

**NEHRU MEMORIAL COLLEGE
(AUTONOMOUS)**

(Nationally Accredited with 'A' Grade by NAAC)

PUTHANAMPATTI – 621 007

TIRUCHIRAPPALLI DISTRICT

TAMIL NADU - INDIA

Revised

**M.Phil., ZOOLOGY SYLLABUS
(WITH EFFECT FROM THE ACADEMIC
YEAR 2019 -2020 ONWARDS)**



**PG AND RESEARCH DEPARTMENT OF
ZOOLOGY**

APRIL– 2019

POST GRADUATE AND RESEARCH DEPARTMENT OF ZOOLOGY

(M.Phil Zoology Program)

VISSION AND MISSION

Vision:

- Scholars get individual attention and focus on the prevailing challenges by way of giving strong foundation.
- Create a conducive environment for Scholars to develop innate skill to discover themselves and explore scientific pursuits with various opportunities.
- The Scholars grow in a fully equipped environment rich in its infrastructure which creates physically sound, mentally serene, spiritually humane and scientifically excelling.
- Creativity is a spark that lasts long. We provide ample opportunity for our students to think and make outside the box. We treasure their pride of being a creator.

Mission:

- Our mission is to mould the Scholars into a world class community who would feel legitimately proud to think critically and innovatively.
- We focus more on the approach of making the Scholars observe, analyze, interpret, evaluate and solve problems.
- Providing very good opportunity to the Scholars who willing to do novel approach on research in various fields.
- The Post Graduate and Research Department of Zoology providing very good learning information with an excellent academic and research facilities to the Scholars of all category and enhance their natural and artificial intelligence.

PROGRAM SPECIFIC OBJECTIVES

1. To enable the Scholars to learn the application of various experiments to the animal and human biology.
2. Understand the impact of Zoology on basic human needs such as, health care, agriculture, industrial, chemical, energy etc.,
3. To know the current development in Zoological Sciences.
4. Evaluate the future priorities in Zoological Research.
5. Know the practical areas for application of Advanced Zoological Research.
6. To develop skill in the various modern bio-techniques.

PROGRAM OUTCOMES

Scholars of Zoology will be able to

1. To become knowledgeable person in the subject of Zoology and apply the principles of the gained knowledge in different fields and to the needs of Society and Nation.
2. Acquisition of technical competence in specialized areas, to develop confidence and gain analytical skills in various fields viz., research methodology, recent trends in zoology, environmental biology, toxicology, immunology, biotechnology, rodent pests, vermibiotechnology, herbal drug technology and phytochemistry, ornithology, medical nanotechnology, medical microbiology etc.,
3. To understand and appreciate professional ethics, community living and Nation Building initiatives.
4. Ability to conduct investigation and research on problems in a chosen field of study.
5. Ability to work effectively as an individual and as a member leader in a team and to be a multi-skilled person in the field of Zoology with good technical knowledge, management, leadership and entrepreneurial skills.
6. Awareness of the social, cultural, global and environmental responsibilities as a Zoologist in various fields.
7. Capability and enthusiasm for self-improvement through continuous professional development and life-long learning.

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 PUTHANAMPATTI – 621 007, TRICHY DISTRICT
P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil., ZOOLOGY PROGRAMME – (CBCS Pattern)
 (For candidates admitted from the Academic year 2019 – 2020)

Semester	Course	Course Title	Course Code(s)	Credits	Marks		Total	
					Internal	External		
I	Course –I	Research Methodology		4	25	75	100	
	Course – II	Recent Trends in Zoology		4	25	75	100	
	Course – III*	1	Management of Rodent Pests		4	25	75	100
		2	Vermibiotechnology					
		3	Toxicology					
		4	Herbal Drug Technology and Phytochemistry					
		5	Ornithology					
		6	Entomology					
		7	Medical Nanotechnology					
	8	Agricultural Ornithology						
9	Medical Microbiology							
Course –IV	Teaching and Learning Skills.		4	25	75	100		
II		Dissertation		8	Thesis =150	Viva =50	200	
		Total		24			600	

**Topic of Research – Guide Paper*

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PUTHANAMPATTI – 621 007, TRICHY – DT.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY

M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)

(For candidates admitted from the Academic year 2019 – 2020)

SEMESTER-I

COURSE I: RESEARCH METHODOLOGY

Course Code:

Max. Marks: 100

Hours per Week:

Internal Marks: 25

Credits: 4

External Marks: 75

Course Objectives:

- To give information about basic concept of research and how to write/publish a thesis and its basic steps.
- Critically analyze Microtechniques, cryotechniques and tissue culture techniques.
- To know the statistical problems in biological science, this is useful for the students for their research works.
- To train the scholars to collect, organize and analyze data.
- Learn to apply different statistical/bioinformatic tools in presenting biological data.

UNIT – I: Scope of Research: Objectives – types of research– research ethics – importance of research – selection of research problem – experimental design – Literature survey - use of internet in literature survey - preparation of index card. Printed and online journals – Refereed journals, Impact Factor, Citation Index. **Preparation of Thesis:** Components of thesis; Preparing of scientific paper for publication in a journal; **Model organisms:** C.elegans, drosophila, hydra, rat, mouse - CPCSEA regulations – IPR - Patent.

UNIT – II: Analytical Instruments: Spectrophotometer (Principles, types, description of instruments and applications). Centrifuge (Principles, types, description of instruments and applications). Chromatography: Paper – TLC - Ion–exchange chromatography, GLC and HPLC (Principles, description of instruments and applications). Electrophoresis – Types of Electrophoresis –PAGE, SDS-PAGE, 2D Electrophoresis – Immunoelectrophoresis – ELISA – Blotting techniques – Southern, Western and Northern.

UNIT – III: Microtechnique: Permanent mounting – narcotization and killing – fixing – washing – tissue processing – staining – mounting – Labeling. Histochemistry – Carbohydrate, Protein, Lipid and Nucleic acids. Microscopy: Types of microscopes–principle and applications of Light microscopes and Electron microscopes (SEM and TEM) – Histological preparation of tissues for SEM and TEM. Photomicrography: principles and applications.

UNIT-IV: Bioinformatics: Scope of Bioinformatics – Genomes and Proteomes – The genome of *Homo sapiens* (the human genome). Single Nucleotide Polymorphisms. Biological Databases – Primary, Secondary, Specialized and Structural database. Databases searches for homologous sequences – FASTA, BLAST and molecular docking. Local and global alignment concepts – Clustal-W –Phylogenetic trees – clustering methods.

UNIT V: Statistical methods: Hypothesis testing. Tests of Significances: Student's "t" test, F – Test – One way ANOVA and Two way ANOVA with interpretation of data – Multiple comparison tests – LSD, SNK, DMRT. Correlation and regression: Correlation (Pearson's and Spearman's Rank), partial and multiple correlation – simple linear regression and multiple regressions. Non-Parametric Tests: Chi square, Mann Whitney "U" test, Wilcoxon's test and Kruskal Wallis tests. Use of SPSS for statistical analysis.

Course Outcomes:

- Relate to the learning process of how to write thesis and how to publish papers in various journals.
- Produce transformants by employing the various transfer techniques in the applied research.
- Experiments with the concept of permanent mounting and its application.
- Critically evaluate cell culture techniques in various experiments.
- Explain the scope of Biostatistics. Test the hypotheses using chi-square test, compare the data using 't' test, Analyze the data using ANOVA, Explain types of Correlation and regression, analyze and apply various statistical tools.

