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.	handle scientific instruments, planning, performing laboratory experiment and work with ethical values in utilizing microbes for eco-friendly studies.
PEO3.	familiarize with new techniques and improve their skills needed for self-employment.

PROGRAMME SPECIFIC OUTCOMES By the Completion of B.Sc MICROBIOLOGY programme, 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: BDMB11	**Course Title: MICROBIOLOGY & MICROBIAL DIVERSITY**
On successful completion of the course, the learners should be able to	
CO1[K2]	outline the history of microbiology and its distribution in early days.
CO2[K2]	summarize the evolutionary relationship of various microbial origins in global level.
CO3[K3]	determine several methods and its application in identifying the structural and characteristics feature of microbes.
CO4[K4]	categorize microbial taxonomy and its classification using advanced techniques.
CO5[K5]	assess the way of control measures against contagious microbes present in natural environment.

MAJOR COURSE	
Course Code: BDMB12	**Course Title:FOOD MICROBIOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	relate the interaction between microorganism and food environment.
CO2[K2]	classify the various methods of food preservation techniques.
CO3[K3]	identify the pathogenicity of food borne microbes.
CO4[K4]	inspect the process of fermentation in various foods.
CO5[K5]	assess the food hygiene with good manufacturing practices for the benefits of society.

ALLIED COURSE	
Course Code: BDMB1A	**Course Title:BASIC BIOCHEMISTRY**
On successful completion of the course, the learners should be able to	
CO1[K2]	illustrate the basic concept of biochemistry as a discipline and discoveries in life.
CO2[K2]	explain the structural properties and techniques involved in studying functions of various biomolecules.
CO3[K3]	identify the functional properties of biomolecules and their role in living system.
CO4[K4]	analyze various features of biomolecules that enhance their bioactive reactions.
CO5[K5]	assess the biological significance and the mechanisms of different types of biomolecules.

MAJOR COURSE	
Course Code: BDMB1L	**Course Title: PRACTICAL I**
On successful completion of the course, the learners should be able to	
CO1[K2]	illustrate the basic staining and enumeration techniques of microbiology.
CO2[K3]	identify the practices involved in determining growth characteristics and metabolic process of bacteria.
CO3[K4]	examine the physiological and biochemical characteristic of microbes in various food products.
CO4[K5]	evaluate different food analytical methods to supply healthy, safe and nutritive products.
CO5[K6]	formulate the strategies for maintaining quality and hygienic properties of food for consumer safety.

VALUE ADDED COURSES	
Course Code:BDES11	**Course Title:ENVIRONMENTAL STUDIES**
On successful completion of the course, the learners should be able to	
CO1[K2]	recognize the importance of environment and role of individual in its protection.
CO2[K2]	represent the primary environmental problems and its potential solutions.
CO3[K3]	utilize the methods for the sustainable use of natural resources.
CO4[K4]	organize an action plan for sustainable alternatives that integrate science, humanist and social perspectives.
CO5[K4]	compare the structure and functions of ecosystems in the context of human-environmental interactions.

MAJOR COURSE	
Course Code: BDMB21	**Course Title: MICROBIAL PHYSIOLOGY & METABOLISM**
On successful completion of the course, the learners should be able to	
CO1[K2]	classify the different types of nutrition and their transport mechanism among microorganism.
CO2[K2]	elaborate the metabolic pathway and degradation process of Lipids-sterols.
CO3[K3]	organize various steps involved in amino acids biosynthesis and other fermentative metabolism.
CO4[K4]	distinguish the different mechanism of photosynthesis in microorganisms.
CO5[K5]	assess the energy metabolism of various physiological pathways in microbes.

ALLIED COURSE	
Course Code: BDMB2A	**Course Title: CELL & MOLECULAR BIOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	summarize the general concept of cell theory, structural and functional properties of both prokaryotes and eukaryotes cell organelles.
CO2[K2]	elaborate the stages of cell cycle, differentiation and multiplication.
CO3[K3]	determine the significance of various molecular events of cell biology.
CO4[K4]	distinguish the sequential steps involved in central dogma of molecular biology.
CO5[K5]	evaluate the molecular mechanisms of DNA, RNA and protein synthesis in prokaryotes and eukaryotes.

