

## Department of Biotechnology

Sant Guru Ghasidas Govt. P.G. College, Kurud, District – Dhamtari (C.G.)

---

### Programme Outcome (PO), Programme Specific Outcomes (PSO) and Course Outcomes (CO)

#### Programme Outcomes

<b>Name of the Program: B.Sc. Biotechnology; Duration of the degree: 3 Years</b>
<p>Current opportunities in biotechnology no more vested upon merely demands for gene editing but those who master diverse skills associated with various dogmas in life science and utilize interventions in them towards solving global issues relevant to both industry, academia dealing with agriculture, environment, food security, bioenergy, healthcare, medicine and so on within the. After completion of Biochemistry program students will able to get exposed to strong theoretical and practical background in fundamental concepts.</p> <ul style="list-style-type: none"><li>▪ To get insights of multiple important technical areas of Biotechnology.</li><li>▪ To apply contextual knowledge and modern tools of biotechnology research for solving problems.</li><li>▪ To demonstrate professional and ethical attitude with enormous responsibility to serve the society.</li></ul>
<b>Name of the Program: M.Sc. Biotechnology; Duration of the degree: 2 Years</b>
<p>The M.Sc. Biotechnology program offered by Sant Guru Ghasidas Govt. P.G. College, affiliated to Pt. Ravishankar Shukla University is a Two Years full time program. In order to make students more career oriented and nurturing their scientific temperaments students will get exposure to the depth of core understanding of various dimensions of Biotechnology during these two years the study.</p> <ul style="list-style-type: none"><li>▪ The training provided will give students the breadth and depth of scientific knowledge.</li><li>▪ A strong understanding of fundamentals of biological process at an advanced level.</li><li>▪ Better understanding of major thrust areas of the discipline</li><li>▪ Knowhow on current developments in the area of biotechnology</li><li>▪ Capacity to identify, analyze and design safe experimental process to provide efficient solutions by fair interpretation of data</li><li>▪ Perfect gain insight into ethical issues for production of quality research and publication.</li><li>▪ An ability to get engages them in lifelong learning to foster their growth as a successful researcher and established as an entrepreneur in the field of biotechnology.</li></ul>

---

## Programme Specific Outcome

<b>B.Sc. Biotechnology</b>
<ul style="list-style-type: none"><li>▪ Comprehending fundamental concepts in modern biology to meet the emerging trends</li><li>▪ Handling microbial and biochemical systems</li><li>▪ Procuring hands on real time experience in industries.</li></ul>
<b>M.Sc. Biotechnology</b>
<ul style="list-style-type: none"><li>▪ Application of knowledge and techniques of Biotechnology</li><li>▪ Scale up of biochemical process after designing, optimization and analysis for developing products required for society.</li><li>▪ Compilation and interpretation of Biological data using computer software.</li><li>▪ Statistical analysis of biological data using computer software and conventional methods.</li></ul>

## Course Outcomes

<b>B.Sc. Biotechnology Part I</b>
<b>CO_Paper I (Biochemistry, Biostatistics and Computers)</b>
<ul style="list-style-type: none"><li>▪ Able to collect, handle, process and present the biological data</li><li>▪ Apply the principles of statistics on biological experiments.</li><li>▪ Students will understand the basic components and organization of computers</li></ul>
<b>CO_Paper II (Cell Biology, Genetics and Microbiology)</b>
<ul style="list-style-type: none"><li>▪ Students will understand the structures and functions of basic components of prokaryotic and eukaryotic cells</li><li>▪ Students will learn the basic principles of inheritance given by Mendel (Classical genetics)</li><li>▪ Students will understand the microbial physiology</li></ul>
<b>B.Sc. Biotechnology Part II</b>
<b>CO_Paper I (Molecular Biology and Biophysics)</b>
<ul style="list-style-type: none"><li>▪ Students will get knowledge on fundamental molecular biology.</li><li>▪ To understand the principles and working of instruments commonly used to study biological material.</li></ul>
<b>CO_Paper II (Recombinant DNA technology and Genomics)</b>
<ul style="list-style-type: none"><li>▪ To understand the steps involved in recombinant DNA technology.</li><li>▪ To explain the construction of DNA &amp; c DNA library and their applications.</li></ul>
<b>B.Sc. Biotechnology Part III</b>
<b>CO_Paper I (Plant, Environment and Industrial Biotechnology)</b>
<ul style="list-style-type: none"><li>▪ Principles, practices and applications of plant biotechnology, plant tissue culture, genetic transformation and molecular breeding of plants.</li><li>▪ Students would develop understanding of the industrial biotechnology and its applications.</li><li>▪ Fundamentals of environmental problems and their control through biotechnology tools.</li></ul>
<b>CO_Paper II (Immunology)</b>
<ul style="list-style-type: none"><li>▪ To get insight in primary and secondary organs of immune system.</li></ul>

- To describe antigenicity and factors affecting it.
- To explain cell mediated immunity, monoclonal antibody production and hypersensitivity.

