

FATIMA COLLEGE (AUTONOMOUS)



**Re-Accredited with “A” Grade by NAAC (3rd Cycle)
94th Rank in India Ranking 2019 (NIRF) by MHRD
Maryland, Madurai- 625 018, Tamil Nadu, India**

NAME OF THE DEPARTMENT: ZOOLOGY

NAME OF THE PROGRAMME : M.Sc

PROGRAMME CODE : PSZO

ACADEMIC YEAR : 2021 -2022

FATIMA COLLEGE (Autonomous), MADURAI-625 018

MINUTES OF THE BOARD OF STUDIES

NAME OF THE DEPARTMENT: M.Sc Zoology


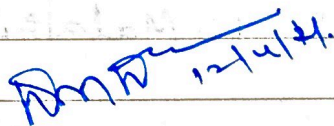

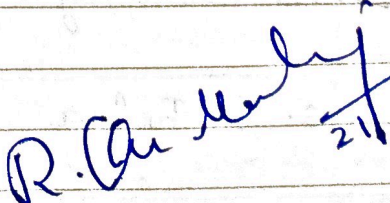
TO BE IMPLEMENTED FROM: 2021-2022 ONWARDS

VENUE: Google Meet - online

CONVENED ON: 12.04.2021

CONVENED AT: 02.00pm

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

12/4/21 |
| 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
Arumigu Palaniandavare
Arts College for Women
Palani - 625 020 | Subject Expert (Zoology)

21/4/21 |

5.	Dr. A. Vanniarajan Scientist Aravind Medical Research Foundation Madurai - 625 020	Industrialist / Scientist A. Vanniarajan 12/04/2021
6.	Miss. S. Susaritha Research Scholar PG & Research Department of Zoology The American College Madurai - 625 020	Alumna S. Susaritha 12/04/21
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
11.	Dr. V. Bharathy	Staff Member V. Bharathy 12/04/2021
12.	Dr. N. Nagarani	Staff Member N. Nagarani 12/04/21
13.	Dr. S. Barathy	Staff Member S. Barathy 12/04/2021
14.	Mrs. J. Thelma	Staff Member J. Thelma 12/04/2021
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 M.Sc Zoology

S. NO	COMMON SUGGESTIONS OFFERED IN THE PREVIOUS BOARD	ACTION TAKEN FOR THE ACADEMIC YEAR 2020-21
1.	Field visit may be included for the courses Animal Diversity, Fisheries & Aquaculture, etc.	Field visit was included for the courses Animal Diversity, Fisheries & Aquaculture, etc.
2.	Importance should be given for the usage of Full Stop, comma and hyphen while framing syllabus.	Usage of Full Stop, comma and hyphen was checked in the syllabi

CHANGE OF COURSE TITLE: 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.	19PG3Z13	Biostatistics & Research Methodology	L	R	N	G	EMP	-	SD	To enhance employability & Skill Development Aspects of the course
2.	19PG3Z14	Lab in Biophysics & Biostatistics	-	-	N	G	EMP	-	SD	To enhance the employability & Skill Development aspects of the course
3.	19PG3Z15	Lab in Immunology, Fisheries & Aquaculture and Bioinformatics	L	R	N	G	EMP	-	SD	To enhance the employability & Skill Development aspects of the course
4.	19PG4ZE3	Economic Zoology	L	R	N	G	-	ENT	SD	To enhance the employability & entrepreneurial aspects of the course

5.	19PG4ZE4	Ethology	L	R	N	G	-	-	SD	To enhance the Skill Development Aspects of the course.
6.	19PG4Z20	Lab in Biotechnology Economic Zoology + Ethology	-	-	N	G	E M P	-	SD	To enhance the Employability & Skill Development Aspects of the course
7.	19PGSLZ1	Self-Learning Course - Vector- borne Diseases	L	R	N	G	-	-	SD	offered to the Advanced Learners

REVISED COURSES

S. NO	COURSE CODE & TITLE	UNIT NO, TITLE REVISED CONTENT	% of Revision	NEED FOR REVISION	RELEVANCE TO				SCOPE FOR		
					L	R	N	G	E M P	EN T	S D
1.	19PG3ZE2 Bioinformatics	Unit-III - Pairwise Alignment Unit-IV - Multiple Sequence Alignment Unit-V - Structure prediction & Drug designing	60 %	Bioinformatics Pg2Z7 has been Offered as Elective Course	L	R	N	G	E M P	-	S D
2.	19PG4Z16 Environmental Biology	Unit-IV Environmental Pollution Unit-V Biodiversity Conservation	50 %	As per the Recommendations of the Board members, Pg2Z8 Ecology & Evolution has been made into separate Courses	L	R	N	G	-	-	S D

2. Updation of open Educational Resources

S. NO	COURSE CODE	COURSE TITLE	DETAILS OF UPDATION
1.	19PG1Z1	Animal Diversity	http://animaldiversity.org/
2.	19PG4Z18	Developmental Biology	http://www.brandguide-phmc.org/human-embryology-lecture-notes .

