GEMS ARTS AND SCIENCE COLLEGE, RAMAPURAM

POST GRADUATE DEPARTMENT OF MICROBIOLOGY

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

## PROGRAMME: MSc. MICROBIOLOGY

### PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1. Gain in-depth understanding of various aspects of microbiology pertaining to medical, agricultural, environmental and industrial applications.

PSO2. Familiarized with latest and advanced research tools and techniques pertaining to biology.

PSO3. Analysis of scientific issues across the spectrum of related disciplines.

PSO4. Acquire skills specific to microbiology and allied fields for converting information to knowledge through hypothesis, design, execution and analysis.

PSO5. Design experiments to prove scientific process and to synthesize product/ services for the benefit of community.

PSO6. Ability to retrieve biological information through data mining and data handling.

PSO7. Ability to present their work through written, oral, and visual presentations, including an original research proposal.

PSO8. Enable the students to improve the quality of human lives in relation to environment with the knowledge in microbiology.

PSO9. Capacity to work as a member of team upholding the essence of collaboration, cooperation, ethics and integrity.

PSO10. Ability to upgrade knowledge independently and act upon means of improvement for lifelong learning.

COURSE OUTCOMES (COs)

## SEMESTER I

| COURSE CODE | PAPER NAME | CREDITS | COURSE OUTCOME |
|---|---|---|---|
| MBG1C01 | GENERAL BIOCHEMISTRY AND MICROBIAL METABOLISM | 4 | **CO1-**Summarise the fundamental biochemical properties of biomolecules |
| | | | **CO2 -**Describe the metabolism of Amino acids, Carbohydrates, Lipids and Nucleic acids |
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| MBG1C02 | BIOPHYSICS AND INSTRUMENTATION | 3 | **CO1-**Discuss the properties of interactions between atoms and molecules. |
| | | | **CO2-**Demonstrate the interactions of DNA-protein, RNA-protein and DNA-drug |
| | | | **CO3-**Analyse the structure of protein through Ramachandran plot and advanced techniques |
| | | | **CO4-**Compare different techniques in microscopy |
| | | | **CO5-**Differentiate the working principle, instrumentation and applications of various bio-analytical instruments. |
| MBG1C03 | ENVIRONMENTAL AND SANITATION MICROBIOLOGY | 3 | **CO1**- Discuss the basic concepts of ecological system, pollution and environment |
| | | | **CO2**- Compare different types of interaction among microbial communities and their significance |
| | | | **CO3** -Explain biogeochemical cycles and their importance in an ecosystem |
| | | | **CO4** -Elaborate the role of microbes in soil, water and air |

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| | | | **CO5**- Summarise the methods of air quantitation, air sanitation, sewage treatment and water purification. |
| | | | **CO6**- Discuss the various aspects and the application of microbes in various fields of agriculture and environmental microbiology like bioremediation, biofertilizers and waste treatment methods. |
| MBG1C04 | AGRICULTURAL MICROBIOLOGY AND PLANT PATHOLOGY | 2 | **CO1-**Describe the microbial interactions between microorganisms, plants and animals |
| | | | **CO2-**Explain the various applications of microorganisms in agriculture to improve soil fertility as bio fertilizers and bio pesticides. |
| | | | **CO3-**Contrast between bio fertilizer and chemical fertilizer. |
| | | | **CO4 -**Illustrate different plant diseases caused by different microorganisms with emphasis to pathology and epidemiology. |
| | | | **CO5 -**Discuss the defence mechanisms exerted by the plant in response to an infection |
| MBG1L01 | PRACTICAL I | 4 | **CO1 -**Apply the knowledge in the preparation of solutions and buffers according to the neediness using molar, percentage etc. |
| | | | **CO2**-Analyse the Qualitative and Quantitative aspects of different bio active components Proteins, carbohydrates, citric acids etc. |
| | | | **CO2**-Analyse the Qualitative and Quantitative aspects of different bio active components Proteins, carbohydrates, citric acids etc. |
| | | | **CO4**-Perform isolation, Quantification, purification and separation of bioactive components using chromatographic techniques. |
| | | | **CO5**-Demonstrate various experiments which |

