Subject Code: 19MPZE01

PERIYAR UNIVERSITY, SALEM-636 011

DEPARTMENT OF ZOOLOGY
M.Phil., DEGREE COURSE IN ZOOLOGY

SEMESTER - I ELECTIVE PAPER

ANIMAL CELL CUTURE AND STEM BIOLOGY

Objectives:

- Students are motivated to impart knowledge and practical skills on isolation, culture and preservation of animal cells.
- It is also to provide a basic and advanced understanding of pluripotent stem cells.
- This subject also aims to provide knowledge practical skills on the synthesis, characterization and application of different nanoparticles.

Outcome:

- You will be an expertise in cell culture theory and practices.
- On completion of the course you can fit yourselves in the international nanotechnology laboratories reproducing your experience the study period.
- You will have basic and novel ideas for future research on monotherapy for various diseases.

UNIT - I

Animal Cell Culture: Historical Background , Importance and progress in Animal Cell Culture Technology, Biology of Animal Cell; Cellular Interactions, Cell Line Preservation, Cell Line Characterization.

UNIT – II

Media Preparation: Importance of Serum and Serum Free Media. Need of Antibiotics for animal cell culture. Culturing and Sub-Culturing of Animal Cells. In Vitro Transformation of Animal Cells and Cloning of Animal Cells. Animal Cell as Bioreactor to produce therapeutic agents. Applications of animal cells in tissue engineering and treatment of non-communicable diseases like cancer, diabetes and obesity.

UNIT III

Principle and Applications of : Chromosome Spreading and Karyotype Analysis, Micro-dissection of Chromosomes, MTT Assay, XTT Assay, TUNEL Assay. Staining Techniques – Acridine orange, Ethidium bromide, Hoechst, DAPI and Immunohistochemistry. Mycoplasma: Detection and Control. Applications of Monoclonal Antibody and its Production strategy. Insect Cell Culture: An Overview.

UNIT IV

Historical background of Stem cell Technology. Stem Cell culture and steps involved in cultivation of stem cells. How Stem Cell Works in understanding diseases and disease treatment. Types of Stem Cells: embryonic, pluripotent, multipotent, mesenchymal, cancer and adult stem cells and their applications.

UNIT V

Synthesis and Characterization of biopolymers: Structure and functions of Gelatin, Collagen, Chitosan, Fibroin, Sericin, Cellulose, and Elastin like peptide (ELP). Characterization of biomaterials- Physical, Chemical: Principles and applications of UV-Vis Spectrophotometer, Nano-drop, IR, GC-MS, Electron Microscopy – SEM, TEM, STEM, and biological methods: Cell viability test, Culture of Neurons, Significance of Neuronal Stem Cells. Delivery of stem cell for treatment. Principles and applications of Cell Therapy. Scope and applications of Tissue engineering.

REFERENCES BOOKS

1 Al-Rubeai M (2015) Animal Cell Culture, Springer.
2 Davis JM (2011) Animal Cell Culture: Essential Methods, Wiley-Blackwell, USA.
3 Dubey RC (2012) A Text Book of Biotechnology, S. Chand Co., New Delhi.
4 Gupta PK (2014) Biotechnology and Genomics, Rastogi Publications, Meerut, India.
5 Mather JP and Barnes D (2003) Methods in Cell Biology, Vol 57 Animal Cell Culture Methods, Academic Press, New York.
6 Potten CS (2010) Stem Cells, Academic Press, London.
7 David J Lockwood (2004) FRSC: Introduction to Nanoscale Science and Technology, National Research Council of Canada Ottawa, Ontario, Canada.
8 Kirkland AI and Hutchison JL (2007) Nanocharacterisation, Department of Materials, Oxford University, Oxford, UK.
9 Yury Gogotsi (2006) Nanomaterials Handbook, Taylor and Francis Group, Boca Raton London, New York.

Subject Code: 19MPZE02

PERIYAR UNIVERSITY, SALEM-636 011

DEPARTMENT OF ZOOLOGY
M.Phil., DEGREE COURSE IN ZOOLOGY

SEMESTER – I

Elective Paper: PATHOPHYSIOLOGY

Objectives:

- Students are motivated to impart knowledge and practical skills on pathophysiology
- It is also to provide a basic and advanced understanding of functions of organs.
- This subject also aims to provide knowledge practical skills on Physiological Processes.

Outcome:

- He/She will be an expertise in Diagnosis of Human Diseases.
- On completion of the course he/she can fit yourselves in the Diagnostic laboratories
- He/She will have basic and novel ideas for future research on human physiology related various diseases.

Unit-I: Basic structure and functions of various components of Human systems:- Circulatory, Digestive, Excretive, Endocrine, Immune, Nervous, Reparative and Reproductive Systems and their associated disorders.