### **M.Sc. Biotechnology Semester 1**

#### **CO\_Paper 1 (Cell Biology)**

- Students will understand the structures and functions of basic components of prokaryotic and eukaryotic cells
- Students will understand how these cellular components are used to generate and utilize energy in cells
- Students will understand the stages of mitosis and meiosis

#### **CO\_Paper 2 (Genetics)**

- Students will learn the basic principles of inheritance at the molecular, cellular and organismal levels.
- Students will learn the basic principles of inheritance given by Mendel (Classical genetics)
- Students will understand causal relationships between molecule/cell level phenomena ("modern" genetics)
- Students will understand organism-level patterns of heredity

#### **CO\_Paper 3 (Microbial Physiology)**

- Students will understand the microbial physiology
- Understand the regulation of biochemical pathway and possible process modifications for improved control over microorganisms for microbial product synthesis.

#### **CO\_Paper 4 (Biomolecules)**

- Student will understand the chemical foundations of Biology
- Classification, chemical reactions and physical properties of major biomolecules
- Analytical techniques in biochemistry and biophysics for small molecules and macromolecules for quantification

#### **CO\_Lab course 01**

- Visualize the prokaryotic (bacterial) cell by staining and eukaryotic cells (plant & animal) structure
- Understand the principles/concept of genetics
- To performance and study of mutation in bacteria.
- Isolation of genetic material from Bacteria.

#### **CO\_Lab course 02**

- Preparation of liquid and solid media for growth of microorganisms.
- Isolation and maintenance of organisms by plating, streaking and serial dilution methods.
- Isolation of pure culture from soil and water
- Qualitative test for carbohydrate (Molisch's test, Anthrone test, Benedict's test, Barfoed's test)
- Qualitative test for amino acid by Ninhydrin reaction, Xanthoprotic reaction & Millon's test.
- Qualitative test for proteins using Biuret test.

<b>M.Sc. Biotechnology Semester 2</b>	
<b>CO_Paper 5 (Biostatistics, Bioinformatics &amp; Computers in Biotechnology)</b>	
<ul style="list-style-type: none"> <li>▪ To know how about the interaction of computer and biology.</li> <li>▪ To understand the knowledge about protein and genome databases.</li> <li>▪ To understand about the data retrieval tools and its utilization.</li> <li>▪ Applications of bioinformatics in drug designing and drug discovery.</li> </ul>	
<b>CO_Paper 6 (Molecular Biology)</b>	
<ul style="list-style-type: none"> <li>▪ DNA replication, repair and recombination</li> <li>▪ The process of transcription and translation</li> <li>▪ Protein localization, molecular mapping of genome</li> <li>▪ Antisense and ribozyme technology</li> </ul>	
<b>CO_Paper 7 (Plant Biotechnology)</b>	
<ul style="list-style-type: none"> <li>▪ Students would understand the importance of plant tissue culture in various aspects like aseptic culture conditions, culture media, organogenesis, somatic embryogenesis, micro-propagation.</li> <li>▪ Explain the concepts of intellectual property management and handling of GMOs.</li> <li>▪ Different types of plant tissue culture techniques</li> <li>▪ Students will be able to explain artificial seeds, production of virus free plants, androgenesis and gynogenesis, somaclonal variations and the production of novel crop plant varieties by using somatic hybrids and cybrids and Plant Genetic resources and their cryopreservation.</li> </ul>	
<b>CO_Paper 8 (Macromolecules &amp; Enzymology)</b>	
<ul style="list-style-type: none"> <li>▪ To give students a foundation in biological macromolecules (Carbohydrate, protein, &amp; lipid).</li> <li>▪ Properties of carbohydrate &amp; amino acids</li> <li>▪ Analytical methods for the detection of carbohydrates</li> </ul>	
<b>CO_Lab course 03</b>	
<ul style="list-style-type: none"> <li>▪ Search nucleotide sequence of a target gene on NCBI website and BLAST it.</li> <li>▪ Find out amino acid sequence of a particular protein from protein database available.</li> <li>▪ Calculation of the mean, mode and median value of given 20 leaves</li> <li>▪ Extraction of DNA from plant leaves by CTAB methods</li> <li>▪ Estimation of plant genomic DNA by Spectrophotometer methods.</li> <li>▪ Separation of plant genomic DNA by Agarose gel electrophoresis.</li> </ul>	
<b>CO_Lab course 04</b>	
<ul style="list-style-type: none"> <li>▪ Preparation of plant tissue culture media (MS media)</li> <li>▪ Extraction of DNA from plant tissue</li> <li>▪ Surface sterilization of explant</li> <li>▪ Qualitative assay of Protein by the Biuret method.</li> <li>▪ To estimate Protein qualitatively by Folin Lowry Method.</li> </ul>	
<b>M.Sc. Biotechnology Semester 3</b>	
<b>CO_Paper 9 (Genetic Engineering)</b>	
<ul style="list-style-type: none"> <li>▪ Scope of Genetic Engineering</li> <li>▪ Molecular tools and their application in genetic engineering</li> <li>▪ Gene cloning vectors, restriction mapping, cDNA synthesis and cloning</li> <li>▪ Processing of recombinant Proteins, T-DNA and transposon tagging</li> <li>▪ Basics of Gene therapy &amp; its applications</li> </ul>	

