



**Sai College®**

**COURSE OUTCOMES**

**OF**

**MASTERS OF SCIENCE**

**(M.Sc. Biotechnology)**

## **VISION**

Our vision is to produce competent Biotechnologists who can employ premium processes and applications which will profoundly influence existing paradigm of agriculture, industry, healthcare and restoration of environment providing sustainable competitive edge to present society.

## **MISSION**

- To provide Biotechnology educational Program with impetus to generate quality workforce.
- To create awareness about potentials of Biotechnology with socio-ethical implications.
- To instill spirit of innovation and creativity in young minds with sound research aptitude.
- To nurture confident individuals who are effective contributors towards growth of the nation.

## **COURSE OBJECTIVES**

- To update, extend and deepen student's knowledge thorough a flexible, research-intensive program to academics and industry requirements.
- To enhance career opportunities in industry, as a preparation for further higher education, exposures and outbound dissertation among Students.
- To enable critical thinking and full-fledged grasp of essential aspects of bioethics inculcating a Value System among Students.
- To enrich students with equipped entrepreneurship abilities contributing to self and national development.

**SYLLABUS****M.Sc. I<sup>st</sup> Semester**

<b>Paper</b>	<b>Name of Paper</b>
<b>Paper I</b>	Cell and development Biology
<b>Paper II</b>	Genetics
<b>Paper III</b>	Microbiology and Biosafety
<b>PAPER IV</b>	Biomolecules

**Course Outcomes**

At the end of this course, a student will have developed ability to:

<b>Paper</b>	<b>Name of Paper</b>	<b>Course Outcomes</b>
<b>Paper I</b>	Cell and development Biology	<p><b>CO-1:</b> Understanding the concepts of Cell Theory and Cellular organelles.</p> <p><b>CO-2:</b> This will provide knowledge of transport mechanisms, cell Cycle and Apoptosis.</p> <p><b>CO-3:</b> It will provide knowledge about Cell Signaling, Motility, Biology of Cancer and Chromosome structure and packaging.</p> <p><b>CO-4:</b> It will help students to learn the fundamentals of Spermatogenesis, oogenesis and</p>

		developmental Biology of Drosophila.
<b>Paper II</b>	Genetics	<p><b>CO-1:</b> Students will enhance their knowledge of Mendelian Genetics, structure of Genes and rearrangement in DNA.</p> <p><b>CO-2:</b> It will help students to learn the fundamentals of interaction of Genes, mutation and variation in genetics.</p> <p><b>CO-3:</b> It will help students to gain knowledge of autosomal and extra chromosomal inheritance, genes and quantitative traits and genetic disorders.</p> <p><b>CO-4:</b> This will provide knowledge of bacterial genetic system, viruses and their genetic system and genetic system of Yeast and neurospora.</p>
<b>Paper III</b>	Microbiology and Biosafety	<p><b>CO-1:</b> The course will help Students in better understanding of Bacterial taxonomy, cell wall of gram Positive and Gram negative bacterial and microbial growth.</p> <p><b>CO-2:</b> This will provide knowledge of different types of bacterial, archae, chemolithotrophy and photosynthetic pigment system.</p> <p><b>CO-3:</b> It will help students to learn the structures of different types of Viruses. Microbial and food borne diseases.</p> <p><b>CO-4:</b> This will provide knowledge of biosafety aspects and antibiotics and antibiotic resistance.</p>
<b>Paper IV</b>	Biomolecules	<p><b>CO-1:</b> This will provide knowledge of basic aspects of biochemical analysis, thermodynamics and chemical foundation of biology.</p> <p><b>CO-2:</b> The course will help Students in getting knowledge of amino acids, proteins, and metabolism of protein.</p> <p><b>CO-3:</b> Students will enhance their knowledge of lipids, metabolism of lipids, secondary metabolite</p>

		in living systems and nucleic acids.  <b>CO-4:</b> This will provide knowledge of carbohydrate structure , classification and metabolism of carbohydrate.
<b>Lab course I</b>		Development of knowledge for chromosomal observation, staining methods, medels experiments. Mutation in bacteria and Plasmid isolation.
<b>Lab course II</b>		Learn the technique of media preparation, isolation methods, gene transfer mechanism, biochemical characterization of microbes and qualitative test for carbohydrate and amino acids and proteins.