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| | | | include basic methods of physical biochemistry, biochemical analysis and separation methods |
| MBG1L02 | PRACTICAL I | 4 | **CO1-**Isolate bacteria, fungi, actinomycetes and phages from various sources of concern |
| | | | **CO2-**Demonstrate various growth patterns, culturing methods and different quantification techniques of microorganisms from air, soil and termite gut |
| | | | **CO3-**Demonstrate the Anaerobic cultivation of bacteria |
| | | | **CO4-**Evaluate the efficacy of autoclave and bacteria proof filters |
| | | | **CO5-**Demonstration of special microorganisms with different unique applications in agriculture and environmental research |
| | | | **CO6-**Assess the quality of water by MPN, DO, BOD and COD. |
| | | | **CO7-**Compare efficacy of different bio control agents. |
| | | | **CO8-**Assessment of the synthesis of extracellular enzymes by microbes |
| | | | **CO9-**Illustrate the role of microorganisms in bioremediation |

**SEMESTER II**

| COURSE CODE | PAPER NAME | CREDITS | COURSE OUTCOME |
|---|---|---|---|
| **MBG2C05** | **PRINCIPLES OF GENETICS** | 4 | **CO1-**Recall the basic concepts of Classical genetics, History of Mandel experiments on pea plants and the laws and importance of Mendelian genetics. |
| | | | **CO2**-Explain the mechanism of sex linkage, crossing over and genetic mapping |
| | | | **CO3**-Summarize the importance and significance of Chromosomal aberrations |
| | | | **CO4-** Analyse the importance of Pedigree analysis and its usage in genetic disease analysis. |
| | | | **CO5**-Discuss the basic concepts of bacterial genetics and mode of gene transfer mechanism in bacteria. |
| | | | **CO6**-Justify and correlate the importance of the molecular events in gene expression and in gene regulation |
| **MBG2C06** | **FOOD AND DAIRY MICROBIOLOGY** | 4 | **CO1**-Classify the type of Microorganisms present in food able to cause contamination and what are the factors influence growths of microbes in foods |
| | | | **CO2**-Explain standards for assessing the quality of milk |
| | | | **CO3**-Summarize spoilage of food, factors causing food spoilage and food preservation methods |
| | | | **CO4**-Elaborate different food borne infections |
| | | | **CO5**-Explain about food hygiene and regulatory practices |
| | | | **CO6**-Discuss the importance of microorganisms in food and factors affecting their growth in foods |

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| **MBG2C07** | **INDUSTRIAL MICROBIOLOGY** | 4 | **CO1**-Describe the methods for screening, isolation, strain improvement, upstream processing and down stream processing in industrial process |
| | | | **CO2-**Apply different isolation and development methods for industrially important microorganisms |
| | | | **CO3**-Explain the mass transfer mechanism in fermentation |
| | | | **CO4**-Compare different types of fermentations |
| | | | **CO5**-Explain the effects of different components in fermentation media. |
| | | | **CO6**-Discuss various techniques used for the recovery of fermentation products |
| **MBG2C08** | **IMMUNOLOGY** | 4 | **CO1**-Describe the cells, organs, molecules, mediators, receptors associated with immune responses |
| | | | **CO2**-Illustrate the development of different immune responses in a host |
| | | | **CO3**-Classify the immunoglobulins with a detailed understanding of their diversity generation |
| | | | **CO4**-Explain the mechanisms of Hybridoma technology, antigen antibody reactions and Complement system |
| | | | **CO5**-Categorize different immune associated disease conditions like hypersensitivity, autoimmunity, graft rejection and tumor development based on mechanism. |
| **MB2L03** | **PRACTICAL III** | 4 | **CO1**-Enumerate the milk microflora and Apply the methods used in Testing the quality of milk. |
| | | | **CO2**-Demonstrate preservation of foods |
| | | | **CO3**-Enumerate microflora of food spoilage |
| | | | **CO4**-Isolation of enzyme producing microorganisms |