TEXT BOOKS:

1. Gurumani, N. 2006. Research methodology for biological science, MJP Publishers, Chennai, P 753.
2. Sathyanarayana, U. 2006. Biotechnology. Books and Allied (P) Lit. India.
3. Dubey, R.C. 2001. A text book of biotechnology, Rajendra Printers, New Delhi.
4. Das, H.K. 2005. Text book of biotechnology (second edition). Wiley Dreamtech India Pvt Ltd., New Delhi. P 149.
5. Arumugam, N., Gopi, A., Sundaralingam, R., Meena, A. and Kumaresan, V. 2009. Biostatistics, Computer Application, Bioinformatics and Instrumentation. Saras Publication, Nagercoil.
6. Ramakrishnan, P. 1995. Biostatistics. Saras Publications, KanyaKumari.
7. Gurumani, N. 2005. An Introduction to Biostatistics 2nd Edition, MJP Publishers, Chennai.
8. Sharma, A.K 2005. Text book of Biostatistics, Discovery publishers House, New Delhi.

REFERENCES BOOKS:

1. John, R.W and Masters, D. 2000. Animal cell culture. A practical approach. IRC Press.
2. Ignacimuthu, S. 1996. Basic Biotechnology. Tata McGraw – Hill publishing company Limited, New Delhi.
3. Anderson, Dunston and Pole. 1970. Thesis and Assignment writing. Wiley Eastern Ltd., New Delhi.
4. Gupta S.C.& Kapoor V.K, (2000): Fundamentals of & Mathematical Statistics, Sultan Chand Sons 10th edition.
5. Croxton F.E., Cowden D.J. & Kelin S, (1967): Applied General Statistics, Prentice Hall.
6. Hogg and Craig, Introduction to Mathematical Statistics, (2013): Prentice Hall, 7th edition.
7. Daniel, W.W. 2000. Biostatistics - A foundation for analysis in the Health science. John Wiley and sons, New york.
8. Sokal, R.R. and Rohlf, F.J. 2000. Biometry. Freeman, San Francisco.
9. Zar, J.H. 2003. Biosatistical Analysis. Person Edition Asia, New Delhi.

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P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY

M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)

(For candidates admitted from the Academic year 2019 – 2020)

SEMESTER-I

COURSE – II: RECENT TRENDS IN ZOOLOGY

Course Code:	Max. Marks: 100
Hours per Week:	Internal Marks: 25
Credits: 4	External Marks: 75

Course Objectives:

- Apply and integrate knowledge of species' biology, interactions among species, and environmental variation to predict EIA & Biodiversity.
- To get a fundamental knowledge about microbes & microbial diversity.
- To understand the role of microbes in different spheres of life and to enlighten the students with the new information related to microbes.
- To teach the students understanding development of antibodies responses to a vaccine.
- To give the idea about environmental microbes which hamper the life in society in various ways and to give knowledge about various cell culture techniques.

UNIT – I: Pollution Abatement Measures: Bioremediation – Solid Waste Management – Biofertilizers and Biopesticides – Environmental Impact Assessment (EIA) – Environmental Laws in India. Genetic, species and ecosystem diversity – Values of biodiversity – Biodiversity indices: Alpha, beta and gamma – Treats to Biodiversity – IUCN Categories – Red Data Book – Conservation of biodiversity – *ex situ* and *in situ*. GPS, GIS, Remote sensing and radio telemetry techniques used in ecological research – Molecular Markers in Genome analysis – RFLP, RADP, AFLP and their applications in Biodiversity.

UNIT – II: Microbial diversity – Prokarya – Eukarya and Viruses – Microbial diseases of Bacterial, Fungal, Viral diseases – Chemotherapy and antibiotics – Vaccines (types) – rDNA Vaccines – applications. Molecular mapping of genome – Genome organization. Cloning technology and its application in biology – Ethical issues.

UNIT – III: Antigen – Antibody interactions – Isolation of pure antibodies – monoclonal and polyclonal antibodies - Assays of complement – Assays for circulating immune complexes – Isolation of lymphocyte populations Effector cell assays, Gene targeting Immunological techniques in medical diagnosis – HIV, Hepatitis A & B, Cancer and Pregnancy.

UNIT – IV: Methods in microbiological studies: Isolation and culture of microorganisms – mixed cultures; physical methods – chemical methods – biological methods. Methods of isolation and maintenance of pure culture. Microbial growth – growth curve of bacteria – measurement of growth. Culture media – characteristics – types and preparation.

UNIT – V: Basic techniques of Mammalian cell cultures – Cell lines – Manipulation of cultured cells and tissues – Application of Animal cell cultures – Stem cell cultures – Apoptosis – Protein Engineering – Transgenic animals – Advantages. Gene Therapy. Human Genome Project – DNA fingerprinting and its applications – Biosensors and Biochips and their Applications.

Course outcome:

- To know about environment and its role in various aspects with respect to GPS, GIS.
- Explain in detail the importance of conservation of Biodiversity and the students will be able to recognize the scope of microbiology.
- Narrate the nutrition for bacterial growth and the factors affecting the growth. Ability to produce fermented products using bacteria.
- To emphasise the importance of bioremediation bacteria and its importance to clean the environment which hamper the society in various ways.
- To gain knowledge about gene therapy, DNA fingerprinting and human genome project.

TEXT BOOKS:

1. Krishnamurthy, K.V. 2004. An advance Text book on Biodiversity. Principles and Practice. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Das, H.K. (Editor) 2005. Text Book of Biotechnology. Wiley Deramtech India Pvt. Ltd., New Delhi.
3. Jogdand, S.N. 2004. Advances in Biotechnology. Himalaya publishing House, Mumbai.
4. Benjamin Lewin. 1999. Genes VII. Oxford University Press, New York.
5. Kumar, H.D. Modern concepts of Biotechnology. Vikas Publishing House Pvt. Ltd., New Delhi.
6. Kumar, D and Kumar, S. 1998. Modern concepts in Microbiology, Vikas Publishing house Pvt. Ltd., New Delhi.
7. Ivan Roitt, David Male and Jonatham Brostoff. 2002. Immunology. Mosby Edinburgh, London.
8. Anathanarayanan, R, and C.K., Jayaramam Paniker. 1990. Text book of Microbiology. Orient London.

REFERENCES BOOKS:

1. Pelczar, M.J. and R.D. Reid. 1996. Microbiology. Tata McGraw Hill.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 1995. Cell and Molecular Biology. 8th Edition, B.I. Waverly Pvt. Lid., New Delhi.
3. Attwood, T.K. and PLarry – Smith, D.J. 2002. Introduction to Bioinformatics, Pearson Education (Singapore).
4. Lesk, A.M., 2007. Introduction to Bioinformatics (S.E.), Oxford University, Oxford.
5. Mani, K. and Vijayaraj, N., 2004. Bioinformatics. A Practical Approach, Aparnaa publications, Coimbatore.
6. Murthy, C.S.V., 2003. Bioinformatics, Himalaya Publishing House, New Delhi.
7. Sundararajan, S. and Balaji, R. 2002. Introduction to Bioinformatics, Himalaya Publishing House, New Delhi.
8. Westhead, D.R., Parish, T.H. and Twyman, R.M., 2003. Instant Notes: Bioinformatics BIOS Scientific Publisher Ltd, Oxford, UK.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER – I
Elective Course I
COURSE III: MANAGEMENT OF RODENT PESTS
(Topic of Research)

Course Code:	Max. Marks: 100
Hours per Week:	Internal Marks: 25
Credits: 4	External Marks: 75

Course Objectives:

- Apply and integrate knowledge of rodent pest control measures among scholars.
- To get a fundamental knowledge about Rodent Pest control.
- To understand the role of rodent pest on agricultural fields.
- To enlighten the scholars with the new information related to rodent control.
- To teach the scholars understanding development of various methods regarding rodent control among agricultural habitats and to give knowledge about role of various institutions in rodent pest control measures.

