Program Title: PhD in Biophysics

Program Specific Outcomes PSO:

PSO1: To understand the principles of various Physical/ Biophysical experimental techniques, e.g. spectroscopy, microscopy, sedimentation etc. for appropriate designing of experiments and analysis of results, which is essential for the researchers, both experimental and theoretical.

PSO2: To enlighten the students & researchers about the functioning of brain and the confluence of various disciplines in Brain Science, e.g. neurobiology, computer science/ informatics, physics, mathematics, psychology/ behavioural science and other related disciplines. Through this paper the students are introduced to an emerging discipline called Cognitive Science (the Science of Learning & Memory).

PSO3: Introduces students to the use of various biological databases and in-silico analysis of biological systems.

PSO4: introduces students to the process of big data analysis in biological data for correct interpretation.

PSO5: overview of research intent and design, methodology and technique, format and presentation, data management and analysis, commonly used statistical methods, ethical, IPR and other relevant issues to the students so that they can carry out research in more systematic, efficient and effective manner.

Course Title: Physical Methods in Biology

Course Code: BPH001

Course Outcomes:

CO1: Review of theories & experiments in Optics.

CO2: Review of electronic structures of atoms , molecules and theories of chemical bonding.

CO3: Scattering of Light and applications to biology.

CO4: UV & Visible absorption spetrophotometry and applications to biology.

CO5: Fluorescence Spectroscopy and applications to biology.

CO6: Polarisation of light, CD and ORD spectroscopy and applications to biology.

CO7: X-ray crystallography and applications to biology.

CO8: Nuclear Magnetic Resonance (NMR) & Electron Spin Resonance (ESR) and applications to biology.

CO9: Optical & Electron Microscopy and applications to biology.

CO10: Hydrodynamic methods, e.g. ultracentrifugation and applications to biology.

CD11: Different types of Chromatography & their applications.

CD12: Electrophoretic methods.

CO13: Radioactivity based methods & biological applications.

CO14: Upcoming trends in Biophysical Methods, e.g. mass spectrometry.

Course Title: The information processing and the brain

Course Code: BPH002

Course Outcomes:
CO1: Electrical behavior of the biological membrane.
CO2: Introduction to Nervous System with a special reference to Sensory Receptors and Perception.
CO3: Origin of the concept of Computability, Turing Machines.
CO4: Synaptic Transmission: Physicochemical Principles, Resting Potential, Action Potential, Membrane Theory of Action Potential, Hodgkin Huxley Model, Mathematical solutions of H-H equations.
CO5: Models of Neurons: Artificial neurons, Physiological Neuronal Network versus Artificial Neural Network.
CO6: Mathematical tools to deal with Spiking Neurons.
CO7: Neural Basis of Cognition: Principles of Learning & Memory, Cellular Mechanism of Learning & Memory, and Comparison with Machine Learning.

CO8: Open discussions on the Interface of Artificial Neural Net and the Brain.

Course Title: Computer Applications in Biology

Course Code: BPH003

Course Outcomes:
CO1: Information of different sources of molecular data information

CO2: Different popular formats of molecular data

CO3: Significance and methods of pair-wise sequence alignment

CO4: Different forms of homologous sequences.

CO5: Methods of phylogeny and their applications.

CO6: Different methods of in-silico genome annotation.

CO7: How is protein structure and sequence related

CO8: Different methods of macromolecular structure determination

CO9: Use of different structural databases

CO10: How to visualize and analyze protein structures

CO11: Methods to predict secondary structure from the sequence of proteins

CO12: Comparing protein structures for understanding similarities and differences in their function

CO13: How to predict structure of proteins through Homology modelling

CO14: who to predict structure of protein when no homologous template is available

CO15: what can structure tell us about the function of a protein

Course Title: Omics Biology

Course Code: BPH004

Course Outcomes:

CO1: Applications of mass spectroscopy in structural dynamics of proteins.

CO2: Methods of structure determinations of proteins.

CO3: How to determine functional divergence of genes/proteins.

CO4: How to predict, compare and anlyze different macro-molecules

CO5: Different approaches of drug-design, optimization and validation.

CO6: Advantages of genome and metagenome sequencing.

CO7: Different algorithms used to assemble sequencing reads.

CO8: What advantage different genomic sequencing projects provide to the researchers.

CO9: Knowledge of different metabolomic platforms.

CO10: Introduction of various metabolic databases.

CO11: Methods of gene expression analysis (transcriptomics, microarray).

CO12: Advantage of genome wide studies to human health.

Course Title: Research Methodology

Course Code: BPH005

Course Outcomes:

CO1: How to frame a "correct" and "unbiased" research problem?

CO2: The history of Indian Science in comparison to the other parts of the world.

CO3: Understanding of the concept of Research Ethics

CO4: Define, recognized and ways to avoid plagiarism

CO5: Types and uses of Intellectual property Rights.

CO6: statistical methods commonly used in biological data analysis

CO7: Introduction to various Operating systems in computers

CO8: Bibliography management through various tools

CO9: How to write good research papers

CO10: How to present the research outcomes for wider audience

CO11: How to publish research in relevant journals

CO12: What are the basic lab safety training requirements