

ST. XAVIER'S COLLEGE (AUTONOMOUS)

Palayamkottai - 627 002

(Recognized as "College with Potential for Excellence" by UGC)

(Re-accredited with "A" Grade with a CGPA of 3.50)



SYLLABUS

M.PHIL. ZOOLOGY
(w.e.f June 2018)

Programme Name : M.Phil. Zoology
Programme Code : MPZO

Course objectives

The objectives of the M.Phil. Zoology Degree course in Zoology are enable the students to the following criteria:

- 1) combine academic components with relevant applied aspects suitable for the problems of regional and national interest
- 2) expose the students to the recent developments of various technologies in zoology
- 3) equip the students for better performance in basic and applied research
- 4) train them to perform better in various competitive examinations conducted by UGC, CSIR, DBT, ICMR etc.

Duration: The M.Phil course is a two semester covering one academic year for full-time students.

Eligibility

Students who have cleared the common entrance examination conducted by any universities in India is eligible to apply for M.Phil. Zoology. Manonmaniam Sundaranar University has been conducting this entrance examination twice in every academic year during the months of May and November. Any student who has passed in the NET or equivalent examination shall be allowed to apply for the M.Phil. programme without appearing for the entrance examination conducted for admission to M.Phil. programme of this University.

M.Phil. scholars admitted into the programme shall present at least one research paper in a conference / seminar before the submission of dissertation / thesis and produce evidence for the same in the form of presentation certificates / reprints.

Programme Specific Outcomes :

At the completion of the M.Phil. programme in Zoology the students will be able to

1. Gain knowledge on how to write a thesis, and also mini and/or major projects to various funding agencies
2. Apply various statistical, instrumentation, computer and analytical tools in biological resources
3. Understand in a special way importance of aquaculture and entomology and taken up their research carrier leading to Ph.D. on these subjects
4. Gain knowledge and hand on exposure to research related to basic and applied aspects of aquaculture or entomology

Programme Structure:

The course of study of the degree shall consist of (a) Part-I comprising three theory papers according to the Syllabus prescribed by the board of studies will help the students to know about recent development in zoology. Third paper should be the Project oriented paper(s) that enable students to gain skill development in the specific field. The syllabus for this paper is related to the expertise of the concerned faculty to know the theoretical knowledge the proposed research and (b) Part-II comprising comprehensive dissertation and *viva-voce*.

Semester	Course Code	Title of the Course	Hours	Credits
I	18MPZO11	Research Methodology	4	4
	18MPZO12	Aquaculture Biotechnology / Insect Pest Management Techniques	4	4
	18MPZOE11	Project Oriented Elective Course	4	4
II	18MPZOE21	Dissertation and viva-voce	-	12
			12	24

Scheme of Examinations for M.Phil (Zoology) with effect from 2017-2018

Project Oriented Elective Course – As prescribed by the project guide

Viva-Voce will be conducted with the following members

H.O.D – Member of the Viva Examination

Guide – Chairman of the Viva Examination

External examiner - Member of the Viva Examination

Double valuation procedure will be adopted for Dissertation, one by the respective guide and the other by the external examiner, preferably by the viva-voce examiner.

Dissertation and viva voce

1. The tentative shall be intimated within one month after the completion of the Theory paper examination.
2. Candidates shall submit the Dissertation to the controller of examinations through the Supervisor and Head of the Department at the end of the academic year from the commencement of the course, which shall be valued by internal examiner (Supervisor) and one external examiner appointed by the controller of examinations from a panel of four names sent by the supervisor through the Head of the Department.
3. The examiners who value the Dissertation shall report on the merit of candidates as “Highly Commended” (75% and above) or “Commended” (50% and above and below 75%) or “Not Commended” (below 50%).
4. If one examiner commends the Dissertation and the other examiner, does not commend, the Dissertation will be referred to a third examiner and the third valuation shall be final. Submission or resubmission of the Dissertation will be allowed twice a year

RESEARCH METHODOLOGY
(Course Code:18MPZO 11)

