THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI – 626 123.

(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade by NAAC, College with Potential for Excellence by UGC and Mentor Institution under UGC PARAMARSH)

DEPARTMENT OF MICROBIOLOGY

UG DEGREE PROGRAMME IN MICROBIOLOGY

PROGRAMME EDUCATIONAL OBJECTIVES The Graduates will	
PEO1.	take up escalating careers as microbiologist in hospitals, industries or pursue higher studies.
PEO2.	produce innovative explanation for maintaining the accuracy of computational biology using bioinformatics tools.
PEO3.	handle scientific instruments, planning and performing laboratory experiment to uplift the need of livelihood.
PEO4.	work with ethical values in utilizing microbes for eco-friendly studies.

PROGRAMME SPECIFIC OUTCOMES By the Completion of B.Sc Microbiology, the learners will be able to	
PSO1.	recall the basic principles of various fields of microbiology and relate its functional aspects in multiple disciplines of applied science.
PSO2.	explain and compare diversified status of microbes and illustrate the techniques related to microbial analysis.
PSO3.	apply innovate microbes in industries and health care for social benefits.
PSO4.	utilize laboratory skills and apply computational techniques for academic research and choose their career as medical transcriptionist.
PSO5.	assess the upshot of valuable team work in exploring the role of microbes in food, pharmaceutical and biotech companies.
PSO6.	employ ethical values to depict effective role of microbes in applied microbiology.
PSO7.	execute interdisciplinary knowledge to provide better solutions and new ideas for the sustainable developments, recognition of the need for, and an ability to engage in life-long learning.

COURSE OUTCOME

Major Course	
Course Code : GLMB11	**Course Title :** Microbiology & Microbial Techniques
On successful completion of the course, the learners should be able to	
CO1.	summarize the general structure of bacteria and its characteristics feature.
CO2.	identify the nutritional necessities of microbes.
CO3.	classify microbial staining and application of Microscopy.
CO4.	interpret microbial identification techniques.
CO5.	choose microbial control measures from various methods.

Major Course	
Course Code : GLMB12	**Course Title :** Food Microbiology
On successful completion of the course, the learners should be able to	
CO1.	relate the interaction between microorganism and food environment.
CO2.	identify the pathogenecity of food borne microbes.
CO3.	inspect the process of fermentation in various foods.
CO4.	apply various methods of food preservation techniques.
CO5.	formulate hygienic food with good manufacturing practices for the benefits of society.

Allied Course	
Course Code : GLMB1A	**Course Title :** Biochemistry
On successful completion of the course, the learners should be able to	
CO1.	classify the physical properties of various biomolecules..
CO2.	identify chemical and structural significance of biomolecules
CO3.	list various biomolecules classification and their mechanism which enhance their bioactive reactions.
CO4.	explain different organic, active lipid compounds and metabolic pathway of bio polymeric macromolecules.
CO5.	adapt suitable biochemical techniques like quantitative and electrophoretic process which are specific for separation and identification of biomolecules and specifically used their team work in biochemical companies

Major Course	
Course Code : GLMB21	**Course Title :** Microbial Taxonomy & Physiology
On successful completion of the course, the learners should be able to	
CO1.	classify microbial taxonomy, phylogeny and diversity of microorganisms.
CO2.	construct bacterial taxonomy based on genotypic and molecular characters.
CO3.	compare prokaryotes and eukaryotic based on morphology and its reproduction.
CO4.	interpret mechanism of transport and nutrient uptake in microorganisms
CO5.	discuss the energy metabolism of various physiological pathways in microbes.

Allied Course	
Course Code : GLMB2A	**Course Title :** Industrial Microbiology
On successful completion of the course, the learners should be able to	
CO1.	summarize the importance of microbes in various industries.
CO2.	make use of different strategies for mass cultivation of microbes.
CO3.	plan the design of fermentor to categorize the different techniques of microbial fermentation..
CO4.	evaluate the industrial production of microbial product.
CO5.	improve efficacy in recovery of product for effectual commercialization

Major Practical	
Course Code : GLMB2L	**Course Title :** PRACTICAL I
On successful completion of the course, the learners should be able to	
CO1.	find the basic staining and enumeration techniques of microbiology.
CO2.	identify the growth characteristics and metabolic process of bacteria.
CO3.	compare the physiological and biochemical characteristic of microbes.
CO4.	assess the quality and hygienic properties of food for consumer safety.
CO5.	make use of various food analytical methods to supply healthy and nutritive product.

