FATIMA COLLEGE (Autonomous)
Affiliated to Madurai Kamaraj University
Re-Accredited with 'A++' (CGPA 3.61) by NAAC (Cycle - IV)
Mary Land, Madurai - 625 018, Tamil Nadu

NAME OF THE DEPARTMENT: ZOOLOGY

NAME OF THE PROGRAMME : B.Sc

PROGRAMME CODE : UAZO

ACADEMIC YEAR :2021-2022

FATIMA COLLEGE (Autonomous), MADURAI-625018

MINUTES OF THE BOARD OF STUDIES

NAME OF THE DEPARTMENT: B.Sc ZOOLOGY

TO BE IMPLEMENTED FROM: 2021-2022 ONWARDS

VENUE: Google Meet - online

CONVENED ON: 12.04.2021 CONVENED AT: 02.00 p.m.

MEMBERS PRESENT:

1.	Dr. A. Tamil Selvi	Head of the Department 12/04/2021
2.	Dr. Capt. N. Arun Nagendran Associate Professor PG & Research Department of Zoology Thiagarajar College Madurai - 625 009	University Nominee 12/04/2021
3.	Dr. F. Brisca Renuga Associate Professor Department of Zoology Holy Cross College (Autonomous) Nagercoil - 04	Subject Expert (Zoology) 12/4/2021
4.	Dr. R. Uma Maheswari Assistant Professor PG Department of Zoology Arulmigu Palaniandavar Arts College for Women Palani - 625 020	Subject Expert (Zoology) 12/04/21

5.	Dr. A. Vanniarajan Scientist Aravind Medical Research Foundation Madurai - 625 020	Industrialist / Scientist	A. Vanni 12/04/2021
6.	Miss. S. Susaritha Research Scholar PG & Research Department of Zoology The American College Madurai - 625 020	Alumna	S. Susaritha 12/04/2021
7.	Dr. N. Malathi	Dean of Academic Affairs	N Malathi
8.	Dr. Antony Amala Jayaseeli	Staff Member	Antony Amala Jayaseeli 12/04/2021
9.	Dr. N. Malathi	Staff Member	N Malathi
10.	Dr. Sr. Biji Cyriac	Staff Member	Sr. Biji Cyriac 12/04/2021
11.	Dr. V. Bharathy	Staff Member	V. Bharathy 12/4/2021
12.	Dr. N. Nagarani	Staff Member	N. Nagarani 12/4/2021
13.	Dr. S. Barathy	Staff Member	S. Barathy 12/4/2021
14.	Mrs. J. Thelma	Staff Member	Thelma 12/4/2021
15.	Miss. T. Malar Meenakshi	Staff Member	T. Malar Meenakshi 12/04/2021

MINUTES OF THE BOARD OF STUDIES

1. ACTION TAKEN REPORT FOR 2020-2021 B.Sc ZOOLOGY

S.NO	COMMON SUGGESTIONS OFFERED IN THE PREVIOUS BOARD	ACTION TAKEN FOR THE ACADEMIC YEAR 2020-21
1.	Field visit maybe included for Skill Based Courses	Field visit was included for Skill Based courses.
2.	Importance should be given for the usage of Full Stop, comma and hyphen while Framing a Syllabus	Usage of full stop, comma and hyphen was checked in the Syllabi.

CHANGE OF COURSE TITLE

S. NO	OLD COURSE CODE	NEW COURSE CODE	OLD COURSE TITLE	NEW COURSE TITLE	NEED FOR CHANGE
1.	Z3SB1	19Z3SB1	Vermiculture	Vermitechnology	As per the recommendations of the Pre-board members
2.	Z3ACQ1	19Q3ACZ1	Allied Botany-I	Plant Diversity & Pathology	As per the recommendations of Deans of Academic Affairs
3.	C3ACZ1	19Z3ACC1	Allied zoology-I	Animal Diversity, Physiology & Genetics	As per the recommendations of Deans of Academic Affairs
4.	Z4ACQ2	19Q4ACZ3	Allied Botany-II	Developmental Botany & Plant Breeding	As per the recommendations of Deans of Academic Affairs
5.	C4ACZ2	19Z4ACC3	Allied Zoology-II	Cell & Molecular Biology	As per the recommendations of Deans of Academic Affairs

NEW COURSES INTRODUCED

S. NO	COURSE CODE	COURSE TITLE	RELEVANCE TO				SCOPE FOR			NEED FOR INTRODUCTION
			L	R	N	G	EMP	ENT	SD	
1.	19Z3CC9	Lab-Human Physiology & Environmental Biology	–	–	N	G	EMP	–	SD	Implementation of Semester-wise Practical
2.	19Q3ACZ2	Lab-Plant Diversity & Pathology	–	–	N	G	EMP	–	SD	Implementation of Semester-wise Practical
3.	19Z3ACC2	Lab-Animal Diversity, Physiology & Genetics	–	–	N	G	EMP	–	SD	Implementation of Semester-wise Practical
4.	19Z4CC12	Lab-Microbiology & Evolution	–	–	N	G	EMP	–	SD	Implementation of Semesterwise practical
5.	19Q4ACZ4	Lab-Developmental Botany & Plant Breeding	–	–	N	G	EMP	–	SD	Implementation of Semester-wise Practical
6.	19Z4ACC4	Lab-Cell & Molecular Biology	–	–	N	G	EMP	–	SD	Implementation of Semester-wise Practical
7.	19Z4SB2	Skill Based Course – Mushroom cultivation	L	R	N	G	EMP	ENT	SD	To enhance the employability & entrepreneurial aspects of the Programme

REVISED COURSES

S.NO	COURSE CODE & COURSE TITLE	UNIT NO & TITLE WITH REVISED CONTENT	% OF REVISION	NEED FOR REVISION	RELEVANCE TO				SCOPE FOR		
					L	R	N	G	EMP	ENT	SD
1.	19Z3CC7 Human Physiology	Unit-I-Digestive System The topic Absorption of Vitamins & Minerals Can be Specified. Unit-III - Unit Title Can be changed as Urogenital System	Nil	As per the recommendations of the Subject Expert	L	R	N	G	-	-	SD
2.	19Z3ACQ2 Lab-Plant Diversity & Pathology	Lab - Identification of Plant diseases Can be included under Spotters	2%	As per the recommendations of the Subjat Expert	-	-	N	G	EMP	-	SD
3.	19Z4CC10 Microbiology	Unit-II - Bacteria The topics transformation & transduction can be included	2%	As per the recommendations of the Subject Expert	L	R	N	G	EMP	-	SD
4.	19Z4ACQ4 Lab - Developmental Botany & Plant Breeding	Demonstration of Anaerobic Respiration can be included	Nil	As per the recommendations of the Subjet Expert	L	R	N	G	EMP	-	SD

2. Updation of Open Educational Resources

S.NO	COURSE CODE	COURSE TITLE	DETAILS OF UPDATION
1.	19Z2CC5	Genetics	https://bio.libretexts.org/Bookshelves/Genetics/Book%3A_Online_Open_Genetics_(Nickle_and_Barrette-Ng)
2.	19Z4CC10	Microbiology	https://microbiologysoceity.org/why-microbiology-matters/what-is-microbiology.html