3. REVISION OF COURSES: NIL

4. NEW COURSES INTRODUCED

S. NO	COURSE CODE	COURSE TITLE	RELEVANCE TO				SCOPE FOR			NEED FOR INTRODUCTION
			L	R	N	G	EMP	ENT	SD	
1.	21PG1ZSLN1	Intellectual Property Rights	L	R	N	G	EMP	-	SD	offered to the Advanced Learners
2.	21PG12ZSL2	Fermentation Technology	L	R	N	G	EMP	-	SD	offered to the Advanced Learners
3.	21PG3NSLZ3	Nutrigenomics	L	R	N	G	-	-	SD	offered to the Advanced Learners
4.	21PG4ZSL4	Vector Borne Diseases	L	R	N	G	-	-	SD	offered to the Advanced Learners

5. Introduction of purely Skill-Embedded certificate/Diploma/Advanced Diploma course: NIL

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

7. Rubrics for Internship/Project:

S.NO	C1 20 MKS	C2 20 MKS	CIA TOTAL 40 MKS	EXTERNAL 60 MKS
1. Internship	Report	Presentation	Can be assessed by all the staffs of the Department	Regularity 20 MKS Work 20 MKS Report 20 MKS
2. Project	Regularity in work	Project Report	Can be assessed by all the staffs of the Department	Thesis 30 MKS Presentation 20 MKS Viva 10 MKS

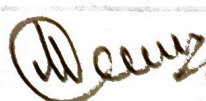
Details of Proposed/Signed MOU: NIL

OTHER SUGGESTIONS	COMMENDATIONS
1. No of Field projects in Per may be increased whenever possible	1. The Internship for postgraduate students will pave a way for their future to become an entrepreneur.
2. Online Slide Share and Video also can be added to DOER	2. Introduction of more Self-learning & interdisciplinary SLc for advanced learners is highly appreciable.
3. The DOER may have a minimum of 5 links for each paper	3. Introduction of DOER is a novel venture

Name of

Signature

- Head of the Department
Dr. A. Tamil Selvi

 12/04/2021

- University Nominee
Dr. Capt. N. Arun Nagendran

 12/4/21

3. Subject Expert
Dr. F. Brisca Renuga

Brisca 12/04/2021

4. Subject Expert
Dr. R. Uma Maheswari

R. Uma Maheswari
12/4/21

5. Dr. A. Vanniarajan (Scientist)

A. Vanniarajan 12/04/2021

6. Miss. S. Susaritha (Alumna)

S. Susaritha
12/04/21

7. Dr. N. Malathi (Dean of Academic Affairs)

N. Malathi

8. Dr. Antony Amala Jayasceli

Antony Amala Jayasceli
12/04/2021

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N. Malathi 12/4/2021

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15. Miss. T. Malar Meenakshi

T. Malar Meenakshi
12/04/2021

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18**DEPARTMENT OF ZOOLOGY***For those who joined in June 2019 onwards***MAJOR CORE – 70 CREDITS****PROGRAMME CODE:PSZO**