UNIT-I: Rodent diversity : Diversity of rodents in the world – Rodent diversity in India – Rodents as Pest Species – Ecological Distribution of Indian Rodents – Rodents as beneficial species – History of Rodent Research in India - AINP on Vertebrate Pest Management: A Profile - Rodent pests of India; **Rodent pests of Tamil Nadu:** The Indian Crested Porcupine, *Hystrix indica* – The Indian Gebril, *Tatera indica* – The house Rat, *Rattus rattus*– The soft-furred Field Rat, *Millardia meltdada* – The mice, *Mus* spp. – The Lesser Bandicoot Rat, *Bandicota bengalensis* – The Large Bandicoot Rat, *Bandicota indica*; **Methods of estimation of rodent pest population:** Tracking tiles – Census cards – Burrow counts – Visual surveys – Calibrating relative estimates of abundance –Equipments for marking techniques - calculating population size from capture- mark- release data.

UNIT-II: Rodent depredation: Magnitude of rodent depredation to agricultural crops (Pre-harvest losses) in Rice, Sugarcane, Groundnut, Soybean, Bengal Gram, Plantation Crops, Coconut – Quantity of production losses due to Rodents in Poultry Farms – The relationship between rodent abundance and rodent damage in crop fields – Extent of production losses due to Rodents in stored food grains (post-harvest losses), Afforestation, Grasses, fodder crops and soil conservation – **Crop specific methods of rodent depredation assessment.**

UNIT-III: Rodent Ecology: Burrow patterns of different rodent pests – Food habits – Breeding ecology – Litter size of predominant rodent pest species – Activity patterns – Home ranges; **Ethology and Eco-Physiology:** Bait preferences – Shyness Behaviour – Scent marking Behaviour – Adaptations in Some Indian Rodent Species; **Design of field studies:** General principles of experimental design – Identification of hypotheses and key factors – Size of experimental units – Duration of an experiment – Inclusion of controls – Replication – Randomisation and interspersation.

UNIT-IV: Rodents of Medical importance – Rodents and Human Diseases: A Global Appreciation of Zoonotic diseases – Plague – Rat typhus – Leptospirosis – Rat bite fever – causative organisms, symptoms, treatment and prophylactic measures of each disease - Managing rodent pests in households and food stores through intensive trapping - Urban Rodent Control Programs for the 21st Century.

UNIT-V: Management of rodent pests: Cultural, Physical, mechanical, biological and chemical methods: Environmental management – Rodent proofing and sanitation – Tribal rodent catchers – Rodent Fumigation Equipments - Rodent management operational schedule for crop fields and threshing floors, Residential premises and godowns - Social Engineering Activity in Rodent Control – Peoples’ Participation in Rodent Control - The Sidhpur Experience - Trap barrier system - Biological agents of managing rodent pests - Registered Acute and chronic rodenticides in India and their efficacies against different rodent pests – Factors influencing the bait preferences – Qualities of a rodent bait – Chemical fumigants – Anti-fertility agents for Rodent Control - The Potential of Pheromonal involvement in Rodent Control Programs – Natural / Synthetic Chemical Repellents - Education and Training of the Stakeholders – Current Integrated Rodent Pests Management (IRPM) packages adopted in India.

Course Outcome:

- To know about equipments and kits with respect to rodent control.
- Explain in detail the importance of and preventive measures of diseases caused by rodents.
- The scholars will be able to recognize the scope of rodent pest control measures.
- To emphasise the importance of equipments and repellents and its importance to clean the rodent pest from agricultural fields in various ways.
- To gain knowledge about rodent pest management.

TEXT BOOKS:

1. Barnett, S. A. and Prakash, I. 1975. Rodents of Economic importance in India. Arnold – Henemann, New Delhi & London. 175p.
2. Prakash, I. and Mathur, R.P. 1987. Management of Rodent Pests. Indian Council of Agricultural Research, New Delhi. 133p.
3. Prakash, I. 1988. Rodent Pest Management. CRC Press, Inc. Boca Raton, Florida. 480p.
4. Fitzwater, W.D. and Prakash, I. 1989. Handbook of vertebrate pest control (Third Edition). Indian Council of Agricultural Research, New Delhi. 103p.
5. Prakash, I. and Ghosh, P.K. 1992. Rodents in Indian Agriculture. Scientific Publishers, Jodhpur. 707p.
6. Singleton, G.R., Hinds, L.A., Leirs, H. and Zhang, Z. (Eds.). 1999. Ecologically-based management of rodent pests. ACIAR Monograph No. 59, 494p.

REFERENCES BOOKS:

1. Singleton, G.R., Hinds, L.A., Krebs, C.J., and Spratt, D.M. 2002. Rats, mice and People: rodent biology and management. ACIAR Monograph No. 96, 564p.
2. Rana, B.D., Tripathi, R.S., Mohd. Idris and Vipin Chaudhary. 2002. Glimpses of Rodent Research in India. Project Co-ordinator's Cell, Jodhpur, 57p.
3. Aplin, K.P., Brown, P.R. Jacob, J., Krebs, C.J., and Singleton, G.R. 2003. Field methods for rodent studies in Asia and the Indo-Pacific. ACIAR Monograph No.100. 223p.
4. Singleton, G.R., Belmain, S.R., Brown, P.R., and Bill Hardy. (Eds.). 2010. Rodents outbreaks : ecology and impacts. Los Banos (Philippines): International Rice Research Institute (IRRI). 289p.
5. Corrigan, R.M. and Don Moreland. 2001. Rodent control: A Practical Guide for Pest Management Professionals. GIE media. 300p.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER I
Elective Course – II
COURSE III: VERMIBIOTECHNOLOGY
(Topic of Research)

Course Code:
Hours per Week:
Credits: 4

Max Marks: 100
Internal Marks: 25
External Marks: 75

Course Objectives:

- To impart the knowledge of vermiculture to the scholars both on site and off site on the technique of Vermiculture and to kindle the scholars to become self employers/entrepreneurs of vermiculture practices of their choice in their native places after getting degree. The part time scholars can able to teach the techniques to their students at 10th and +2 level.
- To impact the scholars to understand the culture practices of various species of earthworms in their backyard for the decomposition of their house hold waste biological materials.
- To prepare the scholars to know about opening of commercially viable business opportunities in the field of vermiculture.
- To aware the scholars about creation of employment, especially in field of vermiculture in rural as well as urban areas.
- To aware the scholars about Governmental organizations for supporting vermiculture.

UNIT – I: Diversity of Earthworms and their Geographical distribution: Systematic position – Classification of Earthworms at family, genera and species level in the Indian subcontinent – Brief account on the classification of Earthworms at the global level – Ecological classification of Earthworms – Epigeic, Endogeic and Anecic - Earthworms used in vermicomposting in India and at the global level – *Eudrilus eugeniae*, *Eisenia foetida*, *Perionyx excavatus* and *Lampito mauritii*.

UNIT – II: Morphology and Biology of Earthworms: External segmentation – External apertures – Clitellum and associated structures – Digestive and Reproductive systems – Life cycles – Reproduction – Spermatogenesis and Oogenesis – Copulation and Fertilization – Growth.

