GEMS ARTS AND SCIENCE COLLEGE, RAMAPURAM

POST GRADUATE DEPARTMENT OF BIOTECHNOLOGY

PROGRAMME OUTCOMES (POS), AND COURSE OUTCOMES (COS)

PROGRAM - BSc BIOTECHNOLOGY

PROGRAMME OUTCOME (PO):

The BSc. Program of Biotechnology at GEMS Arts and Science College, Ramapuram started in 2009, 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.

Students will attain following capabilities after successful completion of B.Sc. Biotechnology programme. To be followed with the OBE from the academic year 2020 admission onwards

- **PO1** Acquire basic knowledge about fundamentals of Biotechnology programme.
- **PO2** Understand the technological components in Biotechnology after acquiring basics of classical science and engineering.
- **PO3** Apply the Biotechnology for the large-scale exploration in healthcare, agriculture, environment and industry.
- **PO4** Analyse the basic problems that can be addressed by biotechnology.
- **PO5** Appreciate difference between technologies adopted by Biotechnology over the other technologies.
- **PO6** Perceive the option of higher studies in the specific area or in a biotechnology based industrial venture.

PROGRAMME SPECIFIC OUTCOMES (PSOS):

PSO1: To enable thepostgraduate 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
BTY1B 01	Cell Biology	**3**	**CO1:** Basics of structural organization of prokaryotic and eukaryotic cell. **CO2:** Cell organelles and its properties. **CO3:** Clear idea of Interaction between cell and its environment. **CO4:** Overview of cell division in prokaryotes and eukaryotes **CO5:** Acquire knowledge about of cell signaling, stem cells and cancer.
BTY1C 01	Environmental Biotechnology	**2**	**CO1:** Basic concepts of ecology and ecological relationships between organisms and their environment **CO2:** Overview of diversity of life forms in an ecosystem. **CO3:** Identify a number of habitats from the different ecosystem. **CO4:** Correlate choice of habitat for organisms to Abiotic Factors. **CO5:** Identify the role of the organism in energy transfers. **CO6:** Ecology of Communities and Dynamics of Population. **CO7:** Ecological Cycles and human influences on ecosystem. **CO8:** Strategies of pollution control and waste management. **CO9:** Experimental design, understanding and use of information from scientific articles. **CO10:** Ecological problems of humanity and nature protection which includes biological variability.
SEMESTER II			
BTY2B 02	General Microbiology	**3**	**CO1:** Know the history of microbiology and classes of microorganisms. **CO2:** Know the Difference between eukaryotic &

			prokaryotic cells. **CO3:** Concept of sterilization, Methods of sterilization of media and equipment. **CO4:** Isolation of pure cultures. **CO5:** Brief account of microbial diseases.
BTY2CO2	Environmental Biotechnology	**2**	**CO1:** Basics of Water pollution and bacteriological examination of water. **CO2:** Various treatments involved in waste water treatment. **CO3:** Advantages and application of primary, secondary and tertiary waste water Treatment. **CO4:** Detailed exposure to Biological wastewater treatment processes. **CO5:** Principles and application of water purification methods.

SEMESTER III			
COURSE CODE	SUBJECT TITLE	CREDITS	COURSE OUTCOME
BTY3BO3	Biochemistry	**3**	**CO1**: Demonstrate the separation techniques in biochemistry and to apply them in basic scientific research. **CO2**: Quantify the biological macro and micro molecules in different samples. **CO3**: Explain the basic principles behind biochemistry. **CO4**: Explain the structure and functions of four major biological macromolecules. **CO5**: Outline the major metabolic pathways in human. **CO6**: Identify the role of regulatory molecules in human body.
BTY3C03	Environmental Biotechnology	**3**	**CO1**: Identify the sources of solid waste pollution and classify them based on their physical and chemical properties. Adopt simple techniques of solid waste management such as landfill composting and vermicomposting in their residence and vicinity. **CO2**: To apply the microbial and floral processes to diminish the solid waste in a specific land area. **CO3**: Understand the biochemical mechanism of xenobiotic and recalcitrant degradation using microorganisms. **CO4**: Create awareness of emerging concerns related to air pollution and new technologies for addressing these.

