# GURU NANAK COLLEGE (AUTONOMOUS)

(Affiliated to University of Madras and Re-Accredited at 'A' Grade by NAAC)

Velachery Main Road, Velachery, Chennai – 600042.

## M.Phil. Zoology

(SEMESTER PATTERN WITH CHOICE BASED CREDIT SYSTEM)

# Syllabus

(For the candidates admitted in the Academic year 2017-18 and thereafter)

## Vision

To instill the scientific dogmas of nature; to provoke the interest towards learning science and allied subjects; to equip the students with scientific skills to acquire competency needed for employment; to inculcate professional ethics and value-based education to improve socio-economic status; to impart interdisciplinary approach for identifying and solving real world scientific problems through research.

## Mission

- To facilitate an encouraging and exciting environment to develop the scientific temper in students through a curriculum based on fundamental as well as advanced scientific knowledge.
- To provide technical skills in the respective disciplines through conducting practical training including internship as well as project, this will hone the skills necessary to become a successful mathematician, physicist, chemist, biotechnologist and visual communication professional.
- To inculcate interdisciplinary knowledge, elective subjects in various fields are offered, thereby providing an opportunity to the students to identify their interest towards a particular field and pursue the passion.

## PROGRAMME OUTCOME

**PO 1:**Acquire a comprehensive knowledge of research methodology and gain the skills to teach basic and advanced concepts in life sciences.

**PO 2:**Demonstrate the ability to engage in critical, independent, and creative thinking.

**PO 3**: Understand how scientific knowledge grows, and is organized, evaluated and disseminated.

**PO 4:**Demonstrate the ability to connect and apply biological knowledge to other disciplines and to integrate knowledge into their personal and professional lives.

**PO 5:**Acquire the practical skills and ability to perform experiments and analyses to obtain accurate results and thus gain the ability to solve problems.

## PROGRAM SPECIFIC OUTCOME

**The course endeavors to:**

**PSO 1 :** Be proficient at critical thinking, annotation and communication of scientific information and able to succeed in competitive examinations like CSIR – NET, UGC-NET in Life Sciences, SET – Tamil Nadu, andinterviews.

**PSO 2 :** Acquire cognitive and hands-on skills in advanced scientific methods in DNA Fingerprinting techniques, cytological techniques, drug designing and stem cell biologyused for identification and analytical purposes in animal sciences research. Be able to identify and apply the recent advances in animal sciences for the improvement of the standard of living through its application in medicine, agriculture, pharmacology, aquaculture, aquarium fishes and entomology and other relevant fields.

# GURU NANAK COLLEGE (AUTONOMOUS)
# VELACHERY, CHENNAI – 600 042

## M.Phil., ZOOLOGY
## COURSE STRUCTURE for 2017 – 2018 Batch

| Semester | Part | Subjects | Credit | Exam hours | Ext. Max Marks |
|---|---|---|---|---|---|
| I & II | Paper I | Research Methodology | 5 | 3 | 100 |
| | Paper II | Recent Advances In Zoology | 5 | 3 | 100 |
| | Paper III | Applied Entomology | 5 | 3 | 100 |
| | Project Work | Dissertation | 21 | - | 300 |

The assignment of marks for Project is as follows:

**Continuous Internal Assessment**

Literature survey, Methodology and Results of the project work - 80 marks

**End Semester Assessment**

Project work book - 70 marks

Dissertation - 150 marks

# M.PHIL SYLLABUS

## Paper –IRESEARCH METHODOLOGY

| | | |
|---|---|---|
| **SUBJECT CODE :16LZOOC01** | **THEORY** | **MARKS 100** |
| **SEMESTER: I & II** | **CREDITS: 5** | **TOTAL NO OF HOURS:180** |

**COURSE OBJECTIVES:**

To describe the principle, working mechanism and applications of various instruments used in research laboratory and to comprehend the central concepts of modern statistical theory and their probabilistic foundation.