Semester: I Core Theory : 1 Hours: 4 Credits: 4

Course Outcomes: At the end of the course the students will be able to

1. Learn, how to write a thesis, and also a research project
2. Learn the importance and utilization various instrumentation to solve biological problems
3. Learn the importance and incorporation of various statistical tools to solve biological problem
4. Understand the utility value of different biotechnological tools in biology
5. Learn the role of computer programmes concepts and application in zoology

UNIT I: DISSERTATION

16 Hours

Basic concepts of research, Parts of the dissertation, Method of writing Dissertation - Preparation of abstract, Collecting information for Introduction and definition of the research problems, Development and standardization of materials and methods with specific objectives of research problem, Interpretation of data and results, method and strategy of discussing results, Tactics of Summarizing the results; Basics of Bibliographic Citations, Different Bibliographic styles.

UNIT II: BIOINSTRUMENTATION:

16 Hours

Principle, structural components of the instrument, working method and applications of pH meter, Centrifuge, Spectrophotometer, UV-Visible spectrophotometer, IR spectrophotometer, NMR and Types, X-ray diffraction, Mass Spectrophotometer, GC-MS, HPLC; Different types of Microscopes (Light, SEM, TEM) used in Biological Sciences.

UNIT III: STATISTICS:

16 Hours

Simple mean, standard deviation, standard error; Hypothesis – formulation and testing; students t-test, and F distribution, Use of statistical tables and levels of significances; Linear regression; Correlation; Analysis of variance: ANOVA and MANOVA; Post- ANOVA-DMRT, Tukey's; Principal Component Analysis (PCA), Discriminate Function Analysis (DFA), Cluster Analysis

UNIT IV: BIOTECHNIQUES

16 Hours

Protein Biotechniques: SDS-PAGE, MALDI; Nucleic acid biotechniques- AGE, PCR, Southern and Western blotting techniques; Immunological techniques- ELISA, flow cytometry, and immuno-histochemistry; Animal cell and tissue culture- cell culture medium; culture and sub-culture methods, cell lines; Cryopreservation- instruments, cryoprotectants, gamest preservation.

UNIT V: COMPUTER APPLICATIONS

16 Hours

Data mining - internet – worldwide web – email; Use of MS-Excel for statistical analysis; Power point and data presentations; SPSS package for chart, line diagram, cluster analyses, LC₅₀ / LD₅₀ calculation; Life table analysis, Bioinformatics – Concept and its applications.

REFERENCE BOOKS:

1. Davis, GB and CA Parker. 1997. Writing the doctoral dissertation. Barrons Educational series, 2nd Edition.
2. Kannan, S. M. Krishnan, R.Thirumurugan and S.Achiraman. 2012. Methods in Molecular Biology – From Cell to Molecules. First Edition, UVN- Press, India
3. Duncary P. 2003. Authoring a Ph.D thesis: How to plan, draft, write and finish a doctoral dissertation. Palgrave Macmillan.
4. Zar, Jerrold H. 2008. Biostatistical Analysis (3rdedn.). Pearson Education Inc., New Delhi.

AQUACULTURE BIOTECHNOLOGY

(Course Code:18MPZO 12)

Semester: I Core Theory : 2 (optional) Hours: 4 Credits: 4

Course Outcomes: At the end of the course the students will be able to

1. Learn the utility value of aquaculture to solve growing populations world-wide
2. Understand the concept and application of genetics and breeding technique in aquaculture
3. Learn how to formulate various types of feed and feeding techniques
4. Understand the immunological aspect of fish and its role in fish diseases
5. Learn various modern high throughput techniques in aquaculture development

UNIT I: SUSTAINABLE AQUACULTURE 16 hrs

Issues of aquaculture: Environmental damage; domestication; High cost of feed; disease outbreak. Strategies for sustainability: Sustainability concept; food security; biosecurity; organic farming; integrated farming; Sustainable use of antibiotics, bioremediation; role of biotechnology, traceability. Application of nanotechnology in aquaculture.

