FATIMA COLLEGE (AUTONOMOUS)

Re-Accredited with "A++" Grade by NAAC (Cycle IV)
Maryland, Madurai- 625 018, Tamil Nadu, India

NAME OF THE DEPARTMENT: ZOOLOGY

NAME OF THE PROGRAMME : M. Sc

PROGRAMME CODE : PSZO

ACADEMIC YEAR :2022-2023

FATIMA COLLEGE (Autonomous), MADURAI - 625 018

MINUTES OF THE BOARD OF STUDIES

NAME OF THE DEPARTMENT: M.Sc Zoology

TO BE IMPLEMENTED FROM: 2022 - 2023 ONWARDS

VENUE: DEPARTMENT OF ZOOLOGY

CONVENED ON: 15.03.2022 CONVENED AT: 02.00 pm

MEMBERS PRESENT:

1. Dr.A.Tamil selvi	Head of the Department 15/3/22
2. Dr.Capt.N.Arun Nagendran Associate Professor PG & Research Department of Zoology Thiagarajar College Madurai - 625 009	University Nominee 15/3/22
3. Dr.F.Brisca Renuga Associate Professor Department of Zoology Holy Cross College (Autonomous) Nagercoil - 04	Subject Expert 15/3/2022
4. Dr.R.Uma Maheswari Assistant Professor PG Department of Zoology Arulmigu Palaniandavar Arts college for Women Palani - 624 615	Subject Expert 15/3/22

5. Dr. A. Vanniarajan Scientist Aravind Medical Research Foundation Madurai – 625020	Industrialist / Scientist A. Vanni 15/03/2022
6. Miss. S. Susaritha Research Scholar PG & Research Department of Zoology	Alumna S. Susaritha 15/03/22
7. Dr. N. Malathi	Dean of Academic Affairs Malathi 15/3/22
8. Dr. Antony Amala Jayaseeli	Staff Member Antony Amala Jayaseeli 15/03/2022
9. Dr. N. Malathi	Staff Member Malathi 15/3/22
10. Dr. Sr. Biji Cyriac	Staff Member (absent)
11. Dr. V. Bharathy	Staff Member V. Bharathy 15/3/22
12. Dr. N. Nagarani	Staff Member N. Nag 15/3/22
13. Dr. S. Barathy	Staff Member S Barathy 15/3/22
14. Mrs. J. Thelma	Staff Member Thelma 15/3/22
15. Dr. K. Manimegalai	Staff Member K. Mani 15/3/22

1. ACTION TAKEN REPORT FOR 2021-2022 M.Sc Zoology

S. NO	COMMON SUGGESTIONS OFFERED IN THE PREVIOUS BOARD	ACTION TAKEN FOR THE ACADEMIC YEAR 2021-2022
1.	Number of field projects in PG may be increased whenever possible.	Number of field projects in PG has been increased.
2.	The DOER may have a minimum of 5 links for each paper	5 links are included in the DOER of each course to maintain uniformity.

CHANGE OF COURSE TITLE

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

NEW COURSES INTRODUCED

S. NO	COURSE CODE	COURSE TITLE	RELEVANCE TO				SCOPE FOR			NEED FOR INTRODUCTION
			L	R	N	G	EMP	ENT	SD	
1.	21PGSLZ1	Fermentation Technology	L	R	N	G	EMP	-	SD	Offered to the Advanced Learners

REVISED COURSES

S. NO	COURSE CODE / TITLE	UNIT NO & REVISED CONTENT	% OF Revision	NEED FOR REVISION	RELEVANCE TO				SCOPE FOR		
					L	R	N	G	EMP	ENT	SD
-	-	NIL	-	-	-	-	-	-	-	-	-

2. Updation of Open Educational Resources

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

3. Revision of courses

S. NO	COURSE CODE & TITLE	UNIT NO & REVISED CONTENT	% of Revision	NEED FOR REVISION	RELEVANCE TO				SCOPE FOR		
					L	R	N	G	EMP	ENT	SD
1.	19PG1Z3 Cell & Molecular Biology	Following topics are added – Unit-I Overview of Cell Biology Topics – Microfilaments & Microtubules Structure & dynamics, Microtubules & mitosis, cell movements – role of kinesin and Dyenin Unit-II Eukaryotic Genome & Replication Topics included – Brief account on Genome, Transcriptome & Proteome. Regulation of Eukaryotic Genome Replication	10%	As per the guidelines of Academic Deans & recommendation of course Teachers	–	–	N	G	–	–	SD
2.	19PG3Z11 Biophysics	Unit-V Biophysical Principles applied to physiology Topics included – Biophysical aspects of hearing, noise and speech – mechanism of hearing – auditory and non-auditory effects of noise pollution.	10%	As per the guidelines of Academic Deans & recommendation of course Teachers	–	–	N	G	–	–	SD
3.	19PG3Z13 Biostatistics & Research Methodology	Unit V Thesis Writing Topics included – Literature review – Source, Structure and Stages of literature Search – Critical review. Ethics in Research	10%	As per the guidelines of Academic Deans & recommendation of course Teachers	–	–	N	G	EMP	–	SD

4.	19PG4Z16 Environmental Biology	Unit-III Natural Resources Topics included - Water resources - Distribution - Types - Surface water, ground water, Management and conservation of water resources	10%	As per the guidelines of Academic Deans & recommend-ation of course Teachers	L	R	N	G	-	-	SA
5.	19PG4ZE3 Economic Zoology	Following topics are included - Unit-I: Apiculture Social organization and Life cycle - Behaviour of Honey bees Unit II: Sericulture Topics:- Moriculture - Vegetative propagation and seeding	10%	As per the guidelines of Academic Deans & Recommend-ations of course Teachers	L	R	N	G	-	ENT	SD

4. New Courses Introduced: NIL

S.NO	COURSE CODE	COURSE TITLE	RELEVANCE TO				SCOPE FOR			Need for Introduction
			L	R	N	G	EMP	ENT	SD	
-	-	NIL	-	-	-	-	-	-	-	-

5. Introduction of Purely Skill-Embedded Certificate / Diploma / Advanced Diploma NIL

S.NO	COURSE CODE	COURSE TITLE	SKILLS SHARPENED	COURSE OUTCOME
-	-	NIL	-	-

6. Approval of Ph.D course Work Syllabus - NIL

7. Rubrics for Internship / Project: NA

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

DETAILS OF PROPOSED/SIGNED MOU: NIL

OTHER SUGGESTIONS	COMMENDATIONS
1. Hands-on training may be provided to the Students whenever possible. 2. Biostatistics problems may be worked using real-time data obtained from research articles. 3. Students may be encouraged to write review articles on topic of their interest.	1. The course Economic Zoology enhances the entrepreneurial skills of Students. 2. Inclusion of Dynamism in the course content imparts current Scientific knowledge to Students.

Name of	Signature
1. Head of the Department Dr. A. Tamil Selvi	15/03/2022
2. University Nominee Dr. Capt. N. Arun Nagendran	15/3/22
3. Subject Expert Dr. F. Brisca Renuga	15/3/2022
4. Subject Expert Dr. R. Uma Maheswari	15/3/22
5. Dr. A. Vanniarajan (Scientist)	15/03/2022
6. Miss. S. Susaritha (Alumna)	15/03/22

7. Dr. N. Malathi (Dean) — 15/3/22

8. Dr. Antony Amala Jayaseeli — 15/05/2022
9. Dr. N. Malathi — 15/3/22
10. Dr. Sr. Biji Cyriac — (absent)
11. Dr. V. Bharathy — 15/3/22
12. Dr. N. Nagarani — 15/3/22
13. Dr. S. Barathy — 15/3/22
14. Mrs. J. Thelma — 15/3/22
15. Dr. K. Manimegalai — 15/3/22

VISION OF THE DEPARTMENT

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

MISSION OF THE DEPARTMENT

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

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 1	Our graduates will be academic, digital and information literates; creative, inquisitive, innovative and committed researchers who would be desirous for the "more" in all aspects
PEO 2	They will be efficient individual and team performers who would deliver excellent professional service exhibiting progress, flexibility, transparency, accountability and in taking up initiatives in their professional work
PEO 3	The graduates will be effective managers of all sorts of real – life and professional circumstances, making ethical decisions, pursuing excellence within the time framework and demonstrating apt leadership skills

PEO 4	They will engage locally and globally evincing social and environmental stewardship demonstrating civic responsibilities and employing right skills at the right moment.

GRADUATE ATTRIBUTES (GA)

Fatima College empowers her women graduates holistically. A Fatimite achieves all-round empowerment by acquiring Social, Professional and Ethical competencies. A graduate would sustain and nurture the following attributes:

I. SOCIAL COMPETENCE	
GA 1	Deep disciplinary expertise with a wide range of academic and digital literacy
GA 2	Hone creativity, passion for innovation and aspire excellence
GA 3	Enthusiasm towards emancipation and empowerment of humanity
GA 4	Potentials of being independent
GA 5	Intellectual competence and inquisitiveness with problem solving abilities befitting the field of research
GA 6	Effectiveness in different forms of communications to be employed in personal and professional environments through varied platforms
GA 7	Communicative competence with civic, professional and cyber dignity and decorum
GA 8	Integrity respecting the diversity and pluralism in societies, cultures and religions
GA 9	All – inclusive skill - sets to interpret, analyse and solve social and environmental issues in diverse environments

GA 10	Self-awareness that would enable them to recognise their uniqueness through continuous self-assessment in order to face and make changes building their strengths and improving on their weaknesses
GA 11	Finesse to co-operate exhibiting team-spirit while working in groups to achieve goals
GA 12	Dexterity in self-management to control their selves in attaining the kind of life that they dream for
GA 13	Resilience to rise up instantly from their intimidating setbacks
GA 14	Virtuosity to use their personal and intellectual autonomy in being life-long learners
GA 15	Digital learning and research attributes
GA 16	Cyber security competence reflecting compassion, care and concern towards the marginalised
GA 17	Rectitude to use digital technology reflecting civic and social responsibilities in local, national and global scenario
II. PROFESSIONAL COMPETENCE	
GA 18	Optimism, flexibility and diligence that would make them professionally competent
GA 19	Prowess to be successful entrepreneurs and employees of trans-national societies
GA 20	Excellence in Local and Global Job Markets
GA 21	Effectiveness in Time Management
GA 22	Efficiency in taking up Initiatives
GA 23	Eagerness to deliver excellent service
GA 24	Managerial Skills to Identify, Commend and tap Potentials

III. ETHICAL COMPETENCE	
GA 25	Integrity and discipline in bringing stability leading a systematic life promoting good human behaviour to build better society
GA 26	Honesty in words and deeds
GA 27	Transparency revealing one's own character as well as self-esteem to lead a genuine and authentic life
GA 28	Social and Environmental Stewardship
GA 29	Readiness to make ethical decisions consistently from the galore of conflicting choices paying heed to their conscience
GA 30	Right life skills at the right moment

PROGRAMME OUTCOMES (PO)

On completion of M.Sc. ZOOLOGY Programme, the graduates would be able to

PO 1	Apply acquired scientific knowledge to solve major and complex issues in the society/industry.
PO 2	Attain research skills to solve complex cultural, societal and environmental issues.
PO 3	Employ latest and updated tools and technologies to solve complex issues.
PO 4	Demonstrate Professional Ethics that foster Community, Nation and Environment Building Initiatives.

PROGRAMME SPECIFIC OUTCOMES (PSO)

On completion of M.Sc. ZOOLOGY programme, the graduates would be able to

PSO 1	Gain comprehensive knowledge in different branches of zoology – Cell & Molecular Biology, Biochemistry, Microbiology, Developmental Biology, Immunology, Genetics, Biotechnology, Bioinformatics and Evolution.
PSO 2	Interrelate the concepts of gene, genome, cell, tissue, organ and organ-system in the physiological adaptations, development, reproduction, behaviour of microbes, plants and animals
PSO 3	Perform experiments in the field of Microbiology, Biochemistry, Cell & Molecular Biology, Environmental Biology, Developmental Biology, Biostatistics, Immunology, Genetics, Biotechnology and Bioinformatics.
PSO 4	Develop empathy towards conservation of plants and animals and appreciate the diversity of animals and their inclusiveness in the sustenance of an ecosystem.
PSO 5	Express ideas and concept through oral presentation and organize research data in the form of dissertation writing.
PSO 6	Solve the environmental, social and ethical problems by applying the biological principles for minimizing pollutants by waste water treatment and solid waste management for eco-sustainable development.
PSO 7	Address the local, regional, national and global environmental issues and mitigating the same through Intervention strategies adopting standard protocol.
PSO 8	Practice judicious way of using animals in experiments, proper disposal of hazardous biological waste and ethics related to conserving endangered animals and plants.
PSO 9	Exhibit the holistic growth by developing interpersonal skills, subject proficiency, and to seek employability in clinical laboratory, Research institutions, Medical coding and IT companies.

PSO 10	Make them self employed/ Entrepreneur in the field of Sericulture, Fisheries and Aquaculture, Dairy farming, Apiculture and Poultry.
PSO 11	Use of computers for Power point presentation, Virtual Dissection, analysis of bio- molecules using bioinformatics software and computing biological data.
PSO 12	Healthy diet pattern for combat life style disorder.

I M.Sc.,ZOOLOGY

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSZO	19PG1Z3	Cell & Molecular Biology	Lecture	6	4

COURSE DESCRIPTION

This course deals with the central dogma of molecular biology and to understand the basis of heredity.

COURSE OBJECTIVES

- To provide an overview of cell structure and functions.
- To understand the cell structure and function at the molecular level , including the flow of information from genes to proteins and its regulation
- To gain knowledge in cancer biology, cell cycle and signaling pathways

UNIT –I: OVERVIEW OF CELL BIOLOGY (18 HRS.)

5%

Structure of animal cell - Cytoskeleton: Structure and organization of actin filaments, intermediate filaments – plasma membrane: structure (review), transport of small molecules, receptor mediated phagocytosis – Cell-cell interactions: Adhesion junctions, tight junctions, gap junctions, plasmodesmata.

Self-study–Structure of animal cell - Cytoskeleton: Structure and organization of actin filaments, intermediate filaments – plasma

membrane: structure (review), transport of small molecules, receptor mediated phagocytosis

UNIT –II EUKARYOTIC GENOME & REPLICATION (18 HRS.)

5%

The complexity of Eukaryotic Genomes: Introns, exons, repetitive DNA sequences C_0t curve – C value paradox – Chromosomes & Chromatin – organization of chromatin in nucleosomes. Genome replication: Topological problems – Process – detailed mechanism - *E.coli* and Eukaryotes – Telomere synthesis . DNA repair -Types and mechanism

Self-study– DNA repair -Types and mechanism

UNIT –III TRANSCRIPTION (18 HRS.)

Eukaryotic transcription and its regulation: RNA polymerases and their promoters, Class I, II, and III Transcription factors, Activators, silencers; post transcriptional modifications – capping, polyadenylation and splicing; other RNA processing – rRNA, tRNA; transplicing and RNA editing.

UNIT –IV TRANSCRIPTION REGULATION & TRANSLATION (18 HRS.)

Transcription regulation – Process and control – *lac, trp, ara* operons. MicroRNA - Protein Synthesis: rRNA, tRNA, Ribosome, process and regulation of translation: Protein folding and processing – Protein Sorting and Transport – Endoplasmic reticulum and Lysosomes - Protein degradation

Self-study– *lac* operon

UNIT –V CELL SIGNALING, CELL CYCLE, CELL DEATH & CANCER

(18 HRS.)

