zoology**			
Core Practical-1 Invertebrata and Chordata				
Batch 2024-2025	Hour/Week 4	Total Hours 120	Credits 2	Employability

Course Objectives

1. To observe various non-chordate specimens by using Microscope.
2. To know the various systems (Digestive system, circulatory system and Reproductive system) of frog or rat by using virtual laboratory.
3. To analyze the quality of excretory product of certain vertebrates.

Course Outcomes (CO)

On successful completion of course the students will be able to

K3to K5	CO1	Get the knowledge on the cellular organization of animal kingdom
	CO2	Understand the knowledge to study various anatomical system by using virtual laboratory
	CO3	Apply the knowledge on phylogenetic classification of animal kingdom
	CO4	Analyze the excretory products of certain vertebrates
	CO5	Evaluate the biological significance, structure, and functions of various animals.

Syllabus

Experiment I

Microscope: Dissection and Compound observation of different parts. Explain structure and functions of each part with suitable diagrams.

Focus non-chordate specimen slides under compound microscope at 10X & 40X as the case may be and describe with suitable diagram.

Slides: Amoeba, Paramecium (WM), Ceratium, Foraminifera shell, Volvox, Cercaria larva, Nauplius larva, Zoea larva, Alima larva of squilla, and Bipinnaria larva.

Experiment II

Virtual laboratory: Observation and description of various systems of Earthworm, Cockroach, Frog and Rat displayed over the computer.

Sub.Code:24UZO2CL

Experiment III:
Qualitative analysis of excretory products of certain vertebrates. Ammonia in water from aquarium - Urea in urine of a mammal - Uric acid in excreta of birds.

Experiment IV: Spotters.
Classify and giving reasons: Euglena, Sycon, Obelia colony, Ascaris, Earth worm, Leech, Sepia, Sea cucumber, Amphioxus, Shark, Teleost fish, Frog, Calotes, Pigeon and Rabbit.

Draw labeled sketches: T.S. of Ascaris (male and female), T.S. of Hydra,T.S. of Taenia solium proglottid, T.S. through an arm of Starfish and T.S. through pharynx of Amphioxus.

Relate structure and function: Gemmule, Nereis parapodium, Earthworm body setae, Trachea (WM) of Cockroach, Tube feet (WM) of star fish, Placiod Scales, Ctenoid scales, Cycloid scales, Carapace, quill feather, and hair of a mammal.

Write descriptive notes: Skeleton of frog : Skull, Vertebral column, Atlas, Typical vertebra, urostyle, pectoral girdle, pelvic girdle, fore limb skeleton and hind limb skeleton. Poisonous and non-poisonous snake (one each).

Biological significance: Paramecium conjugation, Opalina, Coral (any one), Peripatus (picture), Limulus, Balanoglossus, Ambystoma, Archeoptryx (picture) and fossil (any one).

Teaching Methods
Smart ClassRoom / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class.

Sub.Code:24UZO2CL

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	M	M
CO2	S	M	H	M	H
CO3	H	M	M	H	M
CO4	S	H	H	M	M
CO5	H	S	M	H	S

S-Strong **H**- High **M**-Medium **L**-Low

Sub.Code:24UZO2IL

Programme code: 06	**B.Sc., Zoology**			
Allied A Practical 1-Sericulture				
Batch 2024-2025	Hour/Week 2	Total Hours 60	Credits 2	Skill Development

Course Objectives

1. To inculcate the practical knowledge on moriculture and sericulture, mulberry propagation, pests and diseases and their control measures.
2. To know the importance of silkworm rearing, pests and diseases of silkworms and their control measures.
3. To analyze the quality of silk through different experiments

Course Outcomes (CO)

On successful completion of course the students will be able to

K3 to K5	CO1	Apply knowledge on moriculture and sericulture
	CO2	Observe the biology, rearing, pests and diseases of silkworm and their control measures
	CO3	Evaluate the quality of silk
	CO4	Train to become an Entrepreneur
	CO5	Evaluate the importance of cocoons, eggs and silk gland

Syllabus

I. Moriculture:

1. Mulberry garden preparation & Maintenance
2. Preparation of Mulberry cuttings.
3. Pests & diseases of Mulberry Plant.
4. Deficiency diseases of Mulberry plant

II. Silkworm rearing:

5. Silkworm: Life cycle.
6. Silkworm egg, larva, pupa and adult
7. Disease free laying.
8. Rearing appliances.
9. Pests and diseases of silkworms.
10. Uzi fly

III. Eggs & Cocoons:

11. Demonstration- silk gland Dissection
12. Treatment of eggs.

13. Cooking & Reeling.
14. Estimation of renditta
15. Estimation of denier.
16. Estimation of shell ratio.

IV. Field Visit/ Study Tour

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	H	S
CO2	S	H	H	S	S
CO3	H	H	H	S	H
CO4	H	S	S	H	M
CO5	H	S	H	S	M

S-Strong **H**- High **M**-Medium **L**-Low

Sub. Code: 24VED201

Programme Code: 06	**For B.A., BBA, B.Com, BCA and B.Sc., Degree Students**		
MORAL AND ETHICS			
Batch 2024-2025	**Hours / Week** 2	**Total Hours** 30	**Credits** 2

Course Objectives

- To impart Value Education in every walk of life.
- To help the students to reach excellence and reap success.
- To impart the right attitude by practicing self introspection.
- To portray the life and messages of Great Leaders.
- To insist the need for universal brotherhood, patience and tolerance.
- To help the students to keep them fit.
- To educate the importance of Yoga and Meditation.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	**CO1**	will be able to recognize Moral values, Ethics, contribution of leaders, Yoga and its practice
	CO2	will be able to differentiate and relate the day to day applications of Yoga and Ethics in real life situations
	CO3	can emulate the principled life of great warriors and take it forward as a message to self and the society
	CO4	will be able to Analyse the Practical outcome of practicing Moral values in real life situation
	CO5	could Evaluate and Rank the outcome of the pragmatic approach to further develop the skills

Syllabus

UNIT I: **(4 Hours)**

Moral and Ethics: Introduction – Meaning of Moral and Ethics – Social Ethics – Ethics and Culture – Aim of Education.

Sub. Code:24VED201

UNIT II: (6 Hours)

Life and Teachings of Swami Vivekananda: Birth and Childhood days of Swami Vivekananda – At the Parliament of Religions – Teachings of Swami Vivekananda

UNIT III: (4 Hours)

Warriors of our Nation: Subhas Chandra Bose – Sardhar Vallabhbhai Patel – Udham Singh – V. O. Chidambaram Pillai – Bhagat Singh – Tiruppur Kumaran – Dheeran Chinnamalai – Thillaiaadi Valliammai – Velu Nachiyar – Vanchinathan

UNIT IV: (8 Hours)

Physical Fitness and Mental Harmony: Simplified Physical Exercise – Hand Exercises – Leg Exercises – Neuro Muscular Breathing Exercises – Eye Exercises – Kabalabathi – Maharasana A & B – Massage - Acupressure – Relaxation – Kayakalpa Yogam – Life Force – Aim & Objectives – Principle – Methods. Introspection – Analysis of Thoughts – Moralization of Desires – Neutralization of Anger – Eradication of Worries

UNIT V: (8 Hours)

Yoga and Meditation – The Asset of India: Yogasanam – Rules & Regulations – Surya Namaskar – Asanas –Sitting – Stanging – Prone - Supine - Pranayama – Naadi Sudhi – Ujjayi – Seethali – Sithkari - Benefits. Meditation – Thanduvasudhi - Agna – Shanthi – Thuriyam – Benefits.

Text Books:

Value Based Education – Moral and Ethics – compiled by Kongunadu Arts and Science College (Autonomous), 2nd Edition (2021).

Reference Books:

1. Swami Vivekananda – A Biography, Swami Nikhilananda, Advaita Ashrama, India, 24th Reprint Edition (2010).
2. Gandhi, Nehru, Tagore and other eminent personalities of Modern India, Kalpana Rajaram, Spectrum Books Pvt. Ltd., revised and enlarged edition(2004).
3. Freedom Fighters of India, Lion M.G. Agrawal, Isha Books Publisher, First Edition (2008).
4. Easy steps to Yoga by Swami Vivekananda, A Divine Life Society Publication(2000).
5. Yoga Practices - 1 – The World Community Service Centre – Vethathiri Publications, Sixth Edition (2017), Erode.
6. Yoga Practices - 2 – The World Community Service Centre – Vethathiri Publications – Eighth Edition (2017),Erode.

Sub. Code:24VED201

Value Education – Moral & Ethics
Question Paper Pattern
(External only)

Duration: 3 hours Total Marks: 50

Answer all Questions (5 x 10 = 50 Marks)
Essay type, either or type questions from each unit.

Sub.Code: 24UZO303

Programme Code: 06	**B.Sc., Zoology**			
Core Paper 3 – Cell and Molecular biology				
Batch 2024-2025	Hours / Week 5	Total Hours 75	Credits 5	Employability

Course Objectives

1. To provide the fundamental knowledge on microscopy, staining techniques, cell types and characters.
2. To enrich the knowledge on cell organelles and their role in metabolic activities.
3. To acquire knowledge about cell division and genetic makeup of the cell and its significance.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Imparting the knowledge on the principles of microscopes
	CO2	Enrich the concepts of the structure and functions of cellular organelles.
	CO3	Understand the structure of chromosome.
	CO4	Gain knowledge on the nucleic acids and DNA repair mechanism.
	CO5	Evaluate the impact of factors in cancer cell formation, diagnostics and treatment.

Syllabus

Unit I: Introduction to cell biology (15 Hours)

Introduction to cell, cell diversity and types. Cell theory and its modern concept, Structure of Prokaryotic and Eukaryotic cell. Microscopy - Use of Microscopes in cytology, Compound microscope, Electron microscopy (EM) – Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM). Cytological techniques: Microtome, stains and fixatives - Nuclear and cytoplasmic stains and staining techniques.

Unit II: Structure and functions of cell organelles (15 Hours)

Plasma membrane - Ultra Structure, models (bilayer, unit membrane, fluid mosaic), Chemical composition and functions - active and passive transport, proton pumps, phagocytosis, pinocytosis, exocytosis, endocytosis. Cell

organelles - Ultra structure and functions (Endoplasmic reticulum, Ribosomes, Mitochondria, Nucleus).

Unit III: Chromosomes structure and functions (15 Hours)

Chromosome : types, structure, components (histones and nonhistones), chromatin – Heterochromatin and Euchromatin; Specialized chromosomes - Polytene, Lampbrush; Endomitosis*****. Cell cycle: stages, regulation - cyclins and cyclin dependent kinase, check points; Mitosis and Meiosis - stages and significance.

Unit IV: Nucleic acid (15 Hours)

Genetic material: Experiments, which proves DNA as genetic material and RNA as genetic material in RNA viruses. Watson - Crick model, Forms of DNA – DNA-A, DNA-B and DNA-Z; RNA types- mRNA, rRNA, tRNA, DNA damage and repair: causes (spontaneous, chemical agent, radiation).

Unit V: Biology of cancer (15 Hours)

Characteristic features of cancer cells – carcinogen – chemical and physical carcinogen; Oncogenes – viral oncogenes, cellular oncogenes, chromosome rearrangement and cancer. Symptoms of cancer, treatment - surgical, chemotherapy and gene therapy. Preventive measures of cancer.

***Denotes Self-study**

Teaching Methods

Smart Classroom/ Powerpoint Presentation/ Seminar/ Quiz, Discussion/ Flipped Class

Text Books

1. C.Rastogi, (2010), Cell & Molecular Biology, New Age International Pvt. Ltd., Publishers, New Delhi.
2. P.S.Verma and V.K. Agarwal, (2009), Cell biology, Genetics, Molecular Biology, Evolution and ecology. S. Chand and Company Ltd, Publisher, Ram Nagar, New Delhi.
3. N.Arumugam, (2007), Cell Biology, Saras Publications, Nagercoil, Tamil Nadu, India.

Reference Books:

1. E.D.P.DeRobertis and E.M.P.DeRobertis, (2017), Cell and Molecular Biology, Wolters Kluwer Publications, Netherlands.
2. B.Alberts, D.Bray, K.Hopkin, A.D.Johnson, J.Lewis, M.Raff, K.Roberts, P.Walter, (2013), Essential cell biology. Garland Science, Taylor & Francis Group, Publishers, New York.
3. C.B.Power, (2009), Cell Biology, Himalaya Publishing House, Mumbai

P.K.Gupta, (2008), Cell and molecular biology, Rastogi Publications, Meerut, India.

4. G.M.Copper and R.E.Hausman, (2004), The Cell: A Molecular Approach, Sinauer Associates, Inc, Publishers, Massachusetts. USA.
5. H.Lodish, A.Berk, S.L.Zipursky, P.Matsudaira, D.Baltimore, J.Darnell, (2000), Molecular Cell Biology, W.H. Freeman & Co., Publishers, New York, USA.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	H	H
CO2	H	H	H	H	H
CO3	H	H	S	H	S
CO4	S	M	H	S	S
CO5	H	H	M	M	S

S – Strong **H** – High **M** – Medium **L** – Low

Sub.Code: 24UGC3S1

Programme Code : 06	**B.Sc., Zoology**				
Skill Based Subject 1–Cyber Security					
Batch 2024-2025	**Semester III**	**Hours / Week 2**	**Total Hours 30**	**Credits 3**	**Skill Development**

Course Objectives

1. The course introduces the basic concepts of Cyber Security
2. To develop an ability to understand about various modes of Cyber Crimes and Preventive measures
3. To understand about the Cyber Legal laws and Punishments

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	**CO1**	To Understand the Concepts of Cybercrime and Cyber Frauds
	CO2	To Know about Cyber Terrorism and its preventive measures
	CO3	To Analyze about the Internet, Mobile Phone and E-commerce security issues
	CO4	To Understand about E-mail and Social Media Issues
	CO5	To Describe about various legal responses to Cybercrime

Syllabus

Unit I **(6 Hours)**

Introduction to Cyber Security: Definition of Cyber Security- Why is Cyber Security important? Layers of Cyber Security- Evolution of Cyber Security. Cyber hacking - Cyber fraud: Definition- Different modes of cyber fraud - Cyber fraud in India. Cyber pornography.

