Kristu Jayanti College
AUTONOMOUS Bengaluru
Reaccredited 'A' Grade by NAAC | Affiliated to Bengaluru North University

FACULTY OF SCIENCE

M.Sc. Microbiology

Programme Educational Objectives

PEO1: To impart advanced knowledge and technical skills in microbiology.

PEO2: To inculcate professional ethics for careers in microbiology and entrepreneurial ventures.

PEO3: To provide training in pure and applied scientific research.

Programme Outcome

After the successful completion of the two year M.Sc. Microbiology Programme, the student will be able to:

PO1: Demonstrate professional skills and scientific prowess to meet agricultural, medical and environmental needs.

Programme Specific Outcomes

After the successful completion of the two year M.Sc. Microbiology Programme, the student will be able to:

PSO1: Apply tools and techniques in microbiology to identify and solve issues in the fields of medicine, agriculture and environment.

PSO2: Appraise scientific concepts and research in a multidisciplinary global environment

PSO3: Demonstrate professional ethics and the potential for independent research, industrial development and entrepreneurial ventures.

I - SEMESTER

Course Type	Course Code	Course Title	Course Outcomes
DSCC	**MMB204A11**	**Bacteriology And Virology**	1. Relate the systems of classification of bacteria 2. Illustrate structure, classification and properties of viruses 3. Explain in vivo and in vitro cultivation of viruses 4. Appraise the morphological types and ultra-structure of bacteria 5. Assess the characteristics and significance of atypical prokaryotes 6. Formulate nutritional requirements, cultivation and growth of bacteria
DSCC	**MMB204A12**	**Eukaryotic Microbiology**	1. Point out the distribution, morphology and life cycle of major classes of algae. 2. Analyze the structure and reproduction of selective blue green algae. 3. Evaluate the biological and economic importance of algae 4. Categorize fungi based on their characteristics, structure and reproduction 5. Compile the nutritional requirements and economic importance of fungi.
DSCC	**MMB204A13**	**Microbial Physiology And Biochemistry**	1. Appraise the mechanism of nutrient transport, stress response and Bioenergetics 2. Assess the characteristics, specificity, mechanism of enzyme action and inhibition 3. Describe the structure, classification, properties and biosynthesis of Carbohydrates, Lipids, Nucleic acids and Proteins 4. Interpret the metabolic pathways of Carbohydrates 5. Summarize the biosynthesis of peptidoglycan and fermentation pathways
DSCC	**MMB204A14**	**Microbial And Biochemical Techniques**	1. Describe the construction, working principle and applications of Dark Field, Phase Contrast, Fluorescence, confocal and Electron Microscopes 2. Illustrate the physical and chemical methods of sterilization 3. Explain isolation, cultivation and identification of bacteria 4. Familiarize concepts on microbial growth and measurement 5. Combine the principle and applications of analytical and separation methods 6. Appraise the principle, techniques and safety measures associated with radio isotopes

DSCL	**MMB2L4A11**	**Bacteriology, Virology And Eukaryotic Microbiology Practical**	1. Execute the isolation and cultivation of bacteria, fungi and algae 2. Perform staining and biochemical tests for the identification of microorganisms 3. Demonstrate growth assessments of bacteria and fungi 4. Trace the effect of nutritional and environmental factors on growth of fungi 5. Summarize the effects of nutritional and environmental factors on the growth of microorganisms 6. Formulate algal culture media for establishment of algae in large scale.
DSCL	**MMB2L4A12**	**Microbial Physiology, Biochemistry, Microbial And Biochemical Techniques Practical**	1. Calibrate the concentration of reducing sugars, proteins and nucleic acids 2. Trace the activities of protease, amylase, malate dehydrogenase 3. Execute the isolation of lipo-lytic microbes and estimate the total lipid 4. Adopt a method to calculate the molecular weight of protein by SDS page.
SEC	**MLS402A11**	**Biostatistics**	1. Combine the basic statistical tools for analysis of data. 2. Develop correlation, regression and probability distribution to interpret data. 3. Assess the significance of data using p value, chi square and‘t’ test.