MAJOR COURSE	
Course Code: BDMB2L	**Course Title: PRACTICAL II**
On successful completion of the course, the learners should be able to	
CO1[K2]	demonstrate the enzymatic activity of microorganism in soil.
CO2[K3]	find the effect of bacterial growth and their metabolic processes in different environmental condition.
CO3[K4]	compare the growth of bacteria on selective and differential medium.
CO4[K5]	assess the quality and acidity of fermentative product.
CO5[K6]	compile the methods involved in estimation of amino acids.

ALLIED COURSE	
Course Code: BDMB2AL	**Course Title: ALLIED PRACTICAL I**
On successful completion of the course, the learners should be able to	
CO1[K2]	indicate the parameters followed for preparation of buffers.
CO2[K3]	select appropriate methods for detection of specific biomolecules.
CO3[K4]	examine the stages cell cycle during mitotic and meiotic division.
CO4[K5]	interpret the variation of cell morphology in prokaryotic and eukaryotic cell.
CO5[K6]	predict the nature of biomolecules using suitable quantitative analytical method.

MAJOR COURSE	
Course Code:BDMB31	**Course Title:FUNDAMENTALS OF IMMUNOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	demonstrate basic knowledge of the organization and function of the immune system.
CO2[K2]	describe the roles of the immune system in both maintaining health and contributing to disease.
CO3[K3]	determine immunological response and how it is triggered and regulated.
CO4[K4]	examine and manage a whole spectrum of immune-mediated disorders.
CO5[K5]	assess the techniques used to analyze the antigen-antibody interaction.

MAJOR COURSE	
Course Code: BDMB32	**Course Title: PHARMACEUTICAL MICROBIOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	outline the characteristics of microorganisms, various microbial infections and the process involved in the antibiotic selection.
CO2[K3]	identify the organisms suitable for the production of various antibiotics and drugs.
CO3[K4]	analyze the methods involved in the manufacturing of antibiotics and the various pharmaceutical products.
CO4[K5]	conclude the process involved in the productions and the preservation techniques.
CO5[K5]	importance the drug therapy used against the infections and the production of various pharmaceutical products for human health.

ALLIED COURSE	
Course Code:BDMB3A	**Course Title: INHERITANCE BIOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	outline the knowledge of genetic principles, gene interaction, gene linkage and inheritance studies.
CO2[K2]	summarize the process involved in inheritance of linked gene relevant to mapping and resolving the genotype.
CO3[K3]	determine the function of gene in sex determination, genetic balance and quantitative inheritance.
CO4[K4]	categorize the complexity of genome and chromosome organization in eukaryotes.
CO5[K5]	assess the significance of genetic elements in heritable changes during developmental stages.

MAJOR COURSE	
Course Code: BDMB3L	**Course Title: PRACTICAL III**
On successful completion of the course, the learners should be able to	
CO1[K3]	identify the body defense mechanism based on immunological reactions.
CO2[K4]	analyze the human blood group typing and evaluate the different types of blood cells.
CO3[K5]	assess the quality and acceptability for pharmaceuticals samples.
CO4[K5]	evaluate antibiotic activities against various microorganisms.
CO5[K6]	compose the role of microorganisms in pharmaceutical products.

MAJOR COURSE	
Course Code: BDMB41	**Course Title: MICROBIAL GENETICS**
On successful completion of the course, the learners should be able to	
CO1[K2]	outline the basic concept of gene, recombination, types of mutation and gene regulation in microbes.
CO2[K2]	demonstrate units of gene and various molecular models of recombination in microbes and their working mechanism.
CO3[K3]	identity various agents involved in mutation and the types of mechanism involved in DNA repair and translocation of gene in microorganisms.
CO4[K4]	analyze the effect of transposition and regulation of gene expression in prokaryotes and eukaryotes
CO5[K5]	assess the epigenetic control of elements and the expression of gene in unicellular and multicellular organisms and converse their mechanism.

ALLIED COURSE	
Course Code: BDMB4A	**Course Title:BIOINFORMATICS**
On successful completion of the course, the learners should be able to	
CO1[K2]	explain the basic principles that underpin bioinformatics analyses.
CO2[K2]	relate the biological data using a variety of bioinformatics tools.
CO3[K3]	make use of protein and biological database and coherently report the findings.
CO4[K4]	analyze output of software tool for considerable predictions.
CO5[K5]	interpret of data sources for Microarray techniques.