Unit II **(6 Hours)**

Cyber Terrorism: Modes of cyber terrorism. Cybercrime: What is Cybercrime? Cybercrime preventive methods - Preventive steps for individuals & organizations - Kinds of cybercrime - Malware and its types– Cyberattacks.

Sub. Code: 24UGC3S1

Unit III **(5 Hours)**

Internet Mobile Phone and E-commerce Security issues: Data theft- Punishment of data theft- Theft of internet hours - Internet safety tips for children & parents. Mobile phone privacy- E-Commerce security issues.

Unit IV **(6 Hours)**

Email and Social media issues: Aspects of Social Media- The Vicious Cycle of unhealthy social media use - Modifying social media use to improve mental health. Computer Virus- Antivirus – Firewalls.

Unit V **(7 Hours)**

Cyber Forensics and Digital Evidence: What does Digital Footprint Mean?- Web Browsing and Digital Footprints- Digital Footprint examples – How to Protect Your Digital Footprints? - How to erase your Footprints? - Browser Extensions and Search Engine Deletion - Cyber Crime and Cyber Laws - Common Cyber Crimes and Applicable Legal Provisions: A Snapshot - Cyber Law (IT Law) in India – The Information Technology Act of India 2000-Cyber Law and Punishments in India- Cyber Crime Prevention guide to users – Regulatory Authorities.

Teaching Methods:

Chalk and Talk, Presentation, Seminar, Quiz, Discussion & Assignment

Text Book:

1. **"Cyber Security", Text Book** prepared by "Kongunadu Arts and Science College", Coimbatore -29, 2022.

Reference Books:

1. Mayank Bhushan, Rajkumar Singh Rathore, Aatif Jamshed, "Fundamental of Cyber Security", BPB Publications, 1st Edition, 2017.
2. Anand Shinde, "Introduction to Cyber Security-Guide to the world of Cyber Security", Notion Press,2021.
3. Paul Grishman, "Cyber Terrorism- The use of the Internet for Terrorist Purpose",Axis Publication,1st Edition 2010.
4. Shilpa Bhatnagar, "Encyclopaedia of Cyber and Computer Hacking",Anmol Publications,1st Edition 2009.

Web References:

1. http://deity.gov.in/ - Department of Electronics and Information Technology, Govt. of India
2. http://cybercellmumbai.gov.in/ - Cybercrime investigation cell
3. http://ncrb.gov.in/ - National Crime Records Bureau
4. http://catindia.gov.in/Default.aspx - Cyber Appellate Tribunal
5. http://www.cert-in.org.in/ - Indian Computer Emergency Response Team

6. http://cca.gov.in/rw/pages/index.en.do - Controller of Certifying Authoritic
7. www.safescrypt.com - Safescrypt
8. www.nic.in – National Informatics Centre
9. https://geekflare.com/digital-footprint/
10. https://www.kaspersky.com/resource-center/definitions/what-is-a-digital-footprint

Sub.Code: 24UZO404

ProgrammeCode : 06		B.Sc., Zoology		
Core Paper 4 –Physiology				
Batch 2024-2025	Hours / Week 5	Total Hours 75	Credits 5	Employability

Course Objectives

1. To get knowledge about the nutrition and feeding mechanism
2. To understand the structure and functions of various organ systems in the animal
3. To distinguish the interrelationship within physiological systems

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Remember and recognize the physiological structure and functions of various organs
	CO2	Understand the anatomical knowledge in predicting the physiological consequences
	CO3	Apply the physiological activity of organ system
	CO4	Analyse the types and functions of endocrine glands
	CO5	Evaluate the properties and functions of physiological systems

Syllabus

Unit I: Nutrition and Respiration (15 Hours)

Nutrition: Types of nutrition, feeding mechanisms, Digestion - extracellular and intracellular. Metabolism of carbohydrates, protein and fats. Vitamins and minerals.

Respiration : Types of respiration, respiratory pigments, transport of gases, Bohr's effect, chloride shift.

Unit II: Circulation and Excretion (15 Hours)

Circulation: Types of heart, neurogenic and myogenic hearts. Blood and its composition, blood clotting, pacemaker. Lymphatic system and its functions.

Sub.Code: 24UZO404

Excretion :Nitrogenous waste products - Ammonotelism, Ureotelism and Uricotelism. Mammalian nephron, urine formation, hormonal control of renal function. Osmoregulation in freshwater, marine and terrestrial animals*****.

Unit III: Nerve Physiology (15 Hours)

Structure and properties of nerve cell, Types of neurons, myelinated and non-myelinated neurons. Origin and conduction of nerve impulse - structure of synapse, mechanism of interneuronal transmission, neuromuscular junction, neurotransmitters and reflex action.

Unit IV: Muscle Physiology (15Hours)

Structure, types and properties of muscles, muscle proteins, types of muscle contraction-isotonic, isometric contractions, Sliding filament theory of muscle contraction - chemistry and mechanism of muscle contraction.

UNIT V: Endocrinology (15 Hours)

Structure and functions of endocrine glands in Human- Pineal, Pituitary, Thyroid, Parathyroid, Islets of Langerhans, Adrenals, Testis and Ovary.

***denotes self study**

Teaching Methods:

Smart ClassRoom / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class.

Text Books:

1. P.S.Verma, and V.K. Agarwal,(2016), Animal Physiology S.Chand& Company Ltd., New Delhi.
2. K.A.Goyal, and K.V.Sastry, (2012),Animal Physiology Rastogi Publications, Meerut, India.
3. Christopher D. Moyer and Patricia M. Schulte. (2007). Principles of Animal Physiology. 2nd Edition. Pearson. Benjamin - Cummings Publishing Company.

Reference Books:

1. W.Hoar, (1983), General and Comparative Physiology. Prentice Hall; 3rd Revised editionW. B.David & C. Lodd. (2018), Comparative Animal Physiology, Franklin Classics Trade Press United States.

1.SunetraRoday, (2012), Food science and Nutrition, IInd Ed. Oxford University Press, New Delhi.

2. H.R.Singh, and Neeraj Kumar, (2007), Animal physiology and Biochemistry – Vishal publications.
3. Jalandhar. Ndramouli R, (2010), Physiology, Jaypee Brothers Publications.
4. Saradha subramaniam and K.Madhavankutty, (2007), Text books of human physiology- Chand Company Ltd., New Delhi.
5. J.E.Hall., V. Mario., T. Raj & K. Anura (2016), Guyton& Hall Textbook of Medical Physiology, 2n South Asia Edition, Elsevier India.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	S	S	S
CO2	M	H	H	S	H
CO3	H	S	S	H	S
CO4	H	H	H	S	S
CO5	H	S	S	M	H

S – Strong **H** – High **M** – Medium **L** – Low

Sub.Code: 24UZO4S2

Programme Code :06	**B.Sc., Zoology**			
Skill Based Subject 2- Health Education				
Batch 2024-2025	Hours / Week 2	Total Hours 30	Credits 3	Skill Development

Course Objectives

1. To inculcate knowledge on health education and life styles.
2. To create awareness about the importance of the environment forhealthy life.
3. To educate students in relation to health education programmes of public importance.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Remember the knowledge about the concept of health
	CO2	Understand the role of Nutrition in Man
	CO3	Apply the knowledge on various environmental pollution anddiseases and their impacts on Man
	CO4	Analyse the Prevention and control of communicable and non-communicable diseases.
	CO5	Evaluate the Basic Knowledge of health care schemes

Syllabus

Unit I : Concept of health (6 Hours)

Determinants of health- Indicators of Health- Personal hygiene- Public health- Concepts of disease- Agent - Host and Environment, Dynamics of disease transmission - Sources and routes of transmission- First Aid.

Unit II: Nutrition and health (6 Hours)

Proteins, Carbohydrates, Fat, Trace elements- Food hygiene- Energy requirements - balanced diet – Malnutrition*.

Unit III: Environment and health (6 Hours)

Air, Water, Soil pollution and their effects on health.

Sub.Code: 24UZO4S2

Unit IV: Communicable diseases (6 Hours)

Viral and bacterial disease (Acquired immune deficiency syndrome (AIDS), Mumps, Tuberculosis, Typhoid).

Non communicable diseases: Diabetes, Cancer, Heart and Kidney problems.

Vector- borne diseases: Dengue, Malaria

Unit V : Health care of the community (6 Hours)

Health care services and Health programmes in India.

***denotes Self-study**

Teaching Methods

Smart ClassRoom / Powerpoint presentation / Seminar/Quiz / Discussion /Flipped Class.

Text Books

1. Murgesh,N, (2008), Health Education and Community Pharmacy. Satya Publishers, Madurai.
2. Srilakshmi, B (2011), Nutrition and Dietetics-New Age International Publishers, 6th Edition.
3. Dr. Arul Kumar and Tripathi, (2015), Fundamentals of Health Education, Khel Sathiya Kendra Publications.

Reference Books

1. Robert, (2001), Hand book of Pollution control processes, Noyesjaico publishing house, Mumbai.
2. Jill Varnes and Stephen, D.C, (2000), Health, Bud Getchell, Rurtypipin, Health and Company, Massachusetts.
3. Mike Davis, Kirsty Forrest, (2008), How to Teach Continuing Medical Education, BMJ Books.
4. M.Stevan, Downing, Rachel Yudkowsky, (2009), Assessment in Health Profession Education, Routledge Publisher.
5. Yvonne Carter, Neil Jackson, (2008), Medical Education and Training from theory to delivery, Publisher Oxford University Press.
6. T. Singh, P. Gupta, D. Singh, (2013), Principles of Medical Education, Fourth Edition IAP National Publication House, Gwalior.

Sub.Code: 24UZO4S2

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	M	H	M
CO2	S	M	H	S	H
CO3	M	H	S	H	S
CO4	S	S	H	M	H
CO5	M	H	H	M	H

S - Strong **H** - High **M** - Medium **L** - Low

Sub.Code: 24UZO4CM

Programme Code : 06	**B.Sc., Zoology**			
Core Practical - 2 Cell and Molecular Biology and Physiology				
Batch 2024-2025	Hours / Week 2	Total Hours 60	Credits 2	Employability

Course Objectives

1. To impart practical knowledge on different types of blood cells.
2. To understand mitotic and meiotic division of cells.
3. To learn the physiological process of oxygen consumption, osmoregulation and enzyme activity.

Course Outcomes (CO)

On successful completion of course the students will be able to

K3 – K5	CO1	Get the knowledge on the techniques and staining process for identification of different types of cells.
	CO2	Understand the process of mitotic and meiotic cell division.
	CO3	Apply the gained knowledge to study the haemin crystal formation and classification of blood groups.
	CO4	Analyze the physiological process such as oxygen consumption, osmoregulation and enzyme activity.
	CO5	Illustrate the different types of blood cells, physiological processes in our body and its impact on our health.

Syllabus

Cell and Molecular Biology

1. Squash preparation of onion root tip to observe mitotic stages.
2. Preparation of Buccal smear (human) to observe Barr body.

Physiology

1. Total RBC count in human blood.
2. Total WBC count in human blood.
3. Preparation of haemin crystal in human blood.
4. Preparation of blood smears (human) and observation on types of leukocytes.

5. Estimation of O_2 consumption in fish
6. Salivary amylase activity in human saliva.
7. Estimation of haemoglobin in human blood.
8. Blood grouping A, B, AB and O with Rh factor.

Spotters:

1. Stages of mitosis.
2. Stages of meiosis.
3. Haemocytometer.
4. Haemoglobinometer.
5. Anti-A & B serum.
6. DNA model.
7. Sphygmomanometer.
8. Glucometer.
9. Columnar epithelium
10. Ciliated epithelium.
11. Cardiac muscle TS.
12. Bone tissue TS.
13. Simple squamous epithelium.
14. Nervous tissue.
15. Frog – Blood smear.

MAPPING

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

S-Strong **H**- High **M**-Medium **L**-Low

Sub.Code: 24UZO505

ProgrammeCode : 06	**B.Sc., Zoology**			
Core Paper – 5 Genetics				
Batch 2024-2025	Hour/Week 5	Total Hours 75	Credits 4	Employability

Course Objectives

1. To make the students develop a comprehensive knowledge on pioneers in genetics and their contributions.
2. To create knowledge about the application of genetic principles in different populations.
3. To make the students understand the various principles of heredity and apply the genetic principles in mutation and genetic disorders.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO 1	Remembering the Mendelian principles of dominance and co-dominance and interaction among the genes.
	CO 2	Understand the genetic linkage, crossing over and sex-linked inheritance in animals
	CO 3	Apply the modern concept of gene, mutation and chromosomal aberrations.
	CO 4	Analyze the deep knowledge on genetic disorders in man.
	CO 5	Evaluate the need of breeding, genetic counseling and its significance.

Syllabus

Unit I: Mendelian Principle (15 Hours)

Mendel's monohybrid and dihybrid experiments. Interactions of genes: incomplete dominance, co-dominance, complementary genes, epistasis, supplementary genes and duplicate genes. Multiple alleles with examples: Eye colour in Drosophila, coat colour in rabbit. Human blood group inheritance: ABO blood grouping and Rh factor.

Sub.Code: 24UZO505

UNIT II: Linkage, Crossing over and Sex determination (15 Hours)

Linkage in Drosophila, Crossing over – types, kinds, mechanism and theories, cytological basis of crossing over, significance of crossing over; sex determination - man and drosophila, genic balance theory and gynandromorphs; Hormonal influence on sex determination-Freemartin. Role of environmental factors on sex determination - *Bonellia*.

Unit III: Human Genetics (15 Hours)

Modern concept of gene, split gene, fine structure of gene (cistron, muton and recon), pedigree analysis; human karyotypes, chromosome banding techniques, mutagenesis and chromosomal aberration, gene mutation, detection of mutation by CLB method, physical and chemical mutagens.

