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

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	FATIMA COLLEGE (Autono	mons), MADURA1-625 018					
10	MINUTES OF THE BOAR	DOF STUDIES					
	NAME OF THE DEPARTMENT: M.Sc Zoology						
	TO BE IMPLEMENTED FROM! 2	01 021-2022 ONWARDS					
	VENUE: Google Meet - online						
	CONVENED ON: 12.04.2021	CONVENED AT: 02.00pm					
	MEMBERS PRESENT:	a Mirra R. Donald Discour					
		La la de de la constante de la					
1.	Dr. A. Tamil Selvi	Head of the Department					
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		Head of the Department					
2.	Dr. Cant. N. Arun Magendran	University Nominee					
. I work sprawages	Dr. Capt. N. Arun Nagendran Associate Professor						
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	PGI & Research Department of	San Windalth.					
	Zoslogy	M. J.					
	Thiagarajar College Madurai - 625 009						
	Madurau - 625 007						
		Subject Expert (Zoology)					
3.	Dr.F. Brisca Renuga						
- H	Associate Professor	(m2 =0/10/14/900/					
ng program	Department of Zoology	m3-01/2/4/202/					
	Holy cross collège (Autonomons)						
	Nagercoil-04						
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4.	Dr. R. Uma Maheswari	Subject Expert (Zoology)					
	Assistant Professor	E CAMPAGO PROPERTIES					
	PG Department of Zoology	12					
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5	Dr. A. Vanniarajan	Industrialist / Scientist
	Scientist	A Wassish (
	Aravind Medical Research	A. Vannich (12/04/2021
	Foundation	and the second of the second o
	Madurai - 625 020	
6.	Miss.S. Sugaritha	Alumna S. Susaritha 12/04/21
	Research Scholar	S. Susantha
	PG & Research Department of	12/04/2
	Zoslogy	
	The American College	
	Madurai -625020	
7.	Dr. N. Malathi	Dean of Academic Affa
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8 .	Dr. Antony Amala Jayaseeli	Staff Member Jayant.
		thing Ament of 12/09
9.	Dr. N. Malathi	Staff Member
1	A American March Control of the Control	Walethi:
10.	Dr. Sr. Biji cyriac	Staff, Member
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11.	Dr. V. Bharathy	Staff Member
		V Bh 1200/2001
12.	Dr.N. Nagarani	Staff Member
		16. 16 9 12/4/21
13:	Dr.S. Barathy	Staff Member
,		8 Bestey 12/12/2021
14.	Mrs. J. Thelma	Staff Member
	· · · · · · · · · · · · · · · · · · ·	Theld 12/4/2021
15:	Miss. T. Malar Meenak Shi	Staff Member
		Tholog Alexandri 12/04/2021
		12/04/2021

MINUTES OF THE BOARD OF STUDIES

1. ACTION TAKEN REPORT FOR 2020-2021 M.Sc Zoology

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diable Ar-	S. NO	COMMON SUGGESTIONS OFFERED IN THE PREVIOUS BOARD	ACTION TAKEN FOR THE ALADEMIL YEAR 2020-21
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		included for the courses	courses Animal Diversity,
		Animal Diversity, Fisherics	
8		4 Aquaculture, etc.	
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2. Updation of open Educational Resources

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37°	S. No	COURSE CODE	COURSE TITLE	DETAILS OF UPDATION
3. 1		19 PG1 Z1	Animal Diversity	http://animaldiversity.org/
		And the sea they are to see	Developmental	http://www.brandguide-
		IT Palace sun	Biology	phmc.org/human-embryology- lecture-notes.

3. REVISION OF COURSES: NIL

		NEW COURSES	IN	TRE	DUC	LED				
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4.	21PG4ZSL4	Vector Borne Diseases	L	R	7	G			SD	Advanced Learners
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- 5. Introduction of purely Skill-Embedded Certificate/Diploma/Advanced
 Diploma course: NIL
- 6. Approval of Ph.D course work Syllabus: NIL

	for Internstr Cl 20 MKs		CIA TOTAL 40 MKs	EXTERNAL 60 MKS
1.Internslup			by all the staffs of the Department	Work 20 MK
2. Project	Regularity in work	project Report	by all the staffs of the Department	Thesis 301 Presentation 201 Viva 10MK
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3.	Subject Expert	
y nigotamanan kalamatan sa sala	Dr. F. Brisca Renuga	Bor 12/04/202/
4.	Subject Expert	4
	Dr. R. Uma Maheswari	R. On realization 12/4/21
5.	Dr.A. Vanniarajan (Scientist)	A Vannel (12/04/2021
6.	Miss.s.Susaritha (Alumna)	J. Jusan thas. 12/04/21
7.	Dr.N. Malathi (Dean of Academic Affaix)	
_8.	Dr. Antony Amala Jayasceli	Atry twale Tayant
9.	Dr. N. Malathi	Ablathi :12/4/2021
	Dr. Sr. Biji cyriac	Sp. Biji Syane
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1	Dr. N. Nagarani	No. Nog 12/4/21
1	Dr. S. Barathy	
	Mrs. J. Thelma	July 12/4/2021
15.	Miss.T. Malar Meenakshi	Thatathlandaria 12/04/2021
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FATIMA COLLEGE (AUTONOMOUS), MADURAI-18 DEPARTMENT OF ZOOLOGY

For those who joined in June 2019 onwards

MAJOR CORE - 70 CREDITS

PROGRAMME CODE:PSZO

S.N o	SEM.	COURSECO DE	COURSE TITLE	HRS	CRED ITS	CIA Mks	ESE Mks	TOT. MKs
1.		19PG1Z1	Animal Diversity	6	4	40	60	100
2.		19PG1Z2	Microbiology	6	4	40	60	100
3.	I	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.		19PG2Z6	Genetics	6	4	40	60	100
7.	**	19PG2Z7	Evolution	6	4	40	60	100
8.	II	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.		19PG3Z11	Biophysics	6	5	40	60	100
12.		19PG3Z12	Immunology	6	5	40	60	100
13.	Ш	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.		19PG4Z16	Environmental Biology	6	5	40	60	100
17.		19PG4Z17	Biotechnology	6	5	40	60	100
18.	IV	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.	COURSECO DE	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 DIT S	SEMEST ER IN WHICH THE COURS E IS OFFERE D	CIA MK S	ES E MK S	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.	Cred its	Semeste r in which the course is offered	CIA Mk s	ES E Mk s	Total Mark s
	SELF LEARNING COURSES for						
21PG2ZS L1	ADVANCED LEARNERS	-	2	II 40	40	60	100
	Fermentation Technology						

• Lab Courses:

o 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:

- o 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.



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

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	COURSE	COURSE	CATEGO	HRS/WEE	CREDIT
ME CODE	CODE	TITLE	RY	K	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=83
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- 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. <a href="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%20chemicall%20processes.

EVALUATION PATTERN

Internal		External
Assignment	2 – 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
со з	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	К3	PSO 9
CO 5	Evaluate the applications and products of fermentation technology	К5	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	РО3	PO4
CO1	3	3	2	2
CO2	3	3	3	2
соз	3	3	3	2
CO4	3	3	3	2
CO5	3	3	3	2

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

COURSE DESIGNER: Mrs. J .Thelma

Forwarded By

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HOD'S Signature & Name