Allied Practical	
Course Code : GLMB2AL	**Course Title :** ALLIED PRACTICAL I
On successful completion of the course, the learners should be able to	
CO1.	choose suitable quantitative analysis for estimation of various biomolecules.
CO2.	select appropriate technique for separation of nucleic acid and protein.
CO3.	inspect the production of industrially important fermented products using bacteria.
CO4.	determine the efficiency of microorganism in antibiotics synthesis.
CO5.	formulate microbial products for scale up process and commercialization.

Major Course	
Course Code : GLMB31	**Course Title :** Fundamentals Of Immunology
On successful completion of the course, the learners should be able to	
CO1.	relate the roles of the immune system in both maintaining health and contributing to disease.
CO2.	interpret the information on immunological response and how it is generated and regulated.
CO3.	distinguish the detrimental reactions of the host immune system.
CO4.	compare the different immune response against auto antigen and microbial antigens.
CO5.	estimate and assess the interaction between antigen and antibody technically.

Major Course	
Course Code : GLMB32	**Course Title :** Cell & Molecular Biology
On successful completion of the course, the learners should be able to	
CO1.	define the structure, functions and cellular mechanism of various organelles in prokaryote and eukaryotes.
CO2.	summarize the types of nucleic acid and outline its replication mechanism
CO3.	identify the central dogma of protein synthesis.
CO4.	assess the rules by which information encoded in genetic material.
CO5.	build in-depth acquaintance in cell and molecular mechanism.

Allied Course	
Course Code : GLMB3A	**Course Title :** Computer Applications In Biology
On successful completion of the course, the learners should be able to	
CO1.	illustrate the basics of computer and associated device.
CO2.	compute operating systems used in computer.
CO3.	categorize various hardware/software interactions and programming languages.
CO4.	analyse available information in biological databases.
CO5.	design drug for computer based pharmaceutical industries.

Major Course	
Course Code : GLMB41	**Course Title** : Microbial Genetics
On successful completion of the course, the learners should be able to	
CO1.	define the basic concept of genes organization and the tools used in artificial gene synthesis in prokaryotes.
CO2.	demonstrate different gene transfer techniques, various molecular models of recombination in microbes and their working mechanism.
CO3.	classify types, various agents involved in mutation and the types of mechanism involved in DNA repair.
CO4.	explain different modes of transposition in prokaryotes and eukaryotes.
CO5.	elaborate the regulation and expression of gene in unicellular and multicellular organisms and converse their mechanism.

Allied Course	
Course Code : GLMB4A	**Course Title** : Bioinformatics
On successful completion of the course, the learners should be able to	
CO1.	explain the basic principles that underpin bioinformatics analyses.
CO2.	compute biological data using a variety of bioinformatics tools.
CO3.	analyse protein and nucleotide database and coherently report the findings.
CO4.	interpret output of software tool for considerable predictions.
CO5.	make use of data visualization software.

Major Practical	
Course Code : GLMB4L	**Course Title** : Practical II
On successful completion of the course, the learners should be able to	
CO1.	label the different stages of cell division.
CO2.	identify different types of blood cells.
CO3.	inspect and explain the body defense mechanism based on immunological reactions.
CO4.	interpret the changes in bacteria by mutagenesis.
CO5.	create genetic alteration in bacterial cell.

Allied Practical	
Course Code : GLMB4AL	**Course Title** : Allied Practical II
On successful completion of the course, the learners should be able to	
CO1.	infer the installation and formatting of the computer program.
CO2.	select the suitable command from MS office.
CO3.	apply Bioinformatics tools available in online.
CO4.	analyze nucleotide and protein sequence using biological database.
CO5.	adapt novel software for docking studies.

