HOLY CROSS COLLEGE (AUTONOMOUS)

Affiliated to Bharathidasan University
Nationally Accredited (3rd Cycle) with 'A' Grade by
NAAC College with Potential for Excellence.
Tiruchirapalli - 620002.

PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY & BIOINFORMATICS

Programme: M.Sc. Bioinformatics

PO No.	Programme Outcomes *Upon completion of the M.Sc. Degree Programme, the graduate will be able to*
PO-1	To upgrade their existing knowledge on scientific discoveries, developing program and techniques on biotechnology and bioinformatics.
PO-2	Study and explore interest in the core pipelines of Bioinformatics such as gene expression, and database queries, structural and functional relationships, and molecular evolution.
PO-3	Apply the scientific knowledge in database designing and validating computational software‟s and tools.
PO-4	Apply their knowledge in developing their own software, database and commercialize it for the wellbeing of the society.
PO-5	Understands the importance and impact of Bioinformatics in analyzing and interpreting the biological data.

PO No.	Programme Specific Outcomes *Upon completion of the courses the student would be able to*
PSO-1	Expand the theoretical concepts applied in testing the biological hypotheses with computational tools and methods.
PSO-2	Develop professional skills in handling information from large database sets and implement that into annotation of gene & proteins and computer modeling.
PSO-3	Develop expertise in problem-solving and designing new algorithms and *in-silico* analysis methods.
PSO-4	Strongly equipped with hands-on training in computer aided drug discovery including target identification, drug interaction pathway analysis, molecular modeling, complex validation etc.
PSO-5	Graduates will be successful in finding employment biotech sectors like research institutes, academicians, pharmaceutical industries or software development companies.

Course Title	Major Core I- Fundamentals Of Biological Systems		
Code	**P15BI1MCT01**		
CO No.	**Course Outcomes**	**PSOs Addressed**	**Cognitive Level**
CO-1	Predict the structural and functional details of various cell organelles and their properties.	PSO 1	An
CO-2	Differentiate the structure, function and numerical alterations of chromosomes in prokaryotes and eukaryotes.	PSO 2	An
CO-3	Construct a model depicting the cell cycle and its regulatory mechanism. Illustrate the major components and pathways of cell signaling.	PSO 3	Ap
CO-4	Outline and classify the types and major components involved in immune response at the cellular and molecular levels.	PSO 1	U
CO-5	Differentiate the mechanism of cell mediated and humoral immune response.	PSO 4	An
CO-6	Examine the structure and function of complements and MHC molecules and investigate the role of HLA complex in human.	PSO 2	An
CO-7	Delineate the role of immunosuppression in organ transplantation and the importance of tissue typing tests.	PSO 2	R
CO-8	Outline the basic mechanism of immune tolerance and distinguish between autoimmunity and hypersensitivity reactions.	PSO1, 2	U

Course Title	Major Core II - Molecular Biology And Genetic Engineering		
Code	**P15BI1MCT02**		
CO No.	**Course Outcomes**	**PSOs Addressed**	**Cognitive Level**
CO-1	Reason out the mechanism of construction, damage and repair of DNA and interactions.	PSO 1	U
CO-2	Examine in detail the factors affecting the regulation of RNA and protein synthesis and their properties.	PSO1	An
CO-3	Present an elaborate account on operons, insertional elements and transposons involved in recombination and interpret the mechanism of tumor formation.	PSO 2	C
CO-4	Experiment with new molecular tools employed in rDNA technology.	PSO 3	Ap
CO-5	Differentiate various types of cloning and expression vectors and integrate them in research.	PSO 3	An
CO-6	Implement gene transfer techniques for producing transformants and select appropriate screening strategies.	PSO 4	Ap
CO-7	Integrate appropriate DNA profiling tools and techniques in their research projects.	PSO 4	E

Course Title	Major Core IV - Computer Programming In C		
Code	**P15BI1MCT04**		
CO No.	**Course Outcomes**	**PSOs Addressed**	**Cognitive Level**
CO-1	Relate with the basic structure of C programming.	PSO 2	U
CO-2	Study on their essentials functions employed in execution of a program.	PSO 3	R
CO-3	Introduction of various types of operators introduced in different programs to perform mathematical functions.	PSO 2	R
CO-4	Understand the rule of using branching and looping in programs.	PSO 1	U
CO-5	Differentiate the usage between various forms of arrays.	PSO 4	An
CO-6	Perform the program with user-defined functions.	PSO 4	Ap

Course Title	Major Core III- Bioinformatics Resources and Applications in Sequence Analysis		
Code	**P15BI1MCT03**		
CO No.	**Course Outcomes**	**PSOs Addressed**	**Cognitive Level**
CO-1	Understand the history and basic concepts in bioinformatics.	PSO 1	U
CO-2	Knowledge on the informative databases available for all the biological macromolecules.	PSO1	U
CO-3	The global and local sequence alignment tools and their importance were conceptualized.	PSO 2, 3	An
CO-4	Study of various protein structure prediction methods through computational approaches.	PSO 3	R
CO-5	Understanding the significance of gene prediction methods.	PSO 1	U
CO-6	Reason out the need for phylogenetic trees in evolutionary studies.	PSO 2	E