UNIT II: FISH GENETICS & BREEDING 16 hrs

Polyploidy, Gynogenesis, Androgenesis and Nuclear Transplantation. Sex reversal: Sexual dimorphism, chemical and mechanical sterilization, Hormonal Sex Reversal, Anabolic effect and Health issues. Transgenesis: Principles of transgenic technology and its application in fisheries. Endocrine manipulation of fish breeding: types and role of hormones used in induced breeding. Conservation genetics: Cryopreservation of gametes, significance of cryopreservation in Aquaculture.

UNIT III: NUTRITION & FEED TECHNOLOGY 16 hrs

Micro-nutrients and vitamins in fish feed, dietary amino acids through GMOs, Probiotics, single cell proteins, Nutraceuticals in fish nutrition. Micro encapsulated feeds, micro bound feed, micro coated feeds, micro-particulate feeds and bio-encapsulated feeds. Sustainable technique for live feed culture: Micro algae-indoor and mass culture methods; Copepod culture

UNIT IV: FISH IMMUNOLOGY & PATHOLOGY 16 hrs

Defence mechanism in fish: Specific and non-specific defence mechanism, immunogenicity, immune cells, immune suppressant, ontogeny of immune system; cellular adaptation, pathogen specificity. Disease diagnostics tools: Histopathological methods, molecular diagnosis of viral diseases: PCR, Dot-blot, Ribotyping, Immunoassay, Biochemical assay, Serological techniques. Disease treatment: vaccines and bactericins, development of vaccines DNA vaccine, adjuvants and immunostimulants.

UNIT V: ANALYTICAL TECHNIQUES & MEASUREMENTS

16 hrs

Aquatic biodiversity measurements: Biodiversity indices-Berger and Parker index, Simpson's index, Shannon index and Brillouin Index. Age and growth measurements: Age and growth measurement methods-Length frequency, Otolith & bone method and details of scale method, length and weight relationship and Morphometric analysis. Molecular markers used in aquaculture: Multiple arbitrary primer markers-RAPD, AFLP, RFLP and allozymes.

References:

1. Leung, L. K. P. and Jamieson, B. G. M. 1991. Live preservation of fish gametes. In : Fish Evolution and Systematics : Evidence from spermatozoa (Ed. Jamieson, B. G. M.) pp. 245 – 295, Cambridge University Press
2. Carvalho, G. R. and L. Hauser 1995. Molecular Genetics in Fisheries. Chapman and Hall, London.
3. Nair, P.R. 2008. Biotechnology and Genetics in Fisheries and Aquaculture. Dominant Publ.
4. Pandian, T.J, Strussmann, C.A and Marian, MP. 2005. Fish Genetics and Aquaculture Biotechnology, Science Publication.
5. Biswas, K. P. 2000. Prevention and control of fish and prawn diseases, Narendra Publishing House, Delhi.
6. Dubey Bandana Gosh, S.K. 2012. Fish biotechnology. Wisdom Press, New Delhi.

INSECT PEST MANAGEMENT TECHNIQUES

(Course Code:18MPZO 12)

Semester: I Core Theory : 2 (optional) Hours: 4 Credits: 4

Course Outcomes: At the end of the course the students will be able to

1. Learn to take decision based on the population, type of pests in an agro-ecosystem
2. understand the role of Physical, mechanical, cultural and legislative control of insect pests
3. understand the role of various chemicals in insect pests control
4. understand the role of various biocontrol agents in pestiferous insects control
5. How recent advancement play a vital role in pest control

Unit-I : Insect pest and Management decision 16 Hrs

Insect pests - nature of damage, diagnosis of pest problem (pest identity and distribution); Estimation of damage -techniques and devices; Economic threshold level-damage concept, economic injury level; Pest management decision making

Unit-II: Physical, mechanical, cultural and legislative control 12 Hrs

Physical control: Manipulation of abiotic factors (Temperature, water, humidity, fire)

Mechanical control: Hand picking and swatting or destruction, trapping

Cultural control: Ploughing and tilling; Crop rotation; Concepts of trap, inter, and barrier crops; Manipulation of sowing and harvest dates.