3. REVISION OF COURSES

S.NO	COURSE CODE & COURSE TITLE	UNIT NO & TITLE WITH REVISED CONTENT	% OF REVISION	NEED FOR REVISION	RELEVANCE TO				SCOPE FOR		
					L	R	N	G	EMP	ENT	SD
1.	19Z5ME1 Biostatistics	In Unit-IV- correlation & Regression - Goodness of fitness (problem) and in Unit-V-Test of Variance - Student's t-test can be specified	2%	As per the recommendations of the Subject Expert	L	R	N	G	EMP	-	SD
2.	19Z5SB3 Ornamental Fish culture	The topic - entrepreneurial aspects can be included in Unit-I Introduction to Aquarium	2%	As per the recommendations of the Subject Expert	L	R	N	G	EMP	ENT	SD
3.	19Z5SB4 Sericulture	Unit-I - Introduction to sericulture - the topic National Sericulture project can be included.	5%	As per the recommendations of the Subject Expert	L	R	N	G	EMP	ENT	SD
4.	19Z6ME6 Entomology	Unit-III Beneficial insects - Lac Insect - culture & harvesting can be included.	5-1.	As per the recommendations of the Subject Expert	L	R	N	G	-	-	SD

5.	19Z6CC20 Lab - Biotechnology	One example can be specified for Holometabolous (Butterfly), Hemimetabolous (Cockroach) insects. Rasmol tool can be given as example for Molecular visualization Tool	5%	As per the recommendations of the Subject Expert	L	R	N	G	EMP	-	SD
6.	19Z6SB6 Dairy Farming	Unit-I - Introduction Significance of indigenous breeds of cow can be included.	2%	As per the recommendations of the Subject Expert	L	R	N	G	EMP	ENT	SD

4. NEW COURSES INTRODUCED:

S. NO	COURSE CODE	COURSE TITLE	RELEVANCE TO				SCOPE FOR			NEED FOR IMPLEMENTATION
			L	R	N	G	EMP	ENT	SD	
1.	19Z5ME2	Animal Behaviour	L	R	N	G	-	-	SD	To introduce the classical Aspects of Zoology
2.	19Z5CC15	Lab - Biochemical Analysis	-	-	N	G	EMP	-	SD	Implementation of Semesterwise Practical
3.	19Z5CC16	Lab - Molecular Biology	-	-	N	G	EMP	-	SD	Implementation of Semesterwise Practical
4.	19Z6CC19	Lab - Immunology	-	-	N	G	EMP	-	SD	Implementation of Semesterwise Practical
5.	19Z6CC20	Lab - Biotechnology	-	-	N	G	EMP	-	SD	Implementation of Semesterwise Practical
6.	21NISLZ1	Nutrition for Health & Fitness	L	R	N	G	-	-	SD	Offered to the Advanced Learners

7.	21Z2SL2	Single cell Protein culture	L	R.	N.	G	EMP	ENT	SD	offered to the Advanced learners
8.	21Z3SLN3	Public Health & Hygine	L	R	N	G	–	–	SD	offered to the Advanced learnors
9.	21S4SLZ4	Developmental Psychology	L	R	N	G	–	–	SD	offered to the Advanced learners
10.	21T5SLZ5	Traditional Medicine	L	R	N	G	–	ENT	SD	offered to the Advanced learners
11.	21Z6SLC6	Herbal Cosmetics	L	R	N	G	–	ENT	SD	offered to the Advanced learners

5. INTRODUCTION OF PURELY SKILL-EMBEDDED CERTIFICATE COURSE

S. NO	COURSE CODE	COURSE TITLE	SKILLS SHARPENED	COURSE OUTCOME
1.	21UGIVACZ2	Livestock Farming	methods of rearing Farm animals. Inculcate the Skills needed for Self-employment	CO1 - Illustrate the breeds of Buffalo & its rearing techniques. CO2 - Plan for swine breeding & Feeding Strategies. CO3 - Analyze the rearing methods of Rabbit CO4 - Discuss the rearing methods of cattle. CO5 - Assess the rearing of Sheep & goat CO6 - Assess the commercial importance of Livestock Farming

6. Approval of Ph.D course work Syllabus: NIL

7. Rubrics for Project: Group Project

S.NO	C1 20 MKS	C2 20 MKS	CIA TOTAL 40 MKS	EXTERNAL 60 MKS
1.	Report	Presentation	Can be assessed by all the Staff members of the Department	Report 30 MKS Presentation 20 MKS Viva 10 MKS

Details of Signed MOU

Kokila Siddha Hospital & Research Centre
(NABH, QCI Accredited)
Jaihindpuram
Madurai – 625 011

OTHER SUGGESTIONS	COMMENDATIONS
1. Group projects / Field Projects may be given to UG Students to document local Biodiversity. 2. Internship may be introduced to the UG Students. 3. The DOER may have a minimum of 5 links for each course.	1. Inclusion of Lab courses in every Semester is a good measure 2. course contents reflect the societal needs and make the Students fit to become entrepreneurs. 3. Use of digital resources that are useful for easy understanding of the Students is well appreciated.

	Name of	Signature
1.	Head of the Department Dr. A. Tamil Selvi	12/04/2021
2.	University Nominee Dr. Capt. N. Arun Nagendran	12/4/2021
3.	Subject Expert Dr. F. Brisca Renuga	12/4/2021
4.	Subject Expert Dr. R. Uma Maheswari	12/04/21
5.	Industrialist Dr. A. Vanniarajan	12/04/2021
6.	Alumna Miss. S. Susaritha	12/04/21
7.	Dean of Academic Affairs Dr. N. Malathi	
8.	Dr. Antony Amala Jayaseeli	12/04/2021
9.	Dr. N. Malathi	
10.	Dr. Sr. Biji Cyriac	12/4/2021
11.	Dr. V. Bharathy	
12.	Dr. N. Nagarani	12/4/2021
13.	Dr. S. Barathy	12/4/2021
14.	Mrs. J. Thelma	12/4/2021
15.	Miss. T. Malar Meenakshi	12/04/2021

12/04/2021

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18

DEPARTMENT OF ZOOLOGY

For those who joined in June 2019 onwards

PROGRAMME CODE: UAZO

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

PART – I – TAMIL

Offered by The Research Centre of Tamil

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. MKs
1.	I	19TL1C1	General Tamil – Ikaala Ilakiyam	5	3	40	60	100
2.	II	19TL2C2	General Tamil - Bakthi Illakiyam	5	3	40	60	100
3.	III	19TL3C3	General Tamil – Kaapiya Illakiyam	5	3	40	60	100
4.	IV	19TL4C4	General Tamil - Sangam Illakiyam	5	3	40	60	100
			Total	20	12			

PART – I –FRENCH

Offered by TheDepartment of French

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. MKs
1.	I	19RL1C1	PART 1 LANGUAGE FRENCH - LE NIVEAU INTRODUCTIF	5	3	40	60	100
2.	II	19RL2C	PART 1 LANGUAGE	5	3	40	60	100

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

PART – I – HINDI

Offered by TheDepartment of Hindi

S. NO	SEM.	COURSECODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. MKs
1.	I	19DL1C1	PART 1 LANGUAGE HINDI - Vyakaran aur Karyalyeen Hindi	5	3	40	60	100
2.	II	19DL2C2	PART 1 LANGUAGE HINDI –Srijanatmak Hindi aur Gadhya	5	3	40	60	100
3.	III	19DL3C3	PART 1 LANGUAGE HINDI –Hindi Sahithya Ka Aadhikaal aur Bhakthikaal	5	3	40	60	100
4.	IV	19DL4C4	PART 1 LANGUAGE	5	3	40	60	100