Signaling molecules and receptors: pathways of intracellular signal transduction: cAMP, GTP, MAP kinase – Cell cycle: phases, regulation, events of M phase – Cell death: events of apoptosis; Cancer: development, types and causes of cancer – Oncovirus hepatitis B & C virus, retrovirus – Oncogenes – tumor suppressor genes.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only)

REFERENCES:

1. Lewin B., (2008) *Genes IX,* Jones and Bartlett publishers, Canada.
2. Cooper G.M., (2007) *The Cell - A Molecular Approach*, 2nd ed., ASM Press, Washington D.C.
3. Brown T.A., (2002) *Genomes, 2nd ed.*, Wiley – Liss publications, New York.
4. Weaver R., (1999*) Molecular Biology*, WCB / Mc Graw-Hill, London.
5. Watson J.D., Baker T.A., Stephen B.P., Gann A., Levine M and Losick R., (2004) *Molecular Biology of the Gene, 5th ed.,* Pearson Education.
6. Lodish D.J and Baltimore D., (2004) *Molecular Cell Biology, 5th ed.*, Sci. American Books, W.H. Freeman and Company, New York.
7. Wolfe S.L., (1995) *An Introduction to Cell and Molecular Biology,* Wadsworth Publishing Company, New York.
8. De Robertis, E.D.P and De Robertis E.M.F., (1988) *Cell and Molecular Biology, 8thed.,*International ed., Infomed, HonKong.
9. Geoffery M. Cooper and Hausman Robert E., (2009) *The Cell: A Molecular Approach, 5th ed.*, ASM Press, Washington, D.C., and Sinauer Associates, Inc., Sunderland, Massachusetts.
10. Malacinski G.M., (2008) Freifelder's*Essentials of Molecular Biology, 4th ed.*, Narosa Publishing House, New Delhi.
11. Rastogi S.C., (2003) *Cell and Molecular Biology – 2nd ed.,* New Age International (P) Limited Publishers, Daryaganj, New Delhi.
12. Verma P.S. and Agarwal V.K., (2008*) Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*. S. Chand and Company, New Delhi.
13. Plopper G., Sharp D., and Sikorski E., (2015) *Lewin's Cells, 3rd ed., 1s*Indian ed., Jones and Bartlett India Pvt. Ltd., New Delhi.
14. Tropp B.E., (2012*) Molecular Biology- Genes to Proteins, 4th ed.*, 1st Indian ed., Jones and Bartlett India Pvt. Ltd., New Delhi.

DIGITAL OPEN EDUCATION RESOURCES (DOER):

1. http://www.axopub.com/Downloads/Cells/Cells_Part_2.pdf
2. https://openstax.org/books/biology-2e/pages/15-3-eukaryotic-transcription
3. https://openstax.org/books/biology-2e/pages/15-4-rna-processing-in-eukaryotes
4. https://openstax.org/books/biology-2e/pages/15-5-ribosomes-and-protein-synthesis
5. https://openstax.org/books/biology-2e/pages/9-1-signaling-molecules-and-cellular-receptors

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1: OVERVIEW OF CELL BIOLOGY				
1.1	Structure of animal cell	2	Discussion	Black Board
1.2	Cytoskeleton: Structure and organization of actin filaments	3	Discussion	PPT
1.3	Intermediate filaments	3	Lecture	PPT & White board
1.4	Plasma membrane: structure (review)	2	Lecture	LCD
1.5	Transport of small molecules & receptor mediated phagocytosis	3	Lecture	Black Board
1.6	Cell-cell interactions: Adhesion junctions & tight junctions	3	Chalk & Talk	Black Board

1.7	Gap junctions & plasmodesmata	2	Chalk & Talk	PPT
UNIT -2 EUKARYOTIC GENOME & REPLICATION				
2.1	The complexity of Eukaryotic Genomes	2	Lecture	Green Board Charts
2.2	Introns, exons & repetitive DNA sequences	2	Chalk & Talk	Green Board
2.3	C_0t curve – C value paradox	3	Lecture	PPT & White board
2.4	Chromosomes & Chromatin – organization of chromatin in nucleosomes.	3	Lecture	Black Board
2.5	Genome replication: Topological Problems	2	Lecture	LCD
2.6	Process – detailed mechanism - *E.coli* and Eukaryotes – Telomere synthesis	4	Discussion	Black Board
2.7	DNA repair -Types and mechanism	2	Discussion	Black Board
UNIT -3 TRANSCRIPTION				
3.1	Eukaryotic transcription and its regulation	3	Chalk & Talk	Black Board
3.2	RNA polymerases and their promoters, Class I, II, and III	3	Chalk & Talk	LCD
3.3	Transcription factors, Activators, silencers	4	Lecture	PPT & White board

3.4	Post transcriptional modifications – capping, polyadenylation and splicing;	3	Lecture	Black Board
3.5	Other RNA processing – rRNA, tRNA; transplicing and	3	Lecture	Black Board
3.6	RNA editing.	2	Discussion	PPT
UNIT -4 TRANSCRIPTION REGULATION & TRANSLATION				
4.1	Transcription regulation – Process and control	2	Chalk & Talk	Black Board
4.2	l*ac, trp&ara* operons.	3	Chalk & Talk	LCD
4.3	MicroRNA	2	Lecture	PPT & White4board
1.4	Protein Synthesis: rRNA, tRNA, Ribosome,	4	Lecture	Black Board
4.5	Process and regulation of translation:	2	Lecture	Black Board
4.6	Protein folding and processing – Protein Sorting and	2	Discussion	Google classroom
4.7	Transport – Endoplasmic reticulum and Lysosomes	2	Lecture	LCD
4.8	Protein degradation	1	Discussion	Black Board
UNIT – 5 CELL SIGNALING, CELL CYCLE, CELL DEATH & CANCER				

5.1	Signaling molecules and receptors	2	Chalk & Talk	Black Board
5.2	Pathways of intracellular signal transduction: cAMP, GTP, MAP kinase	4	Chalk & Talk	LCD
5.3	Cell cycle: phases, regulation, events of M phase	4	Lecture	PPT & White board
5.4	Cell death: events of apoptosis	2	Lecture	Smart Board
5.5	Cancer: development	1	Lecture	Black Board
5.6	Types and causes of cancer	1	Discussion	Google classroom
5.7	Oncovirus - hepatitis B & C virus & retrovirus	2	Chalk & Talk	LCD
5.8	Oncogenes – tumor suppressor genes	2	Chalk & Talk	Black Board

EVALUATION PATTERN

Internal

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Seminar 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks	35 Mks.	5 Mks.	40Mks.	
K2	4	4	-	-	-	8	-	8	20 %
K3	2	2	-	5	-	9	-	9	22.5 %
K4	2	2	-	-	5	9	-	9	22.5 %

K5	**2**	**2**	**5**	**-**	**-**	**9**	**-**	**9**	22.5 %
Non Scholastic	**-**	**-**	**-**	**-**	**-**		**5**	**5**	12.5 %
Total	**10**	**10**	**5**	**5**	**5**	**35**	**5**	**40**	**100 %**

CIA

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	**C2**	**C3**	**C4**	**C5**	**C6**	**CIA**	**ESE**	**Total**
10	**10**	**5**	**5**	**5**	**5**	**40**	**60**	**100**

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Explain the ultrastructure and functions of Cytoskeletons and Plasma membrane	**K5**	PSO1, PSO2, PS05
CO 2	Discuss the complexity of eukaryotic genome organization and its replication in Prokaryotes & Eukaryotes	**K3**	PSO2, PSO5, PSO9 & PSO11
CO 3	Describe the process of transcription and post transcriptional modification in Eukaryotes	**K2**	PSO2, PSO5, PSO9
CO 4	Evaluate the regulation of transcription and translation in Prokaryotes & Eukaryotes	**K5**	PSO1, PSO2 PSO5&PSO11
CO 5	Assess the events of cell cycle, cell signalling pathways, cell death and cancer	**K5**	PSO1, PSO9& PS011

Mapping of COs with PSOs

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

Mapping of COs with POs

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

CO5	**3**	**3**	**2**	**2**

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

COURSE DESIGNER:

1. **Dr. N. Malathi**
2. **Dr. Sr. Biji Cyriac**

Forwarded By

Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

HOD'S Signature & Name

I M.Sc.,ZOOLOGY

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSZO	**19PG1Z3**	**Cell & Molecular Biology**	**Lecture**	**6**	**4**

COURSE DESCRIPTION

This course deals with the central dogma of molecular biology and to understand the basis of heredity.

COURSE OBJECTIVES

- To provide an overview of cell structure and functions.

- To understand the cell structure and function at the molecular level, including the flow of information from genes to proteins and its regulation
- To gain knowledge in cancer biology, cell cycle and signaling pathways

UNIT –I: OVERVIEW OF CELL BIOLOGY (18 HRS.)

Cytoskeleton: Microfilaments and microtubules – structure and Dynamics – microtubules and mitosis – cell movements- role of kinesin and Dyenin – Plasma membrane: structure (review), transport of small molecules, receptor-mediated phagocytosis – Cell-cell interactions: Adhesion junctions, tight junctions, gap junctions, plasmodesmata.

Self-study– Plasma membrane: structure (review), transport of small molecules, receptor-mediated phagocytosis

UNIT –II EUKARYOTIC GENOME & REPLICATION (18 HRS.)

A brief account on Genome, Transcriptome and Proteome; The complexity of Eukaryotic Genomes: Introns, exons, repetitive DNA sequences - Tm value-C_0t curve – C value paradox – Chromosomes & Chromatin – organization of chromatin in nucleosomes. Genome replication: Topological problems – Process – detailed mechanism - *E.coli* and Eukaryotes – Telomere synthesis-Regulation of Eukaryotic Genome Replication.DNA repair -Types and mechanism

Self-study– DNA repair -Types and mechanism

UNIT –III TRANSCRIPTION (18 HRS.)

Eukaryotic transcription and its regulation: RNA polymerases and their promoters, Class I, II, and III Transcription factors, Activators, silencers; post-transcriptional modifications – capping, polyadenylation and splicing; other RNA processing – rRNA, tRNA; transplicing and RNA editing.

UNIT –IV TRANSCRIPTION REGULATION & TRANSLATION (18 HRS.)

Transcription regulation – Process and control – *lac, trp, ara* operons. MicroRNA - Protein Synthesis: rRNA, tRNA, Ribosome, process and regulation

of translation: Protein folding and processing – Protein Sorting and Transport – Endoplasmic reticulum and Lysosomes - Protein degradation

Self-study– *lac* operon

UNIT –V CELL SIGNALING, CELL CYCLE, CELL DEATH & CANCER

(18 HRS.)

Signaling molecules and receptors: pathways of intracellular signal transduction: cAMP, GTP, MAP kinase – Cell cycle: phases, regulation, events of M phase – Cell death: events of apoptosis; Cancer: development, types and causes of cancer – Oncovirus hepatitis B & C virus, retrovirus – Oncogenes – tumor suppressor genes.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only)

REFERENCES:

10. Lewin B., (2008) *Genes IX,* Jones and Bartlett publishers, Canada.
11. Cooper G.M., (2007) *The Cell - A Molecular Approach*, 2nd ed., ASM Press, Washington D.C.
12. Brown T.A., (2002) *Genomes, 2nd ed.*, Wiley – Liss publications, New York.
13. Weaver R., (1999*) Molecular Biology*, WCB / Mc Graw-Hill, London.
14. Watson J.D., Baker T.A., Stephen B.P., Gann A., Levine M and Losick R., (2004) *Molecular Biology of the Gene, 5th ed.,* Pearson Education.
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16. Wolfe S.L., (1995) *An Introduction to Cell and Molecular Biology,* Wadsworth Publishing Company, New York.
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18. Geoffery M. Cooper and Hausman Robert E., (2009) *The Cell: A Molecular Approach, 5th ed.*, ASM Press, Washington, D.C., and Sinauer Associates, Inc., Sunderland, Massachusetts.

10. Malacinski G.M., (2008) Freifelder's *Essentials of Molecular Biology, 4th ed.*, Narosa Publishing House, New Delhi.
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12. Verma P.S. and Agarwal V.K., (2008*) Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*. S. Chand and Company, New Delhi.
13. Plopper G., Sharp D., and Sikorski E., (2015) *Lewin's Cells, 3rd ed., 1s*Indian ed., Jones and Bartlett India Pvt. Ltd., New Delhi.
14. Tropp B.E., (2012*) Molecular Biology- Genes to Proteins, 4th ed.*, 1st Indian ed., Jones and Bartlett India Pvt. Ltd., New Delhi.

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6. http://www.axopub.com/Downloads/Cells/Cells_Part_2.pdf
7. https://openstax.org/books/biology-2e/pages/15-3-eukaryotic-transcription
8. https://openstax.org/books/biology-2e/pages/15-4-rna-processing-in-eukaryotes
9. https://openstax.org/books/biology-2e/pages/15-5-ribosomes-and-protein-synthesis
10. https://openstax.org/books/biology-2e/pages/9-1-signaling-molecules-and-cellular-receptors

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1: OVERVIEW OF CELL BIOLOGY				
1.1	Cytoskeleton -Microfilaments and microtubules – structure	2	Discussion	Black Board
1.2	Dynamics of cytoskeletal elements	3	Discussion	PPT
1.3	Role of kinesin and Dyenin	3	Lecture	PPT & White board

1.4	Plasma membrane: structure (review)	2	Lecture	LCD
1.5	Transport of small molecules &receptor-mediated phagocytosis	3	Lecture	Black Board
1.6	Cell-cell interactions: Adhesion junctions and tight junctions	3	Chalk & Talk	Black Board
1.7	Gap junctions and plasmodesmata	2	Chalk & Talk	PPT
UNIT -2 EUKARYOTIC GENOME & REPLICATION				
2.1	A brief account on Genome, Transcriptome and Proteome	1	Chalk & Talk	Green Board
2.2	The complexity of Eukaryotic Genomes	2	Lecture	Green Board Charts
2.3	Introns, exons and repetitive DNA sequences	2	Chalk & Talk	Green Board
2.4	Tm value, C_0t curve and C value paradox	3	Lecture	PPT & White board
2.5	Chromosomes and Chromatin – organization of chromatin in nucleosomes.	3	Lecture	Black Board
2.6	Genome replication: Topological Problems	2	Lecture	LCD
2.7	Process – detailed mechanism - *E.coli* and Eukaryotes – Regulation of Eukaryotic Genome Replication-Telomere synthesis	4	Discussio n	Black Board
2.8	DNA repair -Types and mechanisms	2	Discussio n	Black Board
UNIT -3 TRANSCRIPTION				
3.1	Eukaryotic transcription and its regulation	3	Chalk & Talk	Black Board
3.2	RNA polymerases and their promoters, Class I, II, and III	3	Chalk & Talk	LCD
3.3	Transcription factors, Activators, silencers	4	Lecture	PPT & White board

3.4	Post transcriptional modifications – capping, polyadenylation and splicing;	3	Lecture	Black Board
3.5	Other RNA processing – rRNA, tRNA; transplicing and	3	Lecture	Black Board
3.6	RNA editing.	2	Discussio n	PPT
UNIT -4 TRANSCRIPTION REGULATION & TRANSLATION				
4.1	Transcription regulation – Process and control	2	Chalk & Talk	Black Board
4.2	l*ac, trp* and *ara* operons.	3	Chalk & Talk	LCD
4.3	MicroRNA	2	Lecture	PPT & White4boar d
1.4	Protein Synthesis: rRNA, tRNA, Ribosome,	4	Lecture	Black Board
4.5	Process and regulation of translation:	2	Lecture	Black Board
4.6	Protein folding and processing – Protein Sorting and	2	Discussio n	Google classroom
4.7	Transport – Endoplasmic reticulum and Lysosomes	2	Lecture	LCD
4.8	Protein degradation	1	Discussio n	Black Board
UNIT – 5 CELL SIGNALING, CELL CYCLE, CELL DEATH & CANCER				
5.1	Signaling molecules and receptors	2	Chalk & Talk	Black Board
5.2	Pathways of intracellular signal transduction: cAMP, GTP, MAP kinase	4	Chalk & Talk	LCD
5.3	Cell cycle: phases, regulation, events of M phase	4	Lecture	PPT & White board
5.4	Cell death: events of apoptosis	2	Lecture	Smart Board
5.5	Cancer: development	1	Lecture	Black Board

5.6	Types and causes of cancer	1	Discussion	Google classroom
5.7	Oncovirus - hepatitis B & C virus and retrovirus	2	Chalk & Talk	LCD
5.8	Oncogenes – tumor suppressor genes	2	Chalk & Talk	Black Board

EVALUATION PATTERN

Internal

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Seminar 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks	35 Mks.	5 Mks.	40Mks.	
K2	4	4	-	-	-	8	-	8	20 %
K3	2	2	-	5	-	9	-	9	22.5 %
K4	2	2	-	-	5	9	-	9	22.5 %
K5	2	2	5	-	-	9	-	9	22.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA

Scholastic	**35**
Non Scholastic	**5**

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Explain the ultrastructure and functions of Cytoskeletons and Plasma membrane	**K5**	PSO1, PSO2, PS05
CO 2	Discuss the complexity of eukaryotic genome organization and its replication in Prokaryotes & Eukaryotes	**K3**	PSO2, PSO5, PSO9 & PSO11
CO 3	Describe the process of transcription and post transcriptional modification in Eukaryotes	**K2**	PSO2, PSO5, PSO9

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 4	Evaluate the regulation of transcription and translation in Prokaryotes & Eukaryotes	**K5**	PSO1, PSO2 PSO5&PSO11
CO 5	Assess the events of cell cycle, cell signalling pathways, cell death and cancer	K5	PSO1, PSO9& PS011

Mapping of COs with PSOs

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

Mapping of COs with POs

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

CO5	3	3	2	2

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

COURSE DESIGNER:

3. **Dr. N. Malathi**
4. **Dr. Sr. Biji Cyriac**

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HOD'S Signature & Name

Syllabus Old

II M.Sc., ZOOLOGY

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSZO	19PG3Z11	Biophysics	Lecture	6	5

COURSE DESCRIPTION

Biophysics which is an inter disciplinary course, deals with the discipline concerned with the application of the principles and methods of physics and the other physical sciences to the solution of biological problems.