			CO5: Demonstrate advanced skills in performing literature searches and presenting a critical appraisal.
A11	Biodiversity Scope and Relevance	**5**	**CO1**: Understand different levels of biodiversity. **CO2**: Outline the main reasons for decline and threats to biodiversity. **CO3**: Identify important approaches and practices in biodiversity conservation and management. **CO5**: Develop an understanding of ethical and aesthetic value of biodiversity.
A12	Research methodology	**5**	**CO1**: Develop understanding on framework of research process. **CO2**: Identify various sources for literature review and data collection **CO3**: Understand ethical issues in research **CO4**: Develop an understanding on project writing, thesis writing and presentation.
SEMESTER IV			
A14	Intellectual Property Rights	**5**	**CO1**: The students are expected to have the following learning outcomes: **CO2**: Acquire skill to understand the concept of intellectual property rights and to develop procedural knowledge to Legal System. **CO3**: Demonstrate the importance of patent and also demonstrate process/procedures of drafting/filing a patent grant. **CO4**: Demonstrate the usage of copyrights/ trademarks and related rights and their functions. **CO5**: Equipped with knowledge in protecting "industrial design", which could be an intellectual property of their experimental design. **CO6**: Ability to solve issues relating to intellectual property rights in scientific inventions especially in biotechnological industries. **CO7**: Also analyze ethical and professional issues which arise in the intellectual property law context. **CO8**: Students will be able to analyze the effects of intellectual property rights on society as a whole.
BTY4BO5	Genetics	**3**	**CO1**: In-depth knowledge about the basis of hereditary and how characters are transferred from one generation to another **CO2**: Understand the mechanistic pathways by which characters are transferred in microorganism **CO3**: Students gain insight into the various genetic disorders and determine the probability of these

			disorders emerging in a family **CO4**: Understand the statistical method to determine the presence of a character within a population **CO5**: Gain knowledge in analysis and comparing different organism and group to their nearest neighbor on the basis of characters and genomic composition
BTY4 C04	Environmental Biotechnology	**3**	**CO1**: Learn different techniques to reduce a load of chemicals in the environment by applying biofertilizers, biopesticides, and microbial consortiums. **CO2**: Learn the theory involved in the production of biofuels from biomass and lignocellulosic waste. **CO3**: Differentiate the advantages and disadvantages of "Single Cell Protein" (SCP) for human consumption and bioplastics for the environment. **CO4**: Know the biochemical mechanism, optimum condition behind bioleaching, and the microbial consortium used in the same. **CO5**: Demonstrate advanced skills in performing literature searches and presenting a critical appraisal.

SEMESTER V			
COURSE CODE	SUBJECT TITLE	CREDITS	COURSE OUTCOME
BTY5B 07	Molecular Biology	**4**	**CO1:** Molecular Biology gives an in-depth knowledge of biological process through the investigation of the underlying molecular mechanisms. **CO2:** Demonstrate the main structural elements and processes that participate in reproduction, growth, maintenance and regulation of the cell. **CO2:** Explain the fundamental structure, properties and processes in which nucleic acids play a part. **CO3:** Discuss the molecular mechanisms by which DNA controls development, growth or morphological characteristics of organisms. **CO4:** Explain the principles of cloning and genetic manipulation and their application in genetic analysis **CO5:** Demonstrate the knowledge of common and advanced laboratory practices in cell and molecular