UNIT IV: Genetic Disorders (15 Hours)

Sex linkage in man - Colour blindness, Haemophilia; Genetic disorders: Chromosomal Aneuploidy (Klinefelter's syndrome, Down syndrome and Turner's syndrome; Chromosome translocation (Chronic Myeloid Leukemia) and Deletion ("cry of cat" syndrome, Gene mutation - Sickle cell anemia; Inborn errors of Metabolism: Phenylketonuria, Albinism, Alkaptonuria. Arterial Intelligence to diagnose Genetic Disorders.

UNIT V: Population Genetics (15 Hours)

Polymorphism - phenotypic and genotypic polymorphisms, transient and balanced polymorphisms. Hardy-Weinberg law, genetic composition of populations. Inbreeding and out breeding- inbreeding co-efficient, genotype frequencies under inbreeding, uses and effects of inbreeding in farm animals, genetic consequences of inbreeding, reasons for inbreeding, Eugenics and Genetic counseling*****.

***Denotes self study**

Teaching Methods:

Smart Class Room / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class.

Sub.Code: 24UZO505

Text Books:

1. Veer Bala Rastogi (2010), A text book of Genetics. Kedarnath Ramnath, New Delhi.
2. P.S.Verma, and V.K.Agarwal, (2007), Genetics. S.Chand and Company Pvt. Ltd, New Delhi.
3. Genes - VIII (2003) by Lewin B Oxford University Press.

Reference Books

1. E.W.Sinnot, Dunn. L.C. Dobzhausky, (2004), Principle of Genetics. McGraw Hill Book Company, New York.
2. Robert H.Lewin, (2002), Principles of Genetics. Tata McGraw Hill Publishing Company Ltd., New Delhi.
3. Peter Snustad. D and Michael J. Simmons (2011), Principles of Genetics. Wiley Publishers.
4. Benjamin A. Pierce (2016), Genetics: A Conceptual Approach 6th Edition. W.H. Freeman and Company, New York.
5. Lewin.B, (2008), Genes IX. Jones and Bartlett Publishers, Boston.
6. P.J.Russel, (2006), Genetics: A Molecular approach 2nd Edition Pearson Education. Chennai.
7. Kaliraj Devi, P.T. (2021). Artificial Intelligence Theory, Models, and applications. 1st Edition, Auerbach Publications, New York.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	M	H
CO2	M	H	M	S	M
CO3	S	H	M	H	S
CO4	H	S	H	H	H
CO5	S	H	M	H	H

S-Strong **H**- High **M**-Medium **L**-Low

Sub.Code: 24UZO506

Programme Code : 06	**B.Sc., Zoology**			
Core Paper - 6- Evolution				
Batch 2024-2025	Hour/Week 5	Total Hours 75	Credits 4	Employability

Course Objectives

1. To learn the evolution of different group of animals
2. To Understand the theories of evolution
3. To acquire knowledge on origin of species

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	COI	Understand the theory and concept of evolution
	CO2	Outline the origin of life, zoological time scale and living fossils
	CO3	Explain the evolutionary theory to understand the evolution of animals
	CO4	Analyze the significance of geological time scale and adaptation on the evolution of animals
	CO5	Describe the evidences proposed for the evolution of horse, elephant and man

Syllabus

Unit I **(15 Hours)**

Introduction, Historical aspects of Evolutionary Concept, Origin of life, Geological time Scale. Living fossils.

Unit II **(15 Hours)**

Evidences of Evolution- Morphological & Anatomical: Homologus and analogus structure, Vestigial organ, Parallel evolution, Atavism, Connecting links. Embryological, Physiological and Biochemical

Unit III **(15 Hours)**

Theories of Evolution-Lamarckism Neo-Lamarckism –Darwinism –Neo-Darwinism/ Modern concept of natural selection –Species Concept –Origin of species and Isolating Mechanisms - Genetic drift - Modern version of mutation theory and it’s significance.

Sub.Code: 24UZO506

Unit IV **(15 Hours)**

Patterns of Evolution -Convergent and parallel evolution, Micro and macroevolution, Adaptive radiation, Mimicry and coloration. Phylogenetic Trees of Invertebrates and Vertebrates (Overview).

Unit V **(15 Hours)**

Evolution Horse- Place of Origin, Time of Origin, Evolutionary trends, Evolutionary Sequence, Evolution Elephant- Place of Orign, Time of Origin, Evolutionary trends, Theories of Elephant Evolution. Evolution Man - Organic Evolution of Man, Ancestor of Man Evolution of Brain as the Moving force of Human Evolution and Animal Distributions*.

*** denotes Self-study**

Teaching Methods

Smart ClassRoom / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class.

Text books:

1. T.S. Gopalakrishnan, I.T.T.A. Sambasiviah, A.P. Kamalakara Rao, (1970), Principles of Organic Evolution Pearl Publications, Madras-40.
2. N.Arumugan, (2019), Organic Evolution – Saras Publication, Nagercoil, Tamil Nadu, India.
3. Mohan P. Arora, Himanshu Arora, (2013), The Text Book of Evolution, Himalaya Publishing House, New Delhi.

Reference Books:

1. M.VeerBala Rastogi, Jayaraj S. (2008), Physiology, Ecology and Evolution. Kedar Nath Ram Nath Publishers, Meerut, New Delhi.
2. S. Chattopadhyay, (2002), Life: Origin Evolution and adaptation Book & Allied (P) Ltd, Kolkata.
3. Hubert P. Yockey, (2005), Information theory, evolution, and the origin of life,Published in the United States of America by Cambridge University Press, New York.
4. P. S Verma, V.K. Agarwal, (2009), Cell biology, Genetics, Molecular Biology, Evolution &ecology. S. Chand & Company LTD, Ram Nagar, New Delhi, India.
5. E.Mayr, (2001), What Evolution Is, Basic Books, New York, USA.
6. C.R.Darwin, (2000), On the Origin of species by means of natural selection (revised edition) Collier Books, New York.

Sub.Code: 24UZO506

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	S	H	H
CO2	H	S	H	H	H
CO3	S	H	H	H	H
CO4	H	H	H	S	H
CO5	H	S	H	H	S

S – Strong **H** – High **M** – Medium **L** – Low

Sub.Code: 24UZO507

Programme Code : 06	**B.Sc, Zoology**			
Core Paper - 7 – Ecology				
Batch 2024-2025	Hour/Week 5	Total Hours 75	Credits 4	Employability

Course Objectives

1. To know the fundamental principles that governs the functioning of the environment.
2. To understand the concept of ecosystem and balance of nature.
3. To assess the relationship between environment and organisms.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Remembering the knowledge about the abiotic and biotic factors of the environment and their significance for ecosystem functioning.
	CO2	Understand the components of the ecosystem
	CO3	Apply knowledge on Community and Habitat ecology at different geographical regions to enhance species specific management
	CO4	Analyze the various types of environmental pollution and its assessment.
	CO5	Evaluate the student's knowledge the ecosystem approach

Syllabus

Unit I: Introduction to environment (15 Hours)

Abiotic factors of the environment - Temperature, Light, Oxygen, Carbon dioxide, Radiation and biological rhythm. Biotic factors of the environment: Commensalism, Symbiosis, and mutualism, Parasitism.

Unit II: Ecosystem (15 Hours)

Structure – Component of ecosystem – primary production and Secondary production, Foodchain - Foodweb-Ecological pyramid and energyflow. Ecotone – Edge effect – Ecological niches and Ecological succession and concept of climax.

Unit III: Habitat ecology (15 Hours)

Structure and functions of Indian ecosystem - terrestrial (Forest, tundra and grass land) aquatic (Fresh water, Marine and Estuary) Zonation-Characters-Flora and Fauna and their adaptation of aquatichabitats.

Sub.Code: 24UZO507

Unit IV: Biogeochemical cycle (15 Hours)

Homeostasis, Concept and types of biogeochemical cycle - Gaseus cycle (Carbon, Nitrogen and Oxygen) sedimentary cycle (Sulphur and Phosphorus).

Population ecology

Density–Natality–Mortality-Agedistribution-Population growth and Dispersal, carrying capacity.Species Interactions: Types of interaction, intraspecific competition, herbivory, carnivory, pollination, symbiosis.

Unit IV: Pollution ecology (15 Hours)

Sources, Biological effects and its control of Environment pollution (Air, Water, solid waste, Radioactive); Environmental Impact Assessment*****.

*** Denotes Self-study**

Teaching Methods:

Smart ClassrRoom / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class.

Text Books

1. M.S.Jeyaraj and Veerbala Rastogi, (2013), Animal ecology and Distribution of Animals, Kedarnath Ramnath publishers, Meerut, Delhi.
2. N.Arumugam, (2010), Concepts of Ecology by, Saras publications Nagercoil, Tamil Nadu, India.
3. E.P.Odum, (1969), Fundamentals of Ecology. W.B. Saunders publications, London.

Reference Books

1. P.S.Verma, and V. K. Agarwal, (1999), Environmental Biology. S.Chand& co, New Delhi
2. P.D.Sharma, (2000), Ecology and Environment – Rostogi Publications, Meerut, India.
3. K.C.Agarwal, (1987), Environmental Biology-Agro Botanical Publisher, India.
4. V.K.Agarwal, and Usha Gupta. (2002), Ecology and Ethology - S.chand and Company Ramnagar, New Delhi.
5. Edward B. Barbier, (2011), Capitalizing on nature: ecosystems as natural assets Cambridge University Press, .Cambridge, UK ; New York.
6. N.S.Subrahmanyam, and A.V.S.S. Sambamurthy, (2006), Ecology, Second Edition, Narosa Publishing House Pvt. Ltd., New Delhi.

Sub.Code: 24UZO507

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	M	H	S	H	M
CO2	S	M	H	S	H
CO3	H	S	H	S	H
CO4	H	H	M	M	H
CO5	H	S	H	S	H

S-Strong **H**- High **M**-Medium **L**-Low

Sub.Code: 24UZO508

Programme Code:06	**B.Sc., Zoology**			
Core Paper- 8 – Biostatistics and Bioinformatics				
Batch 2024-2025	Hours / Week 5	Total Hours 75	Credits 4	Skill Development

Course Objectives

1. To provide the fundamental knowledge on Biostatistics and Bioinformatics in biology.
2. To enhance the knowledge on importance of statistics and Bioinformatics tools in the analysis of Biological data at significance level.
3. To learn the biological databases and apply biostatistics and bioinformatics tools to analyse the structure of the molecules and drug discovery.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Classify the data collection methods and primary and secondary data analysis
	CO2	Understand the significance of biostatistics in biological sciences and also applied in research work.
	CO3	Apply fundamental knowledge of Biostatistics and bioinformatics tools to Analyse of Biological data generated by research
	CO4	Outline the role of Biostatistics and bioinformatics tools in biological data interpretation.
	CO5	Analyse the application of Biostatistics and Bioinformatics tools on structure prediction of molecules and drug discovery

Syllabus

Unit I **(15 Hours)**

Data Collection- Classification - Primary and secondary data, Tabulations, Diagrammatic representation of data- Bar diagram, Pie diagram, Graphical presentation of data - Histogram, Frequency polygon, Frequency curve, Ogive, Pictograph.

Unit II **(15 Hours)**

Measures of Central Tendency - arithmetic mean, median and mode. Merits and demerits. Measures of dispersion - Standard deviation, standard error and Student's t- test.

Sub.Code: 24UZO508

Unit III **(15 Hours)**

ANOVA - one way and two way (Shortcut method) and Statistical package, Chi square test, Correlation and Regression analysis,

Unit IV **(15 Hours)**

Introduction to Bioinformatics, Definition, Scope, and Application, Systems Biology, Human genome project, Genomics, Proteomics*****.

Unit V **(15 Hours)**

Introduction to database, DNA, Protein, Nucleic acid sequence database, Genebank, EMBL, UCSC, Swiss-port, PDB, Multiple sequence alignment Clustal W, FASTA,BLAST, PHYLIP

***denotes self study**

Teaching Methods

Smart Classroom/ Powerpoint Presentation/ Seminar/ Quiz, Discussion/ Flipped Class.

Text Books

1. N.Gurumani, (2015), An Introduction to Biostatistics. 2nd Edition, MJP Publisher, Chennai
2. S.P.Gupta, (2006), Statistical methods. Sultan Chand and sons- 23, Educational publishers, Daryagans, New Delhi.
3. T.Attwood, (2007), Introduction to Bioinformatics. Pearson Education; 1st Edition

Reference Books

1. Jerrold H. Zar., (2010), Biostatistical Analysis. Prentice Hall Publication, 5th Edition.
2. R.S.N.Pillai, and V.Bhagavathi, (2001), Statistics, S.Chand and Co., New Delhi..
3. S.Prasad, (2004), Elements of Biostatistics Rastogi Publications, Meeruit, India.
4. V.Rajaram, (2006), Fundamentals of computers, 4th edition. Prenlice Hall of India, Private Ltd- New Delhi.
5. S.Choudhuri, (2014), Bioinformatics for beginners. Tokyo Academic Press.
6. S.C.Rastogi, P.Rastogi, N.Mendiratta, (2008), Bioinformatics Methods and Applications: Genomics Proteomics and Drug Discovery 3rd Edition, PHI Learning Pvt. Ltd., New Delhi.

Sub.Code: 24UZO508

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	H	H
CO2	H	H	H	H	H
CO3	H	H	S	H	S
CO4	S	M	H	S	S
CO5	S	S	H	M	S

S – Strong **H** – High **M** – Medium **L** – Low

Sub.Code: 24UZO609

Programme Code: 06	**B.Sc., Zoology**			
Core Paper 9 – Microbiology and Immunology				
Batch 2024-2025	Hours / Week 5	Total Hours 60	Credits 4	Employability

Course Objectives

1.To update basic knowledge on microorganisms.
2.To understand the Disease causing microbes and their pathogenesis.
3.To analyze and inculcate knowledge about the immune system and its responses against pathogens.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Aware the nature of microbes and its detection techniques.
	CO2	Understand the life process of viruses and its impacts on living organisms.
	CO3	Familiarize the pathogenesis of microbes, and its treatment.
	CO4	Promoting the knowledge on immune cells, immune organs and its functions.
	CO5	Illustrate the immune response against pathogens and its therapeutics.