S. NO	SEM.	COURSECODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. MKs
			HINDI –Reetikaleen Hindi Sahithya aur Aadhunik Kaal					
			Total	**20**	**12**			

PART – II -ENGLISH – 12 CREDITS

Offered by The Research Centre of English

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. MKs
1.	I	19EL1LB	BASIC COMMUNICATIVE ENGLISH	5	3	40	60	100
2.		19EL1LI	INTERMEDIATE COMMUNICATIVE ENGLISH					
3.		191EL1LA	ADVANCED COMMUNICATIVE ENGLISH					
4.	II	19EL2LB	ENGLISH FOR EFFECTIVE COMMUNICATION (BASIC)	5	3	40	60	100
5.		19EL2LI	ENGLISH FOR EMPOWERMENT (INTERMEDIATE)					
6.		19EL2LA	ENGLISH FOR CREATIVE WRITING (ADVANCED)					
7.	III	19EL3LN	ENGLISH FOR THE DIGITAL ERA	5	3	40	60	100

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. MKS
8.	IV	19EL4LN	ENGLISH FOR INTEGRATED DEVELOPMENT	5	3	40	60	100
			Total	**20**	**12**			

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

MAJOR CORE COURSES INCLUDING PRACTICALS : 60 CREDITS

S.NO	SEM.	COURSECODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. Mks
1.	I	19Z1CC1	INVERTEBRATA	5	4	40	60	100
2.		19Z1CC2	CELL BIOLOGY	4	3	40	60	100
3.		19Z1CC3	LAB - INVERTEBRATA & CELL BIOLOGY	3	2	40	60	100
4.	II	19Z2CC4	CHORDATA	5	4	40	60	100
5.		19Z2CC5	GENETICS	4	3	40	60	100
6.		19Z2CC6	LAB - CHORDATA & GENETICS	3	2	40	60	100
7.	III	19Z3CC7	HUMAN PHYSIOLOGY	5	4	40	60	100
8.		19Z3CC8	ENVIRONMENTAL BIOLOGY	4	3	40	60	100
9.		19Z3CC9	LAB - HUMAN PHYSIOLOGY & ENVIRONMENTAL BIOLOGY	3	2	40	60	100
10.	IV	19Z4CC10	MICROBIOLOGY	5	4	40	60	100
11.		19Z4CC11	EVOLUTION	4	3	40	60	100

S.NO	SEM.	COURSECODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. Mks
12.		19Z4CC12	LAB - MICROBIOLOGY& EVOLUTION	3	2	40	60	100
13.	V	19Z5CC13	FUNDAMENTALS OF BIOCHEMISTRY	6	4	40	60	100
14.		19Z5CC14	MOLECULAR BIOLOGY	6	4	40	60	100
15.		19Z5CC15	LAB - BIOCHEMICAL ANALYSIS	4	2	40	60	100
16.		19Z5CC16	LAB - MOLECULAR BIOLOGY	4	2	40	60	100
17.	VI	19Z6CC17	BASIC IMMUNOLOGY	5	4	40	60	100
18.		19Z6CC18	PRINCIPLES OF BIOTECHNOLOGY	5	4	40	60	100
19.		19Z6CC19	LAB - IMMUNOLOGY	3	2	40	60	100
20.		19Z6CC20	LAB - BIOTECHNOLOGY	3	2	40	60	100
			Total	**84**	**60**			

ALLIEDCOURSES- 20 CREDITS

S.NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. MKS
1.	I	19C1ACZ1	ALLIED CHEMISTRY - I	3	3	40	60	100
2.		19C1ACZ2	LAB IN VOLUMETRIC ANALYSIS	2	2	40	60	100

S.NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. MKS
3.	II	19C2ACZ3	ALLIED CHEMISTRY - II	3	3	40	60	100
4.		19C2ACZ4	LAB IN QUALITATIVE ORGANIC ANALYSIS	2	2	40	60	100
5.	III	19Z3ACQ1	PLANT DIVERSITY &PATHOLOGY	3	3	40	60	100
6.		19Z3ACQ2	LAB - PLANT DIVERSITY &PATHOLOGY	2	2	40	60	100
7.	IV	19Z4ACQ3	DEVELOPMENTAL BOTANY & PLANT BREEDING	3	3	40	60	100
8.		19Z4ACQ4	LAB -DEVELOPMENTAL BOTANY & PLANT BREEDING	2	2	40	60	100
			Total	**20**	**20**			

ELECTIVES-15 CREDITS

S.No	SEM.	COURSECODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. Mks
1.	V	19Z5ME1/ 19Z5ME2	BIOSTATISTICS / ANIMAL BEHAVIOUR	5	5	40	60	100
2.	VI	19Z6ME3 / 19Z6ME4	EMBRYOLOGY / CLINICAL LABORATORY TECHNIQUES	5	5	40	60	100

S.No	SEM.	COURSECODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. Mks
3.		19Z6ME5 / 19Z6ME6	BIOINFORMATICS / ENTOMOLOGY	5	5	40	60	100
			Total	**15**	**15**			

PART – IV – 20 CREDITS

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

S. No	SEM.	COURSECODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. Mks
1.	I	21G1VE1	Personal Values	1	1	40	60	100
2.		19Z1NME	Non-Major Elective – Maternity and Child Health (Offered to other major Students)	2	2	40	60	100
3.	II	21G2VE2	Values for Life	1	1	40	60	100
4.		19Z2NME	Non-Major Elective – Maternity and Child Health (Offered to other major Students)	2	2	40	60	100
5.	III	19G3EE1	Environmental Education	1	1	40	60	100
6.		19Z3SB1	Vermitechnology	2	2	40	60	100
7.	IV	19G4EE2	Gender Studies	1	1	40	60	100
8.		19Z4SB2	Mushroom Cultivation	2	2	40	60	100
9.	V	19Z5SB3	Ornamental Fish Culture	2	2	40	60	100

S. No	SEM.	COURSECODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. Mks
10.		19Z5SB4	Sericulture	2	2	40	60	100
11.	VI	19Z6SB5	Apiculture	2	2	40	60	100
12.		19Z6SB6	Dairy Farming	2	2	40	60	100
			TOTAL	**20**	**20**			

PART – V – 1 CREDIT

OFF-CLASS PROGRAMMES - ALL PART-V

SHIFT - I

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

OFF-CLASS PROGRAMMES

ADD-ON COURSES

COURSE CODE	COURSE TITLE	HRS.	CREDITS	SEMESTER IN WHICH THE COURSE IS OFFERED	CIA Mks	ESE Mks	TOTAL Mks
21UAD1CA	**COMPUTER APPLICATIONS**(offered by the department of PGDCA for Shift I)	40	2	I&II	40	60	100
21UADFCS	**ONLINE SELF LEARNING COURSE-**Foundation Course for Science	40	2	II	40	60	100
21UAD3ES	Professional Ethics	15	1	III	40	60	100
21UAD4ES	Personality Development	15	1	IV	40	60	100
21UAD5ES	Family Life Education	15	1	V	40	60	100
21UAD6ES	Life Skills	15	1	VI	40	60	100
19UAD5HR	**HUMAN RIGHTS**	15	2	V	100	-	100
21UAD6RS	**OUTREACH PROGRAMME**- Reach Out to Society through Action**ROSA**	100	3	V & VI	100	-	100
21UAD6PR	**PROJECT**	30	4	VI	40	60	100
21UAD6RC	**READING CULTURE**	10/ Semester	1	II-VI	-	-	-
	TOTAL		**20**				