MAJOR COURSE	
Course Code: BDMB4L	**Course Title: PRACTICAL IV**
On successful completion of the course, the learners should be able to	
CO1[K2]	demonstrate technique for introducing DNA into bacterial cell.
CO2[K3]	determine the effect of mutagen on bacterial growth.
CO3[K4]	categorize methods for isolation of antibiotic resistant mutant.
CO4[K5]	interpret the nutritional requirement of wild and mutant strains.
CO5[K5]	assess various nutritional and recombinant mutants.

ALLIED COURSE	
Course Code: BDMB4AL	**Course Title: ALLIED PRACTICAL II**
On successful completion of the course, the learners should be able to	
CO1[K2]	describe pedigree analysis to determine dominant and recessive characters of inheritance.
CO2[K3]	identify different types of stains, preservatives used for observing cell organelles.
CO3[K4]	inspect Mendelian Inheritance and gene interactions [Non Mendelian Inheritance] using suitable examples.
CO4[K4]	analyze nucleotide and protein sequence using biological database.
CO5[K5]	appraise novel software for Sequence analysis studies.

DISCIPLINE SPECIFIC COURSE	
Course Code: BDMB4DS	**Course Title: INSTRUMENTATION & BIOTECHNIQUES**
On successful completion of the course, the learners should be able to	
CO1[K2]	summarize the basic concept of qualitative and quantitative analysis of a sample.
CO2[K2]	illustrate the nature of synthetic or biological compounds through analytical instruments.
CO3[K3]	apply the aseptic technique to isolate the biological samples.
CO4[K4]	categorize the purity of synthesized substance through biotechnical methods.
CO5[K5]	evaluate the safety measures adapted in preparation and storage of microbial cultures.

MAJOR COURSE	
Course Code:BDMB51	**Course Title: MEDICAL MICROBIOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	illustrate common microbial infectious agents and route of their cause.
CO2[K3]	identify the use of antimicrobial agents and common mechanisms of antimicrobial action and resistance.
CO3[K4]	distinguish the characteristics, life cycle of infectious agents.
CO4[K4]	categorize the epidemiology of pathogens including its transmission mechanism.
CO5[K5]	appraise the clinical features and prophylaxis of infections caused by microbial pathogens.

MAJOR ELECTIVE COURSE	
Course Code:BDMB5E1	**Course Title: RECOMBINANT DNA TECHNOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	outline various tools, gene synthesis, gene cloning and expression strategies in different host system.
CO2[K3]	identify the significance of recombinant DNA techniques in modern biotechnology.
CO3[K4]	compare different cloning and expression strategies of prokaryotes and eukaryotes.
CO4[K5]	interpret the ethical value in implementing gene manipulating methods for engineering plant and animals.
CO5[K6]	compile various bio techniques used for heterologous expression cloned for its suitable application.

MAJOR ELECTIVE COURSE	
Course Code:BDMB5E2	**Course Title: VIROLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	classify fundamentals of viral taxonomy and life cycle.
CO2[K3]	determine different strategies for virus isolation and cultivation.
CO3[K4]	differentiate various infection caused by virus.
CO4[K5]	mark the ethics relevant to diagnostic method used to spot the viral diseases.
CO5[K6]	predict the relevant antiviral chemotherapies according to ethical morality.

MAJOR ELECTIVE COURSE	
Course Code: BDMB5E3	**Course Title: MICROBES IN PLANT PATHOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	relate the bacterial pathogens associations with plant.
CO2[K3]	identify the specific virulence factors present in microbes for their pathogenesis.
CO3[K4]	compare compatible and incompatible interaction in plant.
CO4[K4]	classify the disease control methods used for the control of microorganisms.
CO5[K5]	assess virulence of plant pathogens present in various environmental conditions.

MAJOR ELECTIVE COURSE	
Course Code: BDMB5E4	**Course Title: GENOMICS & PROTEOMICS**
On successful completion of the course, the learners should be able to	
CO1[K2]	outline the fundamentals of genomics and proteomics.
CO2[K3]	make use of the various techniques used in functional genomics and proteomics.
CO3[K4]	inspect technology behind protein expression analysis.
CO4[K4]	analyze biological pathway involved in studying the whole genome and proteome.
CO5[K5]	assess the various strategies for drug targeting.