Major Course	
Course Code : GLMB51	**Course Title** : Medical Microbiology
On successful completion of the course, the learners should be able to	
CO1.	define common microbial infectious agents and route of their cause.
CO2.	categorize the epidemiology of pathogens including its transmission mechanism.
CO3.	identify the clinical features and lab diagnosis of infections caused by microbial pathogens.
CO4.	determine the characteristics, life cycle and treatment strategies of infectious agents.
CO5.	make use of antimicrobial agents and common mechanisms of antimicrobial action and resistance.

Major Practical	
Course Code : GLMB5L	**Course Title** : Practical III
On successful completion of the course, the learners should be able to	
CO1.	distinguish the pathogen and non pathogenic microbes in various clinical samples.
CO2.	experiment the potential clinical diagnostic techniques.
CO3.	examine the antibiotic profile of pathogens.
CO4.	evaluate various tools of Recombinant DNA technology.
CO5.	choose modern techniques for gene manipulation.

Major Course	
Course Code : GLMB61	**Course Title** : Environmental Microbiology
On successful completion of the course, the learners should be able to	
CO1.	recalling biosphere organization in aquatic, aero and soil microbiology.
CO2.	illustrate the preventive measures against microbial infections transmitted through air and water.
CO3.	make use of microbial biomass for waste water treatment technology.
CO4.	examine the role of microbes in bioremediation and bioleaching.
CO5.	develop resourceful microorganism for pollution free environment.

Major Course	
Course Code : GLMB62	**Course Title** : Microbial Biotechnology
On successful completion of the course, the learners should be able to	
CO1.	list the scope of microbial biotechnology, various bioreactor design, production and applications of microbial products in various fields.
CO2.	make use of various strategies to enhance microbial production.
CO3.	discover novel method for obtaining desired industrial products.
CO4.	judge the release of GMO based on ethical principle.
CO5.	compile application of nanobiology in various fields.

Major Practical	
Course Code : GLMB6L1	**Course Title** : Practical IV
On successful completion of the course, the learners should be able to	
CO1.	infer basic techniques of environmental microbiology
CO2.	apply the practical aspects of degradation using microbes.
CO3.	discover beneficial microbes in ecological process.
CO4.	assess potability of water using various techniques.
CO5.	create professionalist for quality checking in aqua companies.

Major Practical	
Course Code : GLMB6L2	**Course Title** : Practical V
On successful completion of the course, the learners should be able to	
CO1.	find the industrially employed microbes.
CO2.	organize the stages of enzyme production.
CO3.	analyze antimicrobial properties of bionanoparticles.
CO4.	judge software tools used for Genomics and proteomics studies.
CO5.	assess molecular homology studies with online tools.

Elective Course	
Course Code : GLMB5E1	**Course Title** : Recombinant DNA Technology
On successful completion of the course, the learners should be able to	
CO1.	outline various tools, gene synthesis, gene cloning and expression strategies in different host.
CO2.	identify the significance of recombinant DNA techniques in modern biotechnology.
CO3.	compare various *in vitro* gene transfer strategies for prokaryotes and eukaryotes.
CO4.	interpret the ethical value in implementing modern biotechniques for society.
CO5.	elaborate heterologous expression of cloned gene and its application.

Major Course	
Course Code : GLMB5E2	**Course Title** : Virology
On successful completion of the course, the learners should be able to	
CO1.	classify fundamentals of viral taxonomy and life cycle.
CO2.	identify different strategies for virus isolation and cultivation.
CO3.	discover various viruses infecting plant and animals.
CO4.	determine the appropriate diagnostic method used to diagnosis of viral diseases.
CO5.	formulate the relevant antiviral chemotherapies according to ethical morality

Elective Course	
Course Code : GLMB5E3	**Course Title** : Agricultural Microbiology
On successful completion of the course, the learners should be able to	
CO1.	define basics of soil microbiology, various properties and identification techniques which enhance soil microbes.
CO2.	identify which interactions occur in single and diversify microbial population.
CO3.	compare the beneficial and pathogenic effect of microorganisms with plants.
CO4.	explain the role of biogeochemical cycle in the ecosystem.
CO5.	formulate the different strategies for agricultural waste management to produce new products using microbes and it is maintain the environment good and enhance the soil crop in agricultural land.