Unit – II : Food poisoning – types, causative factors, symptoms, diagnosis and treatment. Common Blood Disorders: Etiology, Epidemology, Diagnosis and treatment anemia, bleeding disorders : hemophilia, blood clots, and blood cancers : leukemia, lymphoma, and myeloma. Life Style Dieases : Diabeties- types and treatment strategies. Impact of Obesity research and its current scenario.

Unit-III: Etiology and epidemiology of Parkinson's disease, fronto-temporal dementia, Huntington's disease, amyothrophic lateral sclerosis (Lou Gehrig's disease), progressive supra-nuclear palsy, spino-cerebellar ataxia, Pick's disease and, prion disease. Landmarks in Alzheimer disease research- Molecular biology of Amyloid beta peptide. Introduction to Cognitive Science-Learning, Memory, Mechanism of hearing and Speech, Cognitive behavioural genetics-sensation and perception. Significance of AD Biomarkers.

Unit-IV: Anatomy of Male and Female genital tract, Physiology of oestrus, menstrual cycle and Ovulation, mechanism of oogenesis. Andrology: Spermatogenesis, Components, Seminogram /

Sperm function tests. Board outlines of causes of male and female infertility. Significance of Assisted reproductive technology. Embryology laboratory: Culture media, Egg identification, Insemination, Fertilization and cleavage check. Embryo transfer technique: Blastocyst culture, Embryo hatching. Techniques of intracytoplasmic sperm injection. Cryopreservation Principles of cryopreservation, Semen freezing / Embryo freezing, Slow freeze techniques / Nitrification of germ cells.

Unit-V: Physiology of Immune organs and immune cells and their functions. Types of immunity and their involvement in defence mechanism. Principle and applications of Immuno electrophoresis, ELISA and RIA. Anatomy and Patho-physiology of Excretory organs: Skin, lungs, liver and Kidney. Types of excretory wastes and mechanism of nitrogenous waste removal. Diagnosis and treatment : Kidney failure, Kidney stones, urinary tract infection, Uremia, Renal cell carcinoma, Bright Disease, Diabetic nephropathy and Nephrotic syndrome.

Reference Books

1. S. Grossman and C.M. Porth, 2018. Essential of Pathophysiology: Concepts of Altered Health states. 9th Edition, Wolters Kluwer Publications. Germany.
2. Kathryn L. McCance and Sue E. Huether 2014.Study Guide : Understanding Pathophysiology. Elsevier Publication. USA.
3. Arthur C. Guyton and John E. Hall, 2012. Textbook of Medical Physiology, 12th Edition. Saunders Publication, NY.
4. K. Sembulingam and S. Prema, 2018. Essentials of Medical Physiology, 7th Edition. Jaypee Medical Publications. India

Subject Code: 19MPZE03

PERIYAR UNIVERSITY, SALEM-636 011

DEPARTMENT OF ZOOLOGY
M.Phil., DEGREE COURSE IN ZOOLOGY

SEMESTER - I ELECTIVE PAPER

DEVELOPMENTAL BIOLOGY AND ENDOCRINOLOGY

UNIT - I

Concept of Embryology – Gametes – Types of sperm and eggs. Fertilization - Biochemistry of fertilization. Early development – Cleavage – Patterns of cleavage, Chemical changes during cleavage, formation of blastula, types of blastula. Gastrulation – Fate map, Morphogenetic movements – Epiboly, Emboly – types of embolic movements. Neurulation – mechanism of neural tube formation.

UNIT - II

Organogenesis in vertebrates – Derivatives of ectoderm, mesoderm and endoderm. Development of Brain, Eye, Heart, Reproductive system, Alimentary canal.Regeneration – Regenerative ability in animals – Types – Autotomy, reparative and physiological regeneration – Mechanism of regeneration in Salamander limb, factors affecting regeneration. Metamorphosis in amphibians, Insects, Hormonal regulation of metamorphosis.

UNIT - III

Historical aspects and anatomical aspects of mammalian endocrine system, Pituitary gland-hormones of the pituitary gland - Chemistry & biochemical functions - neurovascular hypothesis; pineal gland- hormones of the pineal gland- Chemistry& biochemical functions.

UNIT - IV

Pineal organ - Structure and functions. The gonads: Structure of testis and ovary - Steroid hormones and their functions - Endocrine control of osmoregulation in fish. Chemical nature of hormones: Hormone Delivery - Hormonal feedback in homeostasis. Thyroid Gland - Biosynthesis of thyroid hormones, Control of secretion and Physiological roles.Parathyroid Gland.

UNIT - V

Steroid hormone biosynthesis and pathways. Testis: Organization, Physiological roles of androgens and Inhibin. Ovary: Organization, Physiological roles of Estrogen, Progesterone

and Relaxin and Inhibin. Adrenal gland: Structure and functions. Pancreas: Biosynthesis and physiological actions of Insulin and Glucagon. Role of parathormone: Calcitonin and vitamin D in calcium homeostasis. Current scenario of endocrine disorders and human health. Clinical evaluation of endocrine functions-over view.