EXTRA CREDIT COURSES

COURSE CODE	COURSE	HRS.	CREDITS	SEMESTER IN WHICH THE COURSE IS OFFERED	CIA MKS	ESE MKS	TOTAL MARKS
21Z2SL1	**SELF LEARNING COURSES for ADVANCED LEARNERS** SingleCellProteinCulture	-	2	II	40	60	100
	MOOC COURSES / International Certified online Courses (Department Specific Courses/any other courses) * Students can opt other than the listed course from UGC-SWAYAM UGC / CEC	-	Minimum 2 Credits	I – VI	-	-	

OFF CLASS PROGRAMMES

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

21UGVACZ2 – Skill – Embedded Value Added Certificate Course (Lifestock Farming)

FATIMA COLLEGE (AUTONOMOUS)

Re-Accredited with 'A++' by NAAC (Cycle – IV)
Mary Land, Madurai

DEPARTMENT OF ZOOLOGY

III B.Sc. Zoology

SEMESTER –V

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	19Z5CC15	Lab - Biochemical Analysis	Practical	4	2

COURSE DESCRIPTION

This course introduces the students to the biochemical analytical experiments for Carbohydrates, Protein and Lipids by providing familiarization with the preparation of reagents, proper use of instrumentation and interpretation of the properties of the Biomolecules.

COURSE OBJECTIVES

- Acquire skills in handling basic equipments
- Estimate the various biomolecules using standard protocols
- Critically analyze and interpret the results
- Design experiments to solve research problems

UNITS

CONTENT

1. Laboratory biosafety guidelines

2. Preparation of solutions – Percentage, Normality, Molarity, Molality, ppm, preparation of working standard from stock solution.

3. Qualitative analysis of Carbohydrates: Barford's Test, Fehling's test, Seliwanoff's test and Iodine test.

4. Qualitative analysis of Proteins: Biuret test and Ninhydrin test.

5. Qualitative analysis of lipids: Saponification test, Iodine Absorption test, Salkowski's Test for Cholesterol and Dunstan's Test for Glycerol.

6. Estimation of Glucose by Anthrone method.

7. Estimation of Protein by Lowry's method.

8. Spotters- pH meter, ChromatographicChamber, Colorimeter, Spectrophotometer

REFERENCES:

1.Plummer, D.T. (2008).*An Introduction to Practical Biochemistry*. Tata McGraw- Hill Publication, New Delhi.

2. Wilson, K and Walker, J. (2008). *Practical Biochemistry*. Cambridge State University Press, U.K.

3. Boyer, R.F. (2012).*Modern Experimental Biochemistry*. Pearson Education, India.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. http://www.oercommons.org/courses/biochemistry-3/view
2. https://louis.oercommons.org/curated-collections/52
3. https://libguides.wesleyan.edu/c.php?g=924060&p=6671362

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
CONTENT				
1	Laboratory biosafety guidelines	1	Lecture	LCD
2.1	Preparation of solutions -Percentage, Normality, Molarity	2	Chalk & Talk	Black Board

2.2	Preparation of solutions - Molality, ppm, preparation of working standard from stock solution.	2	Chalk & Talk	Black Board
3.1	Qualitative analysis of Carbohydrates: Barford's Test, Fehling's test	1	Demonstration & hands on training	Black Board
3.2	Qualitative analysis of Carbohydrates: Seliwanoff's test and Iodine test.	1	Demonstration & hands on training	Black Board
4.1	Qualitative analysis of Proteins: Biuret test and Ninhydrin test.	1	Demonstration & hands on training	Black Board
5.1	Qualitative analysis of lipids - Saponification test, Iodine Absorption test	2	Demonstration & hands on training	Black Board
5.2	Qualitative analysis of lipids: Salkowski's Test for Cholesterol and Dunstan's Test for Glycerol.	1	Demonstration & hands on training	Black Board
6	Estimation of Glucose by Anthrone method.	1	Demonstration & hands on training	Green Board
7	Estimation of Protein by Lowry's method	2	Demonstration & hands on training	Green Board
8	Spotters- pH meter, Chromatographic Chamber, Colorimeter, Spectrophotometer	1	Specimen	LCD

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

EVALUATION PATTERN

MARKS		
CIA	ESE	Tota l
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	Make use of the knowledge of basic principles of Biochemistry to carry out the biochemical experiments	K3	PSO1, PSO2, PSO4, PSO7 & PSO8
CO 2	Infer the outcome of the qualitative analytical tests of Biomolecules	K2	PSO1, PSO2, PSO4 & PSO8
CO 3	Estimate the biomolecules using standard protocols	K5	PSO1, PSO2, PSO4, PSO7 & PSO8
CO 4	Develop skills in handling basic equipments	K3	PSO1, PSO2, PSO4, PSO7 & PSO8
CO 5	Develop familiarity with the principles of Laboratory safety	K3	PSO1, PSO2, PSO4,PSO7 & 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	2	3	2	2	3	3	2	2	2	2
CO2	3	3	2	3	2	2	2	3	2	2	2	2
CO3	3	3	2	3	2	2	3	3	2	2	2	2
CO4	3	3	2	3	2	2	3	3	2	2	2	2
CO5	3	3	2	3	2	2	3	3	2	2	2	2

Mapping of COs with POs

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

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

COURSE DESIGNER:

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Mary Land, Madurai

DEPARTMENT OF ZOOLOGY

III B.Sc. Zoology

SEMESTER – V

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	19Z5CC16	Lab - Molecular Biology	Practical	4	2

COURSE DESCRIPTION

The course intends to provide hands on experience on techniques related to isolation and estimation of DNA, RNA and separation of phytoconstituents by paper chromatography and thin layer chromatography

COURSE OBJECTIVES

To gain practical skills to isolate, estimate and separate various biomolecules

EXPERIMENTS

MOLECULAR BIOLOGY

1. Laboratory biosafety guidelines
2. Isolation of Genomic DNA from Bacteria.
3. Isolation of Genomic DNA from mammalian tissue.
4. Qualitative analysis of DNA
5. Isolation of RNA from Yeast.
6. Qualitative analysis of RNA
7. pH metry - Titration curve
8. Buffer preparation

9. Separation of phytoconstituents and amino acids - Ascending chromatography
10. Circular paper chromatography
11. Separation of amino acids - Thin Layer Chromatography
12. Plasmolysis
13. **Spotters:** DNA Double Helix Model, DNA Replication, Agarose Gel Electrophoresis, Polyacrylamide Gel Electrophoresis, Centrifuge

BIOSTATISTICS

1. Measures of central tendency & Measures of dispersion (problems)
2. Diagrammatic representation of data

ANIMAL BEHAVIOUR

1. Social behavior of animals – Ant
2. Geotactic and phototactic behavior of earthworms

REFERENCES:

1. Rajan S., Christy, S.R., (2011). E*xperimental procedures in Life Sciences*, Anjana Book House, Chennai.
2. Sinha J., Chatterjee A.K., Chattopadhyay P., (2015). *Advanced Practical Zoology*, Books and Allied (P) Ltd., Calcutta.
3. Tembhare D.B., (2008). *Techniques in Life Sciences*, 1st ed., Himalaya Publishing House Pvt. Ltd., Mumbai.
4. Dutta A., (2009). *Experimental Biology Lab manual*, Narosa Publishing House, New Delhi.
5. Plummer T.D., (1990). *An Introduction to Practical Biochemistry*, 4th ed., Mc Graw Hill Book Company, Europe.
6. Palanivelu P., (2004). *Analytical Biochemistry and Separation Techniques – A laboratory manual for B.Sc and M.Sc students*, 3rd ed., Kalaimani Printers, Madurai.
7. Wilson K and Walker J., (2013). *Principles and Techniques of Biochemistry and Molecular Biology*, 7th ed., Cambridge University Press, New York.
8. Boyer R., (2000). *Modern Experimental Biochemistry*, 3rd ed., Pearson Education Inc.