Syllabus

Unit I: Introduction to Microbiology (12 Hours)

Outline classification for bacteria, structural organization of bacteria – size, shape and arrangement of bacterial cells - ultrastructure of a bacterial cell. Culture methods (streak plate, spread plate, pour plate, stab culture, slant culture). Staining – simple staining and gram staining. Bacterial growth curve - factor affecting bacterial growth curve.

Unit II: Biology of Viruses (12 Hours)

Classification of viruses - general characteristics of virus, morphology - helical, polyhedral, enveloped, complex; brief study of Virions and Prions. Bacteriophages – T4 phage, stages in life cycle; Lambda phage-life cycle; switch between lysogeny and lytic cycle – Environmental microbiology - microbiology of water, soil and air.

Sub.Code: 24UZO609

Unit III: Medical Microbiology (12 Hours)

Microbial diseases of man - causative organisms: basic structure, toxicity, symptoms and preventive measures; Protozoan diseases: Trypanosomiasis, Leishmaniasis; Bacterial disease: Typhoid, Diphtheria, Wooping cough; Viral disease: Poliomyelitis, AIDS and COVID-19.

Unit IV: Immune cells and its function (12 Hours)

Immune system – Basic concept and overview; immune cells and their functions;Organs of immune system - primary lymphoid organs (thymus, bone marrow), secondary lymphoid organs (lymph node, spleen, mucosal associated lymphoid tissue - MALT). Types of immunity - innate, and acquired immunity.

Unit V: Biology of Immune Responses (12 Hours)

Antibodies – Classification, structure, properties and biological functions of immunoglobulins, antigen-antibody interactions; Complement system – components, activation pathways and functions; MHC - structure, pathways and functions; Cytokines - Basic properties and functions; Monoclonal antibody - production strategy and applications; Various types of vaccines*****.

*** Denotes Self-study**

Teaching Methods

Smart Classroom/ Powerpoint Presentation/ Seminar/ Quiz, Discussion/ Flipped Class.

Text Books

1. R.Ananthanarayan and C.K.JayaramPaniker, (2009), Text Book of Microbiology Orient Longman Pvt, Ltd., Publishers, Chennai.
2. P. Chakraborty, (2013), A Textbook of Microbiology, New Central Book Agency Pvt. Ltd., Publishers, New Delhi.
3. T.J.Kindt, R.A.Goldsby, B.A.Osborne, J.Kuby, (2006), Immunology, W.H. Freeman & Co., Publishers, New York, USA.

Sub.Code: 24UZO609

Reference Books

1. M.T.Madigan, K.S.Bender, D.H.Buckley, W.M.Sattley, D.A. Stahl, (2017), Brock Biology of Microorganisms. Pearson India Education Services Pvt. Ltd., Publishers, Chennai.
2. J.M Willey, L.M Sherwood, J.Christoper, (2011), Microbiology, McGraw-Hill International, Publishers, New York, USA.
3. R.Y.Stanier, J.L.Ingraham, M.L.Wheelis, P.R.Painter P.R, (2005). General Microbiology, MacMillan, Publishers, New York. USA.
4. C.Richard and S.Geiffrey, (2009), Immunology. Wiley Blackwell Publications, New Jersey, USA.
5. P.Delves, S.Martin, D.Burton, I.M.Roitt, (2006), Roitt's Essential Immunology, Wiley, Blackwell Scientific Publications, Oxford, London.
6. A.K.Abbas and L.H.Andrew (2003), Cellular and Molecular Immunology, Saunders Publications, Philadelphia, USA.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	H	H
CO2	H	H	H	H	H
CO3	H	H	S	H	S
CO4	S	M	H	S	S
CO5	H	H	M	M	S

S – Strong **H** – High **M** – Medium **L** – Low

Sub.Code: 24UZO610

Programme Code : 06	**B.Sc., Zoology**			
Core Paper 10 – Biotechnology				
Batch 2024-2025	Hours / Week 5	Total Hours 60	Credits 4	Skill Development

Course Objectives

1. To Learn the theoretical basis of techniques in Genetic Engineering
2. To understand the methods adapted for the industrial production of recombinant products
3. To learn the biosafety and bioethics to understand the social and scientific issues in Biotechnology

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Explain the Basic concepts and tools of Genetic Engineering
	CO2	Discuss the techniques of cloning
	CO3	Apply the knowledge of Gene transfer techniques in cloning and industrial recombinant product production
	CO4	Analyse the impact of applied techniques on the cloning and production of recombinant products
	CO5	Illustrate the impact of Biotechnology on human health and Environment

Syllabus

Unit I: Tools of Genetic Engineering (12 Hours)

Basic principles - mechanism of natural gene transfer by Agrobacterium, generation of foreign DNA molecules, restriction enzymes, ligase, linkers, adapters, enzymes used in genetic engineering, cloning vectors and their properties.

Unit II : DNA Cloning and Sequencing (12 Hours)

Cloning strategies - cloning with single strand DNA vectors, cDNA cloning and gene libraries, recombinant selection and screening methods, DNA sequencing strategies - Sanger's and Maxam - Gilbert's methods, applications of PCR, Southern, Northern and Western blotting.

Sub. Code: 24UZO610

Unit III : Gene Transfer and Applications (12 Hours)

Basics in animal cell culture, Methods of gene transfer to animals, gene knockouts and transgenic animals, animal pharming and xenogarfting, biodegradation, bioleaching.

Unit IV: Industrial Biotechnology and Gene therapy (12 Hours)

Applications of biotechnology-industrial biotechnology-fermentors, principle, types enzyme biotechnology- production and uses of industrially important enzymes such as protease, waste treatment, Gene therapy (somatic)-the principle and approaches. Internet of Things (IoT) and analytics Platforms are the future of Scientific Laboratory Operations, White Biotechnology.

Unit V: Biosafety and Bioethics (12 Hours)

Biotechnology - potential hazards, biological weapons, human genome research - the objectives and approaches, genomics and genome prospecting - the controversies, issues of biotechnology-social and scientific, technology protecting systems and the terminator, IPR, its concepts and conditions - patenting of genes, cells and life forms, evaluation of life patenting*****.

***Denotes self study**

Teaching Methods:

Smart Classroom/ Powerpoint Presentation/ Seminar/ Quiz, Discussion/ Flipped Class/ Assignment.

Text books

1. H.K. Das, (2009), Text of Biotechnology, John willey Publications.
2. J. Glick, and Jack J. Pasternak, (2010),Molecular Biotechnology-Bernard American Society for Microbiology, 4th edition, Canada.
3. U. Satyanarayana, (2008), Biotechnology –Books and Allied Ltd.
4. Pau Lake Show,Kit Wayne Chew,Tau Chuan Ling. 2021.The Prospect of Industry 5.0 in Bio manufacturing. Boca Raton, CRC Press, Ist Edition.
5. Shok Pandey,Rainer Hofer, Mohammad Taherzadeh, Madhavan Nampoothiri, Christian Larroche.2015. Industrial Biofefineries and White Biotechnology. Ist Edition. eBook ISBN : 9780444634641.

Reference Books

1. Genes - VIII (2003) by Lewin B Oxford University Press.
2. S.Sadasivam, (2004), Biochemical methods - New Age International Publications.

3.

Sub. Code: 24UZO610

4. S.N.Jogdand, (2005), Advances in Biotechnology -Fifth revised edition Published by Himalaya publishing house.
5. T.A.Brown, (2001), Gene cloning and DNA analysis - Fourth editionBlackwell Publishing.
6. R. Renneberg, V.Loroch, (2017), Biotechnology for beginners, Second Edition, Elsevier Publication.
7. Pranv kumar et al., (2015), 4th Edition, Biotechnology: A problem approach, pathfinder publication.
8. Perkel and Jeffrey, M. 2017.The Internet if things comes to the lab. Nature News.P.125.
9. Horvath and Balint. 2019. Investigating the current business model innovation trends in the biotechnology industry. Journal of Business Economics and management.pp.63-85.
10. Saha, Himadrinath, Supratim Auddy, Subrata Pai, Shubham Kumar, Subhadeep Jasu, Rocky Singh, Rakhee Singh, Swarnadeep Banerjee, Priyanshu Sharan and AnkitaMaity.2017. "Internet of Things (IoT) on biotechnology".8th Annual Industrial Automation Engineering Conference (IEMECON).IEEE.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	S	S	M
CO2	S	M	H	M	H
CO3	M	S	M	H	S
CO4	S	H	H	M	M
CO5	S	H	H	H	H

S-Strong **H**- High **M**-Medium **L**-Low

Sub. Code: 24UZO611

Programme Code : 06	B.Sc., Zoology			
Core Paper- 11 – Developmental Biology				
Batch 2024-2025	Hours / Week 5	Total Hours 75	Credits 5	Employability

Course Objectives

1. To get knowledge about theories of development and gametogenesis.
2. To study the process of fertilization and cleavage of eggs in animals.
3. To understand the embryonic developmental stages and extra embryonic nutrition of animals.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Remember the laws and theories of development and gametogenesis.
	CO2	Understand the process and different methods of fertilization.
	CO3	Apply the knowledge on various developmental stages of animals.
	CO4	Analyze the importance organogenesis and process of embryonic nutrition.
	CO5	Evaluate the theories, principles and techniques of embryology and its applications in assisted reproductive technology.

Syllabus

Unit I: Theories of Development (15Hours)

Theory of Preformation, Theory of Epigenesis, Theory of Pangenesis, Von Baer's law, Biogenetic law, Germplasm theory, Mosaic theory, Regulative theory, Gradient theory and Theory of Organizer. Gametogenesis - Spermatogenesis, Oogenesis.

Unit II: Fertilization and cleavage (15Hours)

Sexual cycles, Theories of fertilization, Chemical and cytological factors of fertilization, Birth control*, Types of egg, polarity–Symmetry.

Planes of cleavage - Patterns of cleavage - Laws of cleavage. Patterns of cleavage as illustrated in Amphioxus, Frog, chick and pig.

Unit III: Blastulation and gastrulation (15Hours)

Blastulation, - Types of blastula, Fate maps, Formation of blastula, Morphogenetic movements - Gastrulation in Frog and Chick.

Sub.Code: 24UZO611

Unit IV: Organogenesis and Embryonic Nutrition (15 Hours)

Development of Brain, Heart, Hormonal control. Extra embryonic membranes in chick and Mammals.

Unit V: Experimental and Clinical Embryology (15 Hours)

Gradient theory and Spemann' s experiments on organizer.

In vitro fertilization (IVF), Artificial insemination and Embryo transfer, Cryopreservation, Stem cells - Definition and basic aspects. Introduction of Robotics in Developmental Biology.

*** Denotes Self-study**

Teaching Methods:

Smart Classroom/ Powerpoint Presentation/ Seminar/ Quiz, Discussion/ Flipped Class/ Assignment.

Text Books:

1. K.V.Sastry and V. Shukla, (2018), Developmental Biology, Second Revised Edition, Rastogi Publications, Meerut, U.P.
2. P.S.Verma and V.K. Agarwal, (2012), Chordate Embryology. S. Chand Company Ltd., New Delhi.
3. M.A.Subramanian, (2019), Developmental Biology. MJP Publishers, Chennai.
4. Stefano Nolfi and Dario Floreano. (2000). Evolutionary Robotics: The Biology, Intelligence and Technology. Publisher MIT Press 55 Hayward St. Cambridge MA United States. ISBN:878-0-262-14070-6.

Reference Books:

1. Michael J. F.Barresi and Scott. F. Gilbert (2019), 12th Edition, Developmental Biology. Sinauer Associates Inc.
2. B.I.Balansky and B.C. Fabian, (2012), 5th Edition, An Introduction to Embryology. Cengage learning India.
3. Werner A Muller, (2019),Developmental Biology. Springer /MBS.
4. B.M.Carlson, (2007), Foundation of Embryology. Tata Mc Graw Hill, New Delhi.
5. Gardner, Weissman, Howles and Shoham, (2009), Textbook of Assisted Reproductive Technology. Informa Health Care. 3rdEdn.
6. Peter R. Brinsden, (2005), Textbook of in vitro Fertilization and Assisted Reproduction – Guide to Clinical Lab Practice. Taylor & Francis. 3rdEdn.
7. https://www.labroots.com/trending/genetics-and-genomics/18928/robots-moving-developmental-biology-forward

Sub.Code: 24UZO611

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	H	H
CO2	S	H	M	S	M
CO3	H	M	S	S	H
CO4	M	H	H	H	S
CO5	H	M	M	H	S

S – Strong **H** – High **M** – Medium **L** – Low

Sub.Code: 24UZO612

Programme Code : 06	**B.Sc., Zoology**			
Core Paper 12 – Biodiversity and Animal behaviour				
Batch 2024-2025	Hours / Week 5	Total Hours 75	Credits 4	Employability

Course Objectives

1. To understand the status and distribution of Fauna.
2. To create awareness on various biodiversity conservation laws for animal protection.
3. To understand the animal behavioural ecology.

Course Outcome (CO)

On successful completion of course the students will be able to

K1. K5	CO1	Outline the status and distribution pattern of animals
	CO2	Understand the biodiversity threats and its conservation
	CO3	Study the people's participation in biodiversity conservation and Biodiversity Acts.
	CO4	Understand the various behavior of animals
	CO5	Evaluate the biological rhythms.

Syllabus

Unit I **(15 Hours)**

Biodiversity– Concept and Definition, Types of biodiversity–Genetic diversity. Species diversity, Ecosystem diversity.Problems inventorying species – Biodiversity Hotspots–Western Ghats and Indo-Burma Region – Biogeography of India. IUCN Threatened categories– Conservation ethics and values of wildlife.

Unit II **(15 Hours)**

Processes responsible for species richness an dextinction–Meta populational concept–Biodiversity Measurement- Threats to biodiversity -habitat loss- poaching of wildlife – Man-wildlife conflicts- Conservation of biodiversity-*In situ* and *ex situ* conservation - Peoples participation and moments in biodiversity conservation- causes of decline of biodiversity-human induced-modern and local extinction- Sacred groves –Stalavrikshas.