REFERENCE BOOKS:

1. Pedro J. Chedrese (2009) Reproductive Endocrinology (A Molecular Approach), Springer publications

2. Peter C. K. Leung, Aaron J. W. Hsueh, Henry G. Friesen (1999.) Molecular Basis of Reproductive Endocrinology, Springer publications

3. Stanley R. Glasser, Joy Mulholland Alexandre Psychoyos (1994) Endocrinology of Embryo-Endometrium Interactions, Plenum Press, New York

4. Arthur C. Guyton, John E. Hall, (2015)Text book medical physiology, 13th edition, Saunders Publications

5. Hadley (2009) Endocrinology, 6th edition, Pearson Publications

6. Gilbert, S.F. (2009). Developmental Biology, Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts.

7. Balinsky, B.I. (2012). Introduction to Embryology, Holt Saunders International, 5th Edition, Philadelphia

8. Wolpert, L. (2007). Principles of Development, Oxford Publication.

9. Kalthoff, K. (1996). Analysis of Biological Development, McGraw-Hill Publishers, New York.

10. Berril, N.J. (1986). Developmental Biology, Tata McGraw-Hill Publication Co. Ltd., New Delhi.

11. Nussey SS and Whitehead SA (2013) Endocrinology: an integrated approach, CRC Press.

Subject Code: 19MPZE04

PERIYAR UNIVERSITY, SALEM – 636 011

DEPARTMENT OF ZOOLOGY

M.Phil. DEGREE COURSE IN ZOOLOGY

SEMESTER – I **Elective Paper**

SYLLABUS Medical Microbiology

Unit-I Morphology of bacteria, Bacterial metabolism, Bacterial taxonomy and classification. Growth and nutrition of bacteria and method of cultivation. Isolation and identification of bacteria, Bacterial genetics and variation.

Unit-II Normal bacterial flora, zoonoses, epidemiology and transmission. Medically important microbes. Microbial diseases - sources, route of transmission. Pathogenesis - adhesion, invasion, host cell damage, release of pathogens. Microbial virulence and virulence factors - Signs and symptoms of microbial diseases. Treatment, Prevention and control of microbial infections.

Unit-III Immunity to different organisms, pathogen defense strategies, avoidance of recognition, inactivation of host-immune effectors mechanisms. Anatomy, development and functions of immune system, Host and parasite relationship, Biology of immune response ,Microbial pathogenicity and host immune response, Infection and immunity

Unit-IV Diagnosis of microbial diseases - Collection, transport and preliminary processing of clinical pathogens. Clinical, microbiological, immunological and molecular diagnosis of microbial diseases. Modern methods of microbial diagnosis.

Unit-V Classification of antibiotics on the basis of structure and mode of action. Assay of antibiotics, antibiotic spectrum Naturally produced drugs. Antibiotics produced by bacteria, actinomycetes and fungi used in chemotherapy.

Reference books

1. Gerard J. Tortora , Berdell R. Funke Christine L. Case Microbiology: An Introduction 13th Edition. Pearson publisher (2018)
2. Topley & Wilson's Microbiology and Microbial infections. 10th edition. Volumes 1-6: 2008 Arnold, London

3. Pedro Escoll Bacterial Evasion of the Host Immune System 2017 Caister academic Press
4. Bailey and Scott's Diagnostic Microbiology 9th Ed. C V Mosby, St: Louis, 2003. Brooks, Geo F Jawetz Medical Microbiology 22nd Ed. Mc Grew Hill 2001
5. Subash Chandra Parija.Textbook of Microbiology & Immunology 3rd Edition Elsevier 2016
6. Lansing M. Prescott, John P Harley, Donald A. Klein; Microbiology, McGraw Hill. Ed. 6; 2005.
7. Michael T. Madigan, John M Martinko, Brock's Biology of Microorganisms, Pearson-Prentice Hall. Ed. 11; 2006
8. David Greenwood, Richard B. Slack John F. Peutherer Medical Microbiology, Churchill Livingstone, London. 18th Edn., 2012.
9. Pelczar Jr MJ, Chan ECS and Kreig NR. Microbiology, 5th edition. Mc. Graw Hill. Inc, New York. 2013

Subject Code: 19MPZE05

PERIYAR UNIVERSITY, SALEM – 636 011

DEPARTMENT OF ZOOLOGY

M.Phil. DEGREE COURSE IN ZOOLOGY

SEMESTER – I

Elective Paper : VERMITECHNOLOGY

SYLLABUS

Course Objectives:

- To impart knowledge on earthworm culture technology.
- To understand the characteristics of earthworm species suitable for vermiculture and vermicomposting.
- To understand various applications of earthworms in organic solid waste management, soil fertility, and bioremediation.