Course Title	Major Elective I - Biodiversity		
Code	**P15BI1MET01**		
CO No.	**Course Outcomes**	**PSOs Addressed**	**Cognitive Level**
CO-1	Outline the basic principles and methods of taxonomy and distinguish the various levels of structural organization of plants, animals and microbes.	PSO 1	U
CO-2	Organize the criteria involved in taxonomic classification of plants, animals and microbes	PSO 2	U
CO-3	Compare and contrast the major types of habitats and species in the Indian subcontinent.	PSO 3	U, E
CO-4	Identify the common parasites and pathogens of humans, animals and plants.	PSO 1, 3	An
CO-5	Develop novel strategies for identification and conservation of endangered species.	PSO 3	C
CO-6	Investigate the applications of biotechnology environmental hazard management and conservation.	PSO 4	E
CO-7	Develop a thorough knowledge of existing biodiversity resources and laws to protect biodiversity.	PSO 3	C
CO-8	Generate new methods of biodiversity augmentation and conserved utilization of bioresources.	PSO3, 5	Ap

Course Title	Major Elective I – Ecology		
Code	**P15BI1MET02**		
CO No.	**Course Outcomes**	**PSOs Addressed**	**Cognitive Level**
CO-1	Explain the concept of habitat, niche and resources.	PSO 1	U
CO-2	Categorize the types and characteristics of inter-specific interactions and populations.	PSO 2	An
CO-3	Demonstrate ecological succession and energy flow and diversity in ecosystems.	PSO 3	U
CO-4	Identify the major terrestrial biomes in India.	PSO 2	Ap
CO-5	Investigate current ecological problems and propose suitable solutions.	PSO 4	An
CO-6	Design and practice conservation strategies involving in situ and ex-situ approaches.	PSO 3	C

Course Title	Major Core VII- Statistics And Mathematics For Bioinformatics		
Coode	**P15BI2MCT07**		
CO No.	**Course Outcomes**	**PSOs Addressed**	**Cognitive Level**
CO-1	Understand about the importance and application of statistics to interpret the biological data set.	PSO 1	U
CO-2	Apply SPSS software package in calculating the measures of central tendency during data analysis.	PSO 2	Ap
CO-3	Analysis of correlation and regression between two variables and perform hypothesis testing.	PSO 3	An
CO-4	Study the basic concepts and laws in probability distribution.	PSO 1	R
CO-5	Assimilate the concept of matrices and vectors.	PSO 2	Ap
CO-6	Differentiate the functions of differentiation and integration in mathematical expressions.	PSO 4	An

Course Title	Major Core VIII - Genomics And Proteomics		
Code	P15BI2MCT08		
CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Simplify the basic concepts of genomics involving structure and organization of genes in human and appraise the concept of genetic and physical mapping.	PSO 1	An
CO-2	Construct genome maps using genome databases and predict gene functions by structural and functional gene annotations.	PSO 2	Ap
CO-3	Compare genomes by employing various tools and predict gene regulatory patterns.	PSO 2, 3	An
CO-4	Categorize the applications of functional genomics in determining the differential expression of genes under normal and diseased conditions.	PSO 4	An
CO-5	Experiment with the techniques involved in proteome analysis.	PSO 1, 4	Ap
CO-6	Integrate the tools used in protein expression and functional analysis in their research.	PSO , 5	E

Course Title	Major Core IX - Programming In Perl And Python		
Code	P15BI2MCT09		
CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Identify and learn writing of basic programming languages.	PSO 1	Ap
CO-2	Perceive the features of PERL program.	PSO 1, 2	E
CO-3	Venture the field of BioPERL about its fundamentals and applications.	PSO 3	U
CO-4	Understand the overview of Python programming.	PSO 1	U
CO-5	Assess the methods in regular expressions, classes and files.	PSO 4, 5	E

Course Title	Major Elective II - Molecular Interactions And Biophysics		
Code	P15BI2MET03		
CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Comprehend the fundamentals of chemical interactions	PSO 1	U
CO-2	Learn about atomic and molecular orbitals.	PSO 1	U
CO-3	Recognize the molecular interaction patterns in biological macromolecules such as proteins.	PSO 2	An
CO-4	Study the structural elucidation technique X-ray crystallography and its significance.	PSO 1, 3	R
CO-5	Analyze the physical parameters involved in the examination of the results.	PSO 3	An
CO-6	Explore the techniques such as DLS, UV, IR,NMR,CD, HPLC.	PSO 3, 5	An