Sub.Code: 24UZO612

Unit III **(15 Hours)**

Indian initiatives in biodiversity conservation- biodiversity act 2002, Biodiversity rules, 2004- National Biodiversity Authority (NBA), Protected Area Network- Important Bird Areas in India- International programmes biodiversity conservation- Conventional on biological diversity- (CBD), CITES, ITTA, UNFCC, Kyoto protocol- TRIPS- Ramsar Convention on wetlands, Caratagena protocol and Bio-safety 2000 (CPB). Biopiracy.

Unit IV **(15 Hours)**

Origin and history of Ethology- The science of behaviour-History-Scope and terminology- Proximate and Ultimate causes of Behaviour-Instinct: Definition and Characteristic (Sign stimuli and Fixed Action Pattern). Learning behaviour: Definition, Spatial learning, Associative learning, classical conditioning- operant conditioning- language learning-. Imprinting. Kin recognition. Instinct versus learning behaviour.

Unit V **(15 Hours)**

Biological rhythms. Biological clock. Circadian rhythms and their synchronization seasonal rhythms- Photoperiodism- Communication: Visual, olfactory- acoustic. Chemoreception: Chemical (pheromones) as a signal in insects-fish and mammals. Hormonal control of behaviour. Cooperation and conflict: Evolution of altruism*.

*** denotes Self-study**

Teaching Methods

Smart ClassRoom / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class.

Text books

1. Reena Mathur, (2014), Animal BehaviourRastogi Publications, Meerut.
2. P.Mohan, (1995), Animal BehaviourArrora Himalaya Publishing House, Mumbai.
3. H.S. Gundevia and Hare Govind Singh, (2009), Animal Behaviour, S. Chand limited.

Reference Books

1. Ramamurthy Rallapalli and Geetha Bali, (2002), Biodiversity, APH Publishing Corporation, New Delhi.
2. T.Pullaiah,(2006), Biodiversity in India, Regency publication, New Delhi.
3.

4. John Alcoc, (2013), 10th Edition, Animal Behaviour and Evolutionary Approach, Sinauer Associates.
5. V.K. Agarwal, (2013), Animal Behaviour (Ethology), S. Chand publishers.
6. K. Krishnamoorthy, (2003), An advanced textbook of biodiversity, Principles and practice., Oxford and IBH publication company Pvt. Ltd, New Delhi.
7. U.Kumar and MahendrajeetAsija, (2005), Biodiversity Principles and Conservation, Student edition, Jodhpur, India.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	H	H
CO2	H	H	S	H	H
CO3	S	S	M	M	S
CO4	H	H	M	M	H
CO5	H	H	H	S	H

S-Strong **H**- High **M**-Medium **L**-Low

Sub.Code: 24UZO6CN

Programme Code :06	**B.Sc., Zoology**			
Core Practical 3 Ecology, Developmental Biology, Biodiversity and Animal Behaviour				
Batch 2023 -2024	Hour/Week 2	Total Hours 60	Credits 2	Employability

Course Objectives

1. To inculcate the students to learn the water quality and planktons
2. To demonstrate the developmental stages of chick
3. To study the biodiversity and create awareness about the rearing of silkworm and Earthworm

Course Outcomes (CO)

On successful completion of course the students will be able to

K3 toK5	CO1	Get the practical knowledge about the species identification, diversity and their ecological significance
	CO2	Understand about the species diversity and water pollution due to anthropogenic activity
	CO3	Apply practical knowledge on plankton analysis and assessment of biodiversity
	CO4	Analyze about practical and filed knowledge in relation to environment management
	CO5	Evaluate the various Developmental stages of Chick and Frog

Syllabus

I. Analysis of water – Pond and Sewage.
   1. Estimation of dissolved oxygen
   2. Salinity
   3. pH
   4. Carbonates and bicarbonates
   5. Carbondioxide

I. Qualitative analysis of plankton (any three) & mounting.

II. Use of Rain gauge, Maximum and minimum thermometer, Hygrometer, Anemometer and Barometer

Sub.Code: 24UZO6CN

Biodiversity:

1. Documentation of biodiversity in the college campus – Insects, Butterflies, Reptiles and Mammals
2. Determination of population density in a natural / hypothetical community by appropriate line transect method and calculation of Shannon-Weiner diversity index for the same community.
3. Report on a visit to National Park/Biodiversity Park/ Wildlife Sanctuary.

Spotters:

1. Stalavrikshas.
2. Wildlife - Birds and Animals.
3. IUCN- Red listed animals.

Spotters:

1. Study of intertidal rocky shore animals
2. Sandy shore animals
3. Muddy shore animals (any three examples) with their specific adaptation

Developmental Biology (Spotters and Slides)

1. Frog embryology slides: Stages of cleavage 2, 4, 8, 16 cell stages, Blastula and Gastrula.
2. Chick embryology slides-Stages of development 24hr, 48hr, 72hr and 96hr.
3. Spotters: Placenta of Pig, Sheep and Man.

Field Study

To visit coastal area and wildlife sanctuaries to study the intertidal fauna and Biodiversity

Sub.Code: 24UZO6CN

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	M	S	M	H	S
CO2	H	S	S	M	H
CO3	H	H	H	H	H
CO4	S	M	H	S	H
CO5	M	H	H	H	H

S-Strong **H**- High **M**-Medium **L**-Low

Sub.Code: 24UZO6CO

Programme Code : 06	**B.Sc., Zoology**			
Core practical 4. Genetics , Evolution, Biostatistics, Microbiology and Immunology and Biotechnology				
Batch 2024-2025	Hours / Week 2	Total Hours 60	Credits 2	Employability

Course Objectives

1. To know the application of various techniques in Microbiology and Biotechnology.
2. To understand the quantitative estimation of biomolecules.
3. Apply and understand the biostatistics in biology and evolutionary significance animals.

Course Outcomes (CO)

On successful completion of course the students will be able to

K3to K5	CO1	Understand the knowledge on microbiology and biotechnological equipments for culture and isolation ofmicrobes.
	CO2	Understand the presence of biomolecules in the tissueand organ from animals.
	CO3	Apply knowledge and understand the immunological techniquesfor isolation of DNA for sequencing.
	CO4	Study the polytene chromosomes, evolutionary significance of animals and analyze the quality of milk.
	CO5	Understand the importance of antibiotics, biofertilizers and biopesticides for wellbeing of life.

SYLLABUS

1. Sterilization techniques; Dry Heat, Wet Heat, Chemical Sterilization
2. Preparation of Culture Media and its Techniques;
   i) Isolation and Preservation of Culture.
   Broth: flask and test tube.
   Solid: Pour plate, streak plate, slant, stab cultures.
3. Isolation of microbes from soil, air and water samples.
4. Gram staining.
5. Estimation of Carbohydrate from fish tissues.

6. Estimation of Protein from fish tissues.
7. Isolation of DNA from Goat liver.
8. uality of milk (MBR Test).
9. Staining and observation of polytene chromosomes in salivary glands of Chironomus Larva (3rd instar).
10. Identification of various types of immune cells in peripheral bloodsmears.
11. Agarose Gel electrophoresis (DEMO).
12. Immuno electrophoresis (DEMO).

Biostatistics

1. Biometrical computations of Mean, Median, Mode and Standarddeviation.
2. Problems on Chi-square test.

Spotters Evolutionary Significance

1. Fish- Latemaria
2. Reptiles- Sphenodon
3. Bird - Duck-billed Platypus

Microbiology and Biotechnology

1. Antibiotic (Penicillin)
2. Biopesticides (Neem, Pongamia)
3. Biofertilizer (Azolla)
4. Vermicompost
5. Insulin (commercial)

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	H	H
CO2	S	H	M	S	S
CO3	S	S	S	H	H
CO4	S	S	H	S	S
CO5	S	H	S	S	S

S-Strong H- High M-Medium L-Low

Sub. Code: 24UZO6Z1

Programme Code :06	**B.Sc., Zoology**			
Project and Viva Voce				
Batch 2024-2025	Hour/Week -	Total hours -	Credits 5	Skill Development

Course Objectives

1. To acquire the basic knowledge about research and carry out research problems in the field of zoology.
2. To explore the ability to plan, carryout innovation in project
3. To improve the knowledge on various research methods in zoology

Course Outcomes (CO)

On successful completion of course the students will be able to

K3to K5	CO1	Get the foundational practical knowledge to carry out research in the specified area.
	CO2	Understand the techniques to be used to carry out the specific research work.
	CO3	Apply the learned techniques to carry out the experiments and obtain the result.
	CO4	Analyse the result by using biostatistical tools and interpret the result.
	CO5	Evaluate the analysed result and conclude the study and highlight its significant outcome

Project work Instruction

1. The maximum four numbers of students are allotted to the faculty members in the roll number order.

2. The students can design their group project title and objectives by discussing with the respective guide.

3. Students should engage in their project before and after class hours in the presence of their respective guide.

4. Two reviews will be conducted during the allotted project period and the students should discuss their work in the presence of respective guide and the Head, Department of Zoology and should submit the project review report.

5. Students will be instructed accordingly if there is any change in their work during the review meeting.

6. Students and guide should ensure the integrity of the work done.

7. The final project report should be submitted on the date intimate for the submission by the Controller of Examination.

8. The work will be evaluated by the external examiner and the guide during the final viva voce which will be scheduled by Controller of Examination.

9. Any form of plagiarism will not be entertained in the dissertation and if found it will be considered as malpractice and action will be taken accordingly.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	M	S	M	H	S
CO2	S	S	S	S	H
CO3	H	H	H	H	S
CO4	S	S	H	S	H
CO5	H	S	H	H	M

S-Strong **H**- High **M**-Medium **L**-Low

Sub. Code: 24UZO6S4

Programme Code : 06	**B.Sc, Zoology**			
Skill Based Subject 3: Commercial Fish Culture				
Batch 2024-2025	Hour/Week 2	Total Hours 30	Credits 3	Entrepreneurship

Course Objectives

1. To develop knowledge in characteristics, structure and resources of fisheries.
2. To increase the fishery sector performance by production, culture practices and farm management.
3. To improve the trade and its contribution to the nation economy.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Get knowledge about the commercial fish resources from India
	CO2	Understand the biology of commercial fish from India
	CO3	Apply the practical knowledge of hatchery maintenance and Feed formulation for fishes
	CO4	To enrich the knowledge of culture practice in commercial fishes
	CO5	Analyze students acquire technical knowledge which is helpful to find the condition of fishes and their by-product utilization

Unit I: Introduction (6 Hours)

Fisheries- status - exploitation and prospects. Marine (*Rachycentron canadum*), Brackish water (*Lates calcarifer*), freshwater (*common carp*) and Cold-water (*Mahaseer*) fisheries of India. Major reservoir, lakes and their fisheries. Fishery Research Institutes in India.

Unit II: Biology of commercial fishes (6 Hours)

Study of food and feeding habits of commercially important fishes. Reproductive biology – maturity stages, gonadosomatic index, ponderal index, fecundity, sex ratio and spawning. Eggs and larval stages and developmental biology of finfishes and shell fishes.

Unit III: Hatchery management (6 Hours)

Site selection –design-construction-equipments-water filtering systems layout and design of hatchery sections-Water quality parameters-quarantine-brood stock-spawning larval rearing-post larval-nursery for commercial species. Feed formulation and manufacturing. Feed evaluation - feed conversion ratio (FCR), feed efficiency ratio (FER). Nutritional deficiency diseases*****.

Sub. Code: 24UZO6S4

Unit IV: Methods of fish culture (6 Hours)

Type of fish farming- Traditional, semi-intensive, intensive and super-intensive culture systems, Ranching, Monoculture, Polyculture. Cage culture and types in India

UNIT V Post Harvest and byproduct of fishes (6 Hours)

Postmortem changes of fishes as raw material for processing. Type of fish processing methods. Valuable by-products (food, ornamental, medicinal) of fishes.

***Denotes Self-study**

Teaching Methods

Smart Class Room / Power point presentation / Seminar/Quiz / Discussion / Flipped Class/E-Content

Text books

1. C.B.L.Srivasta, (2002),A text book of fishery science and Indian fisheries, kitab Mahal, Allahabad.
2. R.Santhanam, (1990), Fisheries Science, Daya publishing House, New Delhi.
3. S.Ayyappan, J. K. Jena, A. Gopalakrishnan, A. K. Pandey,(2011), Handbook of fisheries and aquaculture. Indian Council of Agricultural Research. Directorate of Information and Publications on Agriculture, New Delhi, India.

Reference books

1. P.Leung, C.S.Lee, J.P.O'Bryen, (Eds.), (2007), Species and System Selection for Sustainable Aquaculture. Blackwell Publ.
2. S.S. De Silva and T.A.Anderson, (1995), Fish Nutrition in Aquaculture. Chapman & Hall Aquaculture Series.
3. P. Lavens and P. Sorgeloos, (1996), Manual on the Production and Use of Live Food for Aquaculture. FAO Fisheries Tech. Paper 361, FAO.
4. G.Wedmeyer, F.P.Meyer, L.Smith, (1999), Environmental Stress and Fish Diseases. Narendra Publ. House. New Delhi.
5. P.V.G.K.Reddy, S.Ayyappan, D.M.Thampy, G.Krishna, (2005), Text book of Fish Genetics and Biotechnology. ICAR, New Delhi.