COURSE OBJECTIVES

- To imbibe the principles of physics involved in the structure elucidation of biomolecules
- To understand the principles of energy transformation in living systems
- To apply the use of modern physical instruments to unravel the importance of therapeutic radiology, in which the measurement of dose is critical to treatment, and in diagnostic radiology, particularly with techniques involving isotopes

UNITS:

UNIT-I: CHEMCAL BONDS AND MOLECULAR INTERACTIONS [15 HRS.]

Electron configuration of an atom: Covalent bond, hydrogen bond, Disulphide bond, Peptide bonds- Forces between Molecules: Electrostatic force, Van der Waal's forces, hydrophobic and hydrophilic - Biological importance and domains of Physics in Biology-Electrolytic dissociation and electrolytes:-

Ionisation, Basis of acidity and Basicity, Bronsted Lowry theory, strength of acids and bases, Henderson and Hasselbalch equation. Water as Dipole -Biological importance of water

Self-Study:-Water as Dipole -Biological importance of water,Electron configuration of an atom: Covalent bond, hydrogen bond, Disulphide bond, Peptide bonds- Forces between Molecules: Electrostatic force, Van der Waal's forces, hydrophobic and hydrophilic

UNIT-II: THERMODYNAMICS AND BIOLOGICAL OXIDATION [15 HRS.]

[15 HRS]

Laws of Thermodynamics: Concept of free energy and entropy, Exergonic and Endergonic reactions, Rate of reactions - Effect of sunlight and temperature on reactions - Energy of Activation: Arrhenius expression, Diffusion: Fick's Laws-I & II law, constant laws, Osmotic coefficient: Gibbs Donnan equilibrium- Oxidation and reduction reactions: Redox potentials in biological system- High energy phosphate group : ATP synthesis in mitochondria, ATP synthase.

UNIT-III: INSTRUMENTATION [15 HRS.]

Principle, Components and Biological applications of Light microscope, Polarising microscope, Inverted microscope, Confocal and X-ray microscope, Flow cytometry - Colorimetry and Spectrophotometry: Laws of absorption, complementary colours, Chromophore concept, Absorption spectrum, Wavelength selectors, Detection devices, amplification and read out. Chromatography: Paper chromatography, TLC and Column chromatography. Centrifugation: Principle, Types & Applications, Relative Centrifugal Force, Factors affecting sedimentation and types of centrifugation

UNIT-IV: PHOTO BIOPHYSICS [15 HRS.]

Electromagnetic spectrum: Components of EMR, Quantum theory of radiation, Biological application, Effects of UV on Biological systems -

Radioactive isotopes: Measurements of radiation, Dosimetry, Cerenkov radiation, Interaction of radioactivity with matter, Gas ionization methods: Ionization chambers, proportional counters, GM tubes, Photographic methods: Autoradiography, Excitation method: Liquid Scintillation counters; Use of isotopes as tracers in Biology; Safety aspects

Self-Study:-Use of isotopes as tracers in Biology; Safety aspects, Effects of UV on Biological systems **10%**

UNIT-V: BIOPHYSICAL PRINCIPLES APPLIED TO PHYSIOLOGY [15 HRS.]

Biophysical aspects of vision: photoreceptors :simple and compound, structure and function of vertebrate eye, mechanism of conversion of light stimulation to neuronal impulse - Nerve conduction: Neurotransmitters and Synapse, Nerve impulse, membrane potential, resting potential and action potential, Action potentials in earthworm nerve fiber - Muscle contraction

Self-Study:-Neurotransmitters and Synapse

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only)

REFERENCES:

1. Claycomb J.J, Tran J.Q.P., (2011) *Introductory Biophysics: Perspectives on the living state, Jones and Bartlett publishers*, New Delhi.
2. Upadhyay A, Upadhyay K and Nath N., (2007) *Biophysical chemistry Principles and Techniques, Himalaya Publishing House Pvt.* Ltd., Mumbai.
3. Narayanan P, (2007) *Essentials of Biophysics, New Age International (P) Ltd.,* Publishers, New Delhi.
4. Nolting B., (2005) *Methods in modern Biophysics, Springer (India) private Ltd.,* New Delhi.
5. Cotterill R., (2004) *Biophysics and Introduction, John Wiley and Sons* Ltd., printed in India by Replika press pvt. Ltd., Kundli

6. Agarwal S.K., (2005) *Advanced Biophysics, APH publishing corporation,* New Delhi.
7. Pattabhi V and Gautham N., (2004) *Biophysics*, Narosa Publishing House, New Delhi.

DIGITAL OPEN EDUCATION RESOURCES (DOER):

1. http://oer.iain-padangsidimpuan.ac.id/items/show/98
2. https://www.oercommons.org/authoring/15047-basic-thermodynamics/view
3. https://www.oercommons.org/courseware/lesson/56957
4. https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Supplemental_Modules_(Organic_Chemistry)/Fundamentals/Ionic_and_Covalent_Bonds
5. https://www.khanacademy.org/science/ap-biology/chemistry-of-life/introduction-to-biological-macromolecules/a/chemical-bonds-article

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**CHEMCAL BONDS AND MOLECULAR INTERACTIONS**			
1.1	Electron configuration of an atom: Covalent bond, hydrogen bond, Disulphide bond, Peptide bonds-	2	Discussion	Black Board
1.2	Forces between Molecules: Electrostatic force, Van der Waal's forces, hydrophobic and hydrophilic	2	Chalk & Talk	LCD
1.3	Biological importance and domains of Physics in Biology	2	Lecture	PPT & White board
1.4	Electrolytic dissociation and electrolytes:- Ionisation, Basis of acidity and Basicity,	3	Lecture	Smart Board

1.5	Bronsted Lowry theory, strength of acids and bases,	2	Lecture	Black Board
1.6	Henderson and Hasselbalch equation.	1	Chalk &Talk Discussion	Google classroom
1.7	Water as Dipole -Biological importance of water	3	Lecture	Black Board
UNIT-2 THERMODYNAMICS AND BIOLOGICAL OXIDATION				
2.1	Laws of Thermodynamics: Concept of free energy	2	Lecture	Green Board Charts
2.2	Entropy, Exergonic and Endergonic reactions,	2	Chalk & Talk	Green Board
2.3	Rate of reactions - Effect of sunlight and temperature on reactions	2	Discussion	Black Board
2.4	Energy of Activation: Arrhenius expression	1	Chalk & Talk	Green Board
2.5	Diffusion: Fick's Laws-I & II law,	2	Lecture	PPT & White board
2.6	constant laws, Osmotic coefficient	1	Lecture	Smart Board
2.7	Gibbs Donnan equilibrium-	2	Lecture	Black Board
2.8	Oxidation and reduction reactions: Redox potentials in biological system	1	Chalk & Talk Discussion	Google classroom
2.9	High energy phosphate group : ATP synthesis in mitochondria, ATP synthase.	2	Lecture	Black Board
UNIT-3 INSTRUMENTATION				
3.1	Principle, Components and Biological applications of Light microscope	1	Chalk &Talk	Black Board
3.2	Principle, Components and Biological applications of Polarising microscope	1	Chalk & Talk	LCD
3.3	Principle, Components and Biological applications of Inverted microscope	1	Lecture	PPT & White board

3.4	Principle, Components and Biological applications of Confocal microscope	1	Lecture	Smart Board
3.5	Principle, Components and Biological applications of X-ray microscope	1	Lecture	Black Board
3.6	Flow cytometry	1	Discussio n	Google classroom
3.7	Colorimetry and Spectrophotometry: Laws of absorption, complementary colours	2	Lecture	Black Board
3.7	Chromophore concept, Absorption spectrum, Wavelength selectors, Detection devices, amplification and read out	2	Lecture	Black Board
3.8	Chromatography: Paper chromatography	1	Lecture	Black Board
3.9	TLC	1	Lecture	PPT & White board
3.10	Column chromatography	1	Lecture	PPT & White board
3.11	Centrifugation: Principle, Types & Applications, Relative Centrifugal Force	1	Lecture	PPT &White board
3.12	Factors affecting sedimentation and types of centrifugation	1	Chalk & Talk	Green Board
UNIT-4 PHOTO BIOPHYSICS				
4.1	Electromagnetic spectrum: Components of EMR	1	Chalk & Talk	Black Board
4.2	Quantum theory of radiation	2	Chalk &Talk	LCD
4.3	Biological application	2	Lecture	PPT & White board
4.4	Effects of UV on Biological systems	1	Lecture	Smart Board
4.5	Radioactive isotopes: Measurements of radiation, Dosimetry	2	Lecture	Black Board

4.6	Cerenkov radiation and Interaction of radioactivity with matter	1	Discussion	Google classroom
4.7	Gas ionization methods: Ionization chambers, proportional counters, GM tubes	2	Lecture	Black Board
4.7	Photographic methods: Autoradiography,	2	Lecture	Black Board
4.8	Excitation method: Liquid Scintillation counters	1	Lecture	Black Board
4.9	Use of isotopes as tracers in Biology; Safety aspects	1	Lecture	Black Board
UNIT-5 BIOPHYSICAL PRINCIPLES APPLIED TO PHYSIOLOGY				
5.1	Biophysical aspects of vision: photoreceptors :simple and compound	2	Chalk & Talk	Black Board
5.2	structure and function of vertebrate eye,	2	Chalk &Talk	LCD
5.3	mechanism of conversion of light stimulation to neuronal impulse	2	Lecture	PPT & White board
5.4	Nerve conduction: Neurotransmitters and Synapse	3	Lecture	Smart Board
5.5	membrane potential, resting potential and action potential,	2	Lecture	Black Board
5.6	Action potentials in earthworm nerve fiber	2	Discussion	Google classroom
5.7	Muscle Contraction	2	Lecture	Black Board

EVALUATION PATTERN

Internal

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1	T2	Seminar	Assignment	OBT/PPT				
	10 Mks.	10 Mks.	5 Mks.	5 Mks	5 Mks	35 Mks.	5 Mks.	40Mks.	

K2	**4**	**4**	**-**	**-**	**-**	**8**	**-**	**8**	20 %
K3	**2**	**2**	**-**	**5**	**-**	**9**	**-**	**9**	22.5 %
K4	**2**	**2**	**-**	**-**	**5**	**9**	**-**	**9**	22.5 %
K5	**2**	**2**	**5**	**-**	**-**	**9**	**-**	**9**	22.5 %
Non Scholastic	**-**	**-**	**-**	**-**	**-**		**5**	**5**	12.5 %
Total	**10**	**10**	**5**	**5**	**5**	**35**	**5**	**40**	**100 %**

CIA

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	**C2**	**C3**	**C4**	**C5**	**C6**	**CIA**	**ESE**	**Total**
10	**10**	**5**	**5**	**5**	**5**	**40**	**60**	**100**

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED	PSOs ADDRESSED

		BLOOM'S TAXONOMY)	
CO 1	Classify the chemical bonds and forces interacting between molecules and Determine the theories involved in acidity and basicity	**K2**	PSO1& PSO2
CO 2	Apply the principles of Thermodynamics and biological oxidation in living organisms	**K3**	PSO2
CO 3	Determine the principle, procedure, components involved and biological applications of Instruments	**K3**	PSO1
CO 4	Analyse the principle, properties, instrumentation and biological applications of Electromagnetic radiation	**K4**	PSO4
CO 5	Assess the principles of Photobiology in the Biophysical aspects of Vision and neurophysiology applied to the Animals	**K5**	PSO1 & PSO2

Mapping of COs with PSOs

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

Mapping of COs with POs

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

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

♦ Weakly Correlated -**1**

COURSE DESIGNER:

1. **Dr.N.MALATHI**

Forwarded By

Dr. A. TAMIL SELVI
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MADURAI-625 018

HOD'S Signature & Name

SYLLABUS NEW

II M.Sc., ZOOLOGY

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSZO	19PG3Z11	Biophysics	Lecture	6	5

COURSE DESCRIPTION

Biophysics which is an inter disciplinary course, deals with the discipline concerned with the application of the principles and methods of physics and the other physical sciences to the solution of biological problems.

COURSE OBJECTIVES

- To imbibe the principles of physics involved in the structure elucidation of biomolecules
- To understand the principles of energy transformation in living systems
- To apply the use of modern physical instruments to unravel the importance of therapeutic radiology, in which the measurement of dose is critical to treatment, and in diagnostic radiology, particularly with techniques involving isotopes

UNITS:

UNIT-I: CHEMCAL BONDS AND MOLECULAR INTERACTIONS [15 HRS.]

Electron configuration of an atom: Covalent bond, hydrogen bond, Disulphide bond, Peptide bonds- Forces between Molecules: Electrostatic force, Van der Waal's forces, hydrophobic and hydrophilic - Biological importance and domains of Physics in Biology-Electrolytic dissociation and electrolytes:-

Ionisation, Basis of acidity and Basicity, Bronsted Lowry theory, strength of acids and bases, Henderson and Hasselbalch equation. Water as Dipole -Biological importance of water

Self-Study:-Water as Dipole -Biological importance of water,Electron configuration of an atom: Covalent bond, hydrogen bond, Disulphide bond, Peptide bonds- Forces between Molecules: Electrostatic force, Van der Waal's forces, hydrophobic and hydrophilic

UNIT-II: THERMODYNAMICS AND BIOLOGICAL OXIDATION [15 HRS.]Laws of Thermodynamics: Concept of free energy and entropy, Exergonic and Endergonic reactions, Rate of reactions - Effect of sunlight and temperature on reactions - Energy of Activation: Arrhenius expression, Diffusion: Fick's Laws-I & II law, constant laws, Osmotic coefficient: Gibbs Donnan equilibrium- Oxidation and reduction reactions: Redox potentials in biological system- High energy phosphate group: ATP synthesis in mitochondria, ATP synthase.

UNIT-III: INSTRUMENTATION [15 HRS.]