S.No	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. MKs
1.	I	19PG1Z1	Animal Diversity	6	4	40	60	100
2.		19PG1Z2	Microbiology	6	4	40	60	100
3.		19PG1Z3	Cell & Molecular biology	6	4	40	60	100
4.		19PG1Z4	Lab in Animal Diversity & Microbiology	4	2	40	60	100
5.		19PG1Z5	Lab in Cell & Molecular Biology	4	2	40	60	100
6.	II	19PG2Z6	Genetics	6	4	40	60	100
7.		19PG2Z7	Evolution	6	4	40	60	100
8.		19PG2Z8	Biochemistry	6	4	40	60	100
9.		19PG2Z9	Lab in Genetics & Evolution	4	2	40	60	100
10.		19PG2Z10	Lab in Biochemistry	4	2	40	60	100
11.	III	19PG3Z11	Biophysics	6	5	40	60	100
12.		19PG3Z12	Immunology	6	5	40	60	100
13.		19PG3Z13	Biostatistics & Research Methodology	6	5	40	60	100
14.		19PG3Z14	Lab in Biophysics & Biostatistics	4	2	40	60	100
15.		19PG3Z15	Lab in Immunology, Fisheries & Aquaculture and Bioinformatics	4	2	40	60	100
16.	IV	19PG4Z16	Environmental Biology	6	5	40	60	100
17.		19PG4Z17	Biotechnology	6	5	40	60	100
18.		19PG4Z18	Developmental Biology	6	5	40	60	100
19.		19PG4Z19	Lab in Environmental Biology & Developmental Biology	4	2	40	60	100
20.		19PG4Z20	Lab in Biotechnology, Economic Zoology & Ethology	4	2	40	60	100
TOTAL				104	70			

**MAJOR ELECTIVE / EXTRA DEPARTMENTAL COURSE / INTERNSHIP/
PROJECT -20 CREDITS**

S. No	SEM.	COURSE CODE	COURSE TITLE	H RS	CRE DITS	CIA Mks	ESE Mks	TOT. Mks
1.	I	19PGZ1EDC	Herbal Medicine	3	3	40	60	100
2.	II	19PGZ2EDC	Herbal Medicine	3	3	40	60	100
3.	III	19PG3ZE1/ 19PG3ZE2	Fisheries & Aquaculture / Bioinformatics	4	4	40	60	100
4.		19PG3ZSI	Summer Internship	-	3	40	60	100
5.	IV	19PG4ZE3/ 19PG4ZE4	Economic Zoology/ Ethology	4	4	40	60	100
6.		19PG4ZPR	Project*& Viva Voce	-	3	50	50	100
TOTAL				14	20			

OFF-CLASS PROGRAMMES

ADD-ON COURSES

COURSE CODE	COURSES	HRS.	CRE DITS	SEMESTER IN WHICH THE COURSE IS OFFERED	CIA MKS	ES E MKS	TOT AL MAR KS
19PAD2SS	SOFT SKILLS	40	3	I	40	60	100
19PAD2CA	• COMPUTER APPLICATIONS Computer Application for Biologists /SPSS	40	4	II	40	60	100
19PAD4CV	COMPREHENSIVE VIVA (Question bank to be prepared for all the courses by the	-	2	IV	-	-	100

	respective course teachers)						
19PAD4RC	READING CULTURE	2	1	I- II	-	-	-
TOTAL			10				

EXTRA CREDIT COURSES

Course Code	Courses	Hrs.	Credits	Semester in which the course is offered	CIA Marks	ESE Marks	Total Marks
21PG2ZSL1	SELF LEARNING COURSES for ADVANCED LEARNERS Fermentation Technology	-	2	II	40	60	100

- **Lab Courses:**

- A range of 10-15 experiments per semester

- **Summer Internship:**

- Duration-1 month (2nd Week of May to 2nd week of June-before college reopens)

- **Project:**

- Off class
- Evaluation components-Report writing + Viva Voce (Internal marks-40) + External marks 60

- **EDC:**

Syllabus should be offered for two different batches of students from other than the parent department in Sem-I & Sem-II.



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 Mary Land, Madurai - 625 018, Tamil Nadu

DEPARTMENT OF ZOOLOGY

For those who joined in June 2019 onwards

I M.Sc.ZOOLOGY

SEMESTER –I

For those who joined in 2021 onwards

Discipline Specific Self Learning Course

PROGRAM ME CODE	COURSE CODE	COURSE TITLE	CATEGO RY	HRS/WEE K	CREDIT S
PSZO	21PG2ZS L1	Fermentation Technology	Tutorial	-	2

COURSE DESCRIPTION

This course deals with culturing microorganisms on a large scale to produce valuable commercial products.

COURSE OBJECTIVES

- To empower the students with various designs of fermentor.
- To enable the students understand the fermentation process to manipulate microbes for improvement.

UNITS

UNIT –I INTRODUCTION

History, Scope and Development of Fermentation technology; Isolation and screening of industrially important microorganisms – primary and secondary screening; Maintenance of Strains; Strain improvement: Mutant selection and Recombinant DNA technology.