6. T.V.R.Pillay and M.N.Kutty, (2005), Aquaculture: Principles and Practices. 2nd Ed. Blackwell.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	H	H
CO2	H	M	M	M	S
CO3	M	H	S	H	H
CO4	H	M	H	M	S
CO5	S	H	M	H	S

S-Strong **H**- High **M**-Medium **L**-Low

MAJOR ELECTIVE PAPERS

1. Economic Zoology
2. Pests and their Management
3. Wildlife Ecology and Management
4. Poultry science and management
5. Vermitechnology
6. Human genetics and Counseling

Programme Code: 06	B.Sc., Zoology			
Major Elective Paper 1 – Economic Zoology				
Batch 2024-2025	Hours / Week 4	Total Hours 60	Credits 5	Employability

Course Objectives

1. To get knowledge about sustainable agriculture, organic farming and waste management by using Vermitechnology.
2. To understand the rearing and harvesting techniques in sericulture, apiculture and lac culture.
3. To inculcate knowledge on Aquaculture, Poultry and Animal husbandry aspects.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 – K5	CO1	Outline the characteristics and role of earthworms in sustainable agriculture.
	CO2	Describe the examples about the problems in sericulture, apiculture and lac culture.
	CO3	Apply the knowledge on disease management in the field of poultry and animal husbandry.
	CO4	Analyze the economic importance of Apiculture, Lac culture, Poultry and aquaculture.
	CO5	Illustrate the marketing strategies of animal byproducts and create the self-opportunities to students.

Syllabus

Unit I: Vermiculture (12 Hours)

Vermiculture – Classification of earthworms, Vermicomposting and their advantages, role of earthworms in sustainable agriculture and organic farming, Miscellaneous uses of earthworms (Poultry, Fisheries and Medicine).

Unit II: Sericulture (12 Hours)

Types of silkworms - Life cycle - Rearing methods - Harvesting –Diseases of Silkworm- Problems in sericulture- Economic importance of Sericulture- Marketing of Cocoons- Role of women in Sericulture.

Unit III: Apiculture and Lac culture (12 Hours)

Types of honey bees- Diseases and pests of bees and Lac insects - Harvesting and processing of honey and Lac -Marketing of honey and Lac - economic importance of apiculture and Lac culture.

Unit IV: Fisheries and Aquaculture (12 Hours)

Fishery resources in India, Economically important aquatic floral and faunal resources, value added fish and fishery products, opportunities in seafood exports, Importance of fisheries (capture, culture and ornamental) sector in Indian economy, Fisheries national income in India- Fisheries an alternative livelihood in India.

Unit V: Poultry farming (12 Hours)

Types of birds for poultry - Diseases and pests of bird – Lighting- Egg and meat production -poultry feed - Economic importance of poultry keeping.

Animal husbandry

Types of animals for animal husbandry - Diseases and pests of animals - milk and meat production and processing - Economic importance of animal husbandry*****

*** denotes Self-study**

Teaching methods

Smart Class Room / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class/E-Content.

Text Books:

1. G.Ganga, and J.Sulochana Chetti, (2018), An Introduction to Sericulture (2018), Second Edition, Oxford IBH, CBS Publishers and Distributors Pvt Ltd.
2. Ashok K Rathoure, Nuzneen Z Deshmukh, Dinesh Kumar, Rachno Goswami, (2009), Applied and Economic Zoology. Astral Publication.
3. D.Sapcota, Avian Poultry Production, (2014), New India Publishing Agency.

Reference Books

1. Clive, A. Edwards, Norman, Q. Arancon, Rhonda Sherman, (2011), Vermiculture Technology, Earthworms, Organic wastes and Environmental Management. Boca Ralton, CRC Press.

2. R. Lokeshwar, (2002), Hand Book of Animal Husbandry, ICAR, New Delhi.
3. N. Ghorai, Lac-Culture in India. First Edition. 167, pages, International Books and Periodicals Supply service.
4. S.P.Rose, Principles of Poultry Science, CABI Publisher, New Delhi, India.
5. Pradip, J. V, (2005), Text Book of Applied Zoology: Vermiculture, Apiculture, Sericulture and their controls, First Edition, Discovery Publishers, New Delhi.
6. Manju yadav, (2003), Economic Zoology, Discovery publishing house, New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	H	H	S
CO2	H	S	M	M	H
CO3	H	H	S	S	H
CO4	M	H	S	H	M
CO5	S	M	H	S	H

S – Strong **H** – High **M** – Medium **L** – Low

Programme Code :06	B.Sc., Zoology			
Major Elective 2- Pests and Their management				
Batch 2024-2025	Hour/Week 4	Total Hours 60	Credits 5	Employability

Course Objectives

1. To acquire information on insect pests and non- insect pests in agricultural crops
2. To get knowledge on biology and nature of damage caused by insect pests and non-insect pests in various crops
3. To understand the impact of insect vector on human and their control measures

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Get knowledge about the importance of insect pests of agricultural crops and plant diseases transmitted by insect pests.
	CO2	Understand the biology and nature of damage caused by insect pests and non-insect pests in various crops.
	CO3	Apply the knowledge to study the impact of damage caused by the of stored grains.
	CO4	Analyse the effect of damage caused by pest on agricultural crops and diseases caused to human by insect pests.
	CO5	Discuss the obtained knowledge on impact of pest on agricultural crop and measures for its control.

Syllabus

Unit I **(12 Hours)**

Insects of agricultural importance - types of damage on crops - insects in relation to plant diseases.

Unit II **(12 Hours)**

Biology, nature of damage on crops and control measures of one major pest of each of the following crops: paddy – Yellow Stem Borer (*Scirpophaga incertulas*), sugarcane- Early Shoot Borer (*Chilo infuscatellus)*, cotton- Fruit Borer (*Helicoverpa armigera*) and coconut- Rhinocerous Beetle (*Oryctes rhinocerous*).

Unit III **(12 Hours)**

Biology, nature of damage on crops and control measures of plant nematodes, mites, crabs, snails, birds and rats.

Unit IV **(12 Hours)**

Insect pests of stored produces- Rice weevil *(Sitophilus oryzae),* Red flour beetle *(Tribolium castaneum)* and Pulse beetle *(Callosbruchus chinensis),* Integrated pest management*.

Unit V **(12 Hours)**

Insects in relation to public health - biology, role of insect vectors of humans and control measures of mosquitoes, house flies, bed bug and head louse.

***denotes self study**

Teaching Methods

Chalk and Talk, PowerPoint Presentation, Seminar, Smart Class Room, Quiz, Discussion, Flipped class, Assignment, E-content.

Text Books

1. D.B.Tembhare, (2000), Modern Entomology, Himalaya Publishing House-Delhi.
2. T.N.Anantha Krishnan, (2007), General and Applied Entomology. Tata Mc Gran Hill Pub. Co.Ltd.
3. Vasantharaj David, (2002), Elements of economic Entomology, Popular Book House, Publishers, Chennai.

Reference Books

1. K.K.Nayar, and T.N. Anathakrishnan, B.V. David, (1983), General and applied Entomology, Tata McGraw Hill publishing Co. Ltd., New Delhi.
2. D.P.Ambrose, (2004),The Insects: Structure, Function and Biodiversity, Kalyani Publishers, New Delhi.
3. R.F.Chapman, (2002), The insects structure and function, Cambridge University press, Publishers, United Kingdom.
4. R.C.Saxena RC and R.C.Srivastava, (2007), Entomology: At a Glance. Agrotech Publishing academy, Publishers, Jodhpur.
5. L.O.Pedigo and M.E.Rice, (2009), Applied Entomology. PHI Learning Pvt. Ltd. Publishers, New Delhi
6. Fenemore P.G., Prakash (2002), A Applied Entomology – 2002. New age International (P) publishers- New Delhi.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	M	S
CO2	H	M	S	S	H
CO3	H	S	M	H	M
CO4	S	H	S	S	S
CO5	H	M	H	H	H

S-Strong **H**- High **M**-Medium **L**-Low

Programme Code: 06		B.Sc., Zoology		
Major Elective 3 - Wildlife Ecology and Management				
Batch 2024-2025	Hours / Week 4	Total Hours 60	Credits 5	Employability

Course Objectives

1. To understand and appreciate biodiversity and the Act to protect the wild species.
2. To learn different techniques to study wildlife and develop knowledge of the benefits of ecosystem.
3. To get knowledge about various methods to conserve biodiversity**.**

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO 1	Remember the various components of an ecosystem
	CO 2	Understand the wildlife management in India and National Parks and Sanctuaries.
	CO 3	Apply the Biodiversity hot spots, Endangered species and their Protection
	CO 4	Analyse the Wild life management Techniques and animal plant interaction.
	CO 5	Evaluate the students to sampling techniques in various fields

SYLLABUS

Unit I **(12 Hours)**

Ecosystem aquatic ecosystem- Pond, terrestrial ecosystem- forest trophic relations in ecosystems, food chain, food web, ecological pyramids. Biotic community and ecological niche.

Unit II **(12 Hours)**

Wild life of India – Ecological sub regions of India. Endangered flora and fauna. Wild life management in India - Indian board for wild life. National parks and sanctuaries.

Unit III **(12 Hours)**

Biodiversity

Biodiversity-kinds of biodiversity; Biogeography-continental shift, zoogeography, biodiversity hot spots*****, endemicity; Endangered species.

Unit IV **(12 Hours)**

Field Sampling Techniques

Population estimation-concept, line transect, quadrate sampling; Basic methods in behavioral and food habit studies; Wildlife management techniques.

Unit V **(12 Hours)**

Ecosystem Services

Animal plant interactions-pollinators, seed dispersal, biological pest control, vector; Wildlife products - food, medicine, Germplasm, domestication; Ecological balance - prey predator relationships.

***denotes Self study**

Teaching methods:

Smart Class Room / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class/E-Content.

Text Books:

1. P.D.Sharma, (2009), Ecology and Environment, 10th Ed, Rastrogi publications, Meerut.
2. B.B.Hoselli, (2008), Concepts in WildLife Management Daya Publishing House, New Delhi
3. B. Seshadri, (1986), India's Wildlife reserves, Sterling Publishers Pvt. Ltd., New Delhi.

Reference Books:

1. K. Krishnamoorthy, (2003), An advanced textbook of biodiversity, Principles and practice., Oxford and IBH publication company Pvt. Ltd, New Delhi.
2. U. Kumar and MahendrajeetAsija, (2005), Biodiversity principles and conservation, Student Edition, Jodhpur, India.
3. M.L. Codand J.M Diamond, (1975), Ecology and evolution of communities, Harvard University Press, Cambridge.
4. H. Giles, (1984), Wildlife Management Techniques, Natraj Publishers, Dehra Dun.
5. R. Gopal, (1992), Fundamentals of Wildlife Management, Justice Home, Allahabad.
6. Madhab Chandra Desh and Sathya Prakash Desh, (2009), Fundamentals of Ecology. 3rd Ed. Tata McGraw Hill Education Pvt. Ltd, New Delhi.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	H
CO2	M	S	H	M	S
CO3	H	M	S	H	M
CO4	H	S	H	S	M
CO5	S	H	M	H	S

S-Strong **H**- High **M**-Medium **L**–Low

Programme Code: 06		B.Sc., Zoology		
Major Elective Paper 4 –Poultry Science and Management				
Batch 2024-2025	Hour/Week 4	Total Hours 60	Credits 5	Employability

Course Objectives

1. To develop knowledge on the history and the role of poultry in rural development and its structure.
2. To learn the methods of rearing, breeding and production of poultry.
3. To get the knowledge about the preparation of feed, antibiotics, vaccines and marketing.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 – K5	CO1	Remember the knowledge about the importance of poultry farming
	CO2	Understand the types of poultry breeding
	CO3	Apply the knowledge in types of incubators for poultry breeding
	CO4	Analyse the importance of poultry marketing
	CO5	Evaluate the students to organize poultry farming and training in the rural area

Syllabus

Unit I **(12 Hours)**

History and importance of Poultry farming, Role of the Poultry in rural development, employment potential***,** Economics and contribution to national productivity, Egg production, manure as by-product. Physiology of poultry birds with reference to digestive and reproductive system.

Unit II **(12 Hours)**

Breeds of poultry birds and scientific methods of breeding Hybrid and cross breed. Indian and exotic selecting chicks and parents for production factors in selection, Hatching, selecting eggs for hatching, Maintenance of temperature and humidity sterilization of room during hatching, separation and selling.

Unit III **(12 Hours)**

Poultry house and equipment, space requirement, types of house, number of birds, equipments for feeding, protection from enemies and adverse conditions.

Unit IV **(12 Hours)**

Nutrition of Poultry birds, requirement according to age feed formulation, classification of feed stuffs. Milling by products, availability of raw materials and their cost, food grinders and mixtures, use of antibiotics.

Unit V (**12 Hours)**

Brooding and rearing, sexing, vaccination, natural and artificial breeding, types of brooding, temp. Requirement culling. Debreaking of poultry, characters of good layers and broilers, rearing of chicks.

*** denotes Self study**

Teaching Methods:

Smart ClassRoom / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class/E-Content.

Text Books

1. Keith Wilson (2007), A Hand book of poultry practice. 2nd Ed. Agrobios (India), Jodhpur.
2. Norris Elye. (2005), The poultry science L.C.R. Biotech books.Delhi.35.
3. P.V. Sreenivasaiah, (2015), Text book of Poultry Science, Write and Print Publications, ISBN: 9789386283368.

Reference Books

1. Manju Yadav (2003), Economic Zoology: Discovery publishing house. New Delhi.
2. Pande, B. V.R.Reddy, V.R.Sadagopen, A.K.Shrinivasan, (1984), reprinted (1997), Feeding of Poultry. Indian council of Agricultural research. Power Printers New Delhi.
3. R.Venkatakrishnan, (1995), Poultry farm. 1st Ed. Balaji publications. Madras.
4. M.E. Ensminger, (2005), Poultry Science, Third Edition,
5. N.Gosh, (2015), Poultry Science and Practice 1st Edition, CBS Publishers & Distributors.
6. R.D.Sharma, (1997), Hand book of Animal Husbandry Indian Council of Agricultural Research. 2nd Ed. (reprint) published by Director Directorate of Publications and information on Agriculture. New Delhi.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	H
CO2	M	S	H	M	S
CO3	H	M	S	H	M
CO4	H	S	H	S	M
CO5	S	H	H	M	S

S-Strong **H**- High **M**-Medium **L**-Low

Programme Code: 06	B.Sc. Zoology			
Major Elective 5- Vermitechnology				
Batch 2024-2025	Hour/Week 4	Total hours 60	Credit 5	Employability

Course Objectives

1. To aware the significance of sustainable agriculture and organic farming.
2. To inoculate basic knowledge on recycling of biodegradable waste of different kinds.
3. To understand the value of Vermitechnology and its significance.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Remember the knowledge on the significance of earthworms.
	CO2	Understand the importance of waste degradation by eco-friendly method.
	CO3	Apply the significance of Vermicomposting methods.
	CO4	Analyse the knowledge on commercialization of Vermiproducts.
	CO5	Evaluate the students to learn application of vermicomposting in Agriculture Field

Syllabus

Unit I **(12 Hours)**

Distribution- Different types of earthworms. General body structure- External characters- Body Setae- Food and feeding habits, digestive system - Gut microflora and their importance***** - Reproductive system cocoon formation.