Course Outcomes:

On successful completion of this course, the student will be able to understand the core concepts of vermiculture and vermicomposting and then involved in the entrepreneurship to promote agriculture. Successful students will apply vermitechnology in vermicomposting, soil fertility, and bioremediation processes and to become an entrepreneur.

Unit I: EARTHWORMS – Taxonomic position and diversity. Types – morphological and anatomical characteristics. Biology of *Lampito mauritii.* Ecological grouping – Epigeic, Anecic and Endogeic species. Ecological role and economic importance of earthworms – Need for earthworm culture.

Unit II: VERMICULTURE – Scope and application. Common species for culture – Environmental requirements. Culture methods – Wormery – Breeding techniques. Indoor and outdoor cultures – Monoculture and Polyculture – Relative merits and demerits.

Unit III: VERMICOMPOSTING & APPLICATIONS – Small scale and Large scale Vermicomposting Methods – Fators affecting vermicomposting- pH, Moisture, Temperature, etc., Use of Vermicastings in Organic farming/Plantation/Agricultural Crops & Horticulture, Earthworms for management of municipal organic solid wastes – as feed/bait for capture/culture fisheries. Nutrient value of worm cast/vermicompost, Quality Control – Effect of vermicompost on plants.

Unit IV: VERMICULTURE PRODUCTS & FUTURE PRESPECTIVES: Marketing the products of vermiculture – Socio-Economic value of Vermiculture – Creating the demand by awareness and demonstration, advertisements, packaging and transport, direct marketing.

Predator, Parasite and pathogen control in Wormeries. Role of Farmers/NGO's in promoting Vermiculture/Vermicompost in India.

Unit-V: TECHNIQUES IN VERMITECHNOLOGY: Earthworm collection Techniques – Assessment of nutrient content of Vermicompost – Estimation of Nitrogen, Phosphorus and Potassium and micronutrient content – Enzymatic activity – pH and Electrical Conductivity.

REFERENCE BOOKS

1. Edwards, C.A. and Bohlen, P.J. 1996. Biology and Ecology of Earthworms, 3rd Edition, Chapman & Hall, London.

2. Ismail, S.A. 1997. Vermicology: The Biology of Earathworms, 1st Edition, Orient Longman, India.

3. Ismail, S.A. 2005. The Earthworm Book, 2nd Edition, Other India Press, Apusa, Goa, India.

4. Ranganathan, L.S. 2006. Vermibiotechnology – From Soil Health to Human Health, Agrobios, India.

5. Edwards, C.A. Arancon, N.Q. and Sherman, R. 2011. Vermiculture Technology: Earthworms, Organic Wastes, and Environmental Management, CRC Press, Boca Raton, FL.

6. Edwards, C.A. Hendrix, P and Arancon N. 2014. Biology and Ecology of Earthworms, Springer Publications.

Subject Code: MPZE06

PERIYAR UNIVERSITY, SALEM – 636 011

DEPARTMENT OF ZOOLOGY

M.Phil. DEGREE COURSE IN ZOOLOGY

SEMESTER – I GUIDE PAPER

ENVIRONMENTAL TOXICOLOGY

SYLLABUS

Course Objectives:

- To provide an overview of environmental toxicology.
- To understand the toxicity of pollutants in biological and environmental systems.

Course Outcomes:

On successful completion of this course, the student will understand the fundamental concepts, methods, and approaches of environmental toxicology and to characterize the toxicological effects of environmental toxicants on living organisms.

Unit I: Introduction to Toxicology: Scope and types – Classification of toxic agents, toxicity, hazard, risk, Routes of exposure, duration and frequency of exposure – Drug toxicity, biochemical basis of toxicity and mechanisms of toxicity, receptor mediated events – Acute and chronic toxicity, LC_{50} and LD_{50}.

Unit II: Environmental Toxicology and Risk Assessment: Biomonitoring of environmental contaminants – Bioindicators of environmental pollutants – Aquatic Toxicology – Pesticides, heavy metals, hydrocarbons, and volatile organic compounds – Bioaccumulation and biomagnification of toxic materials in food chain. Xenobiotics – Risk Assessment Procedures.

Unit III: Environmental Contaminants and Remediation Technologies: Organic and inorganic environmental pollutants – Soil and water quality parameters – Physical, chemical and biological remediation technologies – Bioremediation – Technologies used for remediation of contaminated terrestrial and aquatic environments – Advantages and Limitations of remediation technologies.

Unit IV: Natural Resources and Management: Status and exploitation of water, land, forest, mineral, energy and wild life resources – Sustainable use of resources – Carbon sequestration – Renewable and non-renewable energy resources – Energy recovery from

wastes, Energy conservation policies – Energy balance and energy audit – Principles of remote sensing, GIS and its environmental applications.

Unit-V: Environmental Ethics and Intellectual Property Rights: Composition of Institutional evaluation Ethical Committee (IEC) – GM crops/GM organisms and their environmental issues - Intellectual Property Right (IPR): Definition – Types of Intellectual Property Right (IPR): Patents, Copyrights, Industrial Design Rights, and Trademarks – Case studies of patents with reference to Turmeric and Neem – Patent procedure in India.