Elective Course	
Course Code : GLMB5E4	**Course Title** : Medical Biotechnology
On successful completion of the course, the learners should be able to	
CO1.	outline the revolutionized era in the medical biotechnology.
CO2.	model the rapid utilization of molecular technique in medical field.
CO3.	categorize various genetic phenomenons in living system.
CO4.	evaluate molecular concept of disease resistance and pathogenecity.
CO5.	discuss various therapeutical aspects for curing genetic disorders.

Elective Course	
Course Code : GLMB6E1	**Course Title** : Genomics and Proteomics
On successful completion of the course, the learners should be able to	
CO1.	show the fundamentals of genomics and proteomics.
CO2.	identify and discuss the techniques used genomics and proteomics.
CO3.	inspect technology behind protein expression analysis.
CO4.	interpret biological pathway through computational methods.
CO5.	construct strategies for drug targeting using computer based design.

Elective Course	
Course Code : GLMB6E2	**Course Title** : Nanobiotechnology
On successful completion of the course, the learners should be able to	
CO1.	Summarize basic substances required for the synthesis of nano materials.
CO2.	Construct methods used for characterization of Nanostructures.
CO3.	Inference of nanostructure synthesized from top town and bottom up approaches.
CO4.	Build nanosensor for various diagnostic and therapeutical applications.
CO5.	Develop nanotechnology for next revolution with nanobusiness.

Non Major Elective Course I	
Course Code : GLMB3N	**Course Title** : Fundamentals of Microbiology
On successful completion of the course, the learners should be able to	
CO1.	show the basics of microbiology.
CO2.	explain the inventions of microbiology.
CO3.	list the microbial flora of natural habitat.
CO4.	determine the microbial diseases associated with environment.
CO5.	elaborate the applications of microorganisms in various industries.

Non Major Elective Course II	
Course Code : GLMB4N	**Course Title** : Mushroom Technology
On successful completion of the course, the learners should be able to	
CO1.	recall different types, nutritive value and life cycle of mushrooms.
CO2.	outline growth requirements and cultivation strategies of mushrooms.
CO3.	classify the parameters affecting growth characteristics of mushrooms.
CO4.	deduct the limitations associated with mushroom processing and production.
CO5.	formulate various methods to control pests and other microbial diseases.

Discipline Specific Course	
Course Code : GLMB4DS	**Course Title** : Leather Processing & Tannery Tech.
On successful completion of the course, the learners should be able to	
CO1.	illustrate the stages of Leather processing.
CO2.	select different methods of treatment tannery effluent.
CO3.	categories the chemicals used in leather processing.
CO4.	appraise the role of microbes in leather technology.
CO5.	develop new strategies for leather processing using microbes.

Job Oriented Course	
Course Code : GLSE67	**Course Title** : Catering Tech. & Hotel Mgt.
On successful completion of the course, the learners should be able to	
CO1.	illustrate the fundamentals of food and hygiene.
CO2.	utilize interpersonal skills to lead/manage first level employees in a hospitality setting.
CO3.	inspect foundation for kitchen layout and safety.
CO4.	appraise various sectors of food service industry.
CO5.	adapt diverse skills for housekeeping in restaurants.

Job Oriented Course -Practical	
Course Code : GLSE67L	**Course Title** : Catering Tech. & Hotel Mgt.- Practical
On successful completion of the course, the learners should be able to	
CO1.	demonstrate the cooking method with several nutritious ingredients.
CO2.	make use of different kinds of cuisines.
CO3.	inspect the quality of product and service provided.
CO4.	appraise diverse environment with focus on client and customer services.
CO5.	formulate skills on financial budging and stock taking.

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DEPARTMENT OF MICROBIOLOGY

PG DEGREE PROGRAMME IN MICROBIOLOGY

PROGRAMME EDUCATIONAL OBJECTIVES The Graduates will	
PEO1.	expertise in various microbial techniques to pursue higher studies and elevate their progressive careers in industries.
PEO2.	unique in designing innovative solutions for medical complications using novel drug development.
PEO3.	acclimatize novel technologies and promote their skills to be a successful entrepreneur.
PEO4.	follow the ethical principles in research finding for employing microbes in welfare of society and nation.