II - SEMESTER

Course Type	Course Code	Course Title	Course Outcomes
DSCC	**MMB204A21**	**Microbial Genetics**	1. Compare the structure and models of prokaryotic genome 2. Assess the structure and function of chromatin, dna methylation, karyotypes and chromosome banding pattern in eukaryotes 3. Appraise the types and molecular mechanisms of mutation 4. Illustrate the genetic recombination and gene transfer methods in prokaryotes and eukaryotes 5. Categorize the types of plasmids and vectors for gene cloning 6. Point out the lytic and lysogenic bacteriophage life cycles and their uses in microbial genetics.
DSCC	**MBT204A22**	**Molecular Biology**	1. Summarise the structure, types, properties and functions of nucleic acids 2. Appraise the events in dna replication, damage and repair 3. Compile the mechanisms of transcription and translation in prokaryotes and eukaryotes 4. Compare principles of gene regulation and silencing in virus, prokaryotes and eukaryotes 5. Infer the applications of double stranded rna, antisense rna, ribozymes in gene silencing 6. Sketch the pathways of protein targeting to intra and intercellular destinations
DSCC	**MBT204A23**	**Immunology And Immunotechnology**	1. Explain the humoral and cell mediated immune response, cells and organs of the immune system 2. Illustrate the types and properties of antigens, structure and classes of immunoglobulins and mechanisms of antigen and antibody interactions 3. Appraise the concepts of auto immunity and auto immune disorders 4. Explain the MHC complex and their role in tissue transplantation and tumor immunology 5. Categorize the different hypersensitivity reactions and their disorders 6. Compile the concepts of immune technology and vaccine production
DSCC	**MMB204A24**	**Agricultural And Environmental Microbiology**	1. Interpret the role of microorganisms in soil fertility and concepts of Nitrogen fixation. 2. Illustrate microbial interaction, types and applications of, biofertilizers and biopesticides. 3. Assess the role of plant pathogens, molecular mechanism of disease establishment and host defence. 4. Point out the principles, types of bioremediation and the applications of extremophiles.

			5. Appraise the conventional and biological methods in treatment of waste water and industrial effluents. 6. Evaluate the biotechnological methods for the management of solid wastes.
DSCL	**MMB2L4A21**	**Microbial Genetics, Immunology And Immunotechnology Practical**	1. Demonstrate the isolation of mutants by physical, chemical agents and replica plating method 2. Perform conjugation, transformation and transduction in e. Coli 3. Execute the agglutination and precipitation reactions. 4. Adopt a method for the separation and staining of lymphocytes from blood
DSCL	**MMB2L4A22**	**Molecular Biology, Agricultural And Environmental Microbiology Practical**	1. Perform isolation of DNA from plant, bacteria and animal tissue. 2. Execute gel electrophoresis for the separation and analysis of DNA 3. Trace the concentration of DNA and RNA by colorimetry 4. Demonstrate genomic and plasmid DNA isolation from bacteria 5. Execute isolation of symbiotic, non-symbiotic nitrogen fixing and phosphate solubilizing bacteria 6. Perform Biological Oxygen Demand, Chemical Oxygen Demand and Most Probable Number to check water quality
SEC	**MLS402A21**	**Bioinformatics**	1. Explain the basics of computer architecture, softwares and programming languages 2. Compile the biological databases and their applications 3. Analyze the protein structure, interactions, modelling and applications using bioinformatics tools

III - SEMESTER

Course Type	Course Code	Course Title	Course Outcomes
DSCC	**MBT204A31**	**Genetic Engineering**	1. Interpret the types, functions of restriction enzymes, and cloning vectors 2. Summarize the physical, chemical, biological methods of gene transfer and selection of recombinants 3. Describe the construction of cdna and genomic libraries 4. Assess the methods and applications of electrophoresis, blotting techniques, molecular markers and dna finger printing 5. Develop the chemical and enzymatic synthesis and sequencing of gene 6. Compile the applications of rdna technology for the development of transgenic plants , animals and gene therapy
DSCC	**MMB204A32**	**Medical Microbiology**	1. Organize the medically important microorganisms and normal flora of the human body. 2. Generalize the mechanism of pathogens in humans. 3. Summarize the etiology, symptoms diagnosis and treatment of bacterial, fungal, protozoan and viral diseases. 4. Assess the classification and mode of action of antibiotics. 5. Appraise the concepts of vaccination and prophylactic care.
DSCL	**MMB2L4A31**	**Recombinant Dna Technology And Medical Microbiology Practical**	1. Demonstrate digestion, ligation of DNA and selection of recombinants 2. Execute identification of DNA fragments through PCR, RAPD and Microarray 3. Perform isolation and identification of clinically important microbes from clinical specimens 4. Adopt a method to test the drug susceptibility by MIC and Kirby Bauer method