REFERENCE BOOKS

1. Botkin, D.B. and Keller, E.A. 2012. Environmental Science, 8th edition, Wiley India Pvt. Ltd., New Delhi.

2. Walker, C.H., Sibly, R.M., Hopkin, S.P. and Peakall, D.B. 2012. Principles of Ecotoxicology, CRC Press, Boca Raton, FL, USA.

3. Manahan, S.E. 2013. Fundamentals of Environmental Toxicology and Toxicological Chemistry – Sustainable Science, 4th Edition, CRC Press, Boca Raton, FL, USA.

4. Amiard-Triquet, C. Amiard, J.C. and Rainbow, P.S. 2013. Ecological Biomarkers – Indicators of Ecotoxicological Effects, CRC Press, Boca Raton, FL, USA.

5. Aswathanarayana, U. 2012. Natural Resources: Technology, Economics and Policy, Taylor and Francis, UK.

6. Canter, L.W. 1996. Environmental Impact Assessment, McGraw Hill, New York.

7. Grebner, D.L., Bettinger, P. and Siry, A. 2013. Introduction to Forestry and Natural Resources, Academic Press, UK.

8. Ostrom L.T. and Wilhelmsen C.A. 2012. Risk Assessment – Tools, Techniques and their Applications, John Wiley & Sons Inc., NJ, USA.

9. Venkateswar Rao, G. 2012. Intellectual Property Rights: Patent Laws in India, SSDN Publishers & Distributors, New Delhi.

10. Wu, Y., Carroll J.J. and Du, Z. 2011. Carbon Dioxide Sequestration and Related Technologies, John Wiley & Sons INc., USA.

11. Singh, D.K. 2012. Pesticide Chemistry and Toxicology, Bentham Books, USA.

Subject Code: 19MPZE07

PERIYAR UNIVERSITY, SALEM-636 011

DEPARTMENT OF ZOOLOGY
M.Phil., DEGREE COURSE IN ZOOLOGY

SEMESTER - I ELECTIVE PAPER

AQUACULTURE AND FISHERY BIOLOGY

UNIT - I

Historical background and present status of aquaculture: purpose and importance of aquaculture. Traditional, extensive, semi-intensive, intensive, super-intensive culture systems. Characteristic features of cultivable species (Indian major carps, murrels, catfish and tilapia). Selection criteria of cultivable species. Cryopreservation of gametes and embryos.

UNIT - II

Freshwater, brackishwater and marine water culture, merits and demerits, Design, construction and management of ponds, types of ponds. Control of aquatic weeds and predators. Composite fish culture: Mono sex culture, culture of air-breathing fishes, sewage fed fish culture, Fish-cum duck culture.

UNIT - III

Induced breeding of carps, Broodstock management. Vaccines and therapeutics for broodstock management. Cryopreservation of fish and shellfish gametes; Methods to identify quality seeds - stress test, microscopic examination.Artificial insemination. Advances in seed production of commercially important finfishes and shellfishes. Effluent treatment in Hatcheries. Seed transportation methods.

UNIT - IV

Identification of Fish diseases: Parasitic, protozoan, bacterial, fungal and viral diseases and their control measures. Protocol for Fish processing and preservation, fishery by-products.

UNIT - V

Genotoxicology, Reproductive toxicology, Immunotoxicology, Respiratory toxicology, Nephrotoxicity, Neurotoxicity, Pharmaceutical toxicology.

REFERENCE BOOKS:

1. P. Santhanam, A.R. Thirunavukkarasu, P. Perumal (2015) Advances in Marine and Brackishwater Aquaculture, Springer publications.

2. B. B. Jana, R. N. Mandal, P. Jayasankar (2018) Wastewater Management Through Aquaculture. Springer publications.

3. Marianne Holmer, Kenny Black, Carlos M. Duarte, Nuria Marbà, Ioannis Karakassis (2008) Aquaculture in the Ecosystem. Springer publications.

4. Alexandra Adams (2016) Fish Vaccines. Springer publications.

5. Philip C. Burcham (2014). An Introduction to Toxicology, Springer publications.

6. Jason M. Hansen, Louise M. Winn (2019), Developmental Toxicology (Methods and Protocols), Springer publications.

7. Jhingran VG (1991) Fish and fisheries of India. Hindustan Publishing Corporation,New Delhi.

8. Pillai TVR (1993) Aquaculture Principles and Practices. Fishing News Agency,London.

9. Biswas SP (1993) Manual of Methods in Fish Biology, International Book Co.,Absecon Highlands. New Jersey.

10. Bose AN. Yang CT and Misra A (1991) Coastal Aquaculture Engineering. Oxfordand IBH Publishing Co., Pvt. Ltd., New Delhi.