PROGRAMME SPECIFIC OUTCOMES By the Completion of M.Sc Microbiology, the learners will be able to	
PSO1.	define the essential principles of advanced studies in microbiology and describe its relevant role in modern era of microbiology.
PSO2.	illustrate and interpret progress on molecular aspects of diversified microbes for gene manipulation.
PSO3.	make use of innovative methodology and strategies to analyze critically and systematically to draw the objective conclusions.
PSO4.	examine and categorizes advanced software tools for microbial phylogenetic analysis, drug designing and docking studies.
PSO5.	appraise the outcome of effective team effort to achieve desired target in multi disciplinary field of microbiology.
PSO6.	design and makeup valuable task of industrial microbiology by applying the ethical principles.
PSO7.	implement ideas to engage in independent and life-long learning in the broadest circumstances of eco-conscious changes.

COURSE OUTCOME

Core Course	
Course Code : HLMB11	**Course Title :** General Microbiology
On successful completion of the course, the learners should be able to	
CO1.	summarize important innovation of various scientists and characterized microorganism based on morphology, structure and cellular components.
CO2.	identify the working principle of different types of Microscopes and elaborate its applications in research.
CO3.	compare diversified taxonomical status of microbes based on Phenetic, Numerical and phylogenetic analysis.
CO4.	explain general characteristics, classification and multiplication cycle of virus and protozoa.
CO5.	compile morphology, reproduction and physiology the fungal and algal groups.

Core Course	
Course Code : HLMB12	**Course Title :** Biochemistry
On successful completion of the course, the learners should be able to	
CO1.	outline the significance of buffer system, structure of universal solvent, specific properties, bonding and their elemental composition.
CO2.	identify energy relationship and transformation of energy within/ between living organism and environment.
CO3.	compare regulation of biochemical pathways and the quantitative data of desired products in microorganism.
CO4.	evaluate the enzymology of anabolism and catabolism which revealed product of complex molecules and their breakdown.
CO5.	choose appropriate biomolecule for regulation of metabolism and get the knowledge of human health.

Core Course	
Course Code : HLMB13	**Course Title :** Fundamentals of Biotechnology
On successful completion of the course, the learners should be able to	
CO1.	outline the scope of Biotechnology in microbes, plant and animals engineering.
CO2.	identify significance of gene manipulating strategies in multidisciplinary field of applied sciences.
CO3.	compare new methods of gene transfer and cloning in microbes, plant and animals.
CO4.	assess the impact of genetic engineering for human welfare and

	commercialization of industrial product.
CO5.	elaborate different molecular techniques and utilize it ethically in medical research.

Major Practical	
Course Code : HLMB1L	**Course Title :** Major practical I
On successful completion of the course, the learners should be able to	
CO1.	show various microbial characterization methods for identification of microorganisms.
CO2.	experiment the methods of analytical Biochemistry used in research.
CO3.	assess the properties and kinetics of enzyme and substrate mechanism.
CO4.	interpret molecular techniques for gene manipulation.
CO5.	demonstrate techniques involved in isolation of genetic material for molecular research.

Core Course	
Course Code : HLMB21	**Course Title :** Immunology And Immunotechniques
On successful completion of the course, the learners should be able to	
CO1.	relate and demonstrate the key mechanisms and cellular materials of innate and adaptive immunity.
CO2.	identify the concepts of immunological processes at a cellular and molecular level.
CO3.	categorize the cells that involved in antigen presentation, and how immunodeficiency's are related to diseases.
CO4.	evaluate the basis of allergy and allergic diseases and unique properties of cancer cells, immune recognition of tumors, immune evasion of cancers.
CO5.	elaborate the immunological mechanism of implantation and antigen- antibody interactions.

Core Course	
Course Code : HLMB22	**Course Title :** Fermentation Technology
On successful completion of the course, the learners should be able to	
CO1.	describe the main steps and processes using different media to produce fermentation products in industry observe their development and maintenance of microbes.
CO2.	design various fermentor and operating strategies for scale up process.
CO3.	analyze fermentation kinetics and processor control of fermentation practice.
CO4.	choose suitable methods for recovery and commercialization of various fermented goods.
CO5.	improve efficacy of microbes in industrial fermentation through scientific strategies.