Course Title	Major Elective II - Biological Techniques		
Code	**P15BI2MET04**		
CO No.	**Course Outcomes**	**PSOs Addressed**	**Cognitive Level**
CO-1	Identify the underlying working principle of various lab instruments with their specific applications.	PSO 1	Ap
CO-2	Interpret the role of centrifugal and frictional force and the biological applications of centrifugation.	PSO 2	E
CO-3	Integrate the use of centrifugation principle for developing new instruments.	PSO 2,3	E
CO-4	Compare the principles and applications of various electrophoretic techniques and invent new applications for electrophoresis.	PSO 3,4	U, E
CO-5	Integrate spectroscopic techniques in their research projects and utilize them to discover the structure of novel compounds.	PSO 3,5	E
CO-6	Investigate the role of radiation in diagnostics and instrumentation and the detection and measurement of radioisotopes in cells and tissues.	PSO 4	An

Course Title	Major Core XII - Systems Biology		
Code	P15BI3MCT12		
CO No	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Knowledge on systems biology and biological networking.	PSO 1	U
CO-2	Understand the need for metabolic web databases in analyzing a biological pathway.	PSO 2	U
CO-3	Acquire information on enzyme reaction kinetics.	PSO 1	R
CO-4	Interpret the reliability of biochemical pathways and cellular functions executed by them.	PSO 3	E
CO-5	Learn the details on system modeling.	PSO 4	R
CO-6	Integrate system biology tools in the areas of research.	PSO 5	E

Course Title	Major Core XIII - Drug Biology And Nano biotechnology		
Code	**P15BI3MCT13**		
CO No.	**Course Outcomes**	**PSOs Addressed**	**Cognitive Level**
CO-1	Classify drugs based on their source, nature, nomenclature and dosage and routes of administration.	PSO 1	U
CO-2	Identify and explain drug protein interactions and receptors involved at the molecular level.	PSO 2	Ap
CO-3	Investigate drug metabolism and kinetics patterns, toxicity and pharmacogenetic analysis.	PSO 1	An
CO-4	Discriminate the various stages of drug development and appraise the role of computer aided drug designing for developing novel customized drugs.	PSO 2	An
CO-5	Examine the basic principles and techniques of nanobiotechnology and categorize their functional principles.	PSO 3	An
CO-6	Develop strategies to produce and characterize novel nanoparticles for research purposes.	PSO 4	Ap
CO-7	Outline the applications of nanotechnology in medical diagnostics and therapeutic procedures.	PSO 5	U

Course Title	Major Core XIV - Molecular Modeling & Computer Aided Drug Design		
Code	**P15BI3MCT14**		
CO No.	**Course Outcomes**	**PSOs Addressed**	**Cognitive Level**
CO-1	Study the basic concepts in molecular modeling.	PSO 1	R
CO-2	Essentials of pharmacophore designing and valuation.	PSO 5	U
CO-3	Understand the concept of molecular mechanics and molecular dynamics.	PSO 1	U
CO-4	Apply the molecular docking tools in drug discovery process.	PSO 3	Ap
CO-5	Comprehend the necessary strategies in drug discovery such as QSAR, TASR and ADMET.	PSO 4	An
CO6	Emerge new ideas on Immunoinformatics and its role in personalized medicine.	PSO 5	An

Course Title	Major Elective III - Cheminformatics And Stereochemistry		
Code	P15BI3MET05		
CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Introduction in the area of cheminformatics.	PSO 1	R
CO-2	Represent the chemical structure in various computer accepted formats via tools.	PSO 1	E
CO-3	Analyze the graph theories in chemistry.	PSO 2	An
CO-4	Investigate the existing chemical databases for information retreival.	PSO 3	An
CO-5	Learn the molecular descriptions about the atomic coordinates, conformations and interaction in proteins.	PSO 1, 4	R
CO-6	Investigate on rule of Ramachandran plot.	PSO	An
CO-7	Master on the stereo forms of chemical structures and the concept of chirality.	PSO 4	C

Course Title	Major Elective III - Evolution		
Code	**P15BI3MET06**		
CO No.	**Course Outcomes**	**PSOs Addressed**	**Cognitive Level**
CO-1	Interpret the origin of evolution and the emergence of evolutionary theories.	PSO 1	E
CO-2	Estimate the time scales, periods and epochs in evolutionary history and the stages of evolution.	PSO 1, 2	E
CO-3	Examine the molecular basis of evolution using molecular tools.	PSO 3	An
CO-4	Investigate the concept of changes in gene frequencies among populations through natural selection, migration and genetic drift.	PSO 3	An
CO-5	Outline the concept of speciation, convergent and divergent evolution and sexual selection.	PSO 4	U
CO-6	Select the appropriate techniques for analyzing the cognitive, behavioral and communication patterns in evolution.	PSO 4, 5	E

Course Title	Non-Major Elective II - Cyber Crimes And Investigation Procedures		
Code	P15BI3NMT02		
CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Determine about the classifications in cybercrimes.	PSO 1	E
CO-2	Understand the various types of cybercrimes and the way in which they are committed.	PSO 1	U
CO-3	Study of Indian laws and acts implemented to control cyber- crime.	PSO 2	R
CO-4	Awareness of appointment of authorities to attend and implement the cyber crime regulations on misusers.	PSO 3	U
CO-5	Categorize the steps in cyber crime investigations.	PSO 4	An