GEMS ARTS AND SCIENCE COLLEGE, RAMAPURAM

POST GRADUATE DEPARTMENT OF BIOTECHNOLOGY

PROGRAMME OUTCOMES (POs), PROGRAMME SPECIFIC OUTCOMES (PSOs), and COURSE OUTCOMES (COs)

PROGRAM - M.SC GENERAL BIOTECHNOLOGY

PROGRAMME OUTCOME (POS):

The M.Sc. Program of Biotechnology at GEMS Arts and Science College, Ramapuram started in 2019, aims to train students in Biotechnology to develop technologies and provide exposure to various aspects in Biology, Agriculture, Pharmaceutical, Industrial, as well as in Clinical Research. The students in this program can acquire knowledge, develop skills in critical thinking and obtain experience in conducting research.

After the completion of this programme, candidate should be able to:
PO1: Demonstrate knowledge for in-depth critical thinking to identify, and solve various issues in Biotechnological/pharmaceutical Industries or related fields.
PO2: Gain the ability to solve, analyze and interpret data generated in experiments from laboratory research or in academic projects.
PO3: Achieve expertise in handling modern analytical tools/ software/ equipment to conduct research.
PO4: Be appreciated in their roles in society as biotechnology professionals, or employees in industries, research field and academics.
PO5: Gain written and oral communication skills for the effective communication in healthcare, industry, academia and research.
PO6: Groom the students to meet challenges in biotechnological field
PO7: Develop skills, attitude and values required for self-directed, lifelong learning and professional development.

PROGRAMME SPECIFIC OUTCOMES (PSOS):

PSO1: To enable the postgraduate students to demonstrate their knowledge in different fields of Biotechnology
PSO2: Students will be prepared to understand three basic fundamental aspects in biological phenomenon: a) what to seek; b) how to seek; c) why to seek?

PSO3: To familiarize with basic laboratory instruments and understand various facets of molecular procedures in different Omics and related field.
PSO4: Students will be able to gain hands on experience in laboratory experiments mentioned in the syllabus so that they will get an exposure in outside research fields
PSO5: To trained them by imparting knowledge of advance modern bioinformatics tools and advanced machine learning like techniques.
PSO6: Gene cloning, protein expression and purification. The experience in gene cloning/protein expression and purification would enable them to begin a career in in genetic engineering as well as in research laboratories conducting fundamental research.

COURSE OUTCOMES (CO):

SEMESTER I			
COURSE CODE	SUBJECT TITLE	CREDITS	COURSE OUTCOME
GBT 1C 01	Cell Biology	**5**	**CO1:** This course introduces the students to the basics of cell and various components. This will help them to attain detail knowledge about cell and its different types. **CO2:** This gives them a strong foundation on the basic unit of life through understanding various cell theories and cell origin **CO3:** Students will acquire the knowledge of structure and functions of cell organelles, their interaction to promote cell growth, division and development. **CO4:** The students will gain in depth knowledge about cell cycle, cell division, cancer research, stem signaling etc. **CO5:** At the end of course, student attained a strong foundation about cellular architecture and trends in cell biology studies.
GBT 1C02	Biomolecules	**4**	**CO1:**To provide a basic knowledge of various biomolecules and thermodynamics **CO2:** Provides contemporary approaches and techniques used in modern cell and molecular biology **CO3:** Gives a clear picture of cellular structure, function, chemical composition, physiochemical and functional organization of organelles, and basic cellular metabolism

			CO4: Gives anunderstanding of relationship between the properties of macromolecules and cellular activities and to understand thermodynamics and biomolecular classifications
GBT 1C03	Microbiology	**4**	**CO1:**Understanding the history, early development and physiology of microbes and microbial taxonomy and classification methods. **CO2:** Studyvarious kinds of media preparation to study about the microbes by phenotypic and genotypic methods **CO3:** Students willlearn about the food spoilage due to cause of microbial contamination and food preservation methods **CO4:** Students can learn about different metabolic pathways in microbes and soil microflora and how man and microbes are interrelated
GBT 1L 01	Laboratory – I (Cell Biology, Biomolecules and Microbiology)	**5**	**CO1:** To understand microscopic techniques, subcellular fractionation, cell division, histochemical techniques and karyotyping **CO2:** Enable understanding spectroscopic techniques and methods for quantification of sugar, proteins and lipids **CO3:** To familiarizewith microbiological media preparation and different staining techniques. **CO4:** Experienced in water quality testing and different biochemical test for the estimation of biomolecules
Total		**18+4**	

SEMESTER II			
COURSE CODE	SUBJECT TITLE	CREDITS	COURSE OUTCOME
GBT 2C 01	Metabolism and Basic Enzymology	**4**	**CO1**: To understand relevance, basic concepts of metabolism and various pathways involved in biological system. CO2: To understand the properties of biomolecules

			and their existence in living system. CO3: To explore enzyme kinetics and their application in daily life CO4: To understand the nature and commonly used types of biochemical experiments. CO5: To provide information in application of enzyme kinetics in engineering, medicine and industry
GBT 2C02	Molecular Biology	**5**	**CO1**: This course introduces the students to the basics of molecular basis of life through the study of genetic material. **CO2:** This gives them a strong foundation on the basics structure and functions of nucleic acids proteins and their interaction within cell to promote cell growth, division and development. **CO3:** Students can illustrate gene, their structural organization and recombination process **CO4**: The student will demonstrate proficiency in understanding the concept of genetic code and proof reading mechanism existing in the body **CO5:** At the end of the course, student learned about cancer biology with special focus on humans.
GBT 2C03	Environmental Biotechnology	**4**	**CO1:** They would understand the basic concept in environmental biotechnology and related issues. **CO2:** Students will learn the microbiology of waste water management system and application of biosensors in the treatment **CO3:** The ecological/biogeographical studies will provide the awareness on ecological importance and adverse effects of pesticide usage in the environment **CO4:** Student will understand the concept of environmental pollution, pollutants and related hazards. **CO5**: They can acquire knowledge of bioremediation and its applications in environmental clean-up, various waste-disaster management methods and policies. **CO6:**Create awareness about environment conservation, environment protection Acts and introduction of biological components for waste treatments.