Principle, Components and Biological applications of Light microscope, Polarising microscope, Inverted microscope, Confocal and X-ray microscope, Flow cytometry - Colorimetry and Spectrophotometry: Laws of absorption, complementary colours, Chromophore concept, Absorption spectrum, Wavelength selectors, Detection devices, amplification and read out. Chromatography: Paper chromatography, TLC and Column chromatography. Centrifugation: Principle, Types & Applications, Relative Centrifugal Force, Factors affecting sedimentation and types of centrifugation.

UNIT-IV: PHOTO BIOPHYSICS [15 HRS.]

Electromagnetic spectrum: Components of EMR, Quantum theory of radiation, Biological application, Effects of UV on Biological systems - Radioactive isotopes: Measurements of radiation, Dosimetry, Cerenkov radiation, Interaction of radioactivity with matter, Gas ionization methods:

Ionization chambers, proportional counters, GM tubes, Photographic methods: Autoradiography, Excitation method: Liquid Scintillation counters; Use of isotopes as tracers in Biology; Safety aspects.

Self-Study:-Use of isotopes as tracers in Biology; Safety aspects, Effects of UV on Biological systems

UNIT-V: BIOPHYSICAL PRINCIPLES APPLIED TO PHYSIOLOGY [15 HRS.]

Biophysical aspects of vision: photoreceptors :simple and compound, structure and function of vertebrate eye, mechanism of conversion of light: Biophysical aspects of hearing, noise and speech-mechanism of hearing-auditory and non-auditory effects of noise pollution; stimulation to neuronal impulse - Nerve conduction: Neurotransmitters and Synapse, Nerve impulse, membrane potential, resting potential and action potential, Action potentials in earthworm nerve fiber - Muscle contraction.

Self-Study:-Neurotransmitters and Synapse

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only)

REFERENCES:

8. Claycomb J.J, Tran J.Q.P., (2011) *Introductory Biophysics: Perspectives on the living state, Jones and Bartlett publishers*, New Delhi.
9. Upadhyay A, Upadhyay K and Nath N., (2007) *Biophysical chemistry Principles and Techniques, Himalaya Publishing House Pvt.* Ltd., Mumbai.
10. Narayanan P, (2007) *Essentials of Biophysics, New Age International (P) Ltd.,* Publishers, New Delhi.
11. Nolting B., (2005) *Methods in modern Biophysics, Springer (India) private Ltd.,* New Delhi.
12. Cotterill R., (2004) *Biophysics and Introduction, John Wiley and Sons* Ltd., printed in India by Replika press pvt. Ltd., Kundli
13. Agarwal S.K., (2005) *Advanced Biophysics, APH publishing corporation,* New Delhi.

14. Pattabhi V and Gautham N., (2004) *Biophysics*, Narosa Publishing House, New Delhi.

DIGITAL OPEN EDUCATION RESOURCES (DOER):

6. http://oer.iain-padangsidimpuan.ac.id/items/show/98
7. https://www.oercommons.org/authoring/15047-basic-thermodynamics/view
8. https://www.oercommons.org/courseware/lesson/56957
9. https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Supplemental_Modules_(Organic_Chemistry)/Fundamentals/Ionic_and_Covalent_Bonds
10. https://www.khanacademy.org/science/ap-biology/chemistry-of-life/introduction-to-biological-macromolecules/a/chemical-bonds-article

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**CHEMCAL BONDS AND MOLECULAR INTERACTIONS**			
1.1	Electron configuration of an atom: Covalent bond, hydrogen bond, Disulphide bond, Peptide bonds-	2	Discussion	Black Board
1.2	Forces between Molecules: Electrostatic force, Van der Waal's forces, hydrophobic and hydrophilic	2	Chalk & Talk	LCD
1.3	Biological importance and domains of Physics in Biology	2	Lecture	PPT & White board
1.4	Electrolytic dissociation and electrolytes:- Ionisation, Basis of acidity and Basicity,	3	Lecture	Smart Board
1.5	Bronsted Lowry theory, strength of acids and bases,	2	Lecture	Black Board
1.6	Henderson and Hasselbalch equation.	1	Chalk &Talk	Google classroom

			Discussio n	
1.7	Water as Dipole -Biological importance of water	3	Lecture	Black Board
UNIT-2 THERMODYNAMICS AND BIOLOGICAL OXIDATION				
2.1	Laws of Thermodynamics: Concept of free energy	2	Lecture	Green Board Charts
2.2	Entropy, Exergonic and Endergonic reactions,	2	Chalk & Talk	Green Board
2.3	Rate of reactions - Effect of sunlight and temperature on reactions	2	Discussio n	Black Board
2.4	Energy of Activation: Arrhenius expression	1	Chalk & Talk	Green Board
2.5	Diffusion: Fick's Laws-I & II law,	2	Lecture	PPT & White board
2.6	constant laws, Osmotic coefficient	1	Lecture	Smart Board
2.7	Gibbs Donnan equilibrium-	2	Lecture	Black Board
2.8	Oxidation and reduction reactions: Redox potentials in biological system	1	Chalk & Talk Discussio n	Google classroom
2.9	High energy phosphate group : ATP synthesis in mitochondria, ATP synthase.	2	Lecture	Black Board
UNIT-3 INSTRUMENTATION				
3.1	Principle, Components and Biological applications of Light microscope	1	Chalk &Talk	Black Board
3.2	Principle, Components and Biological applications of Polarising microscope	1	Chalk & Talk	LCD
3.3	Principle, Components and Biological applications of Inverted microscope	1	Lecture	PPT & White board
3.4	Principle, Components and Biological applications of Confocal microscope	1	Lecture	Smart Board

3.5	Principle, Components and Biological applications of X-ray microscope	1	Lecture	Black Board
3.6	Flow cytometry	1	Discussio n	Google classroom
3.7	Colorimetry and Spectrophotometry: Laws of absorption, complementary colours	2	Lecture	Black Board
3.7	Chromophore concept, Absorption spectrum, Wavelength selectors, Detection devices, amplification and read out	2	Lecture	Black Board
3.8	Chromatography: Paper chromatography	1	Lecture	Black Board
3.9	TLC	1	Lecture	PPT & White board
3.10	Column chromatography	1	Lecture	PPT & White board
3.11	Centrifugation: Principle, Types & Applications, Relative Centrifugal Force	1	Lecture	PPT &White board
3.12	Factors affecting sedimentation and types of centrifugation	1	Chalk & Talk	Green Board
UNIT-4 PHOTO BIOPHYSICS				
4.1	Electromagnetic spectrum: Components of EMR	1	Chalk & Talk	Black Board
4.2	Quantum theory of radiation	2	Chalk &Talk	LCD
4.3	Biological application	2	Lecture	PPT & White board
4.4	Effects of UV on Biological systems	1	Lecture	Smart Board
4.5	Radioactive isotopes: Measurements of radiation, Dosimetry	2	Lecture	Black Board
4.6	Cerenkov radiation and Interaction of radioactivity with matter	1	Discussio n	Google classroom

4.7	Gas ionization methods: Ionization chambers, proportional counters, GM tubes	2	Lecture	Black Board
4.7	Photographic methods: Autoradiography,	2	Lecture	Black Board
4.8	Excitation method: Liquid Scintillation counters	1	Lecture	Black Board
4.9	Use of isotopes as tracers in Biology; Safety aspects	1	Lecture	Black Board
UNIT-5 BIOPHYSICAL PRINCIPLES APPLIED TO PHYSIOLOGY				
5.1	Biophysical aspects of vision: photoreceptors: simple and compound	2	Chalk & Talk	Black Board
5.2	Structure and function of vertebrate eye,	2	Chalk & Talk	LCD
5.3	Mechanism of conversion of light stimulation to neuronal impulse	2	Lecture	PPT & White board
5.4	Biophysical aspects of hearing, noise and speech-mechanism of hearing-auditory and non-auditory effects of noise pollution	2	Lecture	Black Board
5.5	Nerve conduction: Neurotransmitters and Synapse	2	Lecture	Smart Board
5.6	Membrane potential, resting potential and action potential,	2	Lecture	Black Board
5.7	Action potentials in earthworm nerve fiber	2	Discussion	Google classroom
5.8	Muscle Contraction	2	Lecture	Black Board

EVALUATION PATTERN

Internal

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Seminar 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks	35 Mks.	5 Mks.	40Mks.	
K2	4	4	-	-	-	8	-	8	20 %
K3	2	2	-	5	-	9	-	9	22.5 %
K4	2	2	-	-	5	9	-	9	22.5 %
K5	2	2	5	-	-	9	-	9	22.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Classify the chemical bonds and forces interacting between molecules and determine the theories involved in acidity and basicity	**K2**	PSO1& PSO2
CO 2	Apply the principles of Thermodynamics and biological oxidation in living organisms	**K3**	PSO2
CO 3	Determine the principle, procedure, components involved and biological applications of Instruments	**K3**	PSO1
CO 4	Analyse the principle, properties, instrumentation and biological applications of Electromagnetic radiation	**K4**	PSO4
CO 5	Assess the principles of Photobiology in the Biophysical aspects of Vision and neurophysiology applied to the Animals	**K5**	PSO1 & PSO2

Mapping of COs with PSOs

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

Mapping of COs with POs

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

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

♦ Weakly Correlated -**1**

COURSE DESIGNER:

2. Dr.N.MALATHI

Forwarded By

Dr. A. TAMIL SELVI
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FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

HOD'S Signature & Name

II M.Sc., ZOOLOGY

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSZO	19PG3Z11	Biophysics	Lecture	6	5

COURSE DESCRIPTION

Biophysics which is an inter disciplinary course, deals with the discipline concerned with the application of the principles and methods of physics and the other physical sciences to the solution of biological problems.

COURSE OBJECTIVES

- To imbibe the principles of physics involved in the structure elucidation of biomolecules
- To understand the principles of energy transformation in living systems
- To apply the use of modern physical instruments to unravel the importance of therapeutic radiology, in which the measurement of dose is critical to treatment, and in diagnostic radiology, particularly with techniques involving isotopes

UNITS:

UNIT-I: CHEMCAL BONDS AND MOLECULAR INTERACTIONS [15 HRS.]

Electron configuration of an atom: Covalent bond, hydrogen bond, Disulphide bond, Peptide bonds- Forces between Molecules: Electrostatic force, Van der Waal's forces, hydrophobic and hydrophilic - Biological importance and domains of Physics in Biology-Electrolytic dissociation and electrolytes:- Ionisation, Basis of acidity and Basicity, Bronsted Lowry theory, strength of

acids and bases, Henderson and Hasselbalch equation. Water as Dipole -Biological importance of water

Self-Study:-Water as Dipole -Biological importance of water,Electron configuration of an atom: Covalent bond, hydrogen bond, Disulphide bond, Peptide bonds- Forces between Molecules: Electrostatic force, Van der Waal's forces, hydrophobic and hydrophilic

UNIT-II: THERMODYNAMICS AND BIOLOGICAL OXIDATION [15 HRS.]Laws of Thermodynamics: Concept of free energy and entropy, Exergonic and Endergonic reactions, Rate of reactions - Effect of sunlight and temperature on reactions - Energy of Activation: Arrhenius expression, Diffusion: Fick's Laws-I & II law, constant laws, Osmotic coefficient: Gibbs Donnan equilibrium- Oxidation and reduction reactions: Redox potentials in biological system- High energy phosphate group: ATP synthesis in mitochondria, ATP synthase.

UNIT-III: INSTRUMENTATION [15 HRS.]

Principle, Components and Biological applications of Light microscope, Polarising microscope, Inverted microscope, Confocal and X-ray microscope, Flow cytometry - Colorimetry and Spectrophotometry: Laws of absorption, complementary colours, Chromophore concept, Absorption spectrum, Wavelength selectors, Detection devices, amplification and read out. Chromatography: Paper chromatography, TLC and Column chromatography. Centrifugation: Principle, Types & Applications, Relative Centrifugal Force, Factors affecting sedimentation and types of centrifugation.

UNIT-IV: PHOTO BIOPHYSICS [15 HRS.]

Electromagnetic spectrum: Components of EMR, Quantum theory of radiation, Biological application, Effects of UV on Biological systems - Radioactive isotopes: Measurements of radiation, Dosimetry, Cerenkov radiation, Interaction of radioactivity with matter, Gas ionization methods: Ionization chambers, proportional counters, GM tubes, Photographic

methods: Autoradiography, Excitation method: Liquid Scintillation counters; Use of isotopes as tracers in Biology; Safety aspects.

Self-Study:-Use of isotopes as tracers in Biology; Safety aspects, Effects of UV on Biological systems

UNIT-V: BIOPHYSICAL PRINCIPLES APPLIED TO PHYSIOLOGY [15 HRS.]

Biophysical aspects of vision: photoreceptors :simple and compound, structure and function of vertebrate eye, mechanism of conversion of light: Biophysical aspects of hearing, noise and speech-mechanism of hearing-auditory and non-auditory effects of noise pollution; stimulation to neuronal impulse - Nerve conduction: Neurotransmitters and Synapse, Nerve impulse, membrane potential, resting potential and action potential, Action potentials in earthworm nerve fiber - Muscle contraction.

Self-Study:-Neurotransmitters and Synapse

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only)

REFERENCES:

15. Claycomb J.J, Tran J.Q.P., (2011) *Introductory Biophysics: Perspectives on the living state, Jones and Bartlett publishers*, New Delhi.
16. Upadhyay A, Upadhyay K and Nath N., (2007) *Biophysical chemistry Principles and Techniques, Himalaya Publishing House Pvt.* Ltd., Mumbai.
17. Narayanan P, (2007) *Essentials of Biophysics, New Age International (P) Ltd.,* Publishers, New Delhi.
18. Nolting B., (2005) *Methods in modern Biophysics, Springer (India) private Ltd.,* New Delhi.
19. Cotterill R., (2004) *Biophysics and Introduction, John Wiley and Sons* Ltd., printed in India by Replika press pvt. Ltd., Kundli
20. Agarwal S.K., (2005) *Advanced Biophysics, APH publishing corporation,* New Delhi.