**SYLLABUS****M.Sc. II<sup>nd</sup> Semester**

<b>Paper</b>	<b>Name of Paper</b>
<b>Paper I</b>	Biostatistics and Bioinformatics
<b>Paper II</b>	Molecular Biology
<b>Paper III</b>	Plant Biotechnology
<b>PAPER IV</b>	Macromolecules and Enzymology

**Course Outcomes**

At the end of this course, a student will have developed ability to:

<b>Paper</b>	<b>Name of Paper</b>	<b>Course Outcomes</b>
<b>Paper I</b>	Biostatistics and Bioinformatics	<p><b>CO-1:</b> Students will enhance their knowledge of measures of central tendency.</p> <p><b>CO-2:</b> This will provide knowledge of simple regression and many more statistical tools.</p> <p><b>CO-3:</b> Students will enhance their knowledge of basics of computer and application.</p> <p><b>CO-4:</b> The course will help Students in knowing the data structure and word processing and computer oriented statistical techniques.</p>
<b>Paper II</b>	Molecular Biology	<p><b>CO-1:</b> The course will help Students in knowing the knowledge of molecular biology including DNA replication, recombinant, DNA damage and repair.</p> <p><b>CO-2:</b> This will provide knowledge of transcription and translation and post translational modification.</p> <p><b>CO-3:</b> Students will enhance their knowledge of protein translocation method, anti sense and ribozyme technology.</p> <p><b>CO-4:</b> Students will enhance their knowledge of biology of cancer causing genes and molecular</p>

		mapping of genome.
<b>Paper III</b>	Plant Biotechnology	<p><b>CO-1:</b> This will provide knowledge of cell and tissue culture, tissue culture media, and techniques in plant tissue culture.</p> <p><b>CO-2:</b> Students will enhance their knowledge of different types of micropropagation and protoplast culture method along with germplasm conservation.</p> <p><b>CO-3:</b> The course will help Students in enhancing their knowledge about plant transformation technology, chloroplast transformation and their application.</p> <p><b>CO-4:</b> Students will enhance their knowledge of metabolic activities and industrial products and molecular markers.</p>
<b>Paper IV</b>	Macromolecules and Enzymology	<p><b>CO-1:</b> Students will enhance their knowledge of supramolecular assembly, and sequencing methods of nucleic acids and proteins.</p> <p><b>CO-2:</b> This will provide knowledge of protein – protein interaction, protein folding and their conformational properties.</p> <p><b>CO-3:</b> Students will enhance their knowledge of enzyme catalysis, physical and chemical methods of immobilization and Glyco and lipoprotein.</p> <p><b>CO-4:</b> The course will help Students in ribozyme technology method and nucleic acid hybridization.</p>
<b>Lab course I</b>		To have an basic hold on biostatistics application in research, use of Microsoft office, isolation and estimation of of genetic material and their separation.
<b>Lab course II</b>		To perform plant tissue culture methods, isolation of Plant DNA, Biochemical analysis.

**SYLLABUS****M.Sc. III<sup>rd</sup> Semester**

<b>Paper</b>	<b>Name of Paper</b>
<b>Paper I</b>	Genetic Engineering
<b>Paper II</b>	Biology of Immune System
<b>Paper III</b>	Bioprocess Engineering and Bio Entrepreneurship
<b>PAPER IV</b>	Environmental Biotechnology

**Course Outcomes**

At the end of this course, a student will have developed ability to:

<b>Paper</b>	<b>Name of Paper</b>	<b>Course Outcomes</b>
<b>Paper I</b>	Genetic Engineering	<p><b>CO-1:</b> Students will get broad knowledge about Genetic engineering and methods involved in them including technique of gene cloning through traditional and PCR.</p> <p><b>CO-2:</b> This will provide knowledge of Vector system, Restriction mapping and library construction as well as Cloning interacting genes.</p> <p><b>CO-3:</b> The course will enhance students' knowledge about mechanism like Site directed mutagenesis, DNA transfection methods, heterologous gene expression</p>