Core Course	
Course Code : HLMB23	**Course Title :** Food & Dairy Microbiology
On successful completion of the course, the learners should be able to	
CO1.	outline the scope of food microbiology and summarize the diversified sources for food contamination.
CO2.	apply modern physical and chemical techniques for food preservation and storage.
CO3.	analyze food borne illness and intoxication caused by bacteria, fungi, protozoa.
CO4.	interpret industrial standards to maintain a safe and hygiene conditions in food processing and production.
CO5.	elaborate different types of food commodities and rationale use of food standards for benefits of society.

Major Practical	
Course Code : HLMB2L	**Course Title :** Major Practical II
On successful completion of the course, the learners should be able to	
CO1.	illustrate advanced methods in implementing immunological techniques.
CO2.	make use of suitable techniques for expertising in quality analysis.
CO3.	inspect the production process of industrially important fermented products.
CO4.	determine the potability of foods by examine the microbial content.
CO5.	formulate the safe and hygienic food for social benefits and commercialization.

Core Course	
Course Code : HLMB31	**Course Title :** Agri & Environmental Microbiology
On successful completion of the course, the learners should be able to	
CO1.	find the diversified interaction among microbial population.
CO2.	classify various habitats of microbial communities
CO3.	identify the importance of microorganisms in agriculture and plant pathology
CO4.	justify the task of microbes in biogeochemical cycle and impact of environmental factors in biodegradation and bioremediation.
CO5.	compile all the facts in order to employ microbes for the benefits of farmers.

Core Course	
Course Code : HLMB32	**Course Title :** Microbial Genetics & Molecular Biology
On successful completion of the course, the learners should be able to	
CO1.	outline the importance of gene concept, genetic organization, gene alteration and molecular events of microbial genetics.
CO2.	model the significant steps involved in various genetic phenomenon required for cell regulation and function.
CO3.	classify molecular mechanism of gene clusters involved in catabolic and anabolic pathways
CO4.	explain the self-transmissible mechanisms of prokaryotic and eukaryotic DNA.
CO5.	compile various types and mechanism of genetic recombination.

Core Course	
Course Code : HLMB33	**Course Title** : Microbial Physiology
On successful completion of the course, the learners should be able to	
CO1.	explain energy metabolism and various diffusion techniques involved in microbes.
CO2.	identify the assimilation process and biological nitrogen fixation in microorganism.
CO3.	classify stress responses of bacteria in extreme environment.
CO4.	interpret factors influencing physiology of microbes in adverse condition.
CO5.	elaborate different approaches for biosynthesis of nucleic acids and recognize the bioluminescent microbes.

Major Practical	
Course Code : HLMB3L	**Course Title** : Major Practical III
On successful completion of the course, the learners should be able to	
CO1.	find soil mineral content and soil microorganism.
CO2.	demonstrate the advanced techniques of molecular biology.
CO3.	examine the effect of physical and chemical factors on microbes.
CO4.	assess the factors governing microbial growth.
CO5.	estimate the biochemical activity of microorganisms.

Major Course	
Course Code : HLMB41	**Course Title** : Clinical Microbiology
On successful completion of the course, the learners should be able to	
CO1.	find clinical significance of pathogenic microbes in transmission of diseases in humans.
CO2.	identify the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
CO3.	inspect opportunities to develop informatics and diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of infectious diseases.
CO4.	assess the relationship of mycotic infection to symptoms, relapse and the accompanying pathology.
CO5.	discuss the chemotherapy and get responsiveness for sanitation practices to prevent communicable diseases.

Core Course	
Course Code : HLMB42	**Course Title** : Bioinformatics
On successful completion of the course, the learners should be able to	
CO1.	choose efficient alignment, assembly and clustering algorithm.
CO2.	utilize appropriate strategy and analyze range of projects involving DNA, RNA or protein sequence data.
CO3.	compare pipeline of analysis tool to analyze real world biological data sets.
CO4.	assess the analytical approaches for efficiency, robustness and correctness of data interpretation.
CO5.	discuss unique methods for analysis of gene or protein expression studies.