DSEC	**MMBA04A31**	**Food And Dairy Microbiology**	1. Illustrate the production and preservation of fermented foods. 2. Summarize the bacterial, fungal borne infections and food intoxication. 3. Assess the food quality standards, regulatory practices and policies for quality assurance. 4. Distinguish the principles and methods of food preservation. 5. Discuss the role of microorganisms in fermentation of milk products, beverages, vinegar and wine . 6. Explain the use of microbial enzymes in the dairy industry.
DSEL	**MMBAL2A31**	**Food And Dairy Microbiology Practical**	1. Demonstrate the adulteration in milk sample by alcohol, starch and formaldehyde tests. 2. Trace the quality of milk by methylene blue reduction test (mbrt). 3. Perform isolation of microorganisms from fermented foods by standard plate count (spc.) 4. Execute the amount of lactose, lactic acid and fat content in milk. 5. Formulate the acid value or acid content in butter.
SEC	**MLS4U2A31**	**Essentials In Parasitology**	1. Appraise the concepts, characteristics and classification of parasites. 2. Summarize the mode of transmission, life cycle, pathogenesis and diagnosis of endo and ecto parasites. 3. Analyze the methods of detection and diagnosis of parasites.
DSEC	**MMBB04A31**	**General Parasitology**	1. Appraise the concepts, characteristics and host parasitic relationship 2. Summarize the classification and structural features of parasites 3. Evaluate the life cycle, pathogenicity and control of protozoan and helminth diseases 4. Analyze the mode of transmission, life cycle, pathogenesis, diagnosis and prophylaxis of ecto- parasites 5. Compile the immune diagnosis, culture and molecular methods for detection of parasites
DSEL	**MMBBL2A31**	**General Parasitology Practical**	1. Perform the isolation and examination of parasites from clinical specimens. 2. Execute the identification of parasites by wet mount and staining method. 3. Demonstrate the immunological diagnosis of parasites in blood serum. 4. Adopt crp test for diagnosis of parasites.

SEC	**MLS4V2A31**	**Essentials In Food Microbiology**	1. Summarize the nutritional values, processing, preservation, assessment and fermentation of milk 2. Analyze the techniques involved in production and purification of food products 3. Assess the food quality standards, regulatory practices and policies for quality assurance.
	MLS402A31	**Research Methodology**	1. Evaluate the concept and scope of pedagogical techniques in research design 2. Summarize the experimental design, methods and significance of research 3. Interpret the outcomes of research in the form of report 4. Prepare research articles for report writing and publication

IV - SEMESTER

Course Type	Course Code	Course Title	Course Outcomes
DSCC	**MBT204A41**	**Genomics And Proteomics**	1. Illustrate the concept of genomics, transcriptomics, proteomics and metabolomics 2. Describe genome sequencing, sequencing projects, genotyping and gene prediction 3. Appraise the methods of genetic mapping and molecular breeding 4. Analyze the techniques of transcriptomics, proteomics and gene expression 5. Summarize the concept, methods and regulation in metabolomics
DSCC	**MMB204A42**	**Fermentation And Microbial Technology**	1. Plan the selection, development and preservation of industrially important microorganisms. 2. Design the features, components of fermentors and types of fermentation process. 3. Illustrate the extraction and purification of fermented end products. 4. Describe the substrates and process of solid substrate fermentation for the production of commercially important products. 5. Compile the process involved in the industrial production of commercially important microbial products. 6. Appraise the production, application of enzymes, techniques of immobilization and applications.

DSEL	**MMB2L4A41**	**Proteomics, Fermentation And Microbial Technology Practical**	1. Execute the process of fermentation and estimation of organic acids, enzyme (amylase) and alcohol. 2. Demonstrate the immobilization of cell and enzyme by gel entrapment method. 3. Perform lab scale production of wine and estimation of total and volatile acidity.
SEC	**MLS402A41**	**Intellectual Property Rights And Bioethics**	1. Identify the implications of appropriate intellectual property rights and the procedures involved in application 2. Summarize the types, specifications, applications and laws of patenting 3. Describe the ethical issues related to gm crops, human genome project, stem cell research, drug testing and use of animals in research