21. Pattabhi V and Gautham N., (2004) *Biophysics*, Narosa Publishing House, New Delhi.

DIGITAL OPEN EDUCATION RESOURCES (DOER):

11. http://oer.iain-padangsidimpuan.ac.id/items/show/98
12. https://www.oercommons.org/authoring/15047-basic-thermodynamics/view
13. https://www.oercommons.org/courseware/lesson/56957
14. https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Supplemental_Modules_(Organic_Chemistry)/Fundamentals/Ionic_and_Covalent_Bonds
15. https://www.khanacademy.org/science/ap-biology/chemistry-of-life/introduction-to-biological-macromolecules/a/chemical-bonds-article

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**CHEMCAL BONDS AND MOLECULAR INTERACTIONS**			
1.1	Electron configuration of an atom: Covalent bond, hydrogen bond, Disulphide bond, Peptide bonds-	2	Discussion	Black Board
1.2	Forces between Molecules: Electrostatic force, Van der Waal's forces, hydrophobic and hydrophilic	2	Chalk & Talk	LCD
1.3	Biological importance and domains of Physics in Biology	2	Lecture	PPT & White board
1.4	Electrolytic dissociation and electrolytes:- Ionisation, Basis of acidity and Basicity,	3	Lecture	Smart Board
1.5	Bronsted Lowry theory, strength of acids and bases,	2	Lecture	Black Board
1.6	Henderson and Hasselbalch equation.	1	Chalk &Talk	Google classroom

			Discussio n	
1.7	Water as Dipole -Biological importance of water	3	Lecture	Black Board
UNIT-2 THERMODYNAMICS AND BIOLOGICAL OXIDATION				
2.1	Laws of Thermodynamics: Concept of free energy	2	Lecture	Green Board Charts
2.2	Entropy, Exergonic and Endergonic reactions,	2	Chalk & Talk	Green Board
2.3	Rate of reactions - Effect of sunlight and temperature on reactions	2	Discussio n	Black Board
2.4	Energy of Activation: Arrhenius expression	1	Chalk & Talk	Green Board
2.5	Diffusion: Fick's Laws-I & II law,	2	Lecture	PPT & White board
2.6	constant laws, Osmotic coefficient	1	Lecture	Smart Board
2.7	Gibbs Donnan equilibrium-	2	Lecture	Black Board
2.8	Oxidation and reduction reactions: Redox potentials in biological system	1	Chalk & Talk Discussio n	Google classroom
2.9	High energy phosphate group : ATP synthesis in mitochondria, ATP synthase.	2	Lecture	Black Board
UNIT-3 INSTRUMENTATION				
3.1	Principle, Components and Biological applications of Light microscope	1	Chalk &Talk	Black Board
3.2	Principle, Components and Biological applications of Polarising microscope	1	Chalk & Talk	LCD
3.3	Principle, Components and Biological applications of Inverted microscope	1	Lecture	PPT & White board
3.4	Principle, Components and Biological applications of Confocal microscope	1	Lecture	Smart Board

3.5	Principle, Components and Biological applications of X-ray microscope	1	Lecture	Black Board
3.6	Flow cytometry	1	Discussio n	Google classroom
3.7	Colorimetry and Spectrophotometry: Laws of absorption, complementary colours	2	Lecture	Black Board
3.7	Chromophore concept, Absorption spectrum, Wavelength selectors, Detection devices, amplification and read out	2	Lecture	Black Board
3.8	Chromatography: Paper chromatography	1	Lecture	Black Board
3.9	TLC	1	Lecture	PPT & White board
3.10	Column chromatography	1	Lecture	PPT & White board
3.11	Centrifugation: Principle, Types & Applications, Relative Centrifugal Force	1	Lecture	PPT &White board
3.12	Factors affecting sedimentation and types of centrifugation	1	Chalk & Talk	Green Board
UNIT-4 PHOTO BIOPHYSICS				
4.1	Electromagnetic spectrum: Components of EMR	1	Chalk & Talk	Black Board
4.2	Quantum theory of radiation	2	Chalk &Talk	LCD
4.3	Biological application	2	Lecture	PPT & White board
4.4	Effects of UV on Biological systems	1	Lecture	Smart Board
4.5	Radioactive isotopes: Measurements of radiation, Dosimetry	2	Lecture	Black Board
4.6	Cerenkov radiation and Interaction of radioactivity with matter	1	Discussio n	Google classroom

4.7	Gas ionization methods: Ionization chambers, proportional counters, GM tubes	2	Lecture	Black Board
4.7	Photographic methods: Autoradiography,	2	Lecture	Black Board
4.8	Excitation method: Liquid Scintillation counters	1	Lecture	Black Board
4.9	Use of isotopes as tracers in Biology; Safety aspects	1	Lecture	Black Board
UNIT-5 BIOPHYSICAL PRINCIPLES APPLIED TO PHYSIOLOGY				
5.1	Biophysical aspects of vision: photoreceptors: simple and compound	2	Chalk & Talk	Black Board
5.2	Structure and function of vertebrate eye,	2	Chalk & Talk	LCD
5.3	Mechanism of conversion of light stimulation to neuronal impulse	2	Lecture	PPT & White board
5.4	Biophysical aspects of hearing, noise and speech-mechanism of hearing-auditory and non-auditory effects of noise pollution	2	Lecture	Black Board
5.5	Nerve conduction: Neurotransmitters and Synapse	2	Lecture	Smart Board
5.6	Membrane potential, resting potential and action potential,	2	Lecture	Black Board
5.7	Action potentials in earthworm nerve fiber	2	Discussion	Google classroom
5.8	Muscle Contraction	2	Lecture	Black Board

EVALUATION PATTERN

Internal

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Seminar 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks	35 Mks.	5 Mks.	40Mks.	
K2	4	4	-	-	-	8	-	8	20 %
K3	2	2	-	5	-	9	-	9	22.5 %
K4	2	2	-	-	5	9	-	9	22.5 %
K5	2	2	5	-	-	9	-	9	22.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Classify the chemical bonds and forces interacting between molecules and determine the theories involved in acidity and basicity	**K2**	PSO1& PSO2
CO 2	Apply the principles of Thermodynamics and biological oxidation in living organisms	**K3**	PSO2
CO 3	Determine the principle, procedure, components involved and biological applications of Instruments	**K3**	PSO1
CO 4	Analyse the principle, properties, instrumentation and biological applications of Electromagnetic radiation	**K4**	PSO4
CO 5	Assess the principles of Photobiology in the Biophysical aspects of Vision and neurophysiology applied to the Animals	**K5**	PSO1 & PSO2

Mapping of COs with PSOs

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

Mapping of COs with POs

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

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

♦ Weakly Correlated -**1**

COURSE DESIGNER:

3. **Dr.N.MALATHI**

Forwarded By

Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

HOD'S Signature & Name

II M.Sc.,ZOOLOGY

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSZO	19PG3Z13	Biostatistics & Research Methodology	Lecture	6	5

COURSE DESCRIPTION

This course deals with specific procedures or techniques used to identify and process the research data.

COURSE OBJECTIVES

- Identify the research problem and generation of raw data through different methods.
- Apply the statistical tools to calculate and tabulate the data.
- Interpret the results and draw conclusion.
- Outline the steps in drafting the thesis.

UNITS

UNIT –I INTRODUCTION TO BIOSTATISTICS (18 HRS.)

Introduction, Definitions, Types of biological data, Sampling – types, samples from populations, graphical frequency distribution and graphical representation of data. Measures of central tendency - Mean, Median, and Mode. Dispersion & variability – the range and the mean deviation, the variance, standard deviation, the coefficient of variance, standard error.

Self – study - Introduction, Definitions, Types of biological data, Sampling – types, samples from populations, graphical frequency distribution and graphical representation of data.

UNIT -II DISTRIBUTION AND TESTING OF HYPOTHESIS (18 HRS.)

The normal distribution- skewness & kurtosis, proportions of a normal curve – Z scores - Testing of hypothesis - Importance & types – Chi – square test – comparison of means of two large samples, means of two small samples, paired & unpaired t tests.

UNIT -III CORRELATION& REGRESSION (18 HRS.)

Correlation analysis-Kinds, Degree - Types of correlation- Pearson's Correlation Coefficient -Regression analysis- Simple, linear regression, testing the significance of regression. The analysis of variance - Single factor ANOVA – basic assumptions under ANOVA, One Way and Two-Way ANOVA.

UNIT -IV INTRODUCTION TO RESEARCH & RESEARCH DESIGN

(18 HRS.)

Research: Definition, Importance, Meaning of research –Characteristics of research –Types of Research – Research approaches (Qualitative and Quantitative)- significance of research. Research problem: Identification, Selection and formulation of research problem –Research design: Features and concepts -Dependent and independent variables, research hypothesis – Types.

Self – study- Research report-components, tables, figures, formatting and typing

10%

UNIT –V THESIS WRITING (18HR

Preparation and Writing of Thesis: Components of thesis – Literature collection - Literature citation- Research report-components, tables, figures, formatting and typing. Preparing of scientific papers for publication to a Journal and presenting in symposia/seminar, Plagiarism - Types.

Self – study- Research report-components, tables, figures, formatting and typing

TEXT BOOK:

Ramakrishnan P., (2010). Biostatistics, Saras publication, Nagercoil, Tamil Nadu.

REFERENCES:

1. Kothari. C.R., (2009). *Research Methodology*, New Age International,
2. Khan and Khanum., (2004).*Fundamentals& Biostatistics*, 2nd ed., Ukaaz Publications, Hyderabad.
3. Gurumani N., (2010). *An Introduction to Biostatistics*, MJP Publishers, Chennai.
4. Satguru Prasad., (2012). *Elements of Biostatistics,* Rastogi publications, Meerut.

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER):

1. http://www.oercommons.org/courses/biostatistics-methods-2/view
2. https://www.oercommons.org/courses/chi-square-test-08-54
3. https://www.oercommons.org/courses/anova-calculations
4. https://www.oercommons.org/authoring/21429-wp-12-1-additional-test-of-two-population-variance/view
5. https://vivaopen.oercommons.org/courseware/unit/420

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION TO BIOSTATISTICS				
1.1	Introduction, Definitions, Types of biological data	2	Chalk & Talk	Black Board

1.2	Sampling – types, samples from populations	3	Chalk & Talk	LCD
1.3	Graphical frequency distribution and graphical representation of data	3	Lecture	PPT & White board
1.4	Measures of central tendency - Mean, Median, and Mode.	4	Lecture	Black Board
1.5	Dispersion & variability – the range and the mean deviation, the variance	3	Lecture	Black Board
1.6	Standard deviation, the coefficient of variance, standard error.	3	Lecture	Black Board
UNIT -2 DISTRIBUTION AND TESTING OF HYPOTHESIS				
2.1	The normal distribution-skewness & kurtosis, proportions of a normal curve – Z scores	4	Lecture	Black Board
2.2	Testing of hypothesis - Importance & types	3	Chalk & Talk	Black Board
2.3	Chi – square test	3	Chalk & Talk	Black Board
2.4	Comparison of means of two large samples, means of two small samples	5	Chalk & Talk	Black Board
2.5	Paired & unpaired t tests	3	Lecture	White board
UNIT -3 CORRELATION & REGRESSION				
3.1	Correlation analysis-Kinds, Degree - Types of correlation-Pearson's Correlation Coefficient	4	Chalk & Talk	Black Board

3.2	Regression analysis- Simple, linear regression, testing the significance of regression.	5	Chalk & Talk	Black Board
3.3	The analysis of variance - Single factor ANOVA – basic assumptions under ANOVA	5	Lecture	White board
3.4	One Way and Two Way ANOVA	4	Lecture	Black Board
UNIT-4 INTRODUCTION TO RESEARCH & RESEARCH DESIGN				
4.1	**Research: Definition, Importance, Meaning of research**	4	Lecture	LCD
4.2	Characteristics of research –Types of Research – Research approaches (Qualitative and Quantitative)- significance of research.	4	Lecture	LCD
4.3	Research problem: Identification, Selection and formulation of research problem	4	Lecture	LCD
4.4	Research design: Features and concepts -Dependent and independent variables	4	Lecture	LCD
4.5	Research hypothesis – Types	2	Lecture	LCD
UNIT –5 THESIS WRITING				
5.1	Preparation and Writing of Thesis	2	Chalk & Talk	LCD

5.2	Components of thesis	2	Chalk & Talk	LCD
5.3	Literature collection - Literature citation	3	Lecture	LCD
5.4	Research report - components, tables, figures, formatting and typing.	3	Lecture	LCD
5.5	Literature review – Source, structure and stages of literature search – critical review.	2	Lecture	LCD
5.6	Preparing of scientific papers for publication to a Journal and presenting in symposia/seminar	2	Lecture	LCD
5.7	Plagiarism – Types	2	Lecture	LCD
5.8	Ethics in research.	2	Discussion	LCD

EVALUATION PATTERN

Internal

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Seminar 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks	35 Mks.	5 Mks.	40Mks.	
K2	4	4	-	-	-	8	-	8	20 %
K3	2	2	-	5	-	9	-	9	22.5 %
K4	2	2	-	-	5	9	-	9	22.5 %
K5	2	2	5	-	-	9	-	9	22.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Organise the research data in appropriate order and apply the measures of central tendency and dispersion values.	K3	PSO3
CO 2	Assess the difference between the expected and observed frequencies by Chi-Square test for testing of hypothesis	K5	PSO2
CO 3	Compute degrees of relationship variables using Correlation and Regression analysis.	K3	PSO 11
CO 4	Examine the Concepts of Research and devise the Research Hypothesis.	K4	PSO 7& PSO8
CO 5	Parapharse the research work through documentation as a Thesis, Oral or Poster Presentation.	K2	PSO 5

Mapping of COs with PSOs

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

Mapping of COs with POs

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

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

♦ Weakly Correlated -**1**

COURSE DESIGNER:

Dr. X. Devanya Rosaline Forwarded By

Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

HOD'S Signature & Name

II M.Sc.,ZOOLOGY

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSZO	19PG3Z13	Biostatistics & Research Methodology	Lecture	6	5

COURSE DESCRIPTION

This course deals with specific procedures or techniques used to identify and process the research data.

COURSE OBJECTIVES

- Identify the research problem and generation of raw data through different methods.
- Apply the statistical tools to calculate and tabulate the data.
- Interpret the results and draw conclusion.
- Outline the steps in drafting the thesis.

UNITS

UNIT –I INTRODUCTION TO BIOSTATISTICS (18 HRS.)

Introduction, Definitions, Types of biological data, Sampling – types, samples from populations, graphical frequency distribution and graphical representation of data. Measures of central tendency - Mean, Median, and Mode. Dispersion & variability – the range and the mean deviation, the variance, standard deviation, the coefficient of variance, standard error.

Self – study - Introduction, Definitions, Types of biological data, Sampling – types, samples from populations, graphical frequency distribution and graphical representation of data.

UNIT -II DISTRIBUTION AND TESTING OF HYPOTHESIS (18 HRS.)

The normal distribution- skewness & kurtosis, proportions of a normal curve – Z scores - Testing of hypothesis - Importance & types – Chi – square test – comparison of means of two large samples, means of two small samples, paired & unpaired t tests.

UNIT -III CORRELATION & REGRESSION (18 HRS.)

Correlation analysis-Kinds, Degree - Types of correlation- Pearson's Correlation Coefficient -Regression analysis- Simple, linear regression, testing the significance of regression. The analysis of variance - Single factor ANOVA – basic assumptions under ANOVA, One Way and Two-Way ANOVA.

UNIT -IV INTRODUCTION TO RESEARCH & RESEARCH DESIGN

(18 HRS.)

Research: Definition, Importance, Meaning of research –Characteristics of research –Types of Research – Research approaches (Qualitative and Quantitative)- significance of research. Research problem: Identification, Selection and formulation of research problem –Research design: Features and concepts -Dependent and independent variables, research hypothesis – Types.

Self – study- Research report-components, tables, figures, formatting and typing

UNIT –V THESIS WRITING (18HRS.)

Preparation and Writing of Thesis: Components of thesis – Literature collection - Literature citation- Research report-components, tables, figures, formatting and typing. Literature review – Source, structure and stages of literature

search – critical review. Preparing of scientific papers for publication to a Journal and presenting in symposia/seminar, Plagiarism - Types. Ethics in research.

Self – study- Research report-components, tables, figures, formatting and typing

TEXT BOOK:

Ramakrishnan P., (2010). Biostatistics, Saras publication, Nagercoil, Tamil Nadu.

REFERENCES:

5. Kothari. C.R., (2009). *Research Methodology*, New Age International,
6. Khan and Khanum., (2004).*Fundamentals& Biostatistics*, 2nd ed., Ukaaz Publications, Hyderabad.
7. Gurumani N., (2010). *An Introduction to Biostatistics*, MJP Publishers, Chennai.
8. Satguru Prasad., (2012). *Elements of Biostatistics,* Rastogi publications, Meerut.