MAJOR COURSE	
Course Code: BDMB5L1	**Course Title: PRACTICAL V**
On successful completion of the course, the learners should be able to	
CO1[K3]	experiment the potential clinical diagnostic techniques.
CO2[K4]	distinguish the pathogen and non-pathogenic microbes in various clinical samples.
CO3[K4]	examine the antibiotic profile of pathogens.
CO4[K5]	evaluate basic tools of Recombinant DNA technology.
CO5[K6]	compile modern techniques of genetic engineering.

MAJOR COURSE	
Course Code: BDMB5L2	**Course Title:PRACTICAL VI**
On successful completion of the course, the learners should be able to	
CO1[K2]	demonstrate the method for the isolation of common pathogenic bacteria present in soil.
CO29K3]	identify the bacteria responsible for the production of siderophore and plant acids.
CO3[K4]	compare the plant growth hormones in the development of plants.
CO4[K4]	correlate the pathogenesis related protein in causing plant diseases.
CO5[K5]	evaluate of various biochemical methods to identify plant components.

Course Code: BDMB5V	**Course Title: INTERNSHIP/ON-THE-JOB TRAINING**
On successful completion of the course, the learners should be able to	
CO1[K2]	relate the class room theory with work place practice.
CO2[K3]	apply the practices / procedures observed in real time working environment
CO3[K4]	analyze the workflow and communication flow prevailing in the institution/industry
CO4[K5]	assess interests and abilities in their field of study
CO5[K6]	propose strategies, policies and guidelines for enhancing efficiency of industrial/institutional operations

MAJOR COURSE	
Course Code:BDMB61	**Course Title: INDUSTRIAL MICROBIOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	summarize the importance of microbes in various industries.
CO2[K2]	illustrate the different designs of fermenter and techniques of microbial fermentation.
CO3[K3]	make use of different strategies for mass cultivation of microbes.
CO4[K4]	categorize the industrial production of microbial product.
CO5[K5]	appraise the efficacy of product recovery for effectual commercialization.

MAJOR COURSE	
Course Code: BDMB62	**Course Title: ENVIRONMENTAL MICROBIOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	outline the organization of biosphere in soil, aquatic, aero and extreme environment condition.
CO2[K2]	illustrate the preventive measures against microbial infections transmitted through air and water.
CO3[K3]	select appropriate microbial biomass and its use in waste water treatment technology.
CO4[K4]	examine the role of microbes in bioremediation and bioleaching.
CO5[K5]	importance of resourceful microorganism to develop pollution free environment.

MAJOR ELECTIVE COURSE	
Course Code:BDMB6E1	**Course Title: APPLIED BIOLOGY &BIOSAFETY**
On successful completion of the course, the learners should be able to	
CO1[K2]	outline the role of applied biology in environment, agriculture, and medical fields.
CO2[K3]	identify the significance of suitable biotechniques implemented in applied biology.
CO3[K4]	compare different strategies adapted to assess GMOs.
CO4[K5]	mark the ethics and risks associated with employing engineered plant and animals.
CO5[K6]	compile various methods concerned with biosafety of applied biology and steps followed to maintain environment clean and sustainable.

MAJOR ELECTIVE COURSE	
Course Code: BDMB6E2	**Course Title:NANOBIOTECHNOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	summarize basic substances required for the synthesis of nano materials.
CO2[K3]	find methods used for characterization of Nanostructures.
CO3[K4]	inference of nanostructure synthesized from top town and bottom up approaches.
CO4[K5]	appraise the ethical value associated with use of nano material for various diagnostic and therapeutic purpose.
CO5[K6]	predict the techniques used to make nano fertilizer by minimum cost requirement.

MAJOR COURSE	
Course Code: BDMB6L1	**Course Title: Practical VII**
On successful completion of the course, the learners should be able to	
CO1[K2]	indicate the industrially employed microbes.
CO2[K3]	identify the stages of antibiotic, organic acid and enzyme production.
CO3[K4]	analyze the strategies used to enhance enzyme production in microbes.
CO4[K5]	assess the essential tools of applied biology.
CO5[K5]	interpret the role of microbes in maintaining environment clean.