9. Wilson K and Kenneth H.G., (1992). *A Biologists Guide to Principles and Techniques of Practical Biochemistry*, 3rd ed., Cambridge University Press, Cambridge, UK.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. https://www.oercommons.org/authoring/2459-conditioning-animals-learning-behaviour-ecology-en/view
2. https://www.oercommons.org/authoring/2442-adaptation-vampirism-ecology-environment-the-virtu/view

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
MOLECULAR BIOLOGY				
1.1	Laboratory biosafety guidelines	4	Lecture & Demonstration	Blackboard & Specimen
1.2	Isolation of Genomic DNA from Bacteria.	4	Demonstration	Specimen
1.3	Isolation of Genomic DNA from mammalian tissue.	4	Demonstration	Specimen
1.4	Qualitative analysis of DNA	4	Demo	Calf Thymus DNA
1.5	Isolation of RNA from Yeast.	4	Demo	Specimen
1.6	Qualitative analysis of RNA	4	Demo	Specimen
1.7	pH metry - Titration curve	4	Hands on training	Buffers & Fruit Juices

1.8	Buffer preparation	2	Hands on training	Buffers
1.9	Separation of phytoconstituents and amino acids - Ascending chromatography	4	Hands on training	Calf Thymus DNA
1.10	Circular paper chromatography	4	Hands on training	Tissue sample
1.11	Separation of amino acids - Thin Layer Chromatography	4	Hands on training	Std. RNA, tissue sample
1.12	Plasmolysis	4	Hands on training	Agarose gel electrophoretic unit
1.13	**Spotters:** DNA Double Helix Model, DNA Replication, Descending Chromatography, Colorimeter, Centrifuge	2	Observation	Models, equipments, Microscope
BIOSTATISTICS & ANIMAL BEHAVIOUR				
2.1	Measures of central tendency & Measures of dispersion (problems)	2	Hands on training	Specimen
2.2	Diagrammatic representation of data	2	Hands on training	MS - Excel
2.3	Social behavior of animals	4	Hands on training	Specimen
2.4	Geotactic and phototactic behavior of earthworms	4	Hands on training	Specimen

CIA

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

EVALUATION PATTERN

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

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Estimate the pH of different samples	**K2**	PSO 2
CO 2	Infer the color changes in DNA and RNA estimation	**K2**	PSO 2 PSO 7
CO 3	Compute the Rf value for paper chromatography	**K3**	PSO 2
CO 4	Demonstrate the genomic DNA isolation, DNA estimation and chromatography	**K3**	PSO 2
CO 5	Solve the presence of nucleic acid in the given sample	**K3**	PSO 2

Mapping of COs with PSOs

CO/ PSO	PSO1	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	3	2	2	2	2	2	2	2	2	2	2
CO3	2	2	2	2	2	2	2	2	2	2	2	2
CO4	2	2	2	2	2	2	2	2	2	2	2	2
CO5	2	2	2	2	2	2	2	2	2	2	2	2

Mapping of COs with POs

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

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

♦ Weakly Correlated -**1**

COURSE DESIGNER:
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DEPARTMENT OF ZOOLOGY

III B.Sc. Zoology

SEMESTER –VI

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	19Z6CC19	Lab - Immunology	Practical	3	2

COURSE DESCRIPTION

The overall objective of this course is to provide the undergraduate students of Zoology an experience of exploring immunological principles through experimentation and to introduce the procedures, basic techniques and instruments used in the clinical laboratories.

COURSE OBJECTIVES

- Acquire skills in handling basic equipments
- Estimate the various biomolecules using standard protocols
- Critically analyze and interpret the results
- Design experiments to solve research problems

IMMUNOLOGY

1. Virtual dissection and onscreen display of lymphoid organs of mouse.

2. Separation of serum and plasma.

3. Separation of lymphocytes from peripheral blood and counting in Haemocytometer.

4. ABO blood grouping in man.

5. Single radial immunodiffusion.

6. Rheumatoid factors – Demo.

Spotters: Lymphoid organs- thymus, spleen, lymph nodes and Bone marrow, Ig – Models.

EMBRYOLOGY

Spotters: Embryonic stages of Chick (24 or 48 hrs); Mammalian Sperm and Ovum, Stages of Human embryo and Placenta of goat.

CLINICAL LABORATORY TECHNIQUES

1. Laboratory biosafety guidelines

2. Preparation of stained blood film to study various types of blood cells.

3. Total W.B.C. & R.B.C. count

4. Differential leukocyte count

5. Qualitative analysis of urine for glucose- Benedict's Test.

6. Qualitative analysis of urine for albumin-Biuret Test.

7. Qualitative analysis of Ketone – Rothera's Test.

8. Qualitative analysis of urine for Urea -Urease Test.

9. Qualitative analysis of Creatinine- Jaffe's Test.

10. Field visit to clinical laboratory & report submission

REFERENCE BOOKS:

1. Hudson, L., Hay, F.C. (1986).*Practical Immunology*.3rd ed., Blackwell Publishing, London.

2. Garvey, J.S., Cremer, N.E., Sussdorf , D.H. (1983).*Methods in Immunology*.3rd ed., Benjamin / Cummins Publishing, London.

3. Stites, D.P., Terr, A.L., Parslow, T.G. (1994).*Basic and Clinical* Immunology.Prentice Hall Publishing, Canada.

4. Mukerjee, K.L. and Gosh, S. (2010). *Medical Laboratory Technology*.Volume

II, McGraw Hill, New Delhi-17.