			biology. **CO6:** Understand and apply the principles and techniques of molecular biology which prepares students for further education and employment in teaching, basic research, or the health professions. **CO7:** They can critically and quantitatively analyze scientific data, either their own original data or the published data of others. **CO8:** They can define a specific hypothesis and design an experiment to test it, also work collaboratively in team to produce a joint intellectual product. **CO9:** With the knowledge of Molecular biology, the student can obtain a position in both public and private sector as a consultant in biochemical, pharmaceutical, biomedical and biotechnological industry
BTY5BO8	Immunology and Immuno-technology	**4**	**CO1:** Demonstrate how the immune system works building on their previous knowledge from biochemistry, genetics, cell biology and microbiology. **CO2:** Know the cellular ontogeny and organs involvement in immunity. **CO3:** Explain the principles of self-tolerance and autoimmunity. **CO4:** Able to provide an overview of the interactionbetween the immune system and pathogens. **CO5:** Understand the molecular basis of complex, cellular processes involved in inflammation and immunity, in health and disease. **CO6:** Effectively communicate the understanding of basic mechanisms and therapeuticimplications. **CO7:** Develop critical thinking and use of primary research publications to understand the scientific processes which lead them to draw hypothesis and scientific discovery.
BTY5B09	Bioprocess Technology	**4**	**CO1:** Students will acquire knowledge about the underlying principles of bioprocess unit operations like fermentation, downstream processing including the types and use parts of a fermenter. **CO2:** Also have knowledge about genetic engineering for recombinant protein expression and production from various cell systems has advanced knowledge about factorial experimental set up. **CO3:** They will understand how industrially useful microorganisms are getting isolated and preserved

			and the processes of using it for synthesis of industrially important products like Antibiotics, organic acids, enzymes, Single cell proteins, vitamins. **CO4:** They will have a strong knowledge about the techniques of development of a new industrially important microorganism. **CO5:** Also understand how to select suitable bioreactor for desired application and also to select suitable separation system for downstream processing. Practical outcome: **CO6 :** Knowledge about isolating antibiotic producing microbes **CO7:** Perform fermentation of grape juice, Microbial enzyme and biomass production
BTY5D01	Open course Introduction toBiotechnology	**3**	**CO1**: Knowledge about the introduction and history of biotechnology. **CO2**: Acquire knowledge about the basic principle of Fermentation. **CO3**: Application of Biotechnology in food industry, agriculture and medicine. **CO4:** DNA finger printing and paternity test
SEMESTER VI			
BTY6B13	Plant Biotechnology	**4**	**CO1:** The goal of this course is to introduce biotechnological methods in plant system. **CO2:** Understanding of biotechnological processes and also has applicative value in pharmaceutical and food industry. **CO3:** Basis of Plant Tissue culture and its importance. **CO4:** This course explores the use of biotechnology tools in manipulating the plant system. **CO5:** A problem-based learning approach is employed to demonstrate the use of various technologies.
BTY6B14	Animal Biotechnology	**3**	**CO1:** Comprehensive knowledge of the outline of how a cell culture lab should be designed and maintained. **CO2:** Learn how to culture and maintain animal cells. **CO3:** Understand the role of different components and their importance for a healthy culture **CO4:** Understand how to subculture and store the cells **CO5:** Gain insight into the methods to determine cytotoxicity which in turn can be used to validate

			drugs for cancer **CO6:** The students at the end of this course would be experienced in culturing of animal cells and utilizing cells as a source for economically important proteins
BTY6B15	Recombinant DNATechnology andbioinformatics	**3**	**CO1:** The objective of the course is to familiarize the students with the basic concepts in genetic engineering; to acquaint the students to versatile tools and techniques employed in genetic engineering and recombinant DNA technology; and to appraise them about applications genetic engineering. **CO2:** To acquire knowledge in Gene regulation and recombinant protein production. **CO3:** Gain the information about Bioinformatics, Biological Databases and Sequence alignment tools.
BTY6 B17	Medical Biotechnology	**3**	**CO1:** Medical biotechnology is an application of biotechnology that touches the lives of individuals every day. Both wellness and illness have ties to biotechnology. **CO2:** This new level of understanding has, in turn, created opportunities for the development of new therapies, drugs, diagnostic tools and research/clinical instrumentation. **CO3:** Medical biotechnology is one of the fastest growing opportunities for employment in the medical research field. Scientists are looking at the genetic causes of diseases, genetic links among family members, and individualized cures. As the Human Genome Project continues to map the locations of genes on human chromosomes, more solutions to the cause, prevention and cure of diseases will be discovered. **CO4:** This chapter will offer information on the growth structure development and other characteristics of microscopic organism such as bacteria algae or fungi **CO5:** Demonstrate theory and practical skills in microscopy and their handling techniques and staining procedures