MAJOR COURSE	
Course Code: BDMB6L2	**Course Title: PRACTICAL VIII**
On successful completion of the course, the learners should be able to	
CO1[K2]	elaborate basic techniques of environmental microbiology.
CO2[K2]	demonstrate the practical aspects of degradation using microbes.
CO3[K3]	calculate portability of water using appropriate techniques.
CO4[K4]	inspect the steps taken by professionalist for quality checking in aqua and organic companies.
CO5[K5]	mark the role of beneficial microbes in various environments.

NON-MAJOR ELECTIVE COURSE – I	
Course Code: BDMB4N	**Course Title: FUNDAMENTALS OF MICROBIOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	outline the historical finding of scientist relevant to various branches of Microbiology.
CO2[K2]	describe the beneficial role of microorganisms in different types of fermented food products of our daily life.
CO3[K4]	analyze the working mechanism of microscope from basics to advance model.
CO4[K5]	access the characteristics of food fermenting and food spoiling microbes.
CO5[K5]	interpret the wide applications of microorganisms in various industries.

NON-MAJOR ELECTIVE COURSE – II	
Course Code: BDMB5N	**Course Title: MUSHROOM TECHNOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	outline common features, types and the uses of mushroom.
CO2[K2]	illustrate various growth requirements and cultivation strategies of mushrooms.
CO3[K4]	analyze the parameters affecting growth characteristics of mushrooms.
CO4[K5]	evaluate the limitations associated with mushroom processing and production.
CO5[K5]	assess suitable methods to control pests and other microbial diseases associated with mushroom cultivation.

SELF EMPLOYMENT COURSE	
Course Code: BDSE67	**Course Title: CATERING TECH. & HOTEL MGMT.**
On successful completion of the course, the learners should be able to	
CO1[[K2]	illustrate the fundamentals of food and hygiene.
CO2[K2]	outline the foundation for kitchen layout and safety.
CO3[K3]	utilize interpersonal skills to lead/manage first level employees in a hospitality setting.
CO4[K4]	plan diverse skills for housekeeping in restaurants.
CO5[K5]	appraise various sectors of food service industry.

SELF EMPLOYMENT COURSE	
Course Code: BDSE67L	**Course Title: CATERING TECH. & HOTEL MGMT.PRACTICAL**
On successful completion of the course, the learners should be able to	
CO1[K2]	demonstrate the cooking method with several nutritious ingredients.
CO2[K3]	make use of different kinds of cuisines.
CO3[K5]	assess the quality of product and service provided.
CO4[K5]	appraise diverse environment with focus on client and customer services.
CO5[K6]	formulate skills on financial budging and stock taking.

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College with Potential for Excellence by UGC and Mentor Institution under UGC PARAMARSH]

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 and follow the ethical principles in research finding for employing microbes in welfare of society and nation.
PEO3.	acclimatize novel technologies and promote their skills to be a successful entrepreneur.

PROGRAMME SPECIFIC OUTCOMES By the Completion of M.Sc Microbiology programme, 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:MDMB11	**Course Title: BACTERIOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	summarize the important innovations, scope, morphological, nutritional requirement and taxonomical characteristics of bacteria.
CO2[K3]	identify the structural and functional characteristic of bacteria and find its varying properties using microscopic observation relevant to its applications in research.
CO3[K4]	analyze diversified taxonomical status of microbes based on phenetic, numerical and phylogenetic analysis.
CO4[K5]	assess the physical, chemical, nutritional and cultivation conditions needed for the growth of microorganisms.
CO5[K6]	compose the anatomical and specific virulence factors present in bacteria for their pathogenicity to the host cell.

CORE COURSE	
Course Code: MDMB12	**Course Title: CHEMISTRY OF BIOMOLECULES**
On successful completion of the course, the learners should be able to	
CO1[K2]	outline the concept of thermodynamics and properties of complex biomolecules.
CO2[K3]	identify the energy transfer relationship and role of biomolecules in living system.
CO3[K4]	categorize the structure and function of different biomolecules.
CO4[K5]	assess the mechanism and synthesis process involved in formation complex molecules.
CO5[K6]	compile the mechanism of enzyme reaction and role of energy metabolism.