UNIT – III: Ecology of Earthworms: Estimation of populations – size of populations – Numbers and Biomass- Population structure – Age distribution and Spatial Distributions – Horizontal and Vertical distributions – Structure of Earthworm Communities – Major ecological groups – Predators, Parasites and Pathogens of Earthworms. **Earthworms and Microorganisms**

- Importance of Microorganisms as food for Earthworms – Dispersal of Microorganisms by Earthworms – Earthworm burrows and casts in soil – Effects of Earthworms on soil structure.

UNIT – IV: Organic wastes and their management utilizing Earthworms: Sources of organic wastes – Conversion of Sewage Sludges, Animals, Vegetable and Industrial organic wastes into Vermicompost – Species of Earthworms suitable for Vermibiotechnology – Criteria used for species selection – Various methods of vermicomposting and vermiwash – Vermicast – Vermicompost - Macro and Micronutrients composition of vermicompost – Methods of application of vermicompost to various crops – Advantages of using vermicompost to crops. **Other beneficial roles of Earthworms** – Interaction with organisms that promote plant growth – production of plant growth promoting substances – Production of biologically active materials by Earthworms.

UNIT – V: Earthworms as a source of Animal Protein: Food Value of Earthworms – Production of Earthworm Feed Protein – Assessment of the value of worm protein as Animal Feed – Fish, Chicken, Pig and Shrimp Feeding trails – Economics of production of Earthworm protein – Earthworms as human food – Medicinal values of Earthworms for humans.

Course Outcome:

- Explain the morphology, structure and reproduction about earthworms.
- Write the different species of earthworms and suitable species for vermiculture.
- Describe the vermiculture techniques and related equipments.
- Justify – earthworms as farmer’s friend.
- Write the values and importance of earthworm and to explain the values and production vermicompost.

TEXT BOOKS:

1. Edwards, C.A. and Bohlen, P.J.1996. Biology and Ecology of Earthworms. Chapman and Hall, London. 380p.
2. Lee, K.E.1985. Earthworms: Their Ecology and Relationship with soils and Land use, Academic press, Sydney.

REFERENCES BOOKS:

1. Ismail, S.A. 1997. Vermicology. The Biology of Earthworms. Orient Longman Limited. Hyderabad.
2. Bhatnagar, R.K and Palta, R.K. 1996. Earthworm – Vermiculture and Vermicomposting. Kalyani Pyblishers, Ludhiana, India, 106 P.
3. Gupta, P.K. 2005. Vermicomposting for Sustainable Agriculture (Second Edition). Agrobios (India), Jodhpur, India. 210P.

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M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER-I
Elective Course - III
COURSE III: TOXICOLOGY
(Topic of Research)

Course Code:
Hours per Week:
Credits: 4

Max Marks: 100
Internal Marks: 25
External Marks: 75

Course Objectives:

- To make the scholars to understand about the toxicological effects of heavy metals, pesticides, and their biotransformation and also to know about toxicity testing techniques.
- The scholars should learn about the strategies of toxicity and their impact on the environment, exposure of toxicants, management strategies, biomagnifications and toxicity testing.
- To know about food additives and hazards of food additives.
- To find out the mechanism of various toxicants storage and excretion.

UNIT-I: Introduction to Toxicology: Scope of Toxicology – Factors influencing Toxicology – Species and strain, Age, Nutritional status, Time of Dosing Environmental factors, Exposure (dosing) characteristics, Formulation and presentation – Exposure to mixtures of chemicals – Drugs toxicity – Types of Toxins.

UNIT- II: Toxicological methods: Acute, sub-acute, chronic and special tests. Statistical concepts of toxicity – Concentrations. Dose Response relationship – Margin of safety, Toxicity curve, Cumulative toxicity, and toxicity of chemical mixture.

UNIT-III: Pesticide toxicity: Pesticides and their types – Insecticides – Herbicides – fungicides – rodenticides – nematicides – fumigants. Properties and effects of pesticides – Mechanism of action – Acute and Chronic effects, treatment, biological monitoring and regulation. Primary and secondary toxicity – Residue analysis.

UNIT-IV: Xenobiotics: Xenobiotic – Transfer across membrane, barriers absorption, distribution. Biotransformation. Phase I: Oxidation, reduction, and hydrolysis. Phase II: Glucoronidation, sulfation, Glutathymine, conjugation, Acetylation, Amino acid conjugation and methylation reactions – Excretion of Xenobiotics.

UNIT-V: Toxicology of food additives and metals (Arsenic, Cadmium, lead, mercury, zinc and nickel). Types and functions of food additives – hazards of food additives, Pharmokinetics of

metals (Absorption, distribution inhalation, oral ingestion, dermal exposure) metabolism. Storage and Excretion.

Course outcome:

- To know various toxicants which affect the environment and its remedial process make the students to create employment opportunities.
- To emphasise the importance of bioremediation techniques and its importance to clean the environment which hamper the society in various ways.
- To emphasise the storage and excretion of various toxicants.

TEXT BOOKS:

1. Srivastav, R.P. and Saxena, R.C. 1989. Text book of Insect Toxicity. Himansha publications, Rajasthan.
2. Brown, A.W.A. 1951. Insect control by chemical. John Wiley and Sons. New York.
3. R.T. Williams. 1959. Detoxification mechanisms. Wiley. New York.
4. Sharma, P.D. 1995. Toxicology. Rastogi and Company, Meerut.

REFERENCES BOOKS:

1. O' Brien, R.D. and Yamamoto, I. 1970. Biochemical Toxicity of Insecticides. Academic Press. New York.
2. Corbett, J.R. 1974. The Biochemical mode of Action of pesticides. Academic Press. New York.
3. Gruzdyer, G.S. 1983. The chemical protection of plants. Ed. MIR publisher, Moscow.
4. Sood, A. 1999. Toxicology. Sarup & Sons. Darya Ganj. New Delhi.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER-I
Elective Course - IV
COURSE III: HERBAL DRUG TECHNOLOGY AND PHYTOCHEMISTRY
(Topic of Research)

Course Code:	Max Marks: 100
Hours per Week:	Internal Marks: 25
Credits: 4	External Marks: 75

Course Objectives:

- Apply and integrate knowledge of herbal drug technology and phytochemistry.
- To get a fundamental knowledge about drug design.
- To understand the role of medicinal plants as drug character to cure various diseases.
- To enlighten the scholars with the new information related to drug discovery.
- To teach the scholars understanding development of herbal drugs.

HERBAL DRUG TECHNOLOGY

UNIT-I: Brief history and scope of herbal science. Definition of herb, herbal medicine and herbal medicinal product. Source of herbs, selection, identification and authentication of herbal materials. Role of natural products in herbal medicine. General status and importance of herbal medicine. Safety of herbals / herbal pharmacovigilance. W.H.O. policy on herbal medicine.

UNIT-II: Preparation of herbal drug - Herbal material drying; processing of herbal raw material - grinding and extraction (choice of solvents; methods of extraction- maceration, percolation, Soxhlet extraction; steam distillation). Herbal Drug Formulations - study of different dosage forms such as solid, semi-solid, liquid and gaseous containing herbs/herbal extracts/herbal products intended for treatment of GIT (Diabetes, Liver, Constipation, Diarrhoea and Dysentery). Physical, chemical, spectral and toxicological standardization, qualitative and quantitative estimations exemplified by the method of preparation of at least two standardized extracts. Stability studies for extracts.