11. MPEDA Hand book of Aquafarming (1992) Freshwater Fishes, Marine ProductsExport Development Agency, Kochi.

Subject Code: 19MPZE08

PERIYAR UNIVERSITY, SALEM – 636 011

DEPARTMENT OF ZOOLOGY

M.Phil. DEGREE COURSE IN ZOOLOGY

SEMESTER – I

Elective Paper: NANOMEDICINE

SYLLABUS

UNIT-I Current Scenario of Nanomedicine: Nanoparticle as drug carriers- Nanoparticles as gene carrier- Nanoparticle as RNAi carriers. Development of nanomedicine to target cancer. Commercialized nanocarriers for cancer treatment. Impact of nano in cancer biology. Tumor immunology, immunodiagnosis and therapy with monoclonal antibodies.

UNIT II Synthesis and characterization of Nanopartiucles: Methods, types and use ofchemical and biological- Fungi, Yeast, Bacteria and Actinomycetes for production of metallic and non-metalic nanoparticles. Collision/Coalescence mechanism of primary particle formation, agglomertates and aerogels. Use of nanoparticles as molecular imaging probes. Techniques used in Nanobiotechnology- Optical microscopy, Atomic force microscopy, SEM, optical microscopy and x-ray diffraction to study the dynamic events in cell.

UNIT-III. Application and benefits of nanotechnology ; Basics tools for nanotechnology – Principals of scanning force microscopy, Scanning electron microscopy ,Transmission electron microscopy; Nanoinprint, Lithography, Bimolecular recognition. Tissue Engineering: Preparation of hydrogel and biopolymer for wound healing. Development of Bioprinting 2D and 3D Bioprinters, Bio inks for Tissue Engineering.

UNIT IV: Applications of Bionanotechnology.Microarray technology.Nanopore technology.Nanobiotechnology for Human health- A remedy for all diseases.Invitro diagnosis. Medical Applications of Nanoparticles &Nanosystems.Nano drug delivery. Conventional drug delivery & targeted drug delivery and advantages. Delivery profile, Role of Nanotechnology in drug delivery & Cancer Biology.

UNIT V: Techniques: Principle and applications of microscopy – phase contrast, polarizing, fluorescence, interference and electron microscope (SEM, TEM and STEM) – AFM & CLSM - microscopic measurements, LASER- principle and applications, Spectrophotometer. UV-Vis, NMR & ESR spectroscopy, structure determination using X ray diffraction and NMR, Mass spectrometry, surface plasma resonance. Zeta analyser, DLS for nanoparticle characterization.

REFERENCE BOOKS :

Babiuk, L.A., John, P. Philips and Murray Moo Young (1989). Animal Biotechnology,Pergamm. Press, Oxford.

Glick, B.R. and Pasterick Jack, J., (2001) Molecular Biotechnology. ASM Press, London.

GorDard and Lucessen, E. (1993) In-vitro Culture of Animal Cells. Butter worth – Heinemann Publications.

Higgins, I. J., Best, D.J. and Jones, J., (1988) Biotechnology - Principles and Applications.Blackwell Scientific Publications, Oxford.

Marx, J.L., (1989) A revolution in Biotechnology.Cambridge University Press.

Old, R. W. and Primrose, S.B., (1991) Principles of Gene Manipulation.Blackwell Scientific Publications.

Primrose, S.B., (1999) Molecular Biotechnology. Panima Publications, New Delhi.

Primrose SB and R.M.Twyman (2006) Principles of Gene Manipulation and Genomics Blackwell Publishing

Smith John, E., (1990) Biotechnology New Revolution.Orbis, London

VandanMohod, (1999) Biotechnology - Recent development.Book enclave, Jaipur.

Watson, J.D., Michael Gilman, Jan Witkowski and Mark Zoller., (1999) Recombinant DNA.Scientific American Books W. H. Freeman & Company, New York

Subject Code:19MPZE09

PERIYAR UNIVERSITY, SALEM- 636011

DEPARTMENT OF ZOOLOGY
SEMESTER- I ELECTIVE PAPER

BEHAVIOURAL ECOLOGY

UNIT I : Introduction- Founding fathers of animal behaviour-, Proximate and ultimate causation of behaviour- Methods of studying animal behaviour- Ethograms- Adlibitum sampling, Focal animal sampling. Animal learning- Trial and error learning- Classical conditioning- Operant conditioning- Insightful learning- Habituation- Imprinting

UNIT II: Pheromone Biology: Chemical Ecology, Semiochemicals, Types of Semio Chemicals- Allelochemicals, Pheromones, Allomones, Kairamones. Pheromones- Types and their sources. Applications of Allomones and Kairamones in pest management programme. Role of Pheromones in pest management programme. Mammalian Pheromoens and their effects- Lee Boot Effect, Bruce Effect, Vandenberg Effect. Pheromoens in Reproductive Endocrinology. Methods of Isolation, Identification and characterization of pheromoens- Principles and working protocol of GC-MS, LC-MS, IR and NMR Spectroscopy.