CORE COURSE	
Course Code: MDMB13	**Course Title: ESSENTIALS OF BIOTECHNOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	outline the scope of Biotechnology in microbes, plant and animals engineering.
CO2[K3]	identify significance of gene manipulating strategies and *in vitro* techniques in multidisciplinary field of applied sciences.
CO3[K4]	discover new strategies of gene transfer and cloning techniques in microbes, plant and animals.
CO4[K5]	assess the impact of biotechnology for human welfare, agriculture and commercialization of genetically engineered product.
CO5[K6]	improve the application of different molecular techniques and apply following ethical value in biotechnological research.

CORE COURSE	
Course Code: MDMB1L1	**Course Title: PRACTICAL I**
On successful completion of the course, the learners should be able to	
CO1[K2]	demonstrate the various microbial characterization methods for identification of microorganisms.
CO2[K3]	experiment the methods of Biochemical activity of diversified microbes.
CO3[K4]	assess the properties of intra cellular metabolites in bacteria.
CO4[K5]	interpret the size of various bacteria by different bacterial measurement techniques.
CO5[K6]	integrate techniques involved in finding the effect of environmental factors on bacterial growth.

CORE COURSE	
Course Code: MDMB1L2	**Course Title: PRACTICAL II**
On successful completion of the course, the learners should be able to	
CO1[K2]	illustrate the natural and artificial ways to propagate plants.
CO2[K3]	organize the methods of plant and animal cell culture.
CO3[K4]	inspect the concepts of establishing cell cultures.
CO4[K5]	assess the molecular techniques for gene manipulation.
CO5[K6]	compile techniques involved in isolation of genetic material for molecular research.

CORE ELECTIVE COURSE	
Course Code: MDMB1E1	**Course Title: DEVELOPMENTAL BIOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	outline the sequential process of embryonic growth in animals and plants.
CO2[K3]	identify the significant gamete formation, fusion and further progress in earlier stages of development.
CO3[K4]	classify the process of cell differentiation, organ formation and morphological changes associated with plant and animal development.
CO4[K5]	assess various developmental events, reactivation during postembryonic life and physiological deterioration.
CO5[K6]	integrate the regulation of organogenesis in different group of living organisms.

CORE ELECTIVE COURSE	
Course Code: MDMB1E2	**Course Title: BIOINSTRUMENTATION**
On successful completion of the course, the learners should be able to	
CO1[K2]	demonstrate the basic biochemical and molecular biology laboratory instruments, unit of measurements and its applications.
CO2[K3]	identify the sedimentation technique used in biochemical laboratories for the characterization of complex mixture.
CO3[K4]	categorize the separation method used for analysis of protein in genetic and diagnostic studies.
CO4[K5]	evaluate the working principle and mechanism of various types of chromatography techniques.
CO5[K6]	compile the characterization technique based on spectral properties in biological field.

CORE COURSE	
Course Code: MDMB21	**Course Title: CLINICAL IMMUNOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	illustrate the fundamental mechanisms underlying immunologic disease and associate these mechanisms with strategies for therapeutic modulation of the immune system.
CO2[K3]	transfer knowledge of immunology into clinical decision-making through case studies presented.
CO3[K4]	plan and undertake research in clinical immunology in the clinic, laboratory and community.
CO4[K4]	compare the commonality among diverse organ-specific disease states, and infer the mechanisms of therapeutic effect.
CO5[K6]	predict how immunological investigations are employed to develop a clinical diagnosis.

CORE COURSE	
Course Code: MDMB22	**Course Title: INTERMEDIARY METABOLISM**
On successful completion of the course, the learners should be able to	
CO1[K2]	explain the different energy metabolism and various diffusion techniques involved in microorganisms.
CO2[K3]	identify the interruption of substrates and their metabolic passageway of various biomolecule.
CO3[K4]	classify the microorganisms based on energy metabolism involved in chemical and biological activity.
CO4[K5]	interpret the various environmental factors for growth of microorganism in diversified environment.
CO5[K6]	compose the physiological and genetic response among various types of bacterial species.

CORE COURSE	
Course Code: MDMB23	**Course Title: FERMENTATION TECHNOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	explain the main steps and process involved in production of fermentation products in industry.
CO2[K2]	illustrate various types of fermenter and operating strategies for scale up process.
CO3[K3]	choose suitable methods for recovery and commercialization of fermented goods.
CO4[K4]	analyze fermentation kinetics and processor control of fermentation practice.
CO5[K6]	develop knowledge on the implementation of computerized technique in upstream and downstream processing.

