GURU NANAK COLLEGE (AUTONOMOUS)

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

Guru Nanak Salai, Velachery, Chennai – 600042.

M.Phil. Zoology

(SEMESTER PATTERN WITH CHOICE BASED CREDIT SYSTEM)

Syllabus

(For the candidates admitted in the Academic year 2019-20 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, and interviews.

PSO 2 : Acquire cognitive and hands-on skills in advanced scientific methods in DNA Fingerprinting techniques, cytological techniques, drug designing and stem cell biology used 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.

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VELACHERY, CHENNAI – 600 042

M.Phil., ZOOLOGY

COURSE STRUCTURE for 2019 – 2020 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	Crustacean Endocrinology and Reproduction	5	3	100
	Project Work	Dissertation	21	-	300
		Total	36		

The assignment of marks for Project is as follows:

(1.) Continuous Internal Assessment
Literature survey, Methodology and Results of the project work - 80 marks

(2.) End Semester Assessment
Project work book - 70 marks
Dissertation - 150 marks

M.PHIL SYLLABUS

Paper –I

RESEARCH 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 scintillation spectrometry. **(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 of Variance). **(20 Hrs)**

References:

1. Alka Prakash. Laboratory manual of Entomology. New Delhi, New Age International, 2001.
2. Kothari, 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 Biological Sciences.
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 Structure of RNA, Structure of Carbohydrates, Polysaccharides, Glycoproteins, Peptides – Glycans, Helix-Coil Transition. Vander Waals Electrostatic, Hydrogen bonding and hydrophobic interaction, Energy terms in Biopolymers Conformational Calculation. **(25 Hours)**

2. Glycolysis and TCA cycle, Glycogen break down and synthesis, Glycogenesis Interconversion of Hexoses and Pentoses, Amino acid metabolism, Co-ordinated 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 cooperativity) Regulation of enzyme activity, Active sites, Co-enzyme activator and Inhibitors, Iso-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 Sequence re-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 Protein synthesis. **(20 Hrs)**

7. Regulation of gene expression, Attenuation and anti-termination, Operon concept, Lytic cascade, Lysogenic repression, DNA methylation, Hetero chromatinization, Antisense RNA, Transposition protein targeting, Post translational modification and Transport of protein-Signal hypothesis environmental controls. **(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 glycoconjugates 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. – Molecular Biotechnology
7. Sivastava and Goal, S.C. – Recent advances in Zoology
8. Verma, S.R. – A Text Book of Cytology

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)
CRUSTACEAN ENDOCRINOLOGY AND REPRODUCTION

SUBJECT CODE : 16LZOOC03	**THEORY**	**MARKS 100**
SEMESTER: I & II	**CREDITS: 5**	**Total Number of Hours: 180**

COURSE OBJECTIVES:

To describe about the crustaceans, their habitats and physiology; to relate the knowledge on the crustacean endocrinology, reproduction and economic importance of crustaceans.

Unit-I: General Biology of Crustacea (35 Hrs)

General characters of the phylum Arthropoda – Class Crustacea: General characters; Classification; Types – Various body systems – Osmoregulation – Feeding mechanisms – Diversity and conservation of Crustacea.

UNIT-II: Neuro-Endocrine System of Crustacea (35 Hrs)

Neurosecretory system of crustacean brain – Sinus gland X-organ complex – Y-organ – Hormonal regulation in molting, growth and reproduction – Hormonal manipulation of crustacean reproduction – Mechanism of vitellogenin synthesis – Fertilization – Various types of parental care of eggs - Stages of embryonic development – Metamorphosis – Different larval forms.

UNIT-III: Aquaculture of Crustacea (40 Hrs)

Prawn culture – Crab culture (fattening) – Lobster culture – Site selection and preparation of culture ponds – Physicochemical factors – Hatchery production of seeds – Food: Live feed; Artificial feed; Balanced diet (iso-nitrous and iso-caloric) – Predators and Parasites in aquaculture – Economics of Aquaculture.

UNIT-IV: Toxicology and Pathology of Crustacea (35 Hrs)

Xenobiotics substances and their toxic effects on crustacean - Toxicity tests – Causes for different diseases - Disease causing pathogens and their preventive measures in aquaculture of crustacean – Cellular stress and Immune responses – Defense and Detoxification systems – Wound healing - Apoptosis - Probiotics in health and growth of crustacean.

UNIT-V: **Genetic Engineering and Biotechnology of Crustacea (35 Hrs)**

Molecular Cytogenetics of Crustacea – Isolation and Purification of DNA and RNA - Isolation and Purification of Enzymes and Hormones – Recombinant DNA technology – Blotting techniques – PCR techniques – Gel documentation – Proteomics, Genomics and Bioinformatics of crustacean.

References:

- Joel W. Martin , Jorgen Olesen , Jens T. Hoeg. Atlas of Crustacean Larvae.Johns Hopkins University Press.2014.
- T. J. Pandian. Reproduction and Development in Crustacea.Taylor & Francis Inc. 2016.
- G.A. Boxshall. An Introduction to Copepod Diversity: v. 166 : 2 volume set. Ray Society. , 2004.
- Elena MenteReproductive Biology of Crustaceans : Case Studies of Decapod Crustaceans.Taylor& Francis Inc. 2008.
- Keith Wilson and John walker "Principles and Techniques of Biochemistry and Molecular biology" 7th edition.Cambridge University Press, 2010.
- Desmond S. T. Nicholl,. "An Introduction to Genetic Engineering" 2008.
- Russ Hodge and Nadia Rosenthal, "Genetic Engineering: Manipulating the Mechanisms of Life" (Genetics & Evolution) 2009.
- Howe C. J., "Gene Cloning and Manipulation" 2007
- R.W. Old and S.B. Primrose.Principals of gene manipulation by, Blackwell Scientific Publications, 1985.
- J.M.Walker and E.B. Gingold, Molecular Biology and Biotechnology, Panima Publishing Corporation; 3rd Ed.,2001.
- SubodhSaxena, Genetic Engineering, Black Prints India Inc., 2014.
- HarinderChaddha, Tissue Culture & Non-gene Biotechnology by 2011.

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 Crustaceans, Conduction field and laboratory experiments to evaluate Crustacean endocrinology, reproduction 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