

Shivaji University, Kolhapur

Name of Department: Biochemistry

Name of Programme: M. Phil and Ph. D.

Vision		
Craft a Competent human resource for research in Clinical Biochemistry and Bioinformatics.		
Mission		
Nurture the department to be a center of excellence in the new era of Biochemical Sciences by grooming youth at par with global competence.		
Course Outcomes		
Compulsory Courses		
Paper I	Research Methodology	<ol style="list-style-type: none">1. Describe basics of computers, programming languages and application software.2. Be able to use different presentation tools and relate to bioinformatics, databases, databank search, data mining, data management and interpretation.3. Describe measures of central tendency and dispersion.4. Apply probability and distribution along with analysis of bivariate data, hypothesis testing.5. Detailed insights into research by understanding i) definitions and kinds of scientific documents; ii) IMRAD system; iii) communications with the publishers; iv) Oral and poster presentation at conferences and v) preparation and submission of research projects for funding.6. Understand identification and characterization of DNA, RNA and Plasmids.7. Illustrate and elaborate various techniques

		involved in molecular biology research viz. RAPD, RFLP, DGGE, TGGE, PCR etc. 8. Learn and understand various analytical techniques associated with biological research.
Paper II	Recent Trends in Biological Sciences	<ol style="list-style-type: none"> 1. Explain the function of restriction endonucleases. 2. Analyze the importance of plasmids and viruses in genetic engineering. 3. Explain how to construct the DNA libraries and how to screen for clones that contain a desired gene fragment. 4. Illustrate the applications of recombinant DNA technology. 5. Be able to explain genetic basis of antibody structure and generation of antibody diversity. 6. Demonstrate the role of MHC I and MHC II in antigen presentation and the concept of MHC polymorphism. 7. Be able to apply the principles of immunological techniques, viz. immunoprecipitation, immunoelectrophoresis, ELISA, RIA, FACS, Western blot, Hybridoma technology, generation and applications of monoclonal antibodies. 8. Be able to demonstrate techniques involved in plant and animal cell and tissue culture: Techniques involved and industrial and clinical applications of PTC and ATC. 9. Understand the commercial utilization of biofertilizers and biosensors.
Optional Courses (Opt for any one)		
Paper III A	Bioinformatics	<ol style="list-style-type: none"> 1. Describe primary, secondary sequence databases, structural databases and types of sequence alignments including scoring matrices. 2. Explain various applications of BLAST and

		<p>phylogenetic analysis methods.</p> <ol style="list-style-type: none"> 3. Be able to understand ribose ring conformations and structural biology of biomolecules. 4. Describe techniques and applications of microarray technology along with gene identification methods 5. Demonstrate molecular modelling and protein structure prediction methods.
Paper III B	Bioremediation and Waste Water Treatment Technologies	<ol style="list-style-type: none"> 1. Explain constraints and priorities of bioremediation, biotransformation and biodegradation. 2. Analyze microbial interactions with organic and inorganic pollutants. 3. Explain methods (biological and chemical) of water pollution monitoring. 4. Elaborate on different waste water treatment systems. 5. Understand applications of Bioremediation, bioaugmentation and biostimulation. 6. Explain the role of biofilms in waste water treatment. 7. Elaborate reactor types and designs utilized in bioremediation and waste water treatment.
Paper III C	Advanced Techniques in Cell Culture	<ol style="list-style-type: none"> 1. Explain basic techniques in plant and animal tissue culture. 2. Understand plant transformation techniques and its applications. 3. Illustrate plant secondary metabolites and their potential utilization in pharmaceutical industry. 4. Elaborate on animal tissue engineering with special reference to surgical manipulations. 5. Understand capillary culture units and feeder layers. 6. Study different application of animal cell culture in mutant cell preparation, karyotyping and cytogenetic

		characterization, production of therapeutic proteins/products etc.
Paper III D	Agricultural Microbiology and Microbial Ecology	<ol style="list-style-type: none"> 1. Capacity to understand Soil Enzymes, Microbial Biofertilisers. Helps to introduce recent advances in biological Nitrogen fixation. 2. Understanding of plant microbe interaction for the elaboration of epidemiology of plant diseases and their biological control. 3. Acquiring concepts of new directions and importance of microbial ecology. 4. Ability to understand microbiology of the extreme environment such as hot springs, acid springs, lakes, Saline habitats, cold temperature habitat and microenvironments having high pressure. 5. Capacity to assess correlation of anaerobic microorganisms and Geomicrobiological processes. Determination of the worth of microorganism in environmental sustainability and biotechnology
Paper III E	Applied and Environmental Microbiology	<ol style="list-style-type: none"> 6. Good for understanding microbial fermentation. Students were able to design different types of fermentative protocols for the production of different microbial products. 7. Elucidation of steroid transformation by microbial activity can be easily understood. 8. Describe productions of flavours, fragrance, pheromones and alkaloids by using different microbial resources and experimental protocols. Implementation of advance fermentation option such as flux control analysis etc. 9. Acquiring knowledge of different dairy microbiology fermentation protocols and standard systems. 10. Describe recent advances in Microbiological waste treatment methods.

Paper III F	Immunology and Medical Microbiology	<ol style="list-style-type: none"> 1. Understand regulation of immune response. 2. Understand the role in vaccine in prevention of infectious disease.s 3. Capacity to assess recent development in monoclonal antibody technology. 4. Able to explain the pathophysiology of infectious diseases. 5. Be able to apply rapid detection method of food borne pathogen.
Paper III G	Fermentation Technology	<ol style="list-style-type: none"> 1. Be able to demonstratemicrobial cell growth, kinetics and Strain improvement by mutation, overproduction of metabolites. 2. Utilize the process and instrumentation involved in fermentation operations including computer controlled operations. 3. Gain the knowledge of fermentation processes involved in pharmaceutical biotechnology ethanoloc beverages; organic acids; Amino acids, Extracellular enzymes, Vitamins, Extracellular polysaccharides and Antibiotics 4. Discuss Intellectual Property Rights: Patent : Criteria for patentability, Indian patent act, Role of patent in R & D.
Paper III H	Clinical Biochemistry	<ol style="list-style-type: none"> 1. Demonstrate the use of enzymes in the process of diagnosis and monitoring of myocardial infarction, liver and pancreatic diseases diseases. 2. Acquire the detailed current and advanced knowledge lipid profile and its significance. 3. Express the physiological significance of Blood groups, Rh factorblood transfusion. Hemoglobinopathies: cell anemia. 4. Describe various types of Biochemical and other techniques used in clinical chemistry ELISA, RIA, IRMA andNoninvasive techniques used in clinical practice,

		<p>sonography, X-ray, MRI, CT Scan.</p> <p>5. Interpret the chemical carcinogenesis and tumor staging at molecular basis.</p> <p>6. Demonstrate the genetic basis of AIDS, SARS, and Dengue.</p>
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