CORE COURSE	
Course Code: MDMB2L1	**Course Title: PRACTICAL III**
On successful completion of the course, the learners should be able to	
CO1[K2]	illustrate the advanced methods involved in implementing immunological techniques.
CO2[K3]	make use of the biochemical method for separation and characterization of serum protein.
CO3[K4]	examine the suitability of biocontrol agent against infectious microorganisms.
CO4[K5]	evaluate the effect of various physical and chemical factors on growth and control of microorganisms.
CO5[K6]	combine the factors in serum of patients with some infection.

CORE COURSE	
Course Code: MDMB2L2	**Course Title: PRACTICAL IV**
On successful completion of the course, the learners should be able to	
CO1[K2]	illustrate the role of microbes involved in fermentation processes.
CO2[K3]	determine the properties of metabolite produced using industrial fermentation.
CO3[K4]	inspect the production process of industrially important fermented products.
CO4[K5]	assess the factors governing production of industrial products.
CO5[K6]	improve the strategies involved in production of dairy products.

CORE COURSE	
Course Code: MDMB31	**Course Title: AQUATIC MICROBIOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	summarize the diversity of microbes in various aquatic eco system and their role in bioremediation.
CO2[K3]	choose appropriate technique for identifying microorganisms of various aquatic system.
CO3[K4]	comment on the merits and demerits of distinctive microbes in aquatic environment.
CO4[K5]	assess the biological resource in and around the aquatic surroundings.
CO5[K6]	formulate strategies of controlling infectious microbes in various water resources.

CORE COURSE	
Course Code: MDMB32	**Course Title: MICROBIAL GENETICS & MOLECULAR BIOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	outline the importance of gene concept, genetic organization, gene alteration, recombination and molecular events of microbial genetics.
CO2[K3]	determine various phenomenon of molecular biology and mechanism of genetic recombination.
CO3[K4]	analyze the significant steps involved in various genetic processes required for Cell multiplication, regulation and function.
CO4[K5]	assess molecular mechanism of genetic event involved in regulatory and Metabolic pathways.
CO5[K6]	compose different gene regulation and silencing mechanisms of living organisms.

CORE COURSE	
Course Code: MDMB33	**Course Title: AGRO-TECHNOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	elaborate the diversified interaction among microbial population, beneficial microbes in agriculture and their implementation for enhancing crop cultivation.
CO2[K3]	identify various types of interaction among microbial community, economically important medicinal plant and biofertilizers used in agriculture.
CO3[K4]	organize the strategies used for extracting natural dye and bioactive compounds for agricultural food and crop management.
CO4[K5]	importance the significance of microorganisms in agriculture and various techniques for crop improvement.
CO5[K6]	combine the various advanced approaches in agrotechnology utilizing genetically improved crop for their patent and protection rights.

CORE COURSE	
Course Code: MDMB3L1	**Course Title: PRACTICAL V**
On successful completion of the course, the learners should be able to	
CO1[K2]	demonstrate the survivability of microorganism on exposure to mutagen.
CO2[K4]	compare the effect of physical and chemical mutagen on bacterial growth.
CO3[K4]	analyze the tools used for molecular studies.
CO4[K5]	assess the advanced techniques of molecular biology.
CO5[K6]	compose the different strategies followed for horizontal gene transfer.

CORE COURSE	
Course Code: MDMB3L2	**Course Title: PRACTICAL VI**
On successful completion of the course, the learners should be able to	
CO1[K2]	illustrate various agro techniques for estimating pigments in fruits and vegetables.
CO2[K3]	identify the physiology of microbes based on their occurrence.
CO3[K4]	categorize the group of microorganism in aquatic and soil environments.
CO4[K5]	evaluate the presence of bacteria in soil and aquatic environment.
CO5[K6]	develop potential biofertilizer to improve the growth of agricultural crops.