UNIT III: Foraging behaviour- Group and solitary foraging- Eavesdropping- Territoriality- Resource sharing and partitioning- Factors affecting foraging – Optimal foraging theory. Foraging Behaviour in insects, fishes, bats and other mammals. Adaptive flexibility in Foraging Behaviour of fishes, Waggle dance in honey bee.

Unit IV: Breeding behaviour- Monogamy, Polygamy, Polyandry- Resource defense polygyny- Advantages of roosting together- Parental care in animals Molecular ecology:– DNA markers – DNA fingerprinting - Minisatellites - Microsatellite - Mitochondrial DNA - PCR – RAPD – RFLP. Reproductive behaviour of mammals: Lordosis and Flehmen behaviour

Unit V: Chronobiology- Introduction- Different types of biological rhythm- Ultradian, Circadian and Infradian rhythms- Zeitgebers, Free running and entrainment of rhythms- Animals with varying circadian rhythms- Molecular Biology of Clock genes and its impact on anial behaviour. Role of abiotic factors in Biological clocks of animals- Photoperiodism, effect of temperature.

References

1. Alcock, J. 2013. Animal Behavior: An evolutionary approach. Sinauer Associates, Inc
2. Chandrashekaran, M.K. 2006. Time in the living world. University Press (India) Ltd.
3. Dytham, C. 1999. Choosing and Using Statistics: *A Biologist's Guide.* Oxford: Blackwell Scientific.
4. Kunz, T.H. & B. Fenton. 2000. Bat ecology. Pp.798, University of Chicago Press.

5. Martin, P. & Bateson, P. 1999. Measuring Behaviour: An Introductory Guide. 2nd edn. Cambridge: Cambridge University Press.
6. Rowe, G., Beebee, T. 2008. An introduction to Molecular Ecology. Oxford University Press.

Subject Code:19MPZE10

PERIYAR UNIVERSITY, SALEM- 636011

DEPARTMENT OF ZOOLOGY
SEMESTER- I ELECTIVE PAPER I

BIODIVERSITY AND CONSERVATION BIOLOGY

Unit I: Biodiversity- Difinition, Concept and Use- consumptive use, productive use, social, ethical, aesthetic and option values of biodiversity. Biodiversity at global, regional and local levels. Monitoring & measurement of Biodiversity; useful indices. Threats like overexploitation, fragmentation, habitat loss & poaching of wildlife

Unit II: . Ex-situ management of biodiversity. Role of zoos, biodiversity parks, gene banks, tissueculture etc. in biodiversity management. Introduction to the concepts of captive breeding. Examples of captive breeding and re-introduction programmes in maintaining biodiversity

Unit III: In-situ management of biodiversity. Introduction to protected area system in India and its role in biodiversity management. Review of existing protected areas and analysis of coverage of biodiversity values by protected areas. Wildlife corridors- Human wildlife conflict.

Unit IV Animal census techniques - Their applications, Line transects – Belt transects – Point counts: fixed and variable width – Call counts - Mark-recapture method – Principles of mist-netting - Types of marking animals: rings/bands, flags, tags, dyes, and natural markers – Radio-tracking & satellite telemetry

Unit V: Major international conventions pertaining to biodiversity protection, Ramsar convention, CITES, Convention on biological diversity, IUCN and WWF –International. National and global organization and treaties involved in regulation and control of biodiversity commerce and trade.

References

1. NY. Hunter Jr., M. L. 2002. Fundamentals of Conservation Biology. Blackwell Science, Malden, Massachusetts, U.S.A.
2. Leveque, C., and J.-C. Mounolou. 2003. Biodiversity. John Wiley and Sons, West Sussex, England.
3. Covello. Mills, L. Scott 2006. Conservation of Wildlife Populations. Blackwell Science, Oxford, U. K.
4. Morris Gosling L & WJ Sutherland (eds) 2000. Behaviour and Conservation. Cambridge University Press, Cambridge.

5. Morris, W. F., and D. F. Doak. 2002. Quantitative Conservation Biology: Theory and Practice of Population Viability Analysis. Sinauer , Associates, Sunderland, Massachusetts, U.S.A.

Subject Code: 19MPZE11

PERIYAR UNIVERSITY, SALEM – 636 011
DEPARTMENT OF ZOOLOGY
M.Phil. COURSE IN ZOOLOGY

SEMESTER I
Elective Paper- ENTOMOLOGY

Objectives:

- Main objective is to provide in-depth knowledge on the insect morphology and physiology of different systems.
- The units are framed to provide basic knowledge on the insects of economical, medical and social interest.
- This topic is designed to provide knowledge on novel techniques in pest management programme.

