

**BHARATHIAR UNIVERSITY: COIMBATORE – 641 046**  
**M. Sc. ANIMAL BIOTECHNOLOGY (CBCS PATTERN)**

**(For the students admitted from the academic year 2012-2013 batch and onwards)**

Note :

The revised syllabus for the papers, **Elective - II – 2EA Molecular Taxonomy , Core IX- Nanobiotechnology, Core Practical – III – 33P Nanobiotechnology ,Immunotechnology, Genetic Engineering, Conservation Biology and Bioethics and Biosafety** for M.Sc. Animal Biotechnology degree programme for the candidates admitted from the academic year 2012-13 are furnished below. **Elective II – Advances in Nematology should be removed and Molecular Taxonomy is included.** There is no change in remaining papers.

**ELECTIVE - II – 2EA**

**MOLECULAR TAXONOMY**

**Unit –I**

**Molecular Phylogeny:** History of Molecular Phylogenetics- Techniques and application-theoretical background- limitations of Molecular systematic. Phylogenetics, Cladistics and ontology- Building Phylogenetic trees- Evolution of Macromolecular sequences.

**Unit – II**

**Taxonomic collection:** Species and specimen selection, preservation of specimens-Protein expression, Purification and analysis-Expression and purification of a fusion protein-SDS polyacrylamide gel electrophoresis-silver stain detection of protein-western blot (immunoblot) detection of proteins kinds of DNAs and their role in molecular taxonomy: Genomic DNA and mitochondrial DNA- RNAs and their role in molecular taxonomy

**Unit-III**

**Basic molecular Biology Techniques:** Enzymes used in molecular biology-Isolation and separation of Nucleic Acids- Isolation of DNA- Isolation of RNA- Electrophoresis of Nucleic Acids- Restriction mapping of DNA Fragments-Nucleic Acid Analysis Methods- DNA blotting –RNA Blotting – Gene Probe derivation. Retrieval of Biological Data- Data retrieval with enterz and DBGET/LinkDB- Data retrieval with SRS (sequence retrieval system)

**Unit-IV**

**Nucleic acids:** Purines, pyrimidines, Nucleosides and Nucleotides, Different structural form of DNA, denaturation and renaturation of DNA Cell Cycle and regulation – Mitosis, Meiosis. Mutation – Types of mutations, types of mutagenic agents and their molecular mechanism; DNA

repair; Chromosomal types and structure; Mechanism by which genome undergoes changes, recombination, mutation, inversion, duplication, and transposition.

## Unit-V

**Principles of Bioinformatics:** Introduction to bioinformatics, Classification of biological databases, Biological data formats, Application of bioinformatics in various fields-Database searches: FASTA and BLAST-Sequencing DNA, RNA and proteins-Determination of protein structure-Gene and protein expression data

### Reference

1. Molecular Biology and Biotechnology, John M Walker, Ralph Raply, 2009, *The Royal Society of Chemistry*, Cambridge CB4 OWF, UK.
2. Bioinformatic, Westhead, J.H Parish and R.M.Twyman 2003, Bios Scientific Publishers Limited, Oxford OXA 1RE, UK.
3. Bioinformatics – Concepts, Skills, Applications”. S.C. Rastogi, Namita Mendiratta, Parag Rastogi.
4. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins. Andrea’s D. Baxevanis, B.F. Francis Ouellette.
5. Bioinformatics sequence and genome analysis - David W. Mount

## NANOBIOTECHNOLOGY

### Unit-I

**Scope of Nanobiotechnology** – Landmarks in Nanobiotechnology – Current Scenario of Nano Science and Technology. Synthesis of Nano materials – Biological Methods and Chemical Methods – Chemical Vapor condensation and Sol gel methods. Synthesis of Gold, Silver, Ormosil and Iron oxide.

### Unit-II

**Characterization of Nano materials:** Physical Method – Zeta potential, Monodispersion of Nanoparticles, SEM, TEM and AFM. Chemical Method – Principle and Applications of UV-visible Spectrophotometer, FT-IR spectroscopy, NMR and XRD. Biological Methods: MTT Assay, XTT Assay and ELISA.

### **Unit-III**

**Surface Enhanced Modification** – Chemical reduction method and Biological reduction method: Using Plant and Microbes. Application of Nanocarriers, Bioelectronics and Microfluidic system. Synthesis and Applications of Nanowires, nanorods and nanotubes.