1. Principles and application of Light, Phase Contrast, Fluorescence, Scanning and Transmission Electron Microscopy, Cytophotometry and Flow Cytometry, Fixation and Staining. **(25 Hrs)**
2. Principles and Applications of Gel Filtration, Ion-exchange and Affinity, HPLC Chromatography, Electrophoresis, Electro-Focusing, Ultra Centrifugation (Velocity and Buoyant Density)ELISA. **(25 Hrs)**
3. Principles and Techniques of Nucleic Acid Hybridization and Cot Curves, Sequencing Of Proteins and Nucleic Acids, Southern, Northern and Western Blotting Techniques, Dot and Slot blot, Polymerase Chain Reaction, DNA Foot Printing, Screening of Genomic AND cDNA Libraries. **(30 Hrs)**
4. Principles of Bio-physical Methods for Biopolymer Structure, Determination of X-ray diffraction, Fluorescence, UV, ORD/CD Visible, NMR & ESR Spectroscopy, Hydrodynamic methods, Atomic Absorption and Plasma Emission Spectroscopy. **(30 Hrs)**
5. Principles and Application of Tracer Techniques in Biology, Radiation Dosimmetry, Radioactive Isotopes and Half-life of isotopes, Autoradiography, Cerenkov radiation, Liquid scintillationspectrometry. **(25 Hrs)**
6. Principles and Practice of Statistical Methods in Biological Research, Samples and Population, Basic Statistics, Average Statistics of Dispersion, Co-efficient of Variation, Standard Error, Confidence Limits. **(25 Hrs)**
7. Probability Distribution (Binomial, Poisson and Normal Tests of Statistical Significance, Simple Correlation and Regression, Analysis ofVariance). **(20 Hrs)**

**References**:


1. Alka Prakash. Laboratory manual of Entomology. New Delhi, New Age International, 2001.
2. Kotahri, C.R. 2004. Research Methodology: Methods and Techniques. New Age International Publishers, Chennai.
3. Plummer, D.T. 1971. An Introduction to Practical Biochemistry. McGraw-Hill Book Company.London.
4. Nigel Strok – Biodiversity Assessment
5. G.S. Sandhu. Research Techniques in BiologicalSciences.
6. Palanichamy, S and Manoharan, M. 1994. Statistical Methods for Biologists, Palani Paramount Publications. Palani.
7. Biochemical Methods- Sadasivam and Manickam.


**Question paper pattern:**

| Section | Question Component | Numbers | Marks | Total |
|---|---|---|---|---|
| **Section A** | **Essay Answer any 5 out of 10 questions** | **1 - 10** | **20** | **100** |
| | | | **Total Marks** | **100** |

**Distribution of Questions**

| Section | Units | No of Questions | |
|---|---|---|---|
| | | Theory | Problems |
| Section A | 1 | 1 | |
| | 2 | 1 | |
| | 3 | 2 | |
| | 4 | 1 | |
| | 5 | 1 | |
| | 6 | 1 | 1 |
| | 7 | 1 | 1 |

# Paper –II

## RECENT ADVANCES IN ZOOLOGY

| SUBJECT CODE :16LZOOC02 | THEORY | MARKS 100 |
|---|---|---|
| SEMESTER: I & II | CREDITS: 5 | TOTAL NO OF HOURS: 180 |

**COURSE OBJECTIVES:**

To describe the fundamental molecular principles of classical and modern genetics and to comprehend the advanced knowledge of present day in molecular level of cell biology.

1. Primary structure of proteins and nucleic acids, Conformation of proteins and polypeptides (secondary, tertiary, quaternary and domain) Structure reverse turns and Ramachandran Plot, Structural Polymorphism of DNA, RNA and 3 Dimensional StructureofRNA,StructureofCarbohydrates,Polysaccharides,Glycoproteins,Peptides – Glycans, Helix-Coil Transition. Vander Waals Electrostatic, Hydrogen bonding and Hydrophobic interaction, Energy terms in Biopolymers Conformational Calculation. **(25 Hrs)**

2. Glycolysis and TCA cycle, Glycogen break down and synthesis, Glycogenesis Interconversion of Hexoses and Pentoses, Amino acid metabolism, Co-ordinate control of metabolism, Biosynthesis of Purines and Pyrimidines, Oxidation of Lipids biosynthesis of Fatty acids, Triglycerides, Phosopholipids, Steroids. **(10 Hrs)**

3. Enzyme kinetics (negative and positive co-operativity) Regulation of enzyme activity, Active sites, Co-enzyme activator and Inhibitors, Co-enzymes. **(10 Hrs)**

4. Energy metabolism (concept of free energy) Thermodynamics Principles in Biology, Energy rich bond, Weak interactions, Couple reactions and Oxidative phosphorylation, Group transfers, Biological energy transductors, Bio-energetics. **(20 Hrs)**

5. DNA replication, Eukaryotic genome organization (structure of chromatin, coding and non-coding sequence, satellite DNA) DNA damage and repair, Gene amplification and Sequencere-arrangement. **(10 Hrs)**

6. Organization of Transcriptional Units, Mechanism of transcription in prokaryotes and eukaryotes, RNA processing (Capping, Poly adenylation, Splicing, Introns and Exons, Ribonucleo proteins, Structure of mRNA, Genetic code and Proteinsynthesis. **(20 Hrs)**