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER):

6. http://www.oercommons.org/courses/biostatistics-methods-2/view
7. https://www.oercommons.org/courses/chi-square-test-08-54
8. https://www.oercommons.org/courses/anova-calculations
9. https://www.oercommons.org/authoring/21429-wp-12-1-additional-test-of-two-population-variance/view
10. https://vivaopen.oercommons.org/courseware/unit/420

COURSE CONTENTS & LECTURE SCHEDULE:

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

1.1	Introduction, Definitions, Types of biological data	2	Chalk & Talk	Black Board
1.2	Sampling – types, samples from populations	3	Chalk & Talk	LCD
1.3	Graphical frequency distribution and graphical representation of data	3	Lecture	PPT & White board
1.4	Measures of central tendency - Mean, Median, and Mode.	4	Lecture	Black Board
1.5	Dispersion & variability – the range and the mean deviation, the variance	3	Lecture	Black Board
1.6	Standard deviation, the coefficient of variance, standard error.	3	Lecture	Black Board
UNIT -2 DISTRIBUTION AND TESTING OF HYPOTHESIS				
2.1	The normal distribution- skewness & kurtosis, proportions of a normal curve – Z scores	4	Lecture	Black Board
2.2	Testing of hypothesis - Importance & types	3	Chalk & Talk	Black Board
2.3	Chi – square test	3	Chalk & Talk	Black Board
2.4	Comparison of means of two large samples, means of two small samples	5	Chalk & Talk	Black Board
2.5	Paired & unpaired t tests	3	Lecture	White board
UNIT -3 CORRELATION & REGRESSION				
3.1	Correlation analysis-Kinds, Degree - Types of correlation-	4	Chalk & Talk	Black Board

	Pearson's Correlation Coefficient			
3.2	Regression analysis- Simple, linear regression, testing the significance of regression.	5	Chalk & Talk	Black Board
3.3	The analysis of variance - Single factor ANOVA – basic assumptions under ANOVA	5	Lecture	White board
3.4	One Way and Two Way ANOVA	4	Lecture	Black Board
UNIT-4 INTRODUCTION TO RESEARCH & RESEARCH DESIGN				
4.1	**Research: Definition, Importance, Meaning of research**	4	Chalk & Talk	Black Board
4.2	Characteristics of research –Types of Research – Research approaches (Qualitative and Quantitative)- significance of research.	4	Chalk & Talk	Black Board
4.3	Research problem: Identification, Selection and formulation of research problem	4	Lecture	White board
4.4	Research design: Features and concepts -Dependent and independent variables	4	Lecture	Black Board
4.5	Research hypothesis – Types	2	Lecture	Black Board
UNIT –5 THESIS WRITING				

5.1	Preparation and Writing of Thesis	2	Chalk & Talk	Black Board
5.2	Components of thesis	2	Chalk & Talk	Black Board
5.3	Literature collection - Literature citation	3	Lecture	White board
5.4	Research report-components, tables, figures, formatting and typing.	4	Lecture	Black Board
5.5	Literature review – Source, structure and stages of literature search – critical review.	4	Lecture	Black Board
5.6	Preparing of scientific papers for publication to a Journal and presenting in symposia/seminar	4	Lecture	Black Board
5.7	Plagiarism – Types	3	Lecture	Black Board
5.8	Ethics in research		Discussion	

EVALUATION PATTERN

Internal

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Seminar 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks	35 Mks.	5 Mks.	40Mks.	
K2	4	4	-	-	-	8	-	8	20 %
K3	2	2	-	5	-	9	-	9	22.5 %
K4	2	2	-	-	5	9	-	9	22.5 %
K5	2	2	5	-	-	9	-	9	22.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Organise the research data in appropriate order and apply the measures of central tendency and dispersion values.	K3	PSO3
CO 2	Assess the difference between the expected and observed frequencies by Chi-Square test for testing of hypothesis	K5	PSO2
CO 3	Compute degrees of relationship variables using Correlation and Regression analysis.	K3	PSO 11
CO 4	Examine the Concepts of Research and devise the Research Hypothesis.	K4	PSO 7& PSO8
CO 5	Parapharse the research work through documentation as a Thesis, Oral or Poster Presentation.	K2	PSO 5

Mapping of COs with PSOs

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

Mapping of COs with POs

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

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

♦ Weakly Correlated -**1**

COURSE DESIGNER:

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HOD'S Signature & Name

Syllabus _ New

II M.Sc.,ZOOLOGY

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSZO	**19PG3Z13**	**Biostatistics & Research Methodology**	**Lecture**	**6**	**5**

COURSE DESCRIPTION

This course deals with specific procedures or techniques used to identify and process the research data.

COURSE OBJECTIVES

- Identify the research problem and generation of raw data through different methods.
- Apply the statistical tools to calculate and tabulate the data.
- Interpret the results and draw conclusion.
- Outline the steps in drafting the thesis.

UNITS

UNIT –I INTRODUCTION TO BIOSTATISTICS (18 HRS.)

Introduction, Definitions, Types of biological data, Sampling – types, samples from populations, graphical frequency distribution and graphical representation of data. Measures of central tendency - Mean, Median, and Mode. Dispersion & variability – the range and the mean deviation, the variance, standard deviation, the coefficient of variance, standard error.

Self – study - Introduction, Definitions, Types of biological data, Sampling – types, samples from populations, graphical frequency distribution and graphical representation of data.

UNIT -II DISTRIBUTION AND TESTING OF HYPOTHESIS (18 HRS.)

The normal distribution- skewness & kurtosis, proportions of a normal curve – Z scores - Testing of hypothesis - Importance & types – Chi – square test – comparison of means of two large samples, means of two small samples, paired & unpaired t tests.

UNIT -III CORRELATION & REGRESSION (18 HRS.)

Correlation analysis-Kinds, Degree - Types of correlation- Pearson's Correlation Coefficient -Regression analysis- Simple, linear regression, testing the significance of regression. The analysis of variance - Single factor ANOVA – basic assumptions under ANOVA, One Way and Two-Way ANOVA.

UNIT -IV INTRODUCTION TO RESEARCH & RESEARCH DESIGN

(18 HRS.)

Research: Definition, Importance, Meaning of research –Characteristics of research –Types of Research – Research approaches (Qualitative and Quantitative)- significance of research. Research problem: Identification, Selection and formulation of research problem –Research design: Features and concepts -Dependent and independent variables, research hypothesis – Types.

Self – study- Research report-components, tables, figures, formatting and typing

UNIT –V THESIS WRITING (18HRS.)

Preparation and Writing of Thesis: Components of thesis – Literature collection - Literature citation- Research report-components, tables, figures, formatting and typing. Literature review – Source, structure and stages of literature

search – critical review. Preparing of scientific papers for publication to a Journal and presenting in symposia/seminar, Plagiarism - Types. Ethics in research.

Self – study- Research report-components, tables, figures, formatting and typing

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10. Khan and Khanum., (2004).*Fundamentals& Biostatistics*, 2nd ed., Ukaaz Publications, Hyderabad.
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12. Satguru Prasad., (2012). *Elements of Biostatistics,* Rastogi publications, Meerut.

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11. http://www.oercommons.org/courses/biostatistics-methods-2/view
12. https://www.oercommons.org/courses/chi-square-test-08-54
13. https://www.oercommons.org/courses/anova-calculations
14. https://www.oercommons.org/authoring/21429-wp-12-1-additional-test-of-two-population-variance/view
15. https://vivaopen.oercommons.org/courseware/unit/420

COURSE CONTENTS & LECTURE SCHEDULE:

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

1.1	Introduction, Definitions, Types of biological data	2	Chalk & Talk	Black Board
1.2	Sampling – types, samples from populations	3	Chalk & Talk	LCD
1.3	Graphical frequency distribution and graphical representation of data	3	Lecture	PPT & White board
1.4	Measures of central tendency - Mean, Median, and Mode.	4	Lecture	Black Board
1.5	Dispersion & variability – the range and the mean deviation, the variance	3	Lecture	Black Board
1.6	Standard deviation, the coefficient of variance, standard error.	3	Lecture	Black Board
UNIT -2 DISTRIBUTION AND TESTING OF HYPOTHESIS				
2.1	The normal distribution- skewness & kurtosis, proportions of a normal curve – Z scores	4	Lecture	Black Board
2.2	Testing of hypothesis - Importance & types	3	Chalk & Talk	Black Board
2.3	Chi – square test	3	Chalk & Talk	Black Board
2.4	Comparison of means of two large samples, means of two small samples	5	Chalk & Talk	Black Board
2.5	Paired & unpaired t tests	3	Lecture	White board
UNIT -3 CORRELATION & REGRESSION				
3.1	Correlation analysis-Kinds, Degree - Types of correlation-	4	Chalk & Talk	Black Board

	Pearson's Correlation Coefficient			
3.2	Regression analysis- Simple, linear regression, testing the significance of regression.	5	Chalk & Talk	Black Board
3.3	The analysis of variance - Single factor ANOVA – basic assumptions under ANOVA	5	Lecture	White board
3.4	One Way and Two Way ANOVA	4	Lecture	Black Board
UNIT-4 INTRODUCTION TO RESEARCH & RESEARCH DESIGN				
4.1	**Research: Definition, Importance, Meaning of research**	4	Chalk & Talk	Black Board
4.2	Characteristics of research –Types of Research – Research approaches (Qualitative and Quantitative)- significance of research.	4	Chalk & Talk	Black Board
4.3	Research problem: Identification, Selection and formulation of research problem	4	Lecture	White board
4.4	Research design: Features and concepts -Dependent and independent variables	4	Lecture	Black Board
4.5	Research hypothesis – Types	2	Lecture	Black Board
UNIT –5 THESIS WRITING				

5.1	Preparation and Writing of Thesis	2	Chalk & Talk	Black Board
5.2	Components of thesis	2	Chalk & Talk	Black Board
5.3	Literature collection - Literature citation	3	Lecture	White board
5.4	Research report-components, tables, figures, formatting and typing.	4	Lecture	Black Board
5.5	Literature review – Source, structure and stages of literature search – critical review.	4	Lecture	Black Board
5.6	Preparing of scientific papers for publication to a Journal and presenting in symposia/seminar	4	Lecture	Black Board
5.7	Plagiarism – Types	3	Lecture	Black Board
5.8	Ethics in research		Discussion	

EVALUATION PATTERN

Internal

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks	CIA Total	

							C6		% of Assessment
	T1 10 Mks.	T2 10 Mks.	Seminar 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks	35 Mks.	5 Mks.	40Mks.	
K2	4	4	-	-	-	8	-	8	20 %
K3	2	2	-	5	-	9	-	9	22.5 %
K4	2	2	-	-	5	9	-	9	22.5 %
K5	2	2	5	-	-	9	-	9	22.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Organise the research data in appropriate order and apply the measures of central tendency and dispersion values.	**K3**	PSO3
CO 2	Assess the difference between the expected and observed frequencies by Chi-Square test for testing of hypothesis	**K5**	PSO2
CO 3	Compute degrees of relationship variables using Correlation and Regression analysis.	**K3**	PSO 11
CO 4	Examine the Concepts of Research and devise the Research Hypothesis.	**K4**	PSO 7& PSO8
CO 5	Parapharse the research work through documentation as a Thesis, Oral or Poster Presentation.	**K2**	PSO 5

Mapping of COs with PSOs

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

Mapping of COs with POs

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

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

♦ Weakly Correlated -**1**

COURSE DESIGNER:
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HOD'S Signature & Name

II M.Sc.,Zoology

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSZO	19PG4Z16	Environmental Biology	Lecture	6	5

COURSE DESCRIPTION

To understand the basic concepts of Ecology.

COURSE OBJECTIVES

To understand the key aspects of ecology, impact of pollution and biodiversity conservation for sustainable development

UNIT –I ECOSYSTEM AND HABITAT (18 HRS.)

Structure – Components of ecosystems - Food chain, Food web - Ecological pyramids-Trophic levels–energy flow - productivity – Biomagnification-Classification of ecosystems- Introduction, structure and function of terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine) - Energy flow and mineral cycling (CNP)- Concept of habitat and niche ecosystem - Ecological indicators- Biomes - Tundra, Forest, Desert and mountain biomes – Biogeography: biogeographical zones of India.

Self-Study - Structure – Components of ecosystems - Food chain, Food web - Ecological pyramids

UNIT –IIPOPULATION AND COMMUNITY ECOLOGY (18 HRS.)

Concept of population - Biotic potential and Natality, Mortality, Survivorship curves, life table, Age structure, carrying capacity, Environmental resistance

-Population growth forms - Life history strategies (r and K selection) –Population fluctuations- Population interactions- Competition, Predation, Parasitism, Mutualism -Concept of Community - Structure, Composition and Stratification- Community Function- Ecological succession – Primary and Secondary succession- Climax community - Hydrarch ,Xerarch - Ecotone and Edge effect – Ecological equivalents - Ecotypes and Ecophenes

Self-Study - Population interactions- Competition, Predation, Parasitism, Mutualism

10%

UNIT –III NATURAL RESOURCES (18 HRS.)

Renewable & Non–renewable resources: Renewable resources–Forest Resources: Types of forests-Biomass, Biogas, Solar energy, Wind Energy, Tidal Energy, Geothermal Energy - Non Renewable resources–Fossil fuel (Coal, Petrol & Natural Gas) Nuclear Fuels

Self study - Forest Resources : Types of forests

UNIT –IV ENVIRONMENTAL POLLUTION (18 HRS.)

Impact of pollutants on general fauna, flora and ecosystems - Environmental pollution: Causes, effects and control measures of air, water, soil, noise and nuclear pollution- Greenhouse gases, Ozone layer and depletion –Waste water management – Primary secondary Global Climatic change - *El nino*and*Lanina*Phenomenon- Green peace movement- Chipko movement- Nuclear disarmament - Role of Government agencies - Central and state Pollution Control Boards- - Environmental protection act, 1986 - Paris Summit- Kyoto protocol.

Self-Study - Environmental pollution: Causes, effects and control measures of air, water, soil, noise and nuclear pollution

UNIT –V BIODIVERSITY CONSERVATION (18 HRS.)

Concepts of Biodiversity - Need for conservation-Conservation Stratagies- *In situ* conservation - Protected areas, National parks, Sanctuaries, Biosphere reserves, Sacred groves – *Ex situ* Conservation - Seed Banks, Gene banks-

Sthalvirukshas - Animal Translocation- Human animal conflicts and management - Biodiversity database - Endangered animals, endemism and Red data Book- Environmental protection act (1986)- Forest conservation Act (1980)- Biodiversity Act, 2002- Remote sensing and GIS: Methods and Applications in environmental management

Self-study - Concepts of Biodiversity- Need for conservation

REFERENCES:

1. Odum, E.P. and Barrett, G.W. (2005) *Fundamental of Ecology. 5th* Ed., Cengage Learning India. New Delhi.
2. Primark R.B., (2000) *A Primer of Conservation Biology. 2nd Ed.*, SinauerAssociates..
3. Kormondy, E.J. (1996) *Concepts of Ecology. 4th Ed.*, PHI Cengage Learning India, New Delhi).
4. Peter J.R., Stephan, L.W., PauleH., Ceche S. &Bevlerly, M. (2008) *Ecology*. Cengage learning India,New Delhi.
5. Wright, R.T.(2008) *Environmental Science*, 10th Ed., Pearson Education, New Delhi.
6. Smith T.M. & Smith R.L. (2008) *Elements of Ecology*. 6th Ed., Pearson Education, New Delhi.
7. Turk A. & Turk J. (1993) *Environmental Science*. 4th Ed., Saunders.
8. Odum, E.P. & Barrett, G.W. (2005) *Fundamentals of Ecology*. 5th Ed., Cengage Learning India. New Delhi).