UNIT –II BIOREACTORS

Basic concepts for selection of a reactor, Types- Packed bed reactor, Fluidized bed reactor, Trickle bed reactor, Bubble column reactor, Waldhof, Tower, Deep jet, Cyclone column, Packed tower and airlift fermenter, Membrane reactor, Photo bioreactor, Solid state fermenter.

UNIT –III TYPES OF CULTURE

Criteria for transfer of inoculum for bacteria, yeast and mycelia; aseptic methods of inoculation, media components - Role of buffers, antifoaming agents, aeration, and agitation. Microbial growth kinetics, Types of culture - Batch culture, Continuous Culture, Fed – Batch.

UNIT –IV PROCESSING AND RECOVERY OF PRODUCTS

Recovery of particulate matter, product isolation, distillation, centrifugation, whole broth processing, filtration, aqueous two-phase separation, solvent extraction, chromatography and electrophoresis.

UNIT –V PRODUCTS OF FERMENTATION TECHNOLOGY

Fermentation processes for production of Single cell protein SCP, enzymes, alcohol, vitamin-B1, amino acids- glutamic acid, organic acid- citric acid, Antibiotic- penicillin, Bioprocess economics and bioproduct regulation.

UNIT –VI DYNAMISM(For CIA only)**REFERENCES:**

1. Arnold L. Demain & Julian E. Davis. Industrial Microbiology & Biotechnology, ASM Press (2004).
2. Coulson, J.M. and J.F. Richardson; 6th Edition, Chemical Engineering Elsevier. McGraw Hill Publication. (1999).
3. Shuler, M. L. and F. Kargi., (2002). Bioprocess Engineering Basic Concepts, 2nd ed., Prentice Hall, Upper Saddle River, NJ,
4. Daniel I. C., et al., (1979) "Fermentation and Enzyme Technology," John Wiley, New York .
5. Willey, J. M. Shrewood, L. M. (2008) Microbiology .7th ed. McGraw Hill., 1067-1069
6. Peter F Stanbury, Allan Whitaker, Stephen J Hall. *Principles of Fermentation Technology*. (2016) Butterworth-Heinemann Press. UK.
7. H. J. Peppler, D. Perlman. *Microbial Technology: Fermentation Technology*. (2014). Academic Press.

8. T. El-Mansi, C. Bryce, Arnold L. Demain, A.R. Allman. *Fermentation Microbiology and Biotechnology*. Second Edition. (2006). CRC Press, USA.
9. Hongzhang Chen. *Modern Solid State Fermentation: Theory and Practice*. (2013). Springer Press, Germany.
10. John E. Smith. *Biotechnology*. (2009). Cambridge University Press. UK.
11. Celeste M. Todaro, Henry C. Vogel. *Fermentation and Biochemical Engineering Handbook*. (2014). William Andrew Press. Norwich, NY.
12. G. Lancini, R. Lorenzetti. *Biotechnology of Antibiotics and other Bioactive Microbial Metabolites*. (2014). Springer publications, Germany.

DIGITAL OPEN EDUCATIONAL RESOURCES (DOER):

1. <https://www.open.edu/openlearn/ocw/mod/oucontent/view.php?id=83424§ion=2.3>
2. <https://www.oercommons.org/search?f.search=Fermentation+technology>
3. <https://openlab.citytech.cuny.edu/bio-oer/cellular-energy/fermentation/>
4. <http://uilis.unsyiah.ac.id/oer/items/show/4191>
5. <https://www.biotechnologynotes.com/amino-acids/industrial-production-of-amino-acids-by-microorganism-and-fermentation/13820#:~:text=Of%20the%20various%20amino%20acids,of%20these%20two%20amino%20acids.&text=Apart%20from%20fermentative%20processes%2C%20some,quite%20economically%20by%20chemical%20processes.>

EVALUATION PATTERN

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	Recall the history and scope of fermentation process	K2	PSO 1
CO 2	Differentiate the types of fermentors	K4	PSO 1
CO 3	Analyse kinetics of cell and product formation in batch, continuous and fed-batch cultures	K4	PSO 3
CO 4	Identify different industrial processes involved in product recovery	K3	PSO 9
CO 5	Evaluate the applications and products of fermentation technology	K5	PSO 9

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

Mapping of COs with POs

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

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

COURSE DESIGNER:
Mrs. J .Thelma

Forwarded By



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

**HOD'S Signature
& Name**