UNIT-III: Analysis of drugs/metabolites in biological studies like urine, blood, and tissue, enzymatic analysis – Biochemical analysis of drugs, estimation of enzymes and other endogenous materials. Microbiological assay of antibiotics and vitamins. Concepts of reverse Pharmacognosy. Herbal drugs with special reference to Cardiovascular, anti-cancer, anti-viral, anti-microbial anti-parasitic, anticoagulant and anti-inflammatory agents.

PHYTOCHEMISTRY

UNIT IV: Preliminary Phytochemical Screening: a) Successive solvent extraction. b) Qualitative chemical examination-(i) Detection of different classes of phyto constituents by test tube and TLC methods. (ii) Detection of volatile oil by hydrodistillation method.

UNIT V: Methods of isolation, purification and characterization of natural products. Phyto constituents – Introduction, definition, classification, source, importance of alkaloids (quinine, morphine and atropine), *Terpenoids* (Citral, Menthol, Isoprene and Zingiberene), *Steroids* (cholesterol and auxins), flavanoids (Resveratrol, Naringin and Quercetin) and *Purines* (Caffeine).

Course outcome

- Explain in detail the importance of conservation of herbal plants.
- The scholars will be able to recognize the scope of phytochemical screening techniques.
- To emphasise the importance of herbal drug to cure dangerous diseases which hamper the society in various ways.
- To gain knowledge about agents which cause diseases.
- To know the knowledge of isolation, purification and characterization of natural drug products.

TEXT BOOKS:

1. Nadkarni, K.M. 1990. Indian Materia Medica. Popular Prakashan Publication, New Delhi.
2. Bhattacharjee, S.K. 1998. Handbook of Medicinal plants, Pointer Publications, Jaipur.
3. Bone, K. 1996. Clinical application of Ayurvedic and Chinese herbs, Phytotherapy press, Australia.
4. Garratt, D.C. 1995. The Quantitative analysis of drugs. 2nd edition.
5. Brain and Turner, 1996. The practical evaluation of phytopharmaceuticals.

REFERENCES BOOKS:

1. Sharma, O.D. Natural products inorganic chemistry. K. Nath & Co.
2. Gurdeep and R. Chatwall. Organic chemistry of Natural Products. Himalaya publishers.
3. Mant Timothy, G.K.M. Ritter, M.James and D. Lewis Lionel. A Text book of Clinical Pharmacology.
4. Mithal. 1984. Text Book of Pharmaceutical formulation, Vallabh Prakasham, Delhi.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER I
Elective Course – V
COURSE III: ORNITHOLOGY
(Topic of Research)

Course Code:
Hours per Week:
Credits: 4

Max Marks: 100
Internal Marks: 25
External Marks: 75

Course Objectives:

- The main aim of this paper is to know the scholars about the importance of avian community in seed dispersal, pollinators etc.,
- To create an awareness to the scholars about avian species and this paper is used for conservation and management issues of birds.
- To teach the scholars about the scientific methods and its application in avian conservation.
- To know the importance of avian community to safeguard the wildlife and to prevent the man and animal conflict among public.
- To emphasize to the scholars about the contribution of NGOs in avian conservation in national and international level.

UNIT I: Classification of Birds: Classification up to order level with examples – IUCN classification - Rare, Vulnerable, Threatened, Endangered, Extinct. Economic importance of birds - Food and other products from birds – birds of agricultural importance – bird hazards in airports – recreation – aesthetics- hunting – bird watching. Social behavior such as aggregation, sexual behaviour. Evolution of biodiversity indices: Shannon and Weninner index, dominance index, similarity and dissimilarity index and association index.

UNIT II: Breeding Biology: breeding seasons- Factors influencing breeding seasons – Seasonal reproductive cycle – Photo periodism – Courtship and display – Sexual selection – Pair bond – Sexual dimorphism – mating systems – Polyandry, Polygyny – Promiscuity – Co-operative breeding – Brood parasites. Nests: Functions of nests- Choice of nest sites – Colonial nesting – Forms of nest – Multiple nests – Nest materials – Nest building - Nesting habitats- copulation- nest building – Nest sanitation – Egg Laying: Timing of egg laying and clutch size – Incubation patterns – incubation and hatching - growth and development – sex ratio. Parental Care: Feeding – Brooding the young – Defense of young.

UNIT III: Bird Migration: Mechanics of migration – timing of migration – physiology of migration – orientation and navigation. Migration and territorial behavior in birds - means of

dispersal and barriers of dispersal, group size and spacing carrying capacity. GPS, GIS and Remote sensing to monitor avian habitats. Radio telemetry and satellite telemetry studies.

UNIT IV: Population estimation: Direct count (Total count, drive counts, transect methods) - Indirect count: (Call count, track count, pellet count) - mark recapture method (Peterson or Lincon index method). Population Regulation: Population densities – Predation – Competition – Climate and weather – Accidents – parasites and diseases – Population fluctuations. Habitat ecology of Indian birds: coastal birds- inland water birds – birds of high altitudes and deserts. Feeding ecology of birds: Insectivores – frugivores – nectarivores – graminivores – carnivores and scavengers- Optimum foraging theory. Adaptive radiation of Aves.

UNIT V: Conservation issues and Management of Aves: Basic concepts and scope of avian conservation and management – Climate change- pesticides – shooting – drought- persecution- intervention at nest sites and agricultural factors – habitat selection - manipulation. Threats to avian habitats – habitat destruction – fragmentation and degradation – exotic species (weeds) intrusion in avian habitat. Role of NGOs in avian conservation: RSPB, BNHS, SACON, Bird life International, IBWL, WPA, WII, WWF, IUCN, US fish and Wildlife services. Wildlife Act.

Course Outcome:

- To know about various avian status and their importance by reading this course.
- To find out the conservation issues to safeguard the various avian community.
- The role NGOs and their importance by carrying out various projects to safe guard the avian community.
- Scholars get through the employment opportunities in various research institutions.
- Students able to understand the various avian population techniques to construct management strategy to safe guard the avian community.

TEXT BOOKS:

1. Ali, S and Ripley, S.D. 1969. The Handbook of the Birds of Indian and Pakistan. Oxford University Press, New Delhi.
2. Farner, D.S and King, J.K. 1971-75. Avian Biology, 5 Vols. Academic Press, New Delhi.
3. Welty J. 1983. The Life of Birds. Saunders College publishing, New York.
4. Welty J. 1983. The Life o Birds. Saunders College Publishing, New York.

REFERENCES BOOKS:

1. Giles, R.H. Jr (Ed). 2002. Wild Life management techniques^{3rd} edition. The Wildlife society, Washington. D.C Nataraj pulishers, Dehra Dun.india P 547.
2. Robinson. W.L and Eric, G. Bolen. 1984. Wild life ecology and management. Mac Milan Publishing co. P 478.
3. Artikeya, K. 2005. Biodiversity: Extinction and Conservation, (202pp).

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER – I
Elective Course – VI
COURSE III: ENTOMOLOGY
(Topic of Research)

Course Code:
Hours per Week:
Credits: 4

Max Marks: 100
Internal Marks: 25
External Marks: 75

Course Objectives:

- To teach the basics of insect structure and function.
- To provide the concepts of beneficial insects; predators and parasitoids, pollinators, scavengers, weed feeders, insects of medicinal and aesthetic value.
- To enable the students know about principles and practices of biological control.
- Describe molecular basis of insect behavior.
- List the types of pesticides, modes of actions, and efficacy.

UNIT – I: Insect nutrition – role of vitamins, proteins, amino acids, carbohydrates, lipids, minerals and other food constituents; extra and intra-cellular microorganisms and their role in physiology – artificial diets.