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER)::

1. https://openoregon.pressbooks.pub/envirobiology/
2. https://bio.libretexts.org/Bookshelves/Botany/Book%3A_Botany_Lab_Manual_(Morrow)/02%3A_Introduction_to_Ecology
3. https://cnx.org/contents/AK5sUWpu@1.1:GNNbYBSX@1/Global-Processes

4. https://bio.libretexts.org/Bookshelves/Ecology/Book%3A_Environmental_Biology_(Fisher)

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**ECOSYSTEM AND HABITAT ECOLOGY**			
1.1	Structure – Components of ecosystems - Food chain, Food web - Ecological pyramids	2	Chalk & Talk	Black Board
1.2	Trophic levels–energy flow - productivity – Biomagnification	2	Chalk & Talk	LCD
1.3	Classification of ecosystems- Introduction, structure and function of terrestrial (forest, grassland)	3	Lecture	PPT & White board
1.4	aquatic (fresh water, marine, estuarine)	3	Lecture	PPT
1.5	Energy flow and mineral cycling (CNP)	3	Lecture	Black Board
1.6	Concept of habitat and niche ecosystem - Ecological indicators-	2	Lecture	Google classroom
1.7	Biomes - Tundra, Forest, Desert and mountain	2	Lecture	PPT
1.8	Biogeography: biogeographical zones of India.	1	Discussion	Black Board
UNIT -2	**POPULATION AND COMMUNITY ECOLOGY**			
2.1	Concept of population- Biotic potential and Natality, Mortality, Survivorship curves, life table, Age structure, carrying capacity,	3	Lecture	Green Board Charts
2.2	Environmental resistance -Population growth forms - Life history strategies (r and K selection) –Population fluctuatuions-	3	Chalk & Talk	Green Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
2.3	Population interactions- Competition, Predation,Parasitism,Mutualism -	3	Chalk & Talk	Black Board
2.4	Concept of Community - Structure, Composition and Stratification- Community Function-	3	Chalk & Talk	LCD
2.5	Ecological succession – Primary and Secondary succession-	2	Lecture	PPT &White board
2.6	Climax community - Hydrarch,Xerarch	2	Lecture	PPT
2.7	Ecotone and Edge effect	1	Lecture	Black Board
2.8	Ecological equivalents - Ecotypes and Ecophenes	1	Lecture	Google classroom
UNIT -3NATURAL RESOURCES				
3.1	Renewable &Non–renewable resources: Renewable resources	1	Chalk & Talk	Black Board
3.2	Forest Resources: Types of forests	3	Chalk & Talk	LCD
3.3	Biomass, Biogas	4	Lecture	PPT & White board
3.4	Solar energy, Wind Energy	4	Lecture	PPT
3.5	Tidal Energy, Geothermal Energy	2	Lecture	Black Board
3.6	Non Renewable resources–Fossil fuel (Coal, Petrol & Natural Gas) Nuclear Fuels	4	Lecture	Google classroom
UNIT -4 ENVIRONMENTAL POLLUTION				
3.1	Renewable &Non–renewable resources: Renewable resources	1	Chalk & Talk	Black Board
3.2	Forest Resources: Types of forests	3	Chalk & Talk	LCD
3.3	Biomass, Biogas	4	Lecture	PPT & White board
3.4	Solar energy, Wind Energy	4	Lecture	PPT

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
3.5	Tidal Energy, Geothermal Energy	2	Lecture	Black Board
3.6	Non Renewable resources–Fossil fuel (Coal, Petrol & Natural Gas) Nuclear Fuels	4	Lecture	Google classroom
UNIT -5 BIODIVERSITY CONSERVATION				
5.1	Concepts of Biodiversity - Need for conservation	2	Discussion	Google classroom
5.2	Conservation Stratagies- *In situ* conservation - Protected areas, National parks, Sanctuaries, Biosphere reserves, Sacred groves	4	Chalk & Talk	Black Board
5.3	*Ex situ* Conservation - Seed Banks, Gene banks- Sthalvirukshas	3	Discussion	Google classroom
5.4	Animal Translocation- Human animal conflicts and management	2	Chalk & Talk	Black Board
5.5	Biodiversity database - Endangered animals, endemism and Red data Book	3	Chalk &Talk	LCD
5.6	Environmental protection act (1986)- Forest conservation Act (1980)- Biodiversity Act, 2002	2	Lecture	Black Board
5.7	Remote sensing and GIS: Methods and Applications in environmental management	2	Lecture	Google classroom

EVALUATION PATTERN

Internal

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Seminar 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks	35 Mks.	5 Mks.	40Mks.	
K2	4	4	-	-	-	8	-	8	20 %
K3	2	2	-	5	-	9	-	9	22.5 %
K4	2	2	-	-	5	9	-	9	22.5 %
K5	2	2	5	-	-	9	-	9	22.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Develop an understanding of ecological key interactions and processes	**K6**	PSO1& PSO3
CO 2	Explain the factors involved in determining population size, Density, Distribution &Community function	**K5**	PSO1& PSO 3
CO3	Analyze sustainable utilization of natural resources	**K4**	PSO3 &PSO7
CO4	Agree significance of Biodiversity, consequences on loss of Biodiversity& conservation Strategies	**K5**	PSO7& PSO8
CO 5	Criticize various kinds of pollution in the environment, their impact on the ecosystem & impact of climatic change	**K5**	PSO6 &PSO8

Mapping of COs with PSOs

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

Mapping of COs with POs

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

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

COURSE DESIGNER:
Dr. V. Bharathy

Forwarded By

Dr. A. TAMIL SELVI
Head, Dept. of Zoology
FATIMA COLLEGE (AUTONOMOUS)
MADURAI-625 018

HOD'S Signature
& Name

NEW SYLLABUS

I M.Sc.,Zoology

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSZO	19PG4Z16	Environmental Biology	Lecture	6	5

COURSE DESCRIPTION

To understand the basic concepts of Ecology.

COURSE OBJECTIVES

To understand the key aspects of ecology, impact of pollution and biodiversity conservation for sustainable development

UNIT –I ECOSYSTEM AND HABITAT (18 HRS.)

Structure, Components of ecosystems - Food chain, Food web, Trophic level Ecological pyramids,Productivity, Energy flow and mineral cycling (CNP). Classification of ecosystems- Introduction, structure and function of terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine) ecosystems. Concept of habitat and niche ecosystem, Biomes - Tundra, Forest, Desert and mountain biomes, Biogeography: biogeographical zones of India.

Self-Study - Structure – Components of ecosystems - Food chain, Food web - Ecological pyramids

UNIT –IIPOPULATION AND COMMUNITY ECOLOGY (18 HRS.)

Concept of population: Natality, Mortality, Biotic potential, Survivorship curves, Life table, Age structure, Carrying capacity, Environmental resistance, Population growth forms, Life history strategies (r and k selection), Population fluctuations, Population interactions- Competition, Predation, Parasitism and Mutualism - Concept of Community: Structure, Composition, Stratification and Community Function. Ecological succession – Primary and Secondary succession, Climax community - Hydrarch, Xerarch. Ecotone and Edge effect, Ecological equivalents, Ecotypes and Ecophenes.

Self-Study - Population interactions- Competition, Predation, Parasitism, Mutualism

UNIT –III NATURAL RESOURCES (18 HRS.)

Renewable & Non–renewable resources: Renewable Resources – Biofuel (Biomass, Biogas, Biohydrogen), Solar energy, Wind Energy, Tidal Energy and Geothermal Energy. Non-Renewable resources –Fossil fuel (Coal, Petrol & Natural Gas) and Nuclear Fuels. Water resources: Distribution – Global, National, Regional, Types – surface water & ground water, Management and conservation of water resources.

Self study -Distribution –Global, National, Regional

UNIT –IV ENVIRONMENTAL POLLUTION (18 HRS.)

Impact of pollutants on general fauna, flora and ecosystems - Environmental pollution: Causes, effects and control measures of air, water, soil, noise and nuclear pollution-–Waste water management – Primary & secondary treatment; Global Climatic change - *El nino* and *La nino* Phenomenon- Green peace movement- Chipko movement- Nuclear disarmament - Role of Government agencies - Central and state Pollution Control Boards- Paris Summit & Kyoto protocol.

Self-Study - Environmental pollution: Causes, effects and control measures of air, water, soil, noise and nuclear pollution

UNIT –V BIODIVERSITY CONSERVATION (18 HRS.)

Concepts of Biodiversity, Need for conservation, Conservation strategies- *In situ* conservation - Protected areas, National parks, Sanctuaries, Biosphere reserves and Sacred groves; *Ex situ* Conservation - Seed Banks, Gene banks. Sthalvirukshas, Animal Translocation, Human animal conflicts and management. Endangered Animals - IUCN Red Data Book, endemism. Environmental Protection Act (1986), Forest conservation Act (1980), Biodiversity Act (2002). Remote sensing and GIS: Methods and Applications in environmental management.

Self-study - Concepts of Biodiversity- Need for conservation

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10. Primark R.B., (2000) *A Primer of Conservation Biology. 2nd Ed.*, SinauerAssociates..
11. Kormondy, E.J. (1996) *Concepts of Ecology. 4th Ed.*, PHI Cengage Learning India, New Delhi).
12. Peter J.R., Stephan, L.W., PauleH., Ceche S. &Bevlerly, M. (2008) *Ecology*. Cengage learning India,New Delhi.
13. Wright, R.T.(2008) *Environmental Science*, 10th Ed., Pearson Education, New Delhi.
14. Smith T.M. & Smith R.L. (2008) *Elements of Ecology.* 6th Ed., Pearson Education, New Delhi.
15. Turk A. & Turk J. (1993) *Environmental Science*. 4th Ed., Saunders.
16. Odum, E.P. & Barrett, G.W. (2005) *Fundamentals of Ecology*. 5th Ed., Cengage Learning India. New Delhi).

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER)::

5. https://openoregon.pressbooks.pub/envirobiology/
6. https://bio.libretexts.org/Bookshelves/Botany/Book%3A_Botany_Lab_Manual_(Morrow)/02%3A_Introduction_to_Ecology

7. https://cnx.org/contents/AK5sUWpu@1.1:GNNbYBSX@1/Global-Processes
8. https://bio.libretexts.org/Bookshelves/Ecology/Book%3A_Environmental_Biology_(Fisher)
9. https://www.nationalgeographic.org/encyclopedia/ecosystem/

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**ECOSYSTEM AND HABITAT ECOLOGY**			
1.1	Structure, Components of ecosystems - Food chain, Food web	2	Chalk & Talk	Black Board
1.2	Trophic level Ecological pyramids,Productivity,	2	Chalk & Talk	LCD
1.3	Energy flow and mineral cycling (CNP).	3	Lecture	PPT & White board
1.4	Classification of ecosystems- Introduction, structure and function of terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine) ecosystems.	3	Lecture	PPT
1.5	aquatic (fresh water, marine, estuarine) ecosystems	3	Lecture	Black Board
1.6	Concept of habitat and niche ecosystem	2	Lecture	Google classroom
1.7	Biomes - Tundra, Forest, Desert and mountain biomes	2	Lecture	PPT
1.8	Biogeography: biogeographical zones of India.	1	Discussion	Black Board
UNIT -2	**POPULATION AND COMMUNITY ECOLOGY**			
2.1	Concept of population: Natality, Mortality, Biotic potential, Survivorship curves, Life table, Age structure, Carrying capacity, Environmental resistance	3	Lecture	Green Board Charts

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
2.2	Population growth forms, Life history strategies (r and k selection), Population fluctuations	3	Chalk & Talk	Green Board
2.3	Population interactions- Competition, Predation, Parasitism and Mutualism	3	Chalk & Talk	Black Board
2.4	Concept of Community: Structure, Composition, Stratification and Community Function	3	Chalk & Talk	LCD
2.5	Ecological succession – Primary and Secondary succession	2	Lecture	PPT &White board
2.6	Climax community - Hydrarch, Xerarch	2	Lecture	PPT
2.7	Ecotone and Edge effect	1	Lecture	Black Board
2.8	Ecological equivalents, Ecotypes and Ecophenes	1	Lecture	Google classroom
UNIT -3NATURAL RESOURCES				
3.1	Renewable & Non–renewable resources: Renewable Resources – Biofuel (Biomass, Biogas, Biohydrogen)	3	Chalk & Talk	Black Board
3.2	Solar energy, Wind Energy, Tidal Energy and Geothermal Energy.	3	Chalk & Talk	LCD
3.3	Non-Renewable resources –Fossil fuel (Coal, Petrol & Natural Gas) and Nuclear Fuels.	4	Lecture	PPT & White board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
3.4	Water resources: Distribution – Global, National, Regional	4	Lecture	PPT
3.5	Types – surface water & ground water	2	Lecture	Black Board
3.6	Management and conservation of water resources.	2	Lecture	Google classroom
UNIT -4 ENVIRONMENTAL POLLUTION				
4.1	Impact of pollutants on general fauna, flora and ecosystems, Environmental pollution: Causes, effects and control measures of air	2	Chalk & Talk	Black Board
4.2	water, soil pollution	2	Chalk & Talk	LCD
4.3	noise and nuclear pollution	2	Lecture	PPT & White board
4.4	Waste water management – Primary & secondary treatment; Global	2	Lecture	PPT
4.5	Climatic change - *El Nino* and *La Nina* Phenomenon	2	Lecture	Black Board
4.6	Green peace movement, Chipko movement, Nuclear disarmament	4	Lecture	Google classroom
4.7	Role of Government agencies - Central and state Pollution Control Boards	2	Lecture	Google classroom
4.8	Paris Summit & Kyoto protocol	2	Lecture	Google classroom

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -5 BIODIVERSITY CONSERVATION				
5.1	Concepts of Biodiversity, Need for conservation, Conservation strategies	2	Discussion	Google classroom
5.2	*In situ* conservation - Protected areas, National parks, Sanctuaries, Biosphere reserves and Sacred groves	4	Chalk & Talk	Black Board
5.3	*Ex situ* Conservation - Seed Banks, Gene banks. Sthalvirukshas	3	Discussion	Google classroom
5.4	Animal Translocation, Human animal conflicts and management	2	Chalk & Talk	Black Board
5.5	Endangered Animals - IUCN Red Data Book, endemism	3	Chalk &Talk	LCD
5.6	Environmental Protection Act (1986), Forest conservation Act (1980), Biodiversity Act (2002)	2	Lecture	Black Board
5.7	Remote sensing and GIS: Methods and Applications in environmental management	2	Lecture	Google classroom

EVALUATION PATTERN

EVALUATION PATTERN

Internal

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Seminar 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks	35 Mks.	5 Mks.	40Mks.	
K2	4	4	-	-	-	8	-	8	20 %
K3	2	2	-	5	-	9	-	9	22.5 %
K4	2	2	-	-	5	9	-	9	22.5 %
K5	2	2	5	-	-	9	-	9	22.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Develop an understanding of ecological key interactions and processes	K6	PSO1& PSO3
CO 2	Explain the factors involved in determining population size, Density, Distribution &Community function	K5	PSO1& PSO 3
CO3	Analyze sustainable utilization of natural resources	K4	PSO3 &PSO7
CO4	Agree significance of Biodiversity, consequences on loss of Biodiversity& conservation Strategies	K5	PSO7& PSO8
CO 5	Criticize various kinds of pollution in the environment, their impact on the ecosystem & impact of climatic change	K5	PSO6 &PSO8

Mapping of COs with PSOs

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

Mapping of COs with POs

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

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

COURSE DESIGNER:
Dr. V. Bharathy

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HOD'S Signature & Name

OLD SYLLABUS

II M.Sc.,Zoology

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSZO	19 PG4ZE3	ECONOMIC ZOOLOGY	PG Major Elective	4	4

COURSE DESCRIPTION

The course has great potential for creating self-employment and business opportunity

COURSE OBJECTIVES

- Enable the students to be familiarized with bee keeping, prawn culture, pearl culture, poultry and dairy farming to become an entrepreneur.
- Understand the medicinal value of honey.
- Know to manage and maintain poultry farms.

UNITS

UNIT –I APICULTURE (12 HRS.)

5 %

Scope of Apiculture - Morphology of honey bees –species of honey bees: *Apisdorsata,Apisindica*, *Apisflorea*, *Apismellifera*– social behaviour of honey bees – Bee keeping: Newton's Bee hive -Extraction of honey – Medicinal value of honey – bee products – Importance of bee colonies in crop pollination.

Self-study – Scope of Apiculture -Social behaviour of honey bees – Bee keeping: Newton's Bee hive -Extraction of honey – Medicinal value of honey – bee products.

UNIT –II SERICULTURE (12 HRS.)

5 %

Sericulture in India –silk route - Role of Central Silk Board - Different silkworm species and their host plants – Life cycle of Mulberry silkworm - silkworm rearing: Rearing appliances and Rearing methods–cocoon marketing – raw silk testing – silk waste – economic importance of silk.