Outcome:

- Strong foundation on the largest group of animals in the animal kingdom will be laid.
- You will be an expert and public advisor in insect transmitted diseases.
- Study on this topic fits you for leading pesticide companies and advisor for crop pest management.

UNIT 1: INSECT PHYSIOLOGY, DIVERSITY, EVOLUTION, IDENTIFICATION AND CLASSIFICATION: Morphology: external features and their articulation. Comparative study of head - antennae, mouth parts; thorax – legs, wings; abdominal appendages, genitalia. Basic methods to Identify insects and Barcoding technique for Identification. Structure and physiology of integumentary, digestive, excretory, circulatory, respiratory, endocrine, reproductive, and nervous system. Methods to estimate growth, food consumption and enzyme activity in Insects.

UNIT 2: AGRICULTURAL INSECT PESTS: Classical identification techniques of following insect pests of Agricultural importance: Rice stem borer, Mango hoppers, Sugarcane borers, Cotton Jassid, Citrus caterpillar, Rice weevil. Chemical and bio-control methods in pest management.

UNIT 3: INSECTS OF MEDICAL IMPORTANCE: Identification tools for Mosquitoes, Housefly, Sand fly, Bedbug, Rat flea, Human lice and Tsetse fly. Data collection methods for mosquito distribution. Techniques to develop bio and nano products to control animal pests.

UNIT 4: INSECT SOCIOBIOLOGY: Life cycle and Social organization of termites, honeybees and ants. Study on societies among bees and factors affecting the society; social significance of the nest; caste determination in bees; Foraging and orientation; Defence mechanisms in bees.

UNIT 5: PEST MANAGEMENT AND CONTROL STRATEGIES: Pest control methods: Mechanical, chemical and biological methods-merits and demerits of these methods

in pest control. Microbial control: Pathogens used in microbial control (Fungi, Bacteria, Viruses, Protozoans, Nematodes etc.). Nanotechnology and recent advances in Pest management.

REFERENCE BOOKS

1. Atwal, A.S., Dhaliwal, G.S. 1997. Agriculture pests of South Asia and their management, Kalyani Publishers, New Delhi.

2. Imms, A. D., Chapman, Hall. 1977. A general text book of entomology, UK.

3. Snodgrass, R. E. 1935. Principles of Insect Morphology, Cornell University Press, USA.

4. Chapman, R. F. 1982. The Insects: Structure and function, Cambridge University Press, UK.

5. Klowden, M. J. 2007. Physiological system in Insects, Academic Press, USA.

6. Shrivastava, K.P. 1996. A textbook of applied Entomology, Kalyani Publishers, New Delhi.

7. Sathe, T.V., Bhoje, P.M. 2000. Biological Pest Control, Daya Publishing House, Delhi.

8. Hill, D.S. 1974. Agricultural insect pests of the tropics and their control. Cambridge University Press, New York.

9. Michener, C.D. 1981. The social behavior of the bees. The Belknap Press of Harvard University, Cambridge.

Subject Code: 19MPZE12

PERIYARUNIVERSITY, SALEM

DEPARTMENT OF ZOOLOGY
M.PHIL. ZOOLOGY COURSE
Semester I

Elective Paper: SERICULTURE

UNIT -I: ECONOMIC IMPORTANCE AND SILKWORM BIOLOGY: Prospects and status – Identification methods of Silk producing species - their distribution - Bombyxmori - life cycle – Methods to estimate life cycle and factors affecting life cycle, organization of larvae, pupae and moth - structure of the silk gland.

UNIT-II: MORICULTURE : Mulberry - distribution - varieties and methods to develop hybrid varieties - methods of cultivation and preparation – Classical and Modern techniques in harvesting, transportation and preservation of leaves. Estimation of feeding and nutrition - specificity of diet – Analysis of factors affecting nutrition value. Identification of Pest and diseases.

UNIT-III: SILKWORM REPRODUCTION AND GENETICS: Reproduction - Growth and Development of silkworms – Determination of mating behavior in Tasar, Eri, Muga and Mulbery silkworms – Methods to estimate physiology of molting in different varieties (Uni, bi and multivoltine) - Endocrinology of reproduction and development. Genetics - mutation breeding techniques and Methods to develop new strains.

UNIT-IV: PATHOGENIC DISEASES AND PEST: Pathology - Viral, bacterial, fungi and protozoan diseases – Techniques to isolate bacterial and fungal pathogens of silkworm. Laboratory culture techniques of microbial pathogens. Control methods. Uzifly menace.

UNIT-V: SILKWORM REARING AND SILK REELING: Rearing operations - Selection and construction of rearing house Incubation - Hatching - brooding, Harvesting methods. Reeling techniques – lacing, skinning and Re-reeling processes.

REFERENCE BOOKS

Eikichi, H. (1999). Silkworm Breeding (Translated from Japanese). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Ganga, G. (2003). Comprehensive Sericulture Vol-II: Silkworm Rearing and Silk Reeling. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.