UNIT – II: Internal anatomy, physiology, biochemistry and modifications of digestive, circulatory, respiratory, excretory, nervous, sensory, reproductive and musculature systems. Embryonic development in insects – formation of different organs – post embryonic developments - physiology of integument, moulting, growth, and metamorphosis - transmission of nerve impulses – neurotransmitters – and modulators – different types of sensilla – toxins and defense mechanisms.

UNIT –III: Digestive enzymes – digestive physiology in phytophagous and wool feeding insects – efficiency of digestion and absorption – role of endosymbionts in insects nutrition – osmoregulation and water conservation mechanisms in insects –polyphenism and diapauses. Endocrine system and insect hormones – physiology of insect growth and development – metamorphosis – exocrine secretion in insects and their application in pest management – bioluminescence in insects.

UNIT-IV: Traditional pest control - Traps - promising botanicals - Biorational approaches - Environment Modelling in pest management. Advanced techniques in chemical control – IRM - Impact of pesticides in Agro ecosystem - Hormones - Insect growth regulators Moulting inhibitor - Juvenile Hormone mimics -Biotechnology – Molecular tools in pest in Management.

UNIT–V: Problems associated with pesticide use in agriculture: Pesticide resistance - Physiology of insecticide resistance - genetic mechanism - Resistance management. Pest resurgence and outbreaks; persistence and pollution; health hazards and other side effects. Insecticide residues, their significance and environmental implications. Estimation of insecticidal residues- sampling, extraction, clean-up and estimation by various methods; maximum residue limits (MRLs) and their fixation; safe use of insecticides; diagnosis and treatment of insecticide poisoning.

Course Outcome:

- Explain the morphology of insects and analyze the appendages and their function.
- Relates the structure and function of organ systems.
- Describe classification, biology and control of insect vector and control. Explain insect metamorphosis and analyze role hormones in metamorphosis.
- Identify the insect pests of crops, vegetables, fruits, stored grains and household pests and to enhance the productivity of agricultural crops through insect pest management.
- Analyze and apply the biological control of insect pests. Explain the IPM

TEXT BOOKS:

1. Ambrose, Dunston P. 2004. The Insects: Structure, function and Biodiversity. Kalyani publishers, Ludhiana – New Delhi.
2. Bhaskaran, G., S. Friedman and J.C .Rodriguez (Eds.) 1981. Current topics in insect endocrinology and nutrition. Plenum Press, New York, pp. 326.
3. Blum,M.S. 1985. Fundamental of insect physiology. Wiley, New York. 598p.
4. Capman, R.F. 2002. The Insect structure and function. English Languages Book Society, Hooder Strongton.
5. Hassal, K. 1990. The biochemistry and uses of pesticides. VCH Publishers, Weinheim, New York, Basel, Cambridge. 536 p.

REFERENCES BOOKS:

1. Matsumara, F. 1985. Toxicology of insecticides. Second edition, Plenum Publns. New York . 598p.
2. O'Brien, R.D. and I. Yamamoto. 1970. Biochemical toxicology of insecticides. Academic Press, New York .218p.
3. Selvanaryanan. V. Arivudainambi. S. 2013. Introductory Entomology, Unicorn printers and publishers, Koyambedu, Chennai.
4. Temphare, D.B. 2009. Modern Entomology, Himalaya publishing Mumbai.
5. Vasantharaj David. B. and V.V. Ramamurthy 2011. Elements of Economic Entomology, Namrutha publications, Chennai-600 116.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER I
Elective Course - VII
COURSE III: MEDICAL NANOTECHNOLOGY
(Topic of Research)

Course Code:	Max Marks: 100
Hours per Week:	Internal Marks: 25
Credits: 4	External Marks: 75

Course Objectives:

- To give information about the techniques of medical nanobiotechnology among scholars.
- To encourage the scholars to take medical nanobiotechnology as their career as it provides ample scope for bright feature.
- Independently execute a laboratory experiment using the standard methods and techniques in nanobiotechnology, with the appropriate analysis and interpretation of results obtained.
- The contents are more informative and essential for scholars lab and research work such as synthesis of nonmaterial in different ways.

UNIT I: Synthesis of Nanomaterials: Synthesis of nanomaterials by Physico-chemical approaches. Bionanocomposites : Nano particles and Microorganisms, Microbial Synthesis of Nano materials, Biological Methods for Synthesis of nano-emulsions using bacteria, Fungi and Actinomycetes, Plant based nanoparticle synthesis.

UNIT II: Characterization Methods: Determination of nanoparticles using microscopes - Optical Microscopy – Scanning Electron Microscopy – Transmission Electron Microscopy - Atomic Force Microscopy – Scanning Tunneling Microscopy – Optical Absorption and Emission Spectroscopy – Thermogravimetric Analysis – Differential Scanning Calorimetry – Thermomechanical Analysis- X-Ray Diffraction.

UNIT III: Nanotechnology in Pharmaceutical Applications: Trends in nanobiotechnology - Protein and peptide based compounds for cancer, diabetes, infectious diseases and organ transplant- therapeutic classes- focused pharmaceutical delivery systems.

UNIT IV: Nanotechnology in Drug Delivery: Nanoparticle in Drug delivery- Nanopowder and Nanocrystals, Targeting Ligands. Applications of Nanoparticle in Drug Delivery, Cancer & Diabetes mellitus Treatment. Nanosystems in Inflammation, Targeting Macrophages to Control Inflammation, Tissue Regeneration, Growth and Repair, Tissue Bioengineering.

UNIT V: Methods for Diagnosis: Animation of the PCR - DNA Profiling - Cantilever Sensors - Targeted Drug Delivery - Magnetic Nanoparticles - Cancer cell targeting - Stem Cell Scaffolds - Electrochemical Impedance Spectroscopy (EIS) - Tethered Lipid Membranes.

Course Outcome:

- Discuss the most significant discoveries and their impacts on the development of medical nanobiotechnology .
- Explain the fundamental structure, properties and processes in which the nanoparticles play a part in different fields.
- This field would help the scholars for drug discovery along with several plant extracts.
- Process the results obtained in the conducted experiments using computer processing, and display the results in the form of a written report.
- Accept the need and importance of ongoing development through the available lifelong learning programmes.

TEXT BOOKS:

1. Inorganic Nanoparticles: Synthesis, Application and Perspectives. Edited by Claudia Altavilla and Enrico Ciliberto. CRC Press, 2011.
2. G.Cao, “Nanostructures and Nanomaterials: Synthesis, Properties and Applications”, Imperial College Press, 2004.
3. T.Pradeep, “Nano: The essentials, understanding Nanoscience and Nanotechnology”, Tata Mc Graw Hill, 2007.

REFERENCES BOOKS:

1. Willard, “Instrumental Methods of Analysis”, Van Nostrand, 2000.
2. R.S. Greco, F.B.Prinz and R.L.Smith, “Nanoscale Technology in Biological Systems”, CRC press, 2005.
3. David.S.Goodsell, “Bionanotechnology: concepts, Lessons from Nature”, Wiley-Liss, 2004.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER I
Elective Course - VIII
COURSE III: AGRICULTURAL ORNITHOLOGY
(Topic of Research)

Course Code:

Max Marks: 100

Hours per Week:

Internal Marks: 25

Credits: 4

External Marks: 75

Course Objectives:

- The main aim of this paper is to know the scholars about the importance and role of birds in various agricultural fields as pollinators, predators etc.
- To create an awareness to the scholars about avian species.
- This paper is used for conservation and management issues of birds present in various agricultural fields.
- To teach the scholars about the scientific methods and its application in avian conservation.
- To know the importance of avian community to safeguard the avian community and to prevent the man and animal conflict among public.