CORE ELECTIVE COURSE	
Course Code:MDMB3E1	**Course Title: ECOLOGY & BIOREMEDIATION**
On successful completion of the course, the learners should be able to	
CO1[K2]	illustrate the evolutionary relationship of living being and it functional characteristic in earth ecosystem.
CO2[K3]	identify the basic features of individual ecological communities and needs of bioremediation.
CO3[K4]	analyze the role of microbes in de-polluting soil and water environmental system.
CO4[K5]	assess the influence of microbial biomass against contaminated compounds in eco system.
CO5[K6]	formulate effective measures to be taken against global environmental pollution.

CORE ELECTIVE COURSE	
Course Code: MDMB3E2	**Course Title: FOOD PROCESS TECHNOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	explain the microorganisms involved in spoilage of food and beverages.
CO2[K3]	find the importance of food preservation techniques used in industries.
CO3[K4]	classify the different food processing methods used for food production and preservation.
CO4[K5]	assess food quality based test for quality control followed in food industry.
CO5[K6]	predict the principle of food fermentation and preservation employed in biotech companies.

CORE COURSE	
Course Code: MDMB41	**Course Title: DIAGNOSTIC MICROBIOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	classify the basic anatomy of the humans and functions of every organ system of the body.
CO2[K3]	organize the principles and methods of proper specimen collection and transport of body secretions.
CO3[K4]	analyze the epidemiology and risk factors associated with infections.
CO4[K5]	appraise the important aspects of the diagnosis of infections and treatment strategies through case studies.
CO5[K6]	predict the risk factors, causative agents, and manifestations of disease associated with humans.

CORE COURSE	
Course Code: MDMB42	**Course Title: COMPUTATIONAL BIOLOGY**
On successful completion of the course, the learners should be able to	
CO1[K2]	classify the various computational methods, tools and algorithms employed for biological data interpretation.
CO2[K2]	explain about the various computational methods and tools used for protein and RNA structure prediction.
CO3[K3]	apply the various tools and methodologies used in phylogenetic analysis observed in biological sequence.
CO4[K5]	assess current techniques and tools employed in computational drug discovery.
CO5[K6]	construct the molecular modeling of protein in research field.

PRACTICAL COURSE	
Course Code: MDMB4L	**Course Title:PRACTICAL VII**
On successful completion of the course, the learners should be able to	
CO1[K3]	identify the pathogens with clinical diagnostic techniques.
CO2[K4]	examine fungi from clinical sample using different staining techniques.
CO3[K5]	assess nucleotide and protein sequence using online tools.
CO4[K6]	develop computational analysis for prediction of protein structure.
CO5[K6]	compose protein visualization using advanced bioinformatics tools.

CORE ELECTIVE COURSE	
Course Code:MDMB4E1	**Course Title: RESEARCH METHODOLOGY & BIOSTATISTICS**
On successful completion of the course, the learners should be able to	
CO1[K2]	summarize the scientific data, implement statistical methods and document the output using statistics tools by using MS Excel.
CO2[K3]	identify the research journals and databases search engines for publishing paper with good ranking.
CO3[K4]	categorize the concepts of modern statistical theory and their probabilistic foundation in scientific experiments.
CO4[K5]	evaluate various kinds of research, objectives of doing research, research process, redefining research problem with ethics.
CO5[K6]	compose the research design and sampling concepts in biological research methods by using statistical analysis.

CORE ELECTIVE COURSE	
Course Code: MDMB4E2	**Course Title: GENOMICS AND PROTEOMICS**
On successful completion of the course, the learners should be able to	
CO1[K2]	explain the use of functional genomics and proteomics in agricultural, medical and genetic research.
CO2[K3]	identify the techniques used in functional genomics such as microarrays, next generation sequencing technology.
CO3[K4]	examine of functional genomics and proteomics studies with high throughput sequencing studies.
CO4[K5]	choose environmental, economic and ethical aspects of this emerging technology.
CO5[K6]	formulate the computational based drug designing software in pharmacogenomics research.

CORE COURSE	
Course Code: MDMB4P	**Course Title: PROJECT AND VIVA VOCE**
On successful completion of the course, the learners should be able to	
CO1[K2]	relate the literature survey to chosen field of microbiology.
CO2[K3]	plan for various stages of research work.
CO3[K4]	examine novel technologies in various fields of Microbiology.
CO4[K5]	evaluate the role of bioinformatics tools in research.
CO5[K6]	create the competence to discuss and conclude the research findings emphasizing its benefits to the society.