5. Harold Varley.(2005). *Practical Clinical Biochemistry*.4th ed. CBS Publishers Pvt Ltd, New Delhi-02.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. https://bio.davidson.edu/courses/immunology/Bio307.html
2. https://www.oercommons.org/courses/clinical-immunology
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5633739/
4. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC379057/
5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7904692/

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
IMMUNOLOGY				
1.1	Virtual dissection and onscreen display of lymphoid organs of mouse	1	Demonstration & hands on training	LCD, Online Virtual Dissection Tools
1.2	Separation of serum and plasma	1	Demonstration & hands on training	Black board
1.3	Separation& counting of lymphocytes	4	Demonstration & hands on training	Microscope
1.4	ABO blood grouping	1	Demonstration & hands on training	Teaching Kit PPT & White board
1.5	Single radial immunodiffusion	1	Demonstration & hands on training	Teaching Kit

1.6	Rheumatoid factors	1	Demonstration	Teaching Kit
1.7	Spotters: Lymphoid organs-thymus, spleen, lymph nodes and Bone marrow, Ig – Models.	1	Specimen & Models	Microscope
EMBRYOLOGY				
2	Spotters: Embryonic stages of Chick (24 or 48 hrs); Mammalian Sperm and Ovum, Stages of Human embryo and Placenta of goat.	1	Permanent Slides & Preserved Specimen	Microscope
CLINICAL LABORATORY TECHNIQUES				
3.1	Laboratory biosafety guidelines	1	Lecture	LCD
3.2	Preparation of stained blood film	1	Demonstration & hands on training	Microscope
3.3	Total W.B.C. & R.B.C. count	1	Demonstration & hands on training	Microscope
3.4	Differential leukocyte count	1	Demonstration & hands on training	Microscope
3.5	Qualitative analysis of urine for glucose- Benedict's Test	1	Demonstration & hands on training	Black Board
3.6	Qualitative analysis of urine for albumin-Biuret Test	1	Demonstration & hands on training	Black Board
3.7	Qualitative analysis of Ketone – Rothera's Test	1	Demonstration & hands on training	Black Board
3.8	Qualitative analysis of urine for Urea -Urease Test	1	Demonstration & hands on	Black Board

			training	
3.9	Qualitative analysis of Creatinine- Jaffe's Test	1	Demonstration & hands on training	Black Board
3.10	Field visit to clinical laboratory & report submission	-	On-site Learning	=

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

EVALUATION PATTERN

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

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Relate the knowledge of basic principles of immunology to carry out the related experiments	**K1**	PSO1, PSO2 PSO4. PSO7 PSO8 & PSO10
CO 2	Acquire skills in handling basic equipments	**K2**	PSO1,PSO2 PSO4,PSO7 PSO8 & PSO10
CO 3	Infer the outcome of the experiments	**K2**	PSO1, PSO2

	of Immunology		PSO4, PSO7 PSO8 & PSO10
CO 4	Relate the biochemical properties of Glucose, Albumin & Ketone bodies while performing the qualitative analytical tests for their detection in urine sample	**K1**	PSO1, PSO2 PSO4, PSO8 & PSO10
CO 5	Develop familiarity with the principles of Laboratory safety	**K3**	PSO1 PSO2 PSO4 PSO7 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	PSO1 0	PSO1 1	PSO1 2
CO1	3	3	2	2	2	2	3	3	2	3	2	2
CO2	3	3	2	2	2	2	3	3	2	3	2	2
CO3	3	3	2	2	2	2	3	3	2	3	2	2
CO4	3	3	2	2	2	2	3	3	2	2	2	2
CO5	3	3	2	2	2	2	3	3	2	2	2	2

Mapping of COs with POs

CO / PSO	PO 1	PO 2	PO 3	PO 4
CO 1	3	2	3	2
CO 2	3	2	3	2
CO 3	3	2	3	2
CO 4	3	2	3	2
CO 5	3	2	3	3

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

COURSE DESIGNER:

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DEPARTMENT OF ZOOLOGY

III B.Sc. Zoology

SEMESTER – VI

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAZO	19Z6CC20	Lab - Biotechnology	Practical	3	2

COURSE DESCRIPTION

Students gain hands-on experience and learn the theoretical basis of lab techniques common to a variety of biological disciplines such as biotechnology, Bioinformatics and Entomology and they will work in groups, learning how to collect, analyze, and present data while using the scientific method to conduct inquiry-based laboratory experiments.

COURSE OBJECTIVES

- Introductory laboratory course in current principles and techniques applicable to research problems in biotechnology, Bioinformatics and Entomology
- Learners can identify insects and able to group them into different taxa

- Learners gain knowledge handling biological database and retrieve information

UNITS

UNIT – I BIOTECHNOLOGY

1. Laboratory biosafety guidelines
2. Isolation of protein from spinach leaves
3. Estimation of Total soluble proteins using Bradford method
4. Electrophoretic separation proteins
5. Isolation of genomic DNA from goat liver/Bacteria.
6. Isolation of Plasmid DNA by alkaline lysis method.
7. Electrophoretic separation of DNA.
8. Demonstration of PCR.
9. Spotters: Agarose gel electrophoresis, SDS-PAGE, pBR322, Spirulina and Insulin

UNIT-II ENTOMOLOGY

1. Collection and Preservation of Insects.

2. Spotters: Mouth parts of Cockroach & Honey bee; Life Cycle of Holometabolous (Butterfly) and Hemimetabolous Insects (Cockroach), Pests of Agricultural Importance – Rice Weevil, Rhinoceros Beetle.

UNIT- III BIOINFORMATICS

1. Sequence retrieval from GenBank

2. Pairwise alignment - BLAST

3. Molecular visualization of Proteins- RASMOL

REFERENCE BOOKS:

1. Rajan S., Christy, S.R., (2011) Experimental procedures in Life Sciences, Anjana Book House, Chennai.

2. Sinha J., Chatterjee A.K., Chattopadhyay P., (2015) Advanced Practical

Zoology, Books and Allied (P) Ltd., Calcutta.
3. Tembhare D.B., (2008) Techniques in Life Sciences, 1st ed., Himalaya Publishing House

DIGITAL OPEN EDUCATIONAL RESOURCES

1. https://www.oercommons.org/courseware/lesson/15022/overview
2. https://www.oercommons.org/authoring/8657-biotechnology-resources/4/view
3. https://www.wileyindia.com/practical-biotechnology-principles-and-protocols.html
4. https://www.researchgate.net/publication/303997580_Principles_of_Biotechnology-Practical_Manual
5. https://www.apsnet.org/edcenter/disimpactmngmnt/labexercises/PlantBiotechnology/Pages/Activity5.aspx

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
BIOTECHNOLOGY				
1.1	Laboratory biosafety guidelines	3	PPT & Discussion	LCD
1.2	Isolation of protein from spinach leaves	3	Hands on training	Chemicals,Glasswares & Instruments
1.3	Estimation of Total soluble proteins using Bradford method	3	Hands on training	Chemicals,Glasswares & Instruments
1.4	Electrophoretic separation proteins	3	Demonstration	Chemicals,Glasswares & Instruments
1.5	Isolation of genomic DNA from goat liver.	3	Hands on training	Chemicals,Glasswares & Instruments

1.6	Isolation of Plasmid DNA by alkaline lysis method	3	Hands on training	Chemicals,Glassw ares & Instruments
1.7	Electrophoretic separation of DNA	3	Hands on training	Chemicals,Glassw ares & Instruments
1.8	Demonstration of PCR	3	Demonstration	Chemicals,Glassw ares & Instruments
1.9	Spotters: Agarose gel electrophoresis, SDS-PAGE, pBR322, Spirulina and Insulin	3	Demonstration	Specimens, Models,Print-Outs ,Bio-Visula Charts
ENTOMOLOGY				
2.1	Collection and Preservation of Insects.	3	Demonstration	Model and specimens
2.2	Spotters: Mouth parts of Cockroach & Honey bee;	3	Demonstration & Hands on training	Glass Slide,Microscope and chemicals etc.,
2.3	Spotters: Life Cycle of Holometabolous (Butterfly)and Hemimetabolous Insects (Cockroach)	3	Demonstration	Bio-Visual Charts,LCD
2.4	Spotters: Pests of Agricultural Importance – Rice Weevil, Rhinoceros Beetle.	3	Demonstration	Specimens, Models, Preserved Insect Box
BIOINFORMATICS				
3.1	Sequence retrieval from GenBank	3	Demonstration & Hands on training	LCD