Legislative control: Enforcement of laws to prevent the import/export and spreading of major pests.

Unit-III: Chemical control 16 Hrs

Inorganic insecticides (arsenicals, sulphur, metal phosphides); Organic insecticides (hydrocarbon oils); Synthetic organic insecticides –Organochlorine (DDT, BHC); Organophosphorous insecticides (chlorpyrifos, monocrotophos); Carbamates (carbaryl); Organic sulphur insecticides (tetradifon); Synthetic pyrethroids (allethrin, cypermethrin); Heterocyclic compounds (bromodiolone); Fermentation products (spinosad), Fumigants (methyl bromide) - modes of action, bio-safety and precautions.

Unit- IV: Biological control Agents 16 Hrs

Botanicals: Common Indian plants (10 no.) with insecticidal properties - vernacular name, availability, and economic importance; Commercial insecticides (azadirachtin, nicotin, pyrethrum, rotinome, pungamine, ryania, anonin) chemical structure, characters and mode of action, spectrum of control with crop specification.

Entomopathogenic Microbes: Bacteria (*Bacillus thuringiensis*); Fungi (*Metarhizium anisopliae*); Virus (NPV), Protozoan (*Neseria gonorrhoeae*), Nematodes (*Steinernema*) - desirable characters, culture, formulation.

Parasites and predators: Egg, larval, pupal and adult parasites (any one); Predators – Neuroptera (*Crysoperla cornea*), Lace wing (*Crysoperla carnea*), Coleoptera (*Cryptalenomous montrusouri*); Assassin bugs (*Rhynocoris fuscipes*)

Unit- V: Recent advances in Pest Management

16 Hrs

Semio-chemicals (Pheromones, Kairamones); Insect Growth Regulators (juvenile hormones and their analogues, Ecdysone); Insect Sterilization techniques (IST) - Physical (sound waves, microwave, X-rays, γ -rays) and Chemical (metals, EDTA) agents; Transgenic crops (Cotton, Rice, Brinjal) - impact on biodiversity, Ethical issues; Integrated and Bio-intensive Integrated Pest Management.

Reference books

1. David, B.V and Ananthakrishnan T.N. 2004. General and Applied Entomology, Tata McGraw- Hill Publishing Company, New Delhi, pp.1184
2. Robert F. Noris, Edward P. Caswell-Chen and Marcos Kogan. 2002. Concepts of Integrated Pest Management, Prentice-Hall of India, New Delhi, pp.586.
3. Francis Borgio. J, Sahayaraj. K and Alper Susurluk. 2011. Microbial insecticides Principles and Applications, Nova Science Publisher Inc, New York, pp.492.
4. Sahayaraj, K. (Ed.). 2014. Basic and Applied aspect of Biopesticides, Springer India Publications, pp.384.
5. David, B.V and Ramamoorthy V.V. 2014. Elements of Economic Entomology, Namartha Publications, Chennai.

Project Oriented Elective Course
(Course Code:18MPZO E21)

Semester: I

Elective: 1

Hours: 4

Credit: 4

1. Syllabus will be framed by the respective guide
2. Syllabus is purely related to the dissertation
3. In order to gain knowledge and know about the concept of the dissertation, student regularly integrated with the guide
4. No internal test
5. Only external test will be conducted
6. Questions will be framed by the respective guide

Course Outcomes: At the end of the course the students will be able to

1. Learn various concepts involved in his/her chosen area of research
2. know what are the techniques involved in the his chosen area of research
3. know what are the different biostatistics can be incorporated to analyze the data
4. How to frame, and write a thesis
5. Learn pros and concept of chosen area of research and also in a thesis

Dissertation with Viva-Voce Examination

(Course Code:18MPZO E22)

Semester: II

Elective: 2

Hours: 10

Credit: 12

Objective

To promote original thinking, insemination of knowledge, modulation and innovation of thought, as an exercise, in order to transport the young minds to the expanding horizon of their chosen area of knowledge and transform them into knowledge generators.