UNIT – I: Diversity and distribution of Avifauna at Global and India level - An overview of Agricultural Ornithology in India – Groups of Birds Associated with Agro-ecosystems - Association of birds with different cultivation practices and crop stages -Their seasonality and succession –Adaptations of Diurnal and Nocturnal Birds.

UNIT – II: Bird pest Surveillance – Estimation of Bird Pest population in crop fields - Bird Census Techniques: Point counts – Line Transects – Netting of Birds – Knowledge of Calls of Birds – Call Playback method for Nocturnal Birds – Economic Threshold Levels - Home Range – Home Range overlap - Resource Partitioning -Radio-telemetry technique and its applications – Use of GIS and GPS for studying Birds - Camera traps – Night vision equipment in bird study – Plotting of GPS locations on Google Maps.

UNIT - III: Food and feeding habits of birds in crop fields: Carnivorous – Frugivorous – Granivorous – Insectivorous- Nectivorous – Omnivorous with suitable examples - Other food habits of Birds - Avivorous — Piscivorous with examples – Roles of these birds in Cropping systems - Bird Pests of Paddy, Sunflower, Maize, Vegetable crops - Types of damage caused by birds in different crops with examples – Methods of assessment of Bird depredation in various crops in India –Paddy – Sunflower – Maize – Vegetable crops – Magnitude of depredation to these crops at pre-harvest level.

UNIT – IV: Roosting and Nesting sites of Birds – Nesting territories –Solitary and Communal nesting - Type of nests - Nest building - Nest defense - Ecology and Biology of Barn owl - Spotted owl - Indian Eagle owl – Mottled Wood owl – Indian Scops owl – Utilization of these birds in managing the pests in crop fields – Use of Artificial Nest Boxes for conservation and propagation of owls – Utilization of Perching poles in managing pests in crop fields.

UNIT–V: Methods and principles of Bird Pest Management – Natural and Artificial Management - Management of bird pests in agriculture: physical, cultural, mechanical, ecological and chemical methods - Role of Insectivorous birds in agriculture as Bio-control agents -Attracting them to crop fields - Use of bird excreta in agriculture -Trends in Managing Bird Pests – Reflective Ribbons – Leaf wrapping in Maize – Paper plate – Spraying of 2% Egg Solution and 2% Neem seed extract solution – Bio-Acoustics – Border crops – Botanical Repellents - Integrated Bird Pest Management (IBPM) adopted currently in India.

Course Outcome:

- To know about various avian status and their importance by reading this course.
- The role NGOs and their importance by carrying out various projects to safe guard the avian community.
- Scholars get through the employment opportunities in various research institutions.
- Students able to understand the various avian population techniques to construct management strategy to safe guard the avian community.
- To emphasize to the scholars about the contribution of NGOs in avian conservation in national and international level.

TEXT BOOKS:

1. Ali, S. 2002. *The Book of Indian Birds*. Oxford University Press, New Delhi, India. 326p.
2. Ali, S. and Ripley, D. *Handbook of the Birds of India and Pakistan*. Vol 1-10. Oxford University Press, India. 3121p.
3. Bibby, C. J., Burgess, N. D. and Hill, A. 1992. *Bird Census Techniques*. Academic Press, UK. 257p.
4. Grimmett, R., Inskipp, C. and Inskipp, T. *Pocket Guide to the Birds of the Indian Subcontinent*.Oxford University Press, New Delhi, India. 384 p.

REFERENCES BOOKS:

1. Manakadan, R., Ranjit Daniels, J. C. and Bhopale, N. 2011. *Birds of Indian Subcontinent: A Field Guide*. Bombay Natural History Society and Oxford University Press, New Delhi.
2. Naoroji, R. 2006. *Birds of Prey of the Indian Subcontinent*.Om Books, 692p.
3. Sridhara, S. 2006. *Invertebrate Pests in Agriculture, The Indian Scenario*. ScientificPublishers, Jodhpur.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER I
Elective Course - IX
COURSE III: MEDICAL MICROBIOLOGY
(Topic of Research)

Course Code:

Max Marks: 100

Hours/Week:

Internal Marks: 25

Credit: 4

External Marks: 75

Course Objectives:

- The aim of this course is to train the students in the field of Medical Diagnostic Microbiology.
- Knowledge and practical skills shall be acquired by the candidates in the sub-specialities of Bacteriology including Mycobacteriology, Virology, Parasitology, Immunology, Serology & Mycology.
- This paper will help the scholars to deal with diagnosis and prevention of infectious diseases in the community.
- Organize the prevention and control of communicable diseases in the community.
- Understand and practice the principle of prevention and control of health care associated infections and rational antibiotic policy.

UNIT-I: General Microbiology: History and pioneers in Microbiology: Microscopy - Morphology of bacteria and other micro-organisms. Growth and nutrition of bacteria - Bacterial metabolism. Sterilization and disinfection - Biomedical waste disposal - Bacterial toxins. Antibacterial substances used in treatment of infections and drug resistance in bacteria. Host parasite relationship. Quality control and Quality Assurance in Microbiology. Laboratory Biosafety - Health care associated infections- prevention and control.

UNIT-II: Immunology and applied aspects: The normal immune system - Innate immunity – Antigens – Immunoglobulins - Complement. Antigen and antibody reactions - Hypersensitivity. Cell mediated immunity – Immunodeficiency – Autoimmunity - Immune tolerance. Transplantation immunity. Tumour immunity. Prophylaxis and immunotherapy Measurement of immunity. Immunity and immunopathogenesis of specific infectious diseases. Molecular Biology Techniques. For e.g. PCR, DNA probes.

UNIT-III: Systematic bacteriology and Virology: Isolation, description and identification of bacteria -The epidemiology, pathogenesis, antigenic characteristics and laboratory diagnosis of disease. Staphylococcus and Micrococcus - Anaerobic Gram positive cocci. - Streptococcus and Lactobacillus. Neisseria, Branhamella and Moraxella. Corynebacterium and other coryneform organisms. Bacillus and Enterobacteriaceae. **VIROLOGY:** Morphology :virus structure. Virus

replication. The genetics of viruses. The pathogenicity of viruses. Epidemiology of viral infections. Vaccines and antiviral drugs Emerging viral infections – SARS, Avian influenza, H1N1.

UNIT-IV: Mycology: The morphology and reproduction of fungi and antimycotic agents. Classification of fungi. Contaminant and opportunistic fungi. Fungi causing superficial mycoses and subcutaneous mycoses. Fungi causing systemic infections

UNIT-V: Applied Clinical Microbiology: Epidemiology of infectious diseases. Hospital acquired infections. Infections of various organs and systems of the human body. Molecular genetics as applicable to Microbiology. Automation in Microbiology. Rapid diagnostic techniques for microbial diseases. Vaccinology : principle, methods of preparation, administration of vaccines. Outbreak investigations & disaster management. Biological warfare

Course Outcome:

At the end of the course the scholars shall be able to:

- State and explain the etiology, pathogenesis and methods of laboratory diagnosis of infectious diseases and apply that knowledge in the treatment, prevention and control of communicable diseases caused by micro-organisms.
- State and explain the principles of immunity and immunological phenomenon which help to understand the pathogenesis, laboratory diagnosis of infectious and non-infectious diseases.
- Establish and practice “laboratory medicine” for diagnosis of infectious diseases in hospitals and community in the field of bacteriology, virology, mycology and immunology in the light of clinical findings.
- State the recent advances in the field of Medical Microbiology and apply this knowledge in understanding aetiopathogenesis and diagnosis of diseases caused by micro-organisms.
- Carry out fundamental or applied research involving microbiological work.