		<p>and phage display.</p> <p><b>CO-4:</b> Students will acquire knowledge about Recombinant Protein Production, TDNA, Transposons tagging and Gene therapy.</p>
<b>Paper II</b>	Biology of Immune System	<p><b>CO-1:</b> This will provide knowledge of introduction to Immunology including cells and organs involved and blood group system.</p> <p><b>CO-2:</b> The course will enhance students' knowledge about Antigen, Antibodies and their interaction, MHC, BCR, TCR and Complement System.</p> <p><b>CO-3:</b> Students will acquire knowledge about Regulatory mechanisms of Immune system; Cell mediated Cytotoxicity, Hypersensitivity and Autoimmunity.</p> <p><b>CO-4:</b> Students will get broad knowledge about Transplantation, Immunity to infectious agents, Hybridoma technology and Monoclonal Antibodies.</p>
<b>Paper III</b>	Bioprocess Engineering and Bio Entrepreneurship	<p><b>CO-1:</b> Students will acquire knowledge about Bioprocess Engineering technology used for microbial growth, media construction and sterilization, Microbial growth and death.</p> <p><b>CO-2:</b> The course will help Students in knowing the detail of Downstream processing and fermentation processes.</p> <p><b>CO-3:</b> Students will acquire knowledge about whole cell immobilization, food technology and industrial production of Chemicals, acids, solvents, antibiotics, amino acids and single cell protein.</p> <p><b>CO-4:</b> Students will acquire in-depth knowledge about Bio-entrepreneurship, MSME, BIRAC and concept of Make in India.</p>
<b>Paper IV</b>		<p><b>CO-1:</b> Students will acquire knowledge about environmental issues and types of pollution and</p>

	Environmental Biotechnology	<p>control through Biotechnology.</p> <p><b>CO-2:</b> The course will help Students in knowing waste water treatment methods and water pollution and its control.</p> <p><b>CO-3:</b> Students will acquire in-depth knowledge about Treatment schemes for waste water remediation, Xenobiotic, biodegradation methods and GMO and their impact.</p> <p><b>CO-4:</b> The course will help Students in knowledge in Biopesticides, Solid waste management, Global environmental problems and IPR.</p>
<b>Lab course I</b>		To expertise in Genetic engineering experiments and immunological diagnosis.
<b>Lab course II</b>		To have knowledge about isolation, identification of bacteria, microbial growth, assessment of water quality and water potability.

## **SYLLABUS**

### **M.Sc. IV<sup>th</sup> Semester**

<b>Paper</b>	<b>Name of Paper</b>
<b>Paper I</b>	Basic concept of bioinformatics and Nano biotechnology
<b>Paper II</b>	Advanced techniques and Research methodology
<b>Paper III</b>	Animal biotechnology and Bioethics
<b>PAPER IV</b>	Functional Genomics and Proteomics

### **Course Outcomes**

At the end of this course, a student will have developed ability to:

<b>Paper</b>	<b>Name of Paper</b>	<b>Course Outcomes</b>
<b>Paper I</b>	Basic concept of bioinformatics and Nano biotechnology	<p><b>CO-1:</b> This will provide knowledge about of introduction to bioinformatics and its application.</p> <p><b>CO-2:</b> Students will enhance their knowledge of types of sequences in biological database and their information.</p> <p><b>CO-3:</b> The course will help Students in bioinformatics software tools and their application.</p> <p><b>CO-4:</b> Students will enhance their knowledge of nanobiotechnology and their application.</p>
<b>Paper II</b>	Advanced techniques and Research methodology	<p><b>CO-1:</b> This will provide knowledge of instruments used in biotechnology such as centrifugation, chromatography, colorimeter and many more.</p> <p><b>CO-2:</b> Students will enhance their knowledge of microscopy, PCR, and different types of spectroscopy.</p> <p><b>CO-3:</b> The course will help Students in getting the knowledge of techniques like cytophotometry, flow cytometry, blotting and DNA sequencer.</p> <p><b>CO-4:</b> Students will enhance their knowledge of research problems and ethics with citation and indexing.</p>
<b>Paper III</b>		<p><b>CO-1:</b> This will provide knowledge of animal cell and cell culture techniques.</p>

	Animal biotechnology and Bioethics	<p><b>CO-2:</b> Students will enhance their knowledge of scaling up methods and cell synchronization and cell transformation.</p> <p><b>CO-3:</b> The course will help Students in knowing cell culture based vaccines, transgenic animals and tissue engineering.</p> <p><b>CO-4:</b> Students will enhance their knowledge of ethical issues in biotechnology, animal rights, protection and biopiracy.</p>
<b>Paper IV</b>	Functional Genomics and Proteomics	<p><b>CO-1:</b> This will provide knowledge of genomics and its application in medicines.</p> <p><b>CO-2:</b> Students will enhance their knowledge of gene sequencing and comparative genomics.</p> <p><b>CO-3:</b> The course will help Students in having basic of proteomics.</p> <p><b>CO-4:</b> Students will enhance their knowledge of future of proteomics and characterization of proteins.</p>
<b>Lab course I</b>		Basic concept of Bioinformatics and nanobiotechnology, instrumentation and advanced biotechnological techniques.
<b>Lab course II</b>		Extraction and estimation of DNA from various tissues, Functional Genomics and Proteomics