GBT 2C04	Biostatistics & Bioinformatics	**4**	**CO1:** To recollect the concepts of biostatistics, bioinstrumentation and bioinformatics **CO2:** Students will acquire knowledge of computer programming languages- PERL,C, SQL and JAVA and to write programs to solve biological problems **CO3:** Students will be able to understand biological databases, perform structured query and analyze and discuss the results in biologically significant way. **CO4:** To understand how to interpret data in a research using various statistical and bioinformatics softwares. **CO5:**Students will become familiar with a wide variety of bioinformatics tools and softwares so as to conduct basic bioinformatics research and thereby develop platform for molecular biology experiments
GBT 2L 01	Laboratory – II (Metabolism & Basic Enzymology,Molecular Biology and EnvironmentalBiotechnology)	**5**	**CO1:** Understand the extraction and purification of enzymes from plant/animal tissues **CO2:**Familiarize with different chromatographic techniques **CO3:** Expertise inQC from potable water and oxygen demand from sewage water **CO4:** Understand different DNA isolation procedures and gel electrophoresis techniques
GBT 2A 01	Application of statistical software such as SPSS – capabilities, data entry, choosing statistical tests,interpretation and analysis of data output. (PCC – Professional Competency Course)		The classes will be conducted by an expert from outside who had an experienced in this course subjects. So after the class students will be able to: **CO1:** Enable to know how to interpret data after research **CO2:** Familiarize with different software employed in data analysis
Total		**22+4**	

\

SEMESTER III			
COURSE	SUBJECT TITLE	CREDITS	COURSE OUTCOME

CODE			
GBT 3C 01	Genetic Engineering	**4**	**CO1:** The students recall the principles of genetic engineering and the vectors used in cloning, methods of introduction of gene and expression **CO2:**To appreciate the different cloning strategies and protein expression **CO3** The students also know about implementation of genetic engineering, biosafety of GMOs, and guidelines to carry out genetic engineering research **CO4:**To investigate different strategies of recombinant DNA technology and its pros and cons to human and other living beings
GBT 3C02	Bioprocess Technology	**4**	**CO1:** To understand basics of fermentation technology, media components from lab scale, pilot scale to industrial scale and further upstream/ down -stream processing. **CO2:** To acquire requisite skills for design and development of bioreactors,production optimization, and preparation of sterile base materials fordownstream processing. **CO3:** Students will be able to understandthe basics of fermentation technology and learnt the concept of screening, optimization andmaintenance of different cultures.
GBT 3C03	Plant Biotechnology	**4**	**CO1:** The students will be familiar with thetechniques of Plant Tissue Culture **CO2:** To enable the students to do research in molecular breeding through various techniques of Plant biotechnology **CO3:**They will get an idea about the metabolite production so that they will gain knowledge in metabolomics **CO4:**Students will gain knowledge in plant transformation and its application in developing new varieties **CO5:**They can able to differentiate biotechnological crops and normal one and their effects.
GBT 3C04	Immunology	**4**	**CO1**: Enable to understand the basics of immune system **CO2:** Demonstrating the basic knowledge of antigen antibody interactions **CO3:** Develop immunological methods to diagnose

			immune disorders and involvement of transplantation technology **CO4:**To know more about vaccines and their therapeutic applications
GBT 3E 01	Stem Cell Biology Part A (Option I)	**4**	**CO1:**Introduce the basics of stem cells and their classification **CO2**: Explained stem cell differentiation and application in mammalian nuclear transfer technology **CO3:**Understood the current trends in stem cell research and their future impacts
GBT 3L 01	Laboratory – III (Genetic Engineering, Bioprocess Technology, Plant Biotechnology and immunology)	**4**	**CO1:** Come to know various blotting techniques and methods in recombinant DNA technology **CO2:** Expertise in production of various components from microorganisms **CO3:** Understand the preparation of media and sterilization procedure in plant tissue culture **CO4:** Enable understanding different methods employed in plant tissue culture techniques **CO5:**To know blood group identification, Blotting techniques and different tests for the detection of infectious diseases
Total		**24**	

SEMESTER IV			
COURSE CODE	SUBJECT TITLE	CREDITS	COURSE OUTCOME
GBT 4P 01	Project Work (Dissertation format – Introduction with aims and objectives,Literature review, Materials and methods, Results andDiscussion, Conclusions and Future prospective)	**5**	Students will be conducted research for the period of three months. The miniature of this dissertation work can be submit to a journal as research paper from their academic research.
GBT 4V 01	Comprehensive Viva-Voce	**3**	
GBT 4E 03	Stem Cell Biology	**4**	**CO1:** Understand the application of stem cells in

	Part B		gene therapy for the treatment of various neurodegenerative diseases **CO2:** Enable understanding of stem cells research in treating hereditary diseases **CO3** describe the stem cell niche and its role on stem cell regulation; **CO4**: Understand the future prospects of stem cell for the disease treatments
GBT 4E 06	Nanobiotechnology	**4**	CO1: Understand the basics of Biotechnology CO2; Explain the present and future application of nanotechnology in medicine. CO3: Optimize the synthesis of Nanomaterials for drug discovery and drug designs CO4: Analyze different DNA based Nanostructures for the development of sensors
Total		**16**	