<b>CO_Paper 10 (Biology of Immune System)</b>
<ul style="list-style-type: none"> <li>▪ To get insight in Primary and Secondary organs of Immune system.</li> <li>▪ To describe Antigenicity and factors affecting it.</li> <li>▪ To explain cell mediated immunity, Monoclonal antibody production and Hypersensitivity.</li> </ul>
<b>CO_Paper 11 (Bioprocess Engineering &amp; Technology)</b>
<ul style="list-style-type: none"> <li>▪ Students should be able to appreciate relevance of microorganisms from industrial context</li> <li>▪ Understand the design and operations of various bioreactors and downstream processes.</li> <li>▪ Calculate yield and production rates in a biological production process, and also interpret data.</li> </ul>
<b>CO_Paper 12 (Environmental Biotechnology)</b>
<ul style="list-style-type: none"> <li>▪ Explain the technologies, tools and techniques in the field of environmental biotechnology.</li> <li>▪ To know the role of microorganisms as biotechnological agents.</li> </ul>
<b>CO_Lab course 05</b>
<ul style="list-style-type: none"> <li>▪ Extraction of DNA from <i>E. coli</i> Bacteria.</li> <li>▪ Estimation of DNA by Spectrophotometer methods</li> <li>▪ Separation of genomic DNA by Agarose gel electrophoresis.</li> <li>▪ Blood group determination by slide agglutination reaction.</li> <li>▪ Study of Agglutination reaction</li> </ul>
<b>CO_Lab course 06</b>
<ul style="list-style-type: none"> <li>▪ Isolation and identification of microorganisms from industrial waste water.</li> <li>▪ Determination of thermal death point (TDP) and thermal death time (TDT) of microorganism</li> <li>▪ To determine the total suspended solids of water (TSS)</li> <li>▪ To determine the total dissolved solids of water (TDS)</li> <li>▪ Determination of Dissolved oxygen (DO) of water.</li> <li>▪ Determination of chemical oxygen demand (COD) of water.</li> <li>▪ Determination of biochemical oxygen demand (BOD) of water.</li> </ul>
<b>M.Sc. Biotechnology Semester 4</b>
<b>CO_Paper 13 (IPR, Biosafety, Bioethics and Nanobiotechnology)</b>
<ul style="list-style-type: none"> <li>▪ Introduction to intellectual property and their types</li> <li>▪ International framework for intellectual property</li> <li>▪ Biosafety-introduction, historical background</li> <li>▪ Nano-biotechnology introduction, concept and applications</li> <li>▪ Thin films: synthesis and applications</li> </ul>
<b>CO_Paper 14 (Advanced techniques in Biotechnology)</b>
<ul style="list-style-type: none"> <li>▪ Principles and application of analytical techniques</li> <li>▪ Principles and application of Thermocycler</li> <li>▪ Principles and application of DNA micro array</li> <li>▪ Southern, Northern, and Western Blotting.</li> </ul>
<b>CO_Paper 15 (Animal Biotechnology)</b>
<ul style="list-style-type: none"> <li>▪ The student shall be able to understand Comprehend basic concepts of establishing animal cell cultures.</li> <li>▪ To introduce students to the principles and application of animal biotechnology</li> </ul>

- Evaluate and discuss public and ethical concerns over the use of animal biotechnology.

#### **CO\_Paper 16 (Genomics & Proteomics)**

- Genomics - General introduction, Types of genomics
- To familiarize students with the tools and databases available for genomic analysis
- The advantages, limitations and challenges associated with analysis of the proteome by different techniques.
- Demonstrate knowledge of the differences between techniques for protein identification and characterization.

#### **CO\_Lab course 07**

- Plagiarism detection by using different online plagiarism-tools
- Write-down guidelines for GMO.
- Find and list-out bio-safety rules for food & beverage.
- List out IPR of a researcher
- Perform the advance biotechnological techniques like spectrophotometer, electrophoresis and chromatography

#### **CO\_Lab course 08**

- Extraction and estimation of DNA
- Find out and study the sequence similarity by BLAST & FASTA
- To study the genome map from NCBI resource
- To retrieve the protein sequence by Swiss Prot database