3.2	Pairwise alignment - BLAST	3	Demonstration & Hands on training	LCD
3.3	Molecular visualization of Proteins- RASMOL	3	Demonstration & Hands on training	LCD

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

EVALUATION PATTERN

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

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Acquire skills in handling basic equipments	**K1**	PSO1, PSO2, & PSO7
CO 2	Identify the insects	**K1**	PSO1, PSO2

			& PSO4
CO 3	Estimate the various biomolecules using standard protocols	**K3**	PSO1, PSO2 & PSO7
CO 4	Identify and comment on the spotters Agarose gel electrophoresis, SDS-PAGE, pBR322, Spirulina and Insulin and Bioinformatics tools	**K3**	PSO1, PSO2 PSO8 & PSO10
CO 5	Examine the features in mouth parts of Cockroach & Honey bee, Pests of Agricultural Importance – Rice Weevil, Rhinoceros Beetle	**K4**	PSO1 & PSO 4

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	PSO1 0	PSO1 1	PSO1 2
CO1	3	3	2	2	2	2	3	2	2	2	2	2
CO2	3	2	2	3	2	2	2	2	2	2	2	2
CO3	3	3	2	2	2	2	3	2	2	2	2	2
CO4	3	3	2	2	2	2	2	2	2	3	2	2
CO5	3	2	2	3	2	2	2	2	2	2	2	2

Mapping of COs with POs

CO / PSO	PO 1	PO 2	PO 3	PO 4
CO 1	3	2	3	2
CO 2	3	2	2	2
CO 3	3	2	3	2
CO 4	3	2	3	2
CO 5	3	2	2	2

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

COURSE DESIGNER:

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Mary Land, Madurai

DEPARTMENT OF ZOOLOGY

III B.Sc.Zoology

SEMESTER –V

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	19Z5ME2	Animal Behaviour	Lecture	5	5

COURSE DESCRIPTION

Students gain knowledge on learning, behaviour and biorhythm in animal.

COURSE OBJECTIVES

- Acquire fundamental knowledge on the behavioural concept in animals
- Understand the environment, social and reproductive behaviour in animals
- Summarize the phenomenon behind the molecular basis of biological rhythm including circadian.

UNITS

UNIT I – INTRODUCTION TO ANIMAL BEHAVIOUR (15 HRS.)

Origin, history and scope of Ethology.Contribution of Karl Von Frish, Ivan Pavlov, Konrad Lorenz, Niko Tinbergen.Causes - Proximate and ultimate. Types - Innate and Acquired, Instinctive and Motivated behaviour. Pattern of behaviour - Stereotyped Behaviours (Orientation, Reflexes); Individual Behavioural patterns; Instinct vs. Learnt behaviour.

Self-Study - Origin, history and scope of Ethology

UNIT II – LEARNING AND MEMORY (15 HRS.)

Types of learning - Physiology and phylogeny of learning - trial and error learning, Imprinting, habituation. Classical conditioning: - Pavlov's experiment; Operant learning – Skinner's experiment, insight, Instrumental conditioning, association learning and reasoning.

UNIT III – SOCIAL AND REPRODUCTIVE BEHAVIOUR - (15 HRS.)

Social Behaviour - Communication and the senses; Altruism; Insects' society with Honey bee as example; Foraging in honey bee and advantages of the waggle dance. Sexual Behaviour: Courtship and signal: *Hilara sartor* (Balloon fly) and ♂ Stickleback's zigzag dance. Asymmetry of sex - Sexual dimorphism, Mate choice, Intra-sexual selection (male rivalry), Inter-sexual selection (female choice), Sexual conflict in parental care.

Self-Study - Insects' society with Honey bee as example

UNIT IV – NEURAL AND HORMONAL CONTROL OF BEHAVIOUR(15 HRS.)

Role of pheromones in reproductive behaviour. Communication - Chemical, visual, light and audio. Ecological aspects of behaviour - Habitat selection, food selection, anti-predator defence, aggression, host parasite relations.

Self-Study - Host parasite relations

UNIT V – BIOLOGICAL RHYTHM (15 HRS.)

Types and characteristics of biological rhythms: Short- and Long- term rhythms, Circadian rhythms, Tidal rhythms and Lunar rhythms. Concept of synchronization and masking - Photic and non-photic zeitgebers. Circannual rhythms; Photoperiod and regulation of seasonal reproduction in vertebrates - Role of melatonin.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (HRS.)

REFERENCES:

1. Arumugam, N and P. Natarajan, (2018).Animal Behaviour – Ethology.Saras Publication.Nagercoil

2. Jay. C. Dunlap, Jennifer. J.Loros, Patricia J. DeCoursey (ed). (2004). Chronobiology Biological Timekeeping: Sinauer Associates, Inc.Publishers, Sunderland, MA, USA
3. Saunders, D.S., C.G.H. Steel, X., (2002) Insect Clocks Afopoulou (ed.)R.D. Lewis. (3rdEd) Barens and Noble Inc. New York, USA
4. Vinod Kumar (2002) Biological Rhythms: Narosa Publishing House, Delhi/ Springer-Verlag, Germany.

DIGITAL OPEN EDUCATIONAL RESOURCES

1. **https://www.oercommons.org/authoring/2459-conditioning-animals-learning-behaviour-ecology-en/view**
2. **https://www.oercommons.org/browse?f.keyword=animal-behaviour**
3. **https://www.psychologytoday.com/intl/basics/animal-behavior**
4. **https://seaworld.org/animals/all-about/training/animal-behavior-and-learning/**
5. **https://www.nature.com/subjects/animal-behaviour**

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 INTRODUCTION TO ANIMAL BEHAVIOUR				
1.1	Origin, history and scope of Ethology	2	Chalk & Talk	Black Board
1.2	Contribution of Karl Von Frish, Ivan Pavlov, Konrad Lorenz, Niko Tinbergen.	1	Lecture	Black Board
1.3	Contribution of Konrad Lorenz, Niko Tinbergen	1	Lecture	PPT & White board

1.4	Causes of behaviour: Proximate and ultimate	1	Lecture	Smart Board
1.5	Types of Behaviour: Innate and Acquired	2	Lecture	Black Board
1.6	Instinctive and Motivated behaviour.	1	Discussion	Google classroom
1.7	Pattern of behaviour: Stereotyped Behaviours (Orientation, Reflexes)	3	Lecture	Black Board
1.8	Individual Behavioural patterns	2	Lecture	Black Board
1.9	Instinct vs. Learnt behaviour	2	Lecture	Black Board
UNIT -2 LEARNING AND MEMORY				
2.1	Types of learning	1	Lecture	Green Board Charts
2.2	Physiology and phylogeny of learning	2	Chalk & Talk	Green Board
2.3	Trial and error learning, Imprinting, habituation.	2	Chalk & Talk	Black Board
2.4	Classical conditioning: - Pavlov's experiment	2	Chalk & Talk	LCD
2.5	Operant learning – Skinner's experiment	4	Lecture	PPT
2.6	Insight - Instrumental conditioning, association learning and reasoning.	4	Lecture	PPT