Unit II **(12 Hours)**

Role of earthworms in sustainable agriculture - organic farming - earthworm activities - soil fertility and texture - soil aeration.

Unit III **(12 Hours)**

Advantages of Vermiculture – Vermicast - Decomposition of bio - degradable Wastes and vermicomposing - Selection of suitable species - Basic characteristics of suitable species - Description of suitable species - Maintenance of Base culture.

Unit IV **(12 Hours)**

Vermicomposting - Advantages of vermicomposting - small scale and large scale vermicomposting. types of Vermicomposting - requirements for Vermicomposting - maintenance of vermicomposting.

Unit V **(12 Hours)**

Recycling of different wastes by vermicomposting - Organic wastes - Solid wastes - Municipal wastes - Animal Dung - Agricultural wastes. Application of Vermicompost - In horticulture and agriculture.

***denotes self study**

Teaching methods

Smart Class Room / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class

Text Books

1. R.K.Bhatnagar, and R.K.Palta, (1996), Vermiculture and Vermicomposting. Kalyani Publishers, New Delhi.
2. Arun K. Sharma. (2002), A hand book of Organic Farming, Agrobios, Jodhpur, India.
3. P.K.Gupta, (2008), Vermicomposting for Sustainable Agriculture. Agrobios. India.

Reference Books

1. ArunK. Sharma, (2002), A Hand book of organic forming, Agrobios, Jothpur, India.
2. C.A.Edwards, and J.R. Lofty (1977), "Biology of Earthworms" Chapman and Hall Ltd., London.
3. K.E.Lee, (1985), "Earthworms: Their ecology and Relationship with Soils and Land Use", Academic Press, Sydney.
4. Clive A. Edwards, Norman Q. Arancon, Rhonda L. Sherman, (2010), Vermiculture Technology: Earthworms, Organic Wastes, and Environmental Management, CRC Press.
5. Talashilkar and Dosani, (2005), Earthworms in Agriculture. Published by Agrobios (India), Chopasani Road Jodhpur.
6. D. Sapcota, Avian Poultry Production, A Text Book, (2014), New India Publishing Agency.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	M	S
CO2	H	M	S	S	H
CO3	H	S	M	H	M
CO4	S	H	S	S	S
CO5	H	S	S	H	M

S-Strong **H**- High **M**-Medium **L**-Low

Programme Code: 06	B.Sc., Zoology			
Major Elective Paper 6 –- Human Genetics and Counseling				
Batch 2024-2025	Hour/Week 4	Total Hours 75	Credits 5	Employability

Course Objectives

1. To understand knowledge on the blood types, transfusion and diseases.
2. To know about the applications of aminocentesis, dermatoglyphics and Population genetics.
3. To learn the applications of Genetic engineering and Genetic counseling

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	COI	Remember the Physiology and genetics of blood groups.
	CO2	Understand the various syndromes and Population genetics.
	CO3	Apply the application of genetic engineering in man.
	CO4	Analyse the genetic counseling and pedigree chart.
	CO5	Evaluate the students to learn about genetic engineering and applications in cancer and AIDS.

Syllabus

Unit I **(12 Hours)**

Blood groups (major types) Blood transfusion, Erythroblastosisfoetalis. Physiology and genetic of blood groups.

Unit II **(12 Hours)**

Aminocentesis, Dermatoglyphics: Terminology, methods of observation and printing, dermatoglyphic features of syndrome.

Unit III **(12 Hours)**

Population genetics, Hardy-Weinberg principle and its application in human population.

Unit IV **(12 Hours)**

Genetic engineering and its applications in human being, Cancer*****, AIDS.

Unit V **(12 Hours)**

Genetic counseling, definition, aims, procedure in genetic counseling and its limitation. Pedigree chart and its uses.

*** Denotes Self study**

Teaching Methods

Smart Class Room / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class

Text Books

1. Veer Bala Rastogi (2010), A text book of Genetics. Kedarnath Ramnath, New Delhi.
2. P.S.Verma, and V.K.Agarwal, (2007), Genetics. S.Chand and Company Pvt. Ltd, New Delhi.
3. Genes - VIII (2003) by Lewin B Oxford University Press.

Reference Books:

1. Tom Strachan and Andrew P. Read, (1999), Human Molecular Genetics, 2nd edition, Wiley Publishers.
2. Genome Analysis, A laboratory manual, Vol 2, Detecting Genes, Bruce Birren et al; (1998), Cold Spring Harbour Laboratory Press.
3. E.W.Sinnot, Dunn. L.C. Dobzhausky, (2004), Principle of Genetics. McGraw Hill Book Company, New York.
4. Robert.H. Lewin, (2002), Principles of Genetics. Tata McGraw Hill Publishing Company Ltd.,New Delhi.
5. Peter Snustad.D and Michael J. Simmons, (2011), Principles of Genetics. Wiley Publishers.
6. Benjamin A. Pierce, (2016), Genetics: A Conceptual Approach 6th Edition. W.H. Freeman, New York

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	H
CO2	M	S	H	M	S
CO3	H	M	S	H	M
CO4	H	S	H	S	M
CO5	M	H	S	S	H

S-Strong **H**- High **M**-Medium **L**-Low

NON MAJOR ELECTIVE PAPERS

1. Human Rights
2. Women's Rights
3. Consumer Affairs

24UHR3N1

Programme Code : 06	**B.Sc., Zoology**			
Part IV -Non Major Elective – I Human Rights				
Batch 2024-2025	Hours / Week 2	Total Hours 30	Credits 2	Employability

Course Objectives

1. To prepare for responsible citizenship with awareness of the relationship between Human Rights, democracy and development.
2. To impart education on national and international regime on Human Rights.
3. To sensitive students to human suffering and promotion of human life with dignity.
4. To develop skills on human rights advocacy
5. To appreciate the relationship between rights and duties
6. To foster respect for tolerance and compassion for all living creature.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	To understand the hidden truth of Human Rights by studying various theories.
	CO2	To acquire overall knowledge regarding Human Rights given by United Nation Commission. (UNO)
	CO3	To gain knowledge about various organs responsible for Human Rights such as National Human Rights Commission and state Human Right commission (UNHCR)
	CO4	To get habits of how to treat aged person, others and positive social responsibilities
	CO5	To treat and confirm, child, refugees and minorities with positive social justice.

Syllabus

Unit I **(6 Hours)**

Definition, Meaning, Concept, Theories and Kinds of Human Rights- Evaluation and Protection of Human Rights in India- Development of Human Rights under the United Nations.

Unit II **(6 Hours)**

United Nations Charter and Human Rights - U.N.Commission on Human Rights- Universal Declaration of Human Rights - International Covenant on Civil & Political Rights Economic, Social and Cultural Rights

24UHR3N1

Unit III **(6 Hours)**

Human Rights and Fundamental Rights (Constitution) - Enactments regarding Human Rights Laws in India - National Human Rights Commission and State Human Rights Commission.

Unit IV **(6 Hours)**

Aged persons and their Human Rights - Human Rights of Persons with Disabilities - Tribal Human Rights in India - Three Generation Human Rights - Social Awareness and Responsibilities of Individuals.

Unit V **(6 Hours)**

Rights of Women, Child, Refugees and Minorities –Social media and Human Rights - NGO's in protection of Human Rights - Right to Election

Text Books

1.Human Rights (2019), Published by Kongunadu Arts and Science College, Coimbatore –29.

Reference Books

1.Human Rights, (2018) Jaganathan, MA., MBA., MMM., ML., ML., Humanitarian Law and J.P.Arjun Proprietor, Usha Jaganathan, Refugee Law law series, 1st floor, Narmatha Nanthi Street, Magathma Gandhi Nagar, Madurai – 625014.

24UHR3N1

NON-Major Electives I – Human Rights
Question Paper Pattern
(External only)

Duration: 3 Hours Max: 75 marks

Section A (5x5=25)
Short answers Either or Type – one Question from each unit

Section B (5X10=50)
Essay type questions Either – or Type – one Question from each unit

Programme Code: 06	For B.A., BBA, B.Com, BCA and B.Sc., Degree Students			
Part IV -Non- Major Elective – II Women's Rights				
Batch 2022-2023	Hours / Week 2	Total Hours 30	Credits 2	Employability

Objectives

1. To know about the laws enacted to protect Women against violence.
2. To impart awareness about the hurdles faced by Women.
3. To develop a knowledge about the status of all forms of Women to access to justice.
4. To create awareness about Women's rights.
5. To know about laws and norms pertaining to protection of Women.
6. To understand the articles which enables the Women's rights.
7. To understand the Special Women Welfare laws.
8. To realize how the violence against Women puts an undue burden on healthcare services.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	**CO1**	Understand the importance of Women's Studies and incorporate Women's Studies with other fields.
	CO2	Analyze the realities of Women Empowerment, Portrayal of Women in Media, Development and Communication.
	CO3	Interpret the laws pertaining to violence against Women and legal consequences.
	CO4	Study the important elements in the Indian Constitution, Indian Laws for Protection of Women.
	CO5	To be Aware of Government Developmental schemes for women and to create Awareness on modernization and impact of technology on Women.

Syllabus

Unit I **(6 Hours)**

Women's Studies:

Basic concepts of Women's studies in Higher education, Women's studies perspectives- Socialization- Patriarchy- Women's studies as an academic discipline- Growth and development of Women's studies as a discipline internationally and in India.

Unit II **(6 Hours)**

Socio-Economic Development of Women:
Family welfare measures, role of Women in economic development, representation of Women in media, status of Women land rights, Women Entrepreneurs, National policy for the empowerment of women.

Unit III **(6 Hours)**

Women's Rights – Access to Justice:
Crime against Women, domestic violence – physical abuse- verbal abuse – emotional abuse - economic abuse – minorities, dowry- harassment and death, code of conduct for work place, abetment of suicide.

Unit IV **(6 Hours)**

Women Protective acts:
Protective legislation for Women in the Indian constitution- Anti dowry, SITA, PNDT, and Prevention Sexual Harassment at Workplace (Visaka case), Domestic violence (Prevention) Act.

Unit V **(6 Hours)**

Women and Child welfare:
Safety provisions - various forms of mass media, radio, visual, internet, cyber space, texting, SMS and smart phone usage. Healing measures for the affected Women and child society by private and public sector, NGO and society.

Teaching Methods:

Smart Class Room / Power point Presentation / Seminar / Quiz / Discussion / Flipped Class

Text Book:

1. **Women's Rights** (2021), compiled by Kongunadu Arts & Science College, Coimbatore – 641 029.

Reference Books:

1. **"Rights of Indian Women"** by Vipul Srivatsava. Publisher: Corporate Law Advisor, 2014.
2. **"Women's security and Indian law"** by Harsharam Singh. Publisher: Aabha Publishers and Distributors, 2015.
3. **"Women's Property Rights in India"** by Kalpaz publications, 2016.

24UWR4N2

NON-MAJOR ELECTIVES I – WOMEN'S RIGHTS
QUESTION PAPER PATTERN
(External only)

Duration: 3 Hours **Max. Marks: 75**

Answer ALL Questions

SECTION A (5 x 5 = 25 marks)

Short answers, either or type, one question from each unit.

SECTION B (5 x 10 = 50 marks)

Essay type questions, either or type, one question from each unit.

Programme Code :06	**For B.A., B.Sc., and BCA Degree Students**		
Non- Major Elective III – Consumer Affairs			
Batch	**Hours/Week**	**Total Hours**	**Credits**
2024-2025	2	30	2

Course Objectives

1. To familiarize the students with their rights and responsibilities as a consumer.
2. To understand the procedure of redress of consumer complaints.
3. To know more about decisions on Leading Cases by Consumer Protection Act.
4. To get more knowledge about Organizational set-up under the Consumer Protection Act
5. To impart awareness about the Role of Industry Regulators in Consumer Protection
6. To understand Contemporary Issues in Consumer Affairs

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	**CO1**	Able to know the rights and responsibility of consumers.
	CO2	Understand the importance and benefits of Consumer Protection Act.
	CO3	Applying the role of different agencies in establishing product and service standards.
	CO4	Analyse to handle the business firms' interface with consumers.
	CO5	Assess Quality and Standardization of consumer affairs

SYLLABUS

UNIT I **(6 Hours)**

Conceptual Framework - Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000suite

UNIT II **(6 Hours)**

The Consumer Protection Law in India - Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, restrictive trade practice.

Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

UNIT III **(6 Hours)**

Grievance Redressal Mechanism under the Indian Consumer Protection Law - Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties.

Leading Cases decided under Consumer Protection law by Supreme Court/National Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

UNIT IV **(6 Hours)**

Role of Industry Regulators in Consumer Protection

I. Banking: RBI and Banking Ombudsman
II. Insurance: IRDA and Insurance Ombudsman
III. Telecommunication: TRAI
IV. Food Products: FSSAI
V. Electricity Supply: Electricity Regulatory Commission
VI. Real Estate Regulatory Authority

UNIT V **(6 Hours)**

Contemporary Issues in Consumer Affairs - Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.

Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview.

Note: Unit 2 and 3 refers to the Consumer Protection Act, 2086. Any change in law would be added appropriately after the new law is notified.