### **Unit-IV**

**Development of Drug delivery system:** Use of polymers and co-polymers in drug delivery. Determination of drug delivery efficiency. Methods of drug loading. Evaluation of cytotoxicity, drugability for the drug loaded nano materials – Applications of Carbon Nano-tubes, Iron, Zinc oxide and Gold in development of drug loading system.

### **Unit-V**

**An Introduction to Nanomedicine** – Nanomaterial as gene delivering agent Uses of Nano materials in controlling of microbial diseases, biochemical disorders and genetic disorders. Development of Nanomedicine for diabetes and cancer.

### **References Books:**

1. Masuo Hosokawa, Kiyoshi Nogi, Makio Naito and Toyokazu Yokoyama: Nanoparticle Technology Handbook, 2007. Osaka University, Joining and Welding Research Institute Ibraki, Osaka, Japan.
2. Guozhong Cao: Nanostructures & Nanomaterials, 2004. University of Washington, USA
3. José A. Rodríguez and Marcos Fernández-García: Synthesis, Properties, And Applications Of Oxide Nanomaterials, 2007. Brookhaven National Laboratory Upton, New York.
4. David J. Lockwood, FRSC: Introduction to Nanoscale Science and Technology, 2004. National Research Council of Canada Ottawa, Ontario, Canada.
5. August I Kirkland and John L Hutchison: Nanocharacterisation, 2007. Department of Materials, Oxford University, Oxford, UK.
6. Dan Peer: Handbook of Harnessing Biomaterials in Nanomedicine, 2012
7. Yury Gogotsi: Nanomaterials Handbook, 2006. Taylor & Francis Group, Boca Raton London, New York.

## **Core Practical – III – 33P - NANOBIO TECHNOLOGY, IMMUNOTECHNOLOGY, GENETIC ENGINEERING, CONSERVATION BIOLOGY AND BIOETHICS AND BIOSAFETY**

### **Nanobiotechnology Practical**

1. Synthesis of Silver Nanoparticle
2. Characterization of Nanoparticle using FT-IR
3. Characterization of Nanoparticles using UV-visible Spectrophotometer
4. Surface Modification of nanoparticles using Chemical Reducing agent
5. Surface Modification of Nanoparticles using Biological Reducing agent

### **Immunotechnology**

1. Media preparation and animal cell culture.
2. Primary cell culture establishment from tissue.
3. Antibody development and purification.
4. ELISA
5. Western Blot.
6. Immunofluorescence.
7. RIA
8. Mounting of Spleen and Bone Marrow Cells
9. Lymphoid organs in Rat.
10. Differential counting of human WBC
11. Demonstration of Antigen – Antibody by interfacial ring test / blood grouping culture.

### **Genetic Engineering**

1. Preparation of plasmid DNA and genomic DNA from *E.coli*.
2. Preparation of genomic DNA from animals/ human.
3. Agarose gel electrophoresis of plasmid and genomic DNA.
4. Restriction mapping of plasmid DNA.
5. PCR amplification, RFLP\*.
6. Vector preparations\*.
7. Insert preparations\*.
8. Ligation\*.
9. Transformation of *E. coli* with plasmid DNA using  $\text{CaCl}_2$  \*.
10. Isolation of the recombinant plasmid\*.
11. Preparation of cDNA using RT-PCR\*.

\* Practical by demonstration only.

### **Conservation Biology**

1. Inventories/Surveys.
2. Field Techniques.
3. Identification and use of keys – Reference specimen.
4. Collection and preservation.
5. Introduction to computerized techniques – Remote sensing CAMP and GIS and their modules for conservation.
6. IUCN Red List Exercise and PVA modeling.
7. Statistical analysis/interpretation.
8. Technical writing and reporting of field studies.
9. Public presentation.
10. Field Project/ Report – Visit to Zoological parks, wildlife sanctuaries and biosphere reserves.

### **Bioethics and Biosafety**

1. CPCSEA Standard operating procedures for IAEC
2. Laboratory animal Handling techniques
3. Mouse anaesthesia and blood collection
4. Collection of blood from tail vein in rat
5. Collection of blood from cardiac puncture in rat
6. Oral feeding in rat
7. Visit to Research institutes holding animal house facility.
8. Visit to pharmaceutical industry and report submission.
9. CPCSEA, GLP, IPR- Group discussion - report submission.