Major Practical	
Course Code : HLMB4L	**Course Title** : Major Practical IV
On successful completion of the course, the learners should be able to	
CO1.	illustrate the pathogens with clinical diagnostic techniques.
CO2.	examine fungi from clinical sample using different staining techniques.
CO3.	assess nucleotide and protein sequence using online tools.
CO4.	develop computational analysis for prediction of protein structure.
CO5.	improve protein visualization using advanced bioinformatics tools.

Project	
Course Code : HLMB4P	**Course Title** : Project And Viva Voce
On successful completion of the course, the learners should be able to	
CO1.	relate the literature survey to chosen field of microbiology.
CO2.	plan for various stages of research work.
CO3.	examine novel technologies in various fields of Microbiology.
CO4.	evaluate the role of bioinformatics tools in research.
CO5.	create the competence to discuss and conclude the research findings emphasizing its benefits to the society.

Elective Course	
Course Code : HLMB1E1	**Course Title** : Biostatistics
On successful completion of the course, the learners should be able to	
CO1.	explain the concepts of modern statistical theory and their probabilistic foundation.
CO2.	identify the concept of probability and distribution studies in statistical inference and design.
CO3.	categorize the importance of Correlation, Regression and its application in data analysis.
CO4.	evaluate scientific data, implement statistical methods and document the output using statistics tools.
CO5.	choose appropriate hypothesis for analyzing variables in scientific interpretation.

Elective Course	
Course Code : HLMB1E2	**Course Title** : Bioinstrumentation
On successful completion of the course, the learners should be able to	
CO1.	outline of safety in laboratories and unit of measurements.
CO2.	appraise the principle and application of pH meter.
CO3.	identify the working mechanism of various chromatography techniques.
CO4.	analyze separation techniques of electrophoresis**.**
CO5.	choose the role of radio isotopic techniques.

Elective Course	
Course Code : HLMB2E	**Course Title** : Biofertilizer
On successful completion of the course, the learners should be able to	
CO1.	outline the characteristics, isolation, production and application of biofertilizers.
CO2.	identify strategies involved in the large scale cultivation of biofertilizer.
CO3.	inference the crop response after field application of biofertilizers.
CO4.	make awareness on different composting strategies for waste reduction.
CO5.	design waste management for implementing organic farming.

Elective Course	
Course Code : HLMB3E1	**Course Title** : CSIR-UGC NET Preparatory course–Life Sciences
On successful completion of the course, the learners should be able to	
CO1.	explain the basic principle of biochemistry and molecular biology.
CO2.	analyse insights of cell functions and embryo development.
CO3.	assess the importance of plant and animal physiology.
CO4.	predict the genetic variations and outline the hierarchy of diversity forms.
CO5.	apply and utilize the advanced techniques in the biomedical field.

Elective Course	
Course Code : HLMB3E2	**Course Title** : Food Process Technology
On successful completion of the course, the learners should be able to	
CO1.	extend the importance of Food preservation techniques used in industries.
CO2.	classify various food additives and flavour used in food products.
CO3.	list out the microorganisms involved in spoilage of food and beverages.
CO4.	assess the principle of food preservation by different fermentation strategies.
CO5.	elaborate milk and dried milk products and discuss the role of sugar and sweetners.

Elective Course	
Course Code : HLMB4E1	**Course Title** : Research Methodology
On successful completion of the course, the learners should be able to	
CO1.	relate various kinds of research, objectives of doing research, research process, research designs and sampling.
CO2.	identify measurement and scaling techniques for quantitative data analysis of research data.
CO3.	analyze research plan for scientific writing from different sources of scientific literature.
CO4.	evaluate the methods to formulate research hypothesis and concluding the research problems.
CO5.	compile the methods of writing research proposals for financial grant from national and international agencies.

Elective Course	
Course Code : HLMB4E2	**Course Title** : Genomics and Proteomics
On successful completion of the course, the learners should be able to	
CO1.	describe the use of functional genomics and proteomics in agricultural, medical and genetic research.
CO2.	identify the techniques used in functional genomics such as microarrays, next generation sequencing technology
CO3.	examine of functional genomics and proteomics studies with high throughput sequencing studies.
CO4.	adapt computational based drug designing software in pharmocogenomic research.
CO5.	choose environmental, economic and ethical aspects of this emerging technology.