Teaching Methods:

Smart Class rooms /Power Point Presentations / Seminars/Quiz /Discussion /Flipped Classrooms

SUGGESTED READINGS:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, Universities Press.
2. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications Pvt Ltd.
3. G. Ganesan and M. Sumathy. (2012). Globalisation and Consumerism: Issues and Challenges, Regal Publications
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, NewDelhi
5. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
7. E-books :-www.consumereducation.in
8. Empowering Consumers e-book, www.consumeraffairs.nic.in
9. ebook,www.bis.org
10. The Consumer Protection Act, 2086 and its later versions.

Question paper pattern (External Only)

Duration: 3 hrs

Max: 75 Marks

Section A (5 x 5=25)

Short notes

Either – or / type – question from each unit.

Section B (5 x 10=50)

Essay type

Either – or / type – question from each unit.

Sub.Code:24UZO5X1

Programme code : 06	For All UG Programmes				
Human Anatomy (EDC)					
Batch 2024-2025	Semester 5	Hour/week 2	Total Hours 30	Credits 3	Skill Development

Course objectives

1. To make the students to learn about the human body from cellular to system level.
2. To set a strong base in the biology related courses for other major students.
3. To motivate the students to pursue healthcare / bio-inspired courses related higher studies and research.

Course outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Remember the different organ system of the human body.
	CO2	Understand the anatomical position and structure of different organ system in human.
	CO3	Apply the knowledge gained on anatomy and function of human organ system in the healthcare.
	CO4	Analyze the role of each organ system for the normal healthy life.
	CO5	Evaluate the physiological function and mechanisms of the organs of all the systems.

Syllabus

Unit I: Integumentary, Skeletal and Muscular system (6 Hours)

Anatomy of generalized cell, Structure of the basic tissues - Epithelial tissue, skin, connective tissue, muscle tissue - Axial muscles, nervous tissue, structure and classification of bones.

Unit II:Digestive system (6 Hours)

Structure of Alimentary canal – Buccal cavity, esophagus, pharynx, stomach, small intestine, microvilli, large intestine, rectum, structure of teeth and salivary glands. Accessory organs -liver and pancreas.

Sub.Code:24UZO5X1

Unit III: Circulatory and Respiratory system (6 Hours)

Circulatory system: Anatomy of heart, chamber, valves and associated vessels, contractile cells, composition of blood, differences in arteries, veins and capillaries. Structure of lymphoid organs.

Respiratory system: Anatomy of respiratory system – Nasal cavity, pharynx, larynx, trachea, pleura, Lungs - location, lobes and surfaces.

Unit IV: Nervous system and Sensory organs (6 Hours)

Nervous system: The anatomical and functional classification of nervous system, neurons, four major regions of brain, protection of the Central nervous system, cranial reflexes, comparison of the peripheral and autonomic nervous systems.

Sensory organs: Anatomy of the eyes and ear.

Unit V: Urinogenital Systems (6 Hours)

Excretory system: Anatomy of kidney – ultra structure of glomerulus - Ureter, urinary bladder and urethra.

Reproductive Systems: Male reproductive system – structure of testis and duct system, Prostate gland. Female reproductive system - Structure of ovaries and duct system. Structure of ovary, uterus, mammary gland and vestibular glands*****.

***denotes self study**

Teaching Methods

Smart Class rooms /Power Point Presentations / Seminars/Quiz /Discussion /Flipped Classrooms

Text Books

1. Sarada Subramanyam, K.MadhavanKutty and H.D.Singh(1996), Text book of Human Physiology, S.Chand& Company.
2. Guyton (2002), Text book of Medical Physiology 10th edition., WB Jaunder company Philadelphi.
3. Elaine N. Mariesh, Suzanne M Keller (2018), Essentials of Human Anatomy and Physiology, Pearson Education.

Reference Books:

1. A. Faller, M. Schuenke, (2004), The Human Body: An introduction to structure and function, 1st Edition, Thieme Medical Publishers Inc.
2. Gerard J. Tortora and Bryan Derikson (2011), Principles of Anatomy and Physiology, 13th Edition, John Wiley and Sons, Inc publication, New York, USA.

3.
4. B.D.Chaurasia's, (2019), Human Anatomy, 8th Edition, CBS publishers, USA.
5. J.Vander, James H. Sherman, Dorothy Vander Lucianao, (2000), Human Physiology: The Mechanism of Body Function, 7th Edition, McGraw Hill International publication, USA.
6. Cyril A.Keele Eric Neil and Neil Norman Joels Samson Wrigths, (1983), Applied Physiology, 13th Edition, Oxford Medical Press, USA.
7. H. Frederic, H. Martini, Judi L Nath, Edwin F. Bartholomew, (2020), Fundamentals of Anatomy and Physiology, 11th edition, Pearson Education.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	S
CO2	S	M	H	S	H
CO3	S	H	H	H	M
CO4	H	S	M	S	H
CO5	H	S	M	S	H

S-Strong **H**-High **M**-Medium **L**-Low

Sub.Code:24UZO1A1

Programme Code : 06	For B.Sc., Botany, Chemistry and Biochemistry			
Allied A Zoology I				
Batch 2024-2025	Hour/Week 5	Total Hours 75	Credits 4	Employability

Course Objectives

1. To learn about the taxonomy and characteristics of non-chordate
2. To obtain the knowledge of morphology and anatomy of the animals
3. To understand the biological significance of non-chordates and chordates

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Get knowledge about the classification of various organisms
	CO2	Study and understand the various parasites and protozoan diseases
	CO3	Apply the knowledge on the developmental stages of different animals.
	CO4	Analyze the morphology and anatomy on chordates.
	CO5	Evaluatethebiological significance of birds Migration, Parental care in fishes and amphibians.

Syllabus

UNIT I **(15 Hours)**

Phylum Protozoa : *Paramecium caudatum:* Systems and Structure
General topic : Canal system in sponges, Coral reefs

UNIT II **(15 Hours)**

Phylum Platyhelminthes : *Fasciola hepatica:* Systems and Structure
General topic : Parasitc worm diseases (Helminths)

UNIT III **(15Hours)**

Phylum Arthropoda : *Periplanata americana:* Systems and Structure
General topic : Metamerism in Annelids Water vascular system in star fish

UNIT IV **(15Hours)**

Phylum Chordata : *Rana hexadactyla*: Systems and Structure (Class Amphibia)(Excluding endoskeleton)
General topic : Parental care of fishes and amphibians

Sub.Code:24UZO1A1

UNIT V (15Hours)

Phylum Chordata :*Oryctolagus cuniculus:* Systems and Structure (Class Mammalia)(Excluding endoskeleton)

General topic : Migration of birds, Dentition in Rabbit*****

***denotes self study**

Teaching Methods

Smart Class Room / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class/E-Content.

Text Books

1. M.EkambaranathaAyyar, T.N.Ananthakrishnan, S.Visvanathan, (1981), Manual of Zoology Vol.1 & 2 Printers & Publishers Pvt.Ltd, Chennai.
2. M.EkambaranathaAyyar, T.N.Ananthakrishnan, S.Viswanathan, (2009), Manual ofZoology Vol.2 & Part 1 Printers & Publishers Pvt.Ltd, Chennai.
3. E.L.Jordan, and P.S.Verma, (2009), Fifteenth Edition, Invertebrate Zoology. S. Chand & Co. New Delhi.

Reference Books

1. E.L.Jordan, P. S Verma, (2009), 15th Edition, Invertebrate Zoology S. Chand & Co. New Delhi.
2. Kotpal R.L. Morden (2016 Edition), Textbook of Zoology-Vertebrates. Rastogi Publication. Meerut.
3. Thangamani, L.M. Narayanan, S.Prasannakumar, N. Arumugam, (2010), Chordate Zoology, Saras Publications, Nagercoil, Tamil Nadu, India.
4. Ruppert, Edward E., S. Fox, Richard S, Barnes D Robert, (2009), Invertebrate Zoology : A Functional Evolutionary Approach. 7th edition. Thomson Brooks / Cole.
5. N.C.Nair, S.Leelavathi, N.Soundrapandian, T.Murugan, N.Arumugam, (2013), A Text book of Invertebrates, Saras Publication, Nagercoil, Tamil Nadu, India.
6. P.K.Talwar and A.G Jhingran, (1991), Inland fishes.Vol.2. Oxford & 1BH publishing Co.Pvt.Ltd. New Delhi.

Sub.Code:24UZO1A1

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	S	M
CO2	S	S	S	H	H
CO3	H	S	H	H	H
CO4	S	H	M	M	S
CO5	S	M	S	M	S

S-Strong **H**- High M-Medium **L**-Low

Sub.Code:24UZO2A2

Programme code:06	**For B.Sc., Botany, Chemistry and Biochemistry**			
Allied A Zoology 2				
Batch 2024-2025	Hour/Week 5	Total Hours 75	Credits 4	Employability

Course Objectives

1. To acquire the knowledge about the cytology and developmental biology of living animals.
2. To understand the physiology and of digestion.
3. To create the awareness about the environmental pollution and learn about evolutionary modification.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Acquire the knowledge about the cell organelles and its functions and Genetic disorders.
	CO2	Understand the embryology of frog
	CO3	Analyze the nutritive components of food and the process of digestion and absorption.
	CO4	Apply the comprehension in the field of eco-system and conservation
	CO5	Evaluate the knowledge on the evolutionary significance of animals

Syllabus

Unit I **(15 Hours)**

Structure of an animal cell, structure and functions of Mitochondria, Golgi body, Centrosome, Lysosomes and Nucleus. Mendel's laws of inheritance, Human genetic disorders-haemophilia and colour blindness.

Unit II **(15 Hours)**

Types of eggs (based on the amount and distribution of yolk , on the basis of potentialities for further development), Egg Cleavage planes and patterns in various animals, types of blastula, blastulation and gastrulation in Frog.

Sub.Code:24UZO2A2

Unit III **(15 Hours)**

Nutrition in human -Food constituents and enzymes, digestion and absorption.

Unit IV **(15 Hours)**

Ecosystem and its components, Ecosystem services, food chain, foodweb, energy flow, Pollution of water, air and noise.

Unit V **(15Hours)**

Evidences of Evolution - morphological, anatomical, embryological and Physiological, biochemical. Theories of evolution - Lamarkism, Darwinism and De Vries, Mutation theory*****.

***denotes self study**

Teaching Methods:

Smart ClassRoom / Powerpoint presentation / Seminar/Quiz / Discussion / Flipped Class/E-content.

Text Books

1. N.Arumugam, R. Meyyan, (2010), Cell Biology, Genetics and Evolution Saras Publications, Nagercoil, Tamil Nadu, India.
2. N.Arumugam, (2014), Concepts of Ecology (Low price Edition), Saras Publications, Nagercoil, Tamil Nadu, India.
3. M.VeerBalaRastogi, (2018),Organic evolution, Third Edition, Medtech Publishers, New Delhi.

Reference Books

1. M.VeerBala Rastogi, Jayaraj S, (2008), Physiology, Ecology and Evolution. Kedar Nath Ram Nath Publishers, Meerut, New Delhi.
2. S. Chattopadhyay, (2009), Life: Origin Evolution and adaptation Book & Allied (P) Ltd, Kolkata.
3. P.S, Verma, V.K. Agarwal, (2002), Concepts of Ecology (Environmental Biology) First Edition. S. Chand & Company Ltd, New Delhi.
4. P. Purohit Agarwal, (2012), Environmental pollution – causes, effects and control – Agrobiospublishes, India.
5. B.I. Balansky, B.C. Fabian, (2012), 5th Edition, An Introduction to Embryology. Cengage learning India.
6. P. S Verma, V.K. Agarwal, (2009), Cell biology, Genetics, Molecular Biology, Evolution &ecology. S. Chand & Company LTD, Ram Nagar, New Delhi, India.

Sub.Code:24UZO2A2

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	H	M
CO2	S	H	S	H	S
CO3	H	S	H	S	M
CO4	S	S	H	M	S
CO5	S	S	H	H	M

S-Strong **H**- High **M**-Medium **L**-Low

Sub. Code: 24UZO2AL

Programme code: 06	For B. Sc Botany, Chemistry and Biochemistry			
Allied –A- Practical I Zoology				
Batch 2024-2025	Hour/Week 2	Total Hours 60	Credits 2	Employability

Course Objectives

1. To observe the various anatomical systems of animals using virtual laboratory.
2. To educate the students about cell division and genetic disorders.
3. To know the developmental stages of frog and identification, observation of planktons.

Course Outcomes (CO)

On successful completion of course the students will be able to

K1 to K5	CO1	Get the knowledge of the parts of various systems of frog, cockroach, Pila and starfish.
	CO2	Understand the structure of few non-chordate and chordate and cells of different tissues.
	CO3	Apply knowledge to differentiate the stages of mitosis and clinical features, chromosomal abnormalities of a few genetic syndromes.
	CO4	Analyze the various stages of gametes development and morphogenetic movements of cells in developing embryo.
	CO5	Evaluate the biological significance of planktons in ecosystem service and observation of their structure.

Syllabus

Experiment I:

Virtual laboratory: Observation of various systems of any one: Cockroach, Frog, Pila, Pig, Pigeon, Starfish displayed over computer. (Digestive system, Arterial system, Venous system, Reproductive system - male & female).

Experiment II:

Spotters

Animals: Paramecium conjugation, Sycon, Obelia colony, Liver fluke, Earth worm, Prawn, Pila, Star fish, Amphioxus, Shark, Toad, Chameleon, Horn Bill and Bat.

Cell Biology: Columnar epithelium & Bone tissue T.S.

Sub. Code: 24UZO2AL

Cell division: Stages of Mitosis: Interphase, Prophase, Metaphase, Anaphase and Telophase.

Genetic Syndromes : Downs, Klinefelter and Turner's Syndrome (Picture).

Adaptive radiation: Forelimb Skeleton of vertebrates (Picture).

Embryology: Frog : ovum (picture), spermatozoa (Picture), 2 cell stage, 4 cell stage, 8 cell stage: Blastula (VS), Gastrula VS and Tadpole (4mmWM).

Experiment III:

Ecology: Observation of Plankton (any five).

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	H
CO2	H	M	H	S	M
CO3	S	H	M	H	H
CO4	H	S	H	M	S
CO5	S	M	H	M	H

S-Strong **H**- High **M**-Medium **L**-Low