TEXT BOOKS:

1. Pelczar, M.J., E.C.S. Chan and N.R. Kreig. 2009. Microbiology, fifth edition. McGraw-Hill. Book Co. Singapore.
2. Tortora, G.J., Funke, B.R. and Case, C.L. 2009. Microbiology: An Introduction. 9th Edition, Pearson Education, Singapore.
3. Madigan, M.T., Martinkl, J.M. and Parker, J. 2009. Brock Biology of Microorganisms, 12th Edition, MacMillan Press, England.
4. Prescott, L.M., Harley, J.P. and Klein, D.A. 2008. Microbiology (7th edition) McGraw Hill, Newyork.
5. Stanier, R.Y., Adelberg, E.A. and Ingram, J.L. 1991. General Microbiology, 5th Ed., Prentice Hall of India Pvt. Ltd., New Delhi.
6. Cappuccino and Sherman, 2012. Microbiology – A Laboratory Manual. 7th Edition, Dorling Kindersley (India) Pvt. Ltd., New Delhi
7. Gunasekaran, P. 2008. Laboratory Manual in Microbiology, New Age International (P) Ltd. Publishers, New Delhi.

REFERENCE BOOKS:

1. Alcamo, I.E. 2001. Fundamentals of Microbiology, sixth edition, Addison wesley Longman, Inc. California.
2. Alexopoulos, C.J., C.W. Mims and M.Blackwell. 2000. Introductory Mycology. fifth edition John Wiley & Sons. Chichester.
3. Atlas, R.A. and Bartha, R. 2000. Microbial Ecology. Fundamentals and Application, Benjamin Cummings, New York.
4. Black, J.G.2005. Microbiology-principles and explorations, 6th edition. John Wiley & Sons, Inc. New York
5. Dubey, R.C. and Maheswari, D.K. 2010. A Text Book of Microbiology. S Chand, New Delhi.
6. Johri, R.M., Snehlatha, Sandhya Shrama, 2010. A Textbook of Algae. Wisdom Press, New Delhi.
7. Kanika Sharma, 2011. Textbook of Microbiology – Tools and Techniques. 1st Edition, Ane Books Pvt. Ltd., New Delhi.
8. Kanika Sharma, 2009. Manual of Microbiology – Tools and Techniques. 2nd Edition, Ane Books Pvt. Ltd., New Delhi.
9. Kulanthaivel,S and S. Janarthanan 2012. Practical Manual on Fermentation Technology. I.K. International Publishing house. New Delhi.

NEHRU MEMORIAL COLLEGE (AUTONOMOUS)
(Nationally Accredited with 'A' Grade by NAAC)
PUTHANAMPATTI – 621 007, TRICHY – DT.
P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER - I
COURSE IV: TEACHING AND LEARNING SKILLS

Course Code:	Max Marks: 100
Hours per Week:	Internal Marks: 25
Credits: 4	External Marks: 75

Course Objectives:

- Apply and integrate knowledge of teaching and learning skills among scholars.
- To get a fundamental knowledge about basic and advanced teaching methods.
- To understand the role of advanced teaching skills in various institutions.
- To enlighten the scholars with the new information related to teaching technology.
- To teach the scholars understanding development of advanced teaching skills and to prepare the scholars e-contents for future use by using various technology.

UNIT-I: Computer Applications Skills: Computer system: Characteristics, parts and their functions – Different generations of computer – Operation of computer: switching on/off/restart. Mouse control, Use key board and some functions of key – Information and Communication Technology (ICT): Definition, Meaning, Features, Trends. Integration of ICT in teaching and learning – ICT applications: Using word processors, Spread sheets, Power point slides in the classroom.

UNIT-II: Communication Skills: Definitions – Elements of communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication – Spoken and Written; Non-verbal Communication – Intrapersonal, Interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics.

UNIT-III: Communication Technology: Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching: Multimedia, E-Content – Satellite-based communication: EDUSAT and ETV Channels. Communication through web: Audio and Video applications on the internet, Interpersonal communication through the web.

UNIT-IV: Pedagogy: Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a

Lecture – Narration I tune with the nature of different disciplines – Lecture with power point presentation – Versatility of Lecture technique – Demonstration: Characteristics, Principles, Planning, Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion – Modes of teaching: CAI, CMI and WBI.

UNIT-V: Teaching Skills: Teaching skill: Definition, Meaning and Nature – Types of Teaching skills: Skill of Set induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing, Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills.

Course Outcome:

- To know about computers and its parts.
- The ICT technology will be improved in various ways.
- The scholars will able to recognize the scope of teaching skills.
- To emphasise the importance of EDUSAT and ETV Channels and its importance to improve the teaching skills.
- To gain knowledge about Evaluation of Teaching Skills.

TEXT BOOKS:

1. Bela Rani Sharma (2007). Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi.
2. Don Skinner (2005). Teacher Training, Edinburgh University Press Ltd., Edinburgh.
3. Information and Communication Technology in Education: A Curriculum for schools and programme of Teacher development, Jonathan Anderson and Tom Van Weert, UNESCO, 2002.
4. Kumar, K.L (2008). Educational Technology, New Age International publishers, New Delhi.
5. Mangal, S.K (2002), Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.

REFERENCES BOOKS:

1. Michael, D and William (2000). Integrating Technology into Teaching and Learning: Concepts and Applications, prentice Hall, New York.
2. Pandey, S.K (2005). Teaching Communication, Commonwealth Publishers, New Delhi.
3. Ram Babu, A and Dandapani, S (2006). Microteaching (Vol.1 &2), Neelkammal Publications, Hyderabad.
4. Singh, V.K and Sudarshan, K.N (1996). Computer Education, Discovery Publishing Company, New York.
5. Sharme, R.A (2006). Fundamentals of Educational Technology, Surya Publications, Meerut.
6. Vanaja, M and Rajasekar, S (2006). Computer Education, Neelkamal Publications, Hyderabad.

**BLUE PRINT OF THEORY QUESTION PAPER
FOR BOTH FULL TIME AND PART TIME**

Question Paper Pattern

I Semester:

External: Total 75 Marks

Theory Paper

Section A : 10 Questions x 2 Marks = 20 Marks (Two Questions from each unit will be asked) Answer all the questions. Define each question in four or six sentences.	20
Section B: 05 Questions x 5 Marks = 25 Marks (Internal choice (or) Either or type and one set of questions from each unit will be asked) Answer all the questions in 500 -700 words, draw diagram wherever necessary.	25
Section C: 03 Questions x 10 Marks = 30 Marks (5 questions will be asked and one question from each unit will be asked) (Answer any THREE questions only) Write the answer in 1500 words, draw diagram wherever necessary.	30
Total	75

Internal: Total 25 Marks

CIA Components	Portions to be covered	Question Paper pattern to be followed	CIA Marks allotted
CIA Test - I	First 2½ Units	Same as Autonomous Examination Question Paper	10
CIA Test - II	Remaining 2½ Units		
Attendance	---	---	05
Assignments (2)	Any topics from five Units	---	05
Seminar (1)		---	05
Total			25

II Semester:

Project Work

Total Marks = 200

(Internal: Thesis = 150 marks, External: viva = 50 marks)