Self-study – silk route- Economic importance of silk

UNIT –III PRAWN AND PEARL CULTURE (12 HRS.)

Prawn culture: Types of prawn culture – Culture of fresh water prawn – Culture of marine prawn – Preparation of farm - Preservation and processing of prawn- Export of prawn.

Pearl culture: Types of pearl - Oysters and pearl formation - Composition, colour, size and quality of pearl – culture of pearls.

UNIT –IV POULTRY FARMING (12 HRS.)

Breeds of chick - Housing and Equipment: Deep litter System - Laying cages - Methods of brooding and Rearing –Debeaking - Management of growers, Layers, Broilers – Feed formulations for chicks, Growers and Broilers – vaccination schedule - Nutritive value of egg and meat.

Self-study – Nutritive value of egg and meat

UNIT –V DAIRY FARMING (12 HRS.)

Indigenousandexotic breeds - Rearing – housing – feedandrationing– Commercialimportanceofdairyfarming- Pasteurization of milk – milk products – nutritive value of milk.

Self-study – Pasteurization of milk

REFERENCES:

1. Vasantharaj David, B. and Kumaraswami T., 1998. *Elements of Economic Entomology* Pop. Book Depot. Chennai.
2. GangaandSulochanaChetty J.G. (2005)*An introduction to sericulture,* second edition, Oxford & IBH Publishing & Co. Pvt. Ltd., New Delhi.
3. Reddy, S. G., (1994)*Silkworm Breeding*, Oxford & INH Publishing Co Pvt. Ltd., New Delhi.
4. Boraiah, G. (1994)*Lectures on Sericulture*, SBS Publishers distributors, Bangalore.
5. Krishnaswamy S., (1988)*Sericulture Manual* 1, 2 &3, FAO Publications, New Delhi.
6. Jhingran,V.G.,(1975) *Fish and Fisheries of India*, Hindustan publishing corporation, India.
7. Rath, A.K., (2011) *Freshwater Aquaculture*, Scientific publishers, Jodhpr, India.
8. Uma Shankar Singh, (2008) *DairyFarming*,Anmol Publications, New Delhi.
9. ICAR, *Hand book of Animal Husbandry*, The Indian Council for Agricultural Research, New Delhi.
10. N. Nagaraja and D.Rajagopal, (2009).*Honey Bees- Diseases, Parasites, Pests, Predators & their management,* MJP Publishers, Chennai.

11.R. C. Mishra, (1998) *Perspectives in Indian Apiculture,* Agro Botanica, New Delhi.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1	**APICULTURE**			
1.1	Morphology of honey bees	3	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
1.2	species of honey bees: *Apisdorsata*,	3	Chalk & Talk	LCD
1.3	*Apisindica*, *Apisflorea*, *Apismellifera*	3	Lecture	PPT
1.4	Importance of bee colonies in crop pollination.	3	Lecture	LCD
1.5	**Self-study – Scope of Apiculture - Social behaviour of honey bees – Bee keeping: Newton's Bee hive -Extraction of honey – Medicinal value of honey – bee products**.		Discussion	
UNIT -2 SERICULTURE				
2.1	Sericulture in India –silk route - Role of Central Silk Board	2	Chalk & Talk	Black Board
2.2	Different silkworm species and their host plants	2	Chalk & Talk	Black Board
2.3	Life cycle of Mulberry silkworm	2	Chalk & Talk	LCD
2.4	silkworm rearing: Rearing appliances and Rearing methods	3	Chalk & Talk	Black Board
2.5	cocoon marketing – raw silk testing – silk waste	3	Lecture	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
2.6	**Self-study – Silk route - Economic importance of silk**		Discussion	
UNIT -3PRAWN AND PEARL CULTURE				
3.1	Prawn culture: Types of prawn culture	1	Chalk & Talk	Black Board
3.2	Culture of fresh water prawn	1	Lecture	Black Board
3.3	Culture of marine prawn	1	Lecture	Black Board
3.4	Preparation of farm	1	Chalk & Talk	Black Board
3.5	Preservation and processing of prawn- Export of prawn.	2	Lecture	Black Board
3.6	Pearl culture: Types of pearl	1	Chalk & Talk	Black Board
3.7	Oysters and pearl formation	2	Chalk & Talk	Black Board
3.8	Composition, colour, size and quality of pearl	2	Chalk & Talk	Black Board
3.9	culture of pearls	1	Chalk & Talk	LCD
UNIT -4POULTRY FARMING				
4.1	Breeds of chick	2	Chalk & Talk	LCD

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
4.2	Housing and Equipment	2	Chalk & Talk	Black Board
4.3	Deep litter System	2	Chalk & Talk	Black Board
4.4	Laying cages - Methods of brooding and Rearing	2	Chalk & Talk	Black Board
4.5	Debeaking - Management of growers, Layers, Broilers - vaccination schedule	2	Chalk & Talk	Black Board
4.6	Feed formulations for chicks, Growers and Broilers	2	Chalk & Talk	PPT
4.7	**Self-study – Nutritive value of egg and meat**		Discussion	
UNIT -5DAIRY FARMING				
5.1	Indigenous and exotic breeds	3	Lecture	LCD
5.2	Rearing – housing	3	Chalk & Talk	Black Board
5.3	feedandrationing	2	Chalk &Talk	Black Board
5.4	Commercial importance of dairyfarming	2	Chalk & Talk	Black Board
5.5	milk products - nutritive value of milk	2	Lecture	PPT
5.6	**Self-study – Pasteurization of milk**		Discussion	

Levels	C1	C2	C3	C4	Total Scholastic Marks	Non Scholastic Marks C5	CIA Total	% of Assessment
	Session-wise Average 5 Mks.	Better of W1, W2 5+5=10 Mks.	M1+M2 15 Mks	MID-SEM TEST 5 Mks	35 Mks.	5 Mks.	40Mks.	
K1	5	-	-	2 ½	-		-	-
K2	-	5	4	2 ½	5		5	12.5 %
K3	-	-	3	5	12		12	30 %
K4	-	-	3	5	9		9	22.5%
Non Scholastic	-	-	-	-	9		9	22.5 %
Total	5	5	10	15	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

- ✔ **All the course outcomes are to be assessed in the various CIA components.**
- ✔ **The levels of CIA Assessment based on Revised Bloom's Taxonomy for I PG are :**

K1- Remember, **K2**-Understand, **K3**-Apply, **K4**-Analyse

✔ **The I PG course teachers are requested to start conducting S1, W1, M1,**

EVALUATION PATTERN

SCHOLASTIC				NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	CIA	ESE	Total
5	10	15	5	5	40	60	100

C1 – Average of Two Session Wise Tests

C2 – Average of Two Monthly Tests

C3 - Mid Sem Test

C4 – Best of Two Weekly Tests

C5 – Non - Scholastic

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Compare the morphological adaptation in bees in relation to their social behaviour.	K2	PSO2
CO 2	Plan for a sericulture unit as a cottage industry.	K3	PSO4, PSO10,

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 3	Analyse the rearing methods of prawn and pearl oysters.	**K4**	PSO10
CO 4	Discuss the rearing methods of chick.	**K6**	PSO2
CO 5	Find the feed formulations for chick.	**K1**	PSO10
CO 6	Assess the commercial importance of dairy farm	**K5**	PSO10

COURSE DESIGNER:

1. **Dr. S. Barathy**

Forwarded By

Dr. A. Tamil Selvi

HOD'S Signature & Name

NEW SYLLABUS

II M.Sc.,ZOOLOGY

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PSZO	19PG4ZE3	Economic Zoology	Lecture	4	4

COURSE DESCRIPTION

The course has great potential for creating self-employment and business opportunity

COURSE OBJECTIVES

- Enable the students to be familiarized with bee keeping, prawn culture, pearl culture, poultry and dairy farming to become an entrepreneur.
- Understand the medicinal value of honey.
- Know to manage and maintain poultry farms.

UNITS

UNIT –I APICULTURE (12 HRS.)

Scope of Apiculture - Morphology of honey bees –species of honey bees: *Apisdorsata*, *Apis indica*, *Apisflorea*, *Apis mellifera*– Social Organization and Life cycle - Behaviour of Honey bees – Bee keeping: Newton's Bee hive -Extraction of honey – Medicinal value of honey – bee products – Importance of bee colonies in crop pollination.

Self-study – Scope of Apiculture -Social Organization and Life Cycle - Behaviour of honey bees – Bee keeping: Newton's Bee hive -Extraction of honey – Medicinal value of honey – bee products.

UNIT –II SERICULTURE (12 HRS.)

Sericulture in India –silk route - Role of Central Silk Board - Different silkworm species and their host plants – Life cycle of Mulberry silkworm & Moriculture- Vegetative Propagation and seeding. Silkworm rearing: Rearing appliances and Rearing methods–cocoon marketing – raw silk testing – silk waste – economic importance of silk.

Self-study – silk route- Economic importance of silk

UNIT –III PRAWN AND PEARL CULTURE (12 HRS.)

Prawn culture: Types of prawn culture – Culture of fresh water prawn – Culture of marine prawn – Preparation of farm - Preservation and processing of prawn- Export of prawn.

Pearl culture: Types of pearl - Oysters and pearl formation - Composition, colour, size and quality of pearl – culture of pearls.

UNIT –IV POULTRY FARMING (12 HRS.)

Breeds of chick - Housing and Equipment: Deep litter System - Laying cages - Methods of brooding and Rearing –Debeaking - Management of growers, Layers, Broilers – Feed formulations for chicks, Growers and Broilers – vaccination schedule - Nutritive value of egg and meat.

Self-study – Nutritive value of egg and meat

UNIT –V DAIRY FARMING (12 HRS.)

Indigenous and exotic breeds - Rearing – housing – feed and rationing– Commercial importance of dairy farming- Pasteurization of milk – milk products – nutritive value of milk.

Self-study – Pasteurization of milk

REFERENCES:

1. Vasantharaj David, B. and Kumaraswami T., 1998. *Elements of Economic Entomology* Pop. Book Depot. Chennai.
2. Ganga and Sulochana Shetty J.G. (2005)*An introduction to sericulture,* second edition, Oxford & IBH Publishing & Co. Pvt. Ltd., New Delhi.
3. Reddy, S. G., (1994)*Silkworm Breeding*, Oxford & INH Publishing Co Pvt. Ltd., New Delhi.
4. Boraiah, G. (1994)*Lectures on Sericulture*, SBS Publishers distributors, Bangalore.
5. Krishnaswamy S., (1988)*Sericulture Manual* 1, 2 &3, FAO Publications, New Delhi.
6. Jhingran,V.G.,(1975) *Fish and Fisheries of India*, Hindustan publishing corporation, India.
7. Rath, A.K., (2011) *Freshwater Aquaculture*, Scientific publishers, Jodhpr, India.
8. Uma Shankar Singh, (2008) *DairyFarming*,Anmol Publications, New Delhi.
9. ICAR, *Hand book of Animal Husbandry*, The Indian Council for Agricultural Research, New Delhi.
10. N. Nagaraja and D.Rajagopal, (2009).*Honey Bees- Diseases, Parasites, Pests, Predators & their management,* MJP Publishers, Chennai.
11. R. C. Mishra, (1998) *Perspectives in Indian Apiculture,*Agro Botanica, New Delhi.

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER):

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6359672/
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4632584/
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2748269/
4. https://www.ncbi.nlm.nih.gov/books/NBK232334/
5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5794767/
6.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 APICULTURE				
1.1	Morphology of honey bees	3	Chalk & Talk	Black Board
1.2	species of honey bees: *Apisdorsata*,	3	Chalk & Talk	LCD
1.3	*Apis indica*, *Apisflorea*, *Apis mellifera*	3	Lecture	PPT
1.4	Importance of bee colonies in crop pollination.	3	Lecture	LCD
1.5	Self-study – Scope of Apiculture - Social Organization and Life Cycle - Behaviour of Honey Bees – Bee keeping: Newton's Bee hive -Extraction of honey – Medicinal value of honey – bee products.		Discussion	
UNIT -2 SERICULTURE				
2.1	Sericulture in India –silk route - Role of Central Silk Board	2	Chalk & Talk	Black Board
2.2	Different silkworm species and their host plants	2	Chalk & Talk	Black Board
2.3	Life cycle of Mulberry silkworm and Moriculture – Vegetative Propagation and seeding	2	Chalk & Talk	LCD
2.4	silkworm rearing: Rearing appliances and Rearing methods	3	Chalk & Talk	Black Board
2.5	cocoon marketing – raw silk testing – silk waste	3	Lecture	Black Board
2.6	Self-study – Silk route - Economic importance of silk		Discussion	
UNIT -3 PRAWN AND PEARL CULTURE				
3.1	Prawn culture: Types of prawn culture	1	Chalk & Talk	Black Board

3.2	Culture of fresh water prawn	1	Lecture	Black Board
3.3	Culture of marine prawn	1	Lecture	Black Board
3.4	Preparation of farm	1	Chalk & Talk	Black Board
3.5	Preservation and processing of prawn- Export of prawn.	2	Lecture	Black Board
3.6	Pearl culture: Types of pearl	1	Chalk & Talk	Black Board
3.7	Oysters and pearl formation	2	Chalk & Talk	Black Board
3.8	Composition, colour, size and quality of pearl	2	Chalk & Talk	Black Board
3.9	culture of pearls	1	Chalk & Talk	LCD
UNIT -4 POULTRY FARMING				
4.1	Breeds of chick	2	Chalk & Talk	LCD
4.2	Housing and Equipment	2	Chalk & Talk	Black Board
4.3	Deep litter System	2	Chalk & Talk	Black Board
4.4	Laying cages - Methods of brooding and Rearing	2	Chalk & Talk	Black Board
4.5	Debeaking - Management of growers, Layers, Broilers - vaccination schedule	2	Chalk & Talk	Black Board
4.6	Feed formulations for chicks, Growers and Broilers	2	Chalk & Talk	PPT
4.7	Self-study – Nutritive value of egg and meat		Discussion	
UNIT -5 DAIRY FARMING				
5.1	Indigenous and exotic breeds	3	Lecture	LCD
5.2	Rearing – housing	3	Chalk & Talk	Black Board
5.3	Feed and rationing	2	Chalk &Talk	Black Board
5.4	Commercial importance of dairy farming	2	Chalk & Talk	Black Board
5.5	milk products - nutritive value of milk	2	Lecture	PPT
5.6	Self-study – Pasteurization of milk		Discussion	

EVALUATION PATTERN

Internal

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Seminar 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks	35 Mks.	5 Mks.	40Mks.	
K2	4	4	-	-	-	8	-	8	20 %
K3	2	2	-	5	-	9	-	9	22.5 %
K4	2	2	-	-	5	9	-	9	22.5 %
K5	2	2	5	-	-	9	-	9	22.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA

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

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Compare the morphological adaptation in bees in relation to their social behaviour.	K2	PSO2
CO 2	Plan for a sericulture unit as a cottage industry.	K3	PSO4& PSO10
CO 3	Analyse the rearing methods of prawn and pearl oysters.	K4	PSO10
CO 4	Summarize the rearing methods of chick.	K2	PSO2
CO 5	Assess the commercial importance of dairy farm	K5	PSO10

Mapping of COs with PSOs

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

Mapping of COs with POs

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

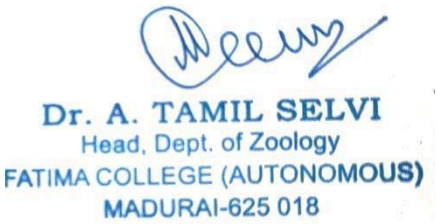
Note: ♦ Strongly Correlated – **3** ♦ Moderately Correlated – **2**

♦ Weakly Correlated -**1**

COURSE DESIGNER:

Dr. S. Barathy

Forwarded By



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