7. Regulation of gene expression, Attenuation and antitermination, Operon concept, Lytic cascade, Lysogenic repression, DNA methylation, Hetero chromatinization, Antisense RNA, Transposition protein targeting, Post translational modification and Transport of protein-Signal hypothesis environmentalcontrols. **(10 Hrs)**

**8.** Biochemistry and molecular biology of cancer, Oncogenes, Chemical carcinogenesis, Genetic and Metabolic Disorders, Hormonal imbalance, Drug Metabolism and Detoxification, Genetic Code and Genetic Counseling. **(10 Hrs)**

**9.** Lysogeny and Lytic cycle in Bacteriophages, Bacterial transformation, Host cell restriction, Transduction, Complementation, Molecular recombination, DNA Ligases, Toposiomerases, Gyrases, Methylases, Nucleases, Restriction Endonucleases, Plasmids, Cosmids, Bacteriophages and their use in Gene cloning for DNA libraries and Genomic libraries. **(25 Hrs)**

**10.** Principles and Methods of Genetic Engineering, Gene targeting, DNA transformation technique. Application in Agriculture, Health, Medicine and Industries, Hybridoma Technology. **(10 Hrs)**

**11.** Immunoglobulin classes, Humoral and Cell-mediated immunity. Immunological memory, Adjuvants, Lymphokines, T-cell receptors, Delayed hypersensitivity reactions, HLA, Autoimmunity. Alternate Classical Complement Pathways, Regulation of Immune Response, Mechanisms of Antibody Diversity, Epitope and Monoclonal antibodies. **(10 Hrs)**

**12.** Cell and Tissue culture in plants and animals, Primary culture, Cell line, Cell clone, Callus culture, Somaclonal variations, Micro propagation, Somatic embryogenesis, Haploidy, Protoplast fusion, Somatic hybridization, Hybrids, Gene transfer by Microinjection, Transgenesis, Allopheny, Artificial Seeds. **(10 Hrs)**

**13.** Structure and organization of membrane glycol conjugates and proteins in membrane system, ion transduction, Na+, K+, ATPase. Hormone mediated message transduction, Adenyl nuclease protein kinase systems, Neurotransmitters, Acetylcholine system, Model Membranes and Liposomes. **(10 Hrs)**

**References:**


1. Becker, W, Kleinsmith, L, Hardin, J. – World of Cells.
2. Berg, JM, Tymoczko, JC and Stryer, L. – Biochemistry.
3. Evan Roitt –Immunology
4. Pelczar, J. –Microbiology
5. Perscott, L, Harley, J, Klein, D. –Microbiology
6. Primrose, SB. – MolecularBiotechnology
7. Sivastava and Goal, S.C. – Recent advances inZoology
8. Verma, S.R. – A Text Book ofCytology

**Question paper pattern:**

| Section | Question Component | Numbers | Marks | Total |
|---|---|---|---|---|
| Section A | Essay Answer any 5 out of 10 questions | 1 - 10 | 20 | 100 |
| | | | Total Marks | 100 |

**Distribution of Questions**

| Section | Units | No of Questions | |
|---|---|---|---|
| | | Theory | Problems |
| Section A | 1 | 1 | |
| | 2 | 1 | |
| | 3 | | |
| | 4 | 1 | |
| | 5 | 1 | |
| | 6 | 1 | |
| | 7 | 1 | |
| | 8 | | |
| | 9 | 1 | |
| | 10 | | |
| | 11 | 1 | |
| | 12 | 1 | |
| | 13 | 1 | |

# Paper III

## (Guide Paper)

## APPLIED ENTOMOLOGY

| | | |
|---|---|---|
| **SUBJECT CODE :16LZOOC03** | **THEORY** | **MARKS 100** |
| **SEMESTER: I & II** | **CREDITS: 5** | **TOTAL NO OF HOURS:180** |

**COURSE OBJECTIVES:**

To describe about the insects, their habitats and physiology; to relate the knowledge on the economic importance of insects.

**Unit I** **(35 Hrs)**

**A. Insect Classification &Biodiversity:**

Classification of insects with distinguishing features of important orders with examples – Thysanoptera, Isoptera, Dictyoptera, Orthoptera, Diptera, Neuroptera, Hemiptera, Hymenoptera, Lepidoptera, Coleoptera. Insect biodiversity and assessment.

**B. Major Crop Pests and their Management:**

Pests of cereals (rice, wheat and sorghum), Cotton, Sugarcane, Pulses, Oil Seeds, Vegetables, Fruit Crops, Plantation Crops, and Stored Grains.