Course Outcomes: At the end of the course the students will be able to

1. Learn how to design and executive a biological problem
2. Techniques involved in the analysis of biological problem
3. Various tools can be used to analyze the data
4. Learn to write, rewrite, check the plagiarism of a thesis
5. Learn pros and concept of biological problems and thesis writing

Process and dissertation frame work

The M.Phil. Dissertation work shall involve in depth study and critical review of the area of the topic and creation of new knowledge in the area. It may include results of original research, a fresh interpretation of existing facts and data or a critical analysis of the state-of-art in the area.

All the students must undertake dissertation work at the final semester (II semester). Each M.Phil. scholar can select a supervisor from faculty member of the department to their choice to work on the dissertation. The maximum number of M. Phil. scholars under a supervisor shall not normally exceed two or three. The topic of research should relate to the Zoology that the student intends to undertake. This process includes:

- (a) The conceptualization of the independent research that will comprise the dissertation,
- (b) The preparation of and satisfactory defense of the dissertation proposal,
- (c) The collection, analysis and interpretation of data,
- (d) Presentation of findings in the dissertation format and oral defense of the dissertation.

Dissertation activity must be completed within prescribed time frame for the semester.

As regards Dissertation, the scheme of evaluation shall be as follows:

Submission, chapters and format of the report:

Candidates must submit three copies of the report duly signed and endorsed by the Head and the Guide to the Head. Following is a brief guideline for the sections / chapters in the report and the formatting of the report. The report will have three main parts:

- a. Initial Pages—in the following sequence: Title Page, Certificate from the guide and declaration by the candidate, Endorsement by the Head of the department, Acknowledgement, Table of Contents, List of figures, photos, drawings, tables; List of abbreviations
- b. Main body of the report consists of Literature review, Introduction with objectives, Methodology, Results and discussion, Conclusions and Summary, Recommendations and References
- c. Appendices (if any)

The system of evaluation shall be as follows:

1. Project work would be assigned at the beginning or end of Semester I to enable students to initiate work on the same.
2. It would formally begin from Semester II and shall be theoretical in nature. The candidate should submit: Tentative title, review of literature, objectives and proposed methodology during the first week of the semester II. This component would be evaluated for 25 marks.
3. In addition, 30 and 60 working days, the candidate should submit results and these components would be evaluated for 25 marks each
4. The Dissertation prepared in the prescribed format, and a Panel of Examiners shall submit to The Controller of Examinations by the candidate by the last date of submission announced by the Controller of Examinations
5. The M.Phil Dissertation will be evaluated by the approved Evaluators as per guidelines prescribed by the College.
6. Oral Defence Examination (*Viva-Voce*): The candidate shall be required to defend his dissertation orally (viva-voce examination) by Power point before a duly constituted Committee (Head, Guide, and external examiner). The date and time of the *viva-voce* shall be duly notified by controller to enable the interested faculty members, staff members and students to attend it.
7. There shall be open *viva-voce* examination (conducted by a board of faculty members) at the end of Semester II on the Dissertation that shall be evaluated for 25 marks.

Dissertation: 75 marks (25 + 25 + 25 – evaluated by the guide and another faculty member from the department); ***Viva voce* examinations: 25 marks**

Allotment of Marks

CIA – 1 conducted for 70 marks

CIA – 2 conducted for 70 marks

Average marks of CIA -1 and 2 will be considered to 70 marks

Assignment – 15 marks + Viva voce – 15 marks

Aggregate marks = 100

Question Pattern for CIA and Semester examinations

Examination type	Section A (1 mark)	Section B (2 marks)	Section C (5 marks)	Section D (15 marks)
	No choice	No choice	Either or	Internal Choice
CIA test	10 x 1 = 10	5 x 2 = 10	4 x 5 = 20	2 x 15 = 30
Semester examinations	20 x 1 = 20	5 x 2 = 10	5 x 5 = 25	3 x 15 = 45