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| | | | **CO5**-Demonstrate the Growth curve of bacteria |
| | | | **CO6**-Demonstrate the detection of industrially important microorganisms and its metabolite production |
| | | | **CO7**-Demonstrate the production of Mushroom production |

## SEMESTER III

| COURSE CODE | PAPER NAME | CREDITS | COURSE OUTCOME |
|---|---|---|---|
| **MBG3C09** | **MEDICAL MICROBIOLOGY** | 4 | **CO1-**Describe the morphology, pathogenicity, epidemiology, laboratory diagnosis and treatment of important human bacterial pathogens. |
| | | | **CO2-**Explain the pathogenesis, laboratory diagnosis and prophylaxis of important viral pathogens |
| | | | **CO3-**Illustrate the characteristics of fungi with focus to superficial, sub cutaneous, deep and opportunistic infections |
| | | | **CO4-**Describe the general features and classification of protozoa |
| | | | **CO5-**Demonstrate the morphology, life cycle, pathogenesis and epidemiology of important protozoan diseases |
| | | | **CO6-**Describe the mechanism of action and activity spectrum of antibiotics |
| | | | **CO7-**Discuss the antifungal and antiviral drugs and determination of MIC |
| **MBG3C10** | **MOLECULAR** | 4 | **CO1**-Explain the mechanisms behind the information flow from DNA to |

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| | **BIOLOGY** | | proteins and the multiple levels at which gene expression can be regulated |
| | | | **CO2**-Compare gene expression and regulation in prokaryotes and eukaryotes |
| | | | **CO3**-Discuss the molecular mechanisms underlying mutations, DNA damage and repair |
| | | | **CO4**-Acquaint knowledge of DNA replication and other mechanisms of gene transfer mechanisms |
| | | | **CO5**-Discuss the concept of Oncogenes and tumour suppressor genes |
| **MBG3E01** | **DIAGNOSTIC MICROBIOLOGY** | 4 | **CO1-**Describe a wide range of diagnostic technologies and methodologies relevant to the fields of clinical biochemistry, haematology, histopathology, cytopathology, molecular biology and microbiology |
| | | | **CO2-**Differentiate between various Probe-Based Microbial Detection and Identification |
| | | | **CO3-**Compare various molecular diagnostic tools |
| | | | **CO4-**Explain the application of molecular tools in systematics |
| **MBG3E02** | **CELL BIOLOGY** | 4 | **CO1**-Explain the structure and functions of cell components in eukaryotic cells |
| | | | **CO2**-To distinguish the mechanism of protein sorting and transportation to various targets |
| | | | **CO3**-Describe the mechanisms of cell signaling, cell death and cancer development. |
| | | | **CO4**-Correlate the cell communication mechanism with the cell cycle and its regulation |
| | | | **CO5**-Conceptualize the theories and molecular mechanism of cancer development |
| | **MICROBIAL** | | **CO1-**Compare the classification systems with contributions of pioneers in |