**C. Pest Population Dynamics and Crop Losses:**

Biotic and Abiotic factors influencing pest population dynamics; Types of losses, Estimation of losses.

**Unit II** **(35 Hrs)**

**Tactics of Insect Control**

1. **Host plant resistance:**

   Types and mechanisms of resistance

   Genetics of resistance and breeding of insect pest resistance varieties

2. **Biological control:**

   Biocontrol agents: Natural (Parasitoids and predators) and Entomo pathogens (bacteria, viruses and fungi). Formulations of microbial pesticides and methods of application Augmentation and conservation of natural enemies.

**Unit III** **(40 Hrs)**

3. **Chemical control**

   Classification of insecticides, major groups of pesticides

   Important insecticides in use, pesticide application methods and appliances (sprayers and dusters), handling of pesticides (precautions, first aid and antidote)

4. **Chemical ecology /Allelo chemicals in insect control**

   Semiochemicals / Allelo chemicals and pheromones and their role in monitoring and mating disruption techniques for the control of pests; constitutive and induced defenses and impact on biological control- Tritrophic interactions.

**Unit IV** **(35 Hrs)**

5. **Hormonal control of insects**
   Brain hormone, Juvenile hormone and Moulting hormone analogues and insect growth regulators and their role in insect control and modes of action.
6. **Cultural control of insect pests:**
   Impact of alternate host plants and weeds, crop rotations, trap crops, fertilizer application, water management and Crop residue disposal. Important Vectors of human and plant diseases. IPM.

**Unit V** **(35 Hrs)**

7. **Industrial Entomology:**
   a) Lac culture and Productivity
   b) Sericulture and resource potential – types of silk moths – methods of sericulture and silk yield
   c) Honey bees and apicultural techniques.
   d) Insects as food, ornamental insects

**References:**


1. R.F. Chapman – The insects structure and function
2. R.G. Davies – Imm's General Text Book of Entomology (Vol. I &II)
3. T.V. Ramakrishna Ayyar – Economic Entomology for South India. Narendra Publishing House, Delhi.
4. V.B. Wigglesworth – Insect Physiology, Chapman and hall.
5. Lourry P. Pedigo – Entomology and Pest Management. Macmillan Publishing Company, New York.
6. Dennis S. Hill – Agricultural insect pests of the tropics and their control, Cambridge University, London.
7. Richard L. Ridgway, Robert M. Livestein, May N. Inscoe. Behavior modifying chemicals for the insect management. Marcel Dekker inc. New York.
8. Mellville, Dupprte. Manual of Insect Morphology. Robert E. Krieger publishing company, New York.
9. AyodhyaP.Gupta. Haemocytic and Hormonal immunity in arthropods. A Wiley Insersuence Publication.
10. Comprehensiveinsectphysiology,biochemistryandpharmoclogy.Vol.I–G.A.Kerkut, L.I. Gilbert.
11. Gupta, A.P. Insect Haemocytes. Cambridge University Press, Cambridge.
12. T.N. Ananthakrishnan- Recent advances in entomology in India. Viswanathan Pvt. Ltd. Chennai.
13. R.F. Chapman, Anthony. Biology of grasshoppers. John Wiley & Sons, Wiley Interscience Publications.
14. Gangwere and M.C. Muralirangan – The bionomics of grass hoppers katydids and their kin. CABI.

**Question paper pattern:**

| Section | Question Component | Numbers | Marks | Total |
|---|---|---|---|---|
| Section A | Essay Answer any 5 out of 10 questions | 1 - 10 | 20 | 100 |
| | | | Total Marks | 100 |

**Distribution of Questions**

| Section | Units | No of Questions | |
|---|---|---|---|
| | | Theory | Problems |
| Section A | 1 | 2 | |
| | 2 | 2 | |
| | 3 | 2 | |
| | 4 | 2 | |
| | 5 | 2 | |

## PROJECT WORK: DISSERTATION

| | | |
|---|---|---|
| **SUBJECT CODE : 16LZOOC04** | **DISSERTATION** | **MARKS 300** |
| **SEMESTER: I & II** | **CREDITS: 21** | **Total No of Hours: 360** |

Study of biodiversity of Insects in crop fields, Conduction field and laboratory experiments to evaluate insecticides/ biopesticides / biocontrol agents/ pheromones/ sticky traps/ light traps, etc.

Animal Ecology

Research in molecular taxonomy of animals, genetics

Reproductive physiology

Growth dynamics of animals

Animal toxicology

Oncology

Biodiversity

Contemporary research topic of interest to student/guide