UNIT -3 SOCIAL AND REPRODUCTIVE BEHAVIOUR				
3.1	Social Behaviour: Concept of Society; Communication and the senses	3	Lecture	Black Board
3.2	Altruism; Insects' society with Honey bee as example	2	Discussion	Black Board
3.3	Foraging in honey bee and advantages of the waggle dance	2	Chalk &Talk	Black Board
3.4	Sexual Behaviour: Courtship and signal: Hilara sartor (Balloon fly) and ♂ Stickleback's zigzag dance.	3	Chalk & Talk	LCD
3.5	Asymmetry of sex, Sexual dimorphism, Mate choice	2	Lecture	PPT
3.6	Intra-sexual selection (male rivalry), Inter-sexual selection (female choice)	1	Lecture	PPT/LCD
3.7	Sexual conflict in parental care.	2	Lecture	PPT & White board
UNIT -4 NEURAL AND HORMONAL CONTROL OF BEHAVIOUR				
4.1	Motivation: Role of hormones	2	Discussion	Black Board
4.2	Aggregation	1	Lecture	PPT

4.3	Role of pheromones in reproductive behaviour	3	Chalk & Talk	Black Board
4.4	Communication: Chemical, visual, light and audio.	3	Chalk & Talk	LCD
4.5	Ecological aspects of behaviour: Habitat selection, food selection, anti-predator defenses, aggression,	4	Lecture	PPT & White board
4.6	Host parasite relations	2	Discussion	Black Board
UNIT -5 BIOLOGICAL RHYTHM				
5.1	Types and characteristics of biological rhythms	2	Discussion	Black Board
5.2	Short- and Long- term rhythms;	2	Lecture	PPT/LCD
5.3	Circadian rhythms; Tidal rhythms and Lunar rhythms	2	Chalk & Talk	Black Board
5.4	Concept of synchronization and masking; Photic and non-photic zeitgebers	3	Lecture	Green Board
5.5	Circannual rhythms	2	Lecture	PPT
5.6	Photoperiod and regulation seasonal reproduction of vertebrates	3	Lecture	PPT
5.7	Role of melatonin	1	Lecture	LCD

INTERNAL – UG

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1 10 Mks.	T2 10 Mks.	Quiz 5 Mks.	Assignment 5 Mks	OBT/PPT 5 Mks	35 Mks.	5 Mks.	40Mks.	
K1	2	2	-	-	-	4	-	4	10 %
K2	2	2	5	-	-	9	-	9	22.5 %
K3	3	3	-	-	5	11	-	11	27.5 %
K4	3	3	-	5	-	11	-	11	27.5 %
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	Outline the scope and history of Ethology	**K1**	PSO1, PSO3, PSO4 & PSO6
CO 2	Explain the types of learning	**K2**	PSO1, PSO4 & PSO10
CO 3	Summarize the methods adopted by the animals in mate selection.	**K2**	PSO1,PSO3, PSO4 PSO8 & PSO10
CO 4	Discuss the various parameters controlling the behaviour in context to nerve and hormone	**K6**	PSO1, PSO3 PSO4 PSO6& PSO8
CO 5	Recall the types and features of biological rhythm	**K1**	PSO1, PSO3, PSO4 PSO8 & 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	3	2	1	3	2	2	2	2	2	2	2	2
CO2	2	2	2	3	2	2	2	2	2	3	2	2

CO3	3	2	1	3	2	2	2	2	2	3	2	2
CO4	3	2	1	3	2	2	2	2	2	2	2	2
CO5	3	2	1	3	2	2	2	3	2	3	2	2

Mapping of COs with POs

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

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

COURSE DESIGNER:
Dr. N. Nagarani

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HOD'S Signature & Name

FATIMA COLLEGE (AUTONOMOUS)

Re-Accredited with 'A++' by NAAC (Cycle – IV)
Mary Land, Madurai

DEPARTMENT OF ZOOLOGY

I B.Sc. Zoology

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAZO	21Z2SL1	Single Cell Protein Culture	Tutorial	-	2

COURSE DESCRIPTION

This course provides the knowledge of cultivation and usage of Single Cell Protein.

COURSE OBJECTIVES

- Emphasize the importance of microbes as an alternative source of food.
- Gain knowledge about the nutritive value of SCP.

UNITS

UNIT – I INTRODUCTION

Introduction to Single Cell Protein (SCP) - History of Single Cell Protein (SCP)– Microorganisms used in single cell protein production- Advantages of SCP – Limitations of using SCP.

UNIT –II ALGAL PROTEIN

Algaeas a source of protein-nutritive value - cultivation - extraction of protein - *Spirulina*sp.,*Chlorella*sp.

UNIT –III BACTERIAL PROTEIN

Bacterial Proteins – Culture - extraction of SCP -*Bacillus*sp.,*Pseudomonas* sp.,*Methylococcus capsulatus*.

UNIT –IV FUNGAL PROTEIN

Fungal Proteins – Culture - extraction from Yeasts -*Candida* sp.&*Saccharomyces* sp. Extraction from Fungi -*Agaricus* sp.&*Aspergillus* sp.

UNIT –V SCP PROUCTION USING WASTE MATERIAL

Production of SCP from Biomass and Waste Materials- Nutritive values of SCP – Dietary supplements for Human, Cattle and birds- Industrially used SCP (Quoron, Pruteen).

REFERENCES:

1. Patel, A.H. (2008). Industrial Microbiology, Macmillan India Ltd.
2. Arumugam, N. (2006). Microbiology, Saras Publ. Nagercoil – India
3. Kumarasan, V. (2001). Biotechnology, Saras Publ. Nagercoil – India
4. Dubey, R.C and Maheswari, D.K. (2005). A Text book of Microbiology - S. Chand & Co., New Delhi – India.
5. Rao, A.S. (1997). Introduction to Microbiology – Prentice-Hall, New Delhi, New Delhi – India.

Digital Open Educational Resources (DOER) :

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5645522/
2. https://pubmed.ncbi.nlm.nih.gov/7180229/
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5937888/
4. https://pubmed.ncbi.nlm.nih.gov/8543324/
5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6925167/

EVALUATION PATTERN

Self-Learning Courses for UG

Internal **External**

Assignment – 20 Marks **Objective – 20 Marks**

Test – 20Marks **Essay Type Qns. – 40 Marks**

Total – 40Marks **Total – 60Marks**

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	List the importance of Single cell protein	**K1**	PSO1
CO 2	Explain the different components present in algal proteins	**K2**	PSO2
CO 3	Outline the method of extraction of bacterial proteins.	**K2**	PSO2
CO 4	Organize the steps involved in the cultivation of yeast proteins.	**K3**	PSO2, PSO6
CO 5	Find the nutritive values of SCP	**K4**	PSO1, PSO6

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	2	2	2	2	2	2	2	2	2	2	2

CO2	2	3	2	2	2	2	2	2	2	2	2	2
CO3	2	3	2	2	2	2	2	2	2	2	2	2
CO4	2	3	2	2	2	2	2	2	2	2	2	2
CO5	3	2	2	2	2	3	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	2	2	3	2
CO4	2	2	3	2
CO5	2	2	2	2

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

♦ Weakly Correlated -**1**

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