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| **MBG3E03** | **TAXONOMY** | 4 | taxonomy |
| | | | **CO2-**Distinguish different criteria used in characterization and classification |
| | | | **CO3-**Analyse the Molecular techniques used in classification |
| | | | **CO4-**Discuss the Bergey's Mannual of Systematic Bacteriology with emphasis to different groups. |
| | | | **CO5-**Demonstrate the knowledge of taxonomy of microorganisms and their importance in clinical microbiology, public health and to prevent growth and spread of microbes in the environment |
| **MBG3L04** | **PRACTICAL IV** | 4 | **CO1**-Perform the acid fast staining procedure |
| | | | **CO2**-Demonstrate skills in isolation and identification of various pathogenic microorganisms |
| | | | **CO3**-Discuss the viral inoculation routes in embryonated eggs |
| | | | **CO4**-Perform immunological tests for diagnosis of antigen/antibody |
| | | | **CO5**-Determine the MIC of an antimicrobial compound |
| **MBG3L05** | **PRACTICAL V** | 4 | **CO1**-Demonstrate the stages of mitosis and meiosis |
| | | | **CO2**-Isolate, purify and estimate DNA, RNA and plasmid from bacteria |
| | | | **CO3**-Demonstrate the visualization of the isolated nucleic acid by electrophoresis |
| | | | **CO4**-Demonstrate the concept of hyperchromism |
| | | | **CO5-**Evaluate the gene transfer process in bacteria by performing conjugation and transformation |
| | | | **CO6**-Assess the gene transfer by induction of beta gal gene in *E coli* Demonstrate cloning and restriction digestion |

**SEMESTER IV**

| COURSE CODE | PAPER NAME | CREDITS | COURSE OUTCOME |
|---|---|---|---|
| **MBG4C11** | **BIOSTATISTICS AND BIOINFORMATICS** | 4 | **CO1**-Discuss the principles and practices of statistical methods in biological research. |
| | | | **CO2**-Explain various biological data bases for sequence retrieval, analysis, sequence alignments, phylogeny and other applications |
| | | | **CO3**-Discuss the method of molecular docking and their application |
| | | | **CO4**-Discuss the concept behind drug designing with the application of bioinformatics tools |
| **MBG4E04** | **MICROBIAL BIOTECHNOLOGY** | 4 | **CO1**-Identify the issues related to plant nutrition, quality improvement, environment adaptation, transgenic crops and their use in agriculture |
| | | | **CO2**-Discuss the environmental impact of genetic engineering related to GM food crops and other agro, diary based products |
| | | | **CO3**-Explain the importance of microbes in oil recovery and degradation, leaching, bio-mining and also production of biopolymers, bio-surfactants, antibiotics enzymes etc |
| | | | **CO4**-Describe about genetic engineering for recombinant protein expression and production from various cell systems which has advanced knowledge about factorial experimental set up. |
| **MBG4E05** | **GENETIC ENGINEERING** | 4 | **CO1**-Discuss the fundamental molecular tools and their applications in DNA modification, manipulation and cloning |
| | | | **CO2**-Compare genomic and cDNA Library |
| | | | **CO3**-Describe advanced molecular techniques in genetic engineering-PCR Methods, sequencing methods, RFLP, RAPD etc |
| | | | **CO4**-Interpret the importance of molecular |

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| | | | marker genes in cloning |
| | | | **CO5**-Explain the techniques for DNA introduction to the vectors and host cells |
| **MBG4E06** | **BIOSAFETY, BIOETHICS & IPR** | 4 | **CO1**-Discuss the significance of biosafety and bioethics related regulations |
| | | | **CO2**-Appreciate the importance of Intellectual property rights and explain various types of IPR |
| | | | **CO3**-Recognize importance of biosafety practices and guidelines in research |
| | | | **CO4**-Comprehend benefits of GM technology and related issues |
| | | | **CO5**-Recognize importance of protection of new knowledge and innovations and its role in business |
| **MBG4L06** | **PRACTICAL VI** | 4 | **CO1**-Demonstrate proficiency in bioinformatics methods including accessing the major public sequence databases, use of the different computational tools to find sequences, analysis of protein and nucleic acid sequences by various software packages |
| | | | **CO2**- Retrieve data from Biological Databases |
| | | | **CO3**-Explain the features of National Centre for Biotechnology Information (NCBI) |
| | | | **CO4**-Preform sequence comparison using various alignment tools |
| | | | **CO5**-Create protein structures with modelling tools. |
| | | | **CO6**-Prediction of Gene structure, gene function and ORF position. |