Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2019-2020 Onwards)

DEPARTMENT OF MICROBIOLOGY

B. Sc – Microbiology

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	Our program will produce graduates to impart skill-oriented education
PEO2	To provide quality education with innovative technology to gain technical expertise
PEO3	To enrich the ambitions of our students to steer with constructive collaboration towards excellence.

PROGRAMME OUTCOMES (POs)

POs	Programme Outcome On completion of B. Sc Microbiology Programme, the students will be able to,
PO1	Enable students to acquire expertise in the use and application of various methods used in microbiology.
PO2	Provide learning opportunity to be reflective about their role as are researcher.
PO3	Handle and independently work on lab protocols involving molecular techniques.
PO4	Awareness of ethical issues in Microbiology research and career options.
PO5	Production of substantial original research of significance and quality sufficient for publications.

COURSE OUTCOMES (COs)

Course Title: GENERAL MICROBIOLOGY Course Code: 19UMB1CC1		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recite the Development of Microbiology	**K1**
CO2	Explain the Size and Shape of Microorganisms using Microscope	**K2**
CO3	Illustrate the knowledge about Bacteria and Viruses	**K2**
CO4	Revise the systematic classification of bacteria	**K3**
CO5	Apply various technology for microbial cultivation	**K3**

Course Title: GENERAL MICROBIOLOGY & MICROBIAL PHYSIOLOGY-PRACTICALS Course Code: 19UMB1CC1P		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recall the safety practice in microbiological laboratory	**K1**
CO2	Explain the ubiquitous nature of microorganisms	**K2**
CO3	Understand the isolation and identification of Bacteria,Actinobacteria, Fungi and Cyanobacteria	**K2**
CO4	Prepare various culture media, cleaning of glasswares and sterilization of media	**K3**
CO5	Compute various pure culture techniques and biochemicaltest for identification of bacteria	**K3**

Course Title: FUNDAMENTALS OF BIOCHEMISTRY -I Course Code: 19UMB1AC1		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recite the views of carbohydrates and their classification	**K1**
CO2	Explain the structure of protein	**K2**
CO3	Illustrate an idea about structure and function of nucleic acids	**K2**
CO4	Relate the structure and properties of lipids	**K3**
CO5	Compute view of vitamins and their deficiency diseases	**K3**

CRITERION I **POs and COs**

COURSE TITLE: FUNDAMENTALS OF BIOCHEMISTRY I & II -PRACTICALS **COURSE CODE: 19UMB1AC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Identify the carbohydrate, amino acid, protein, lipid and nucleicacid both quantitatively and quantitatively.	**K1**
CO2	Interpret the amount of ascorbic acid present in the biologicalsample.	**K2**

COURSE TITLE: MICROBIAL PHYSIOLOGY **COURSE CODE: 19UMB2CC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	State the Nutritional requirements of microorganisms	**K1**
CO2	Explain the enzyme mechanisms	**K2**
CO3	Describe the Carbohydrate metabolism	**K2**
CO4	Illustrate the Protein and Amino acid Metabolism	**K2**
CO5	Compute the view of Aerobic and Anaerobic Respiration	**K3**

COURSE TITLE: FUNDAMENTALS OF BIOCHEMISTRY-II **COURSE CODE: 19UMB2AC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recall basic hematology	**K1**
CO2	Identify the deficiency diseases associated withendocrine hormones	**K1**
CO3	Explain the structure and functions of hormones	**K2**
CO4	Restate the basic ideas about secondary metabolites	**K2**
CO5	Apply the use of plant hormones and their biological role	**K3**

CRITERION I **POs and COs**

COURSE TITLE: ENVIRORMENTAL STUDIES **COURSE CODE: 19UGES**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Outline the nature and scope of environmental studies	**K2**
CO2	Illustrate the various types of natural resourcesand its importance.	**K2**
CO3	Classification of various types of ecosystem with its structure and function.	**K2**
CO4	Develop an understanding of various types of pollution and biodiversity.	**K3**
CO5	List out the various types of social issuesrelated with environment.	**K4**

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2020-2021 Onwards)

DEPARTMENT OF MICROBIOLOGY

B. Sc – Microbiology

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	Our program will produce graduates to impart skill-oriented education
PEO2	To provide quality education with innovative technology to gain technical expertise
PEO3	To enrich the ambitions of our students to steer with constructive collaboration towards excel.

PROGRAMME OUTCOMES (POs)

POs	Programme Outcome On completion of B. Sc Microbiology Programme, the students will be able to,
PO1	Enable students to acquire expertise in the use and application of various methods used in microbiology
PO2	Provide learning opportunity to be reflective about their role as are researcher
PO3	Handle and independently work on lab protocols involving molecular techniques
PO4	Awareness of ethical issues in Microbiology research and career options.
PO5	Production of substantial original research of significance and quality sufficient for publications.

COURSE OUTCOMES (COs)

Course Title: GENERAL MICROBIOLOGY Course Code: 19UMB1CC1		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recite the Development of Microbiology	**K1**
CO2	Explain the Size and Shape of Microorganisms using Microscope	**K2**
CO3	Illustrate the knowledge about Bacteria and Viruses	**K2**
CO4	Revise the systematic classification of bacteria	**K3**
CO5	Apply various technology for microbial cultivation	**K3**

Course Title: GENERAL MICROBIOLOGY &MICROBIAL PHYSIOLOGY– PRACTICALS Course Code: 19UMB1CC1P		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recall the safety practice in microbiological laboratory	**K1**
CO2	Explain the ubiquitous nature of microorganisms	**K2**
CO3	Understand the isolation and identification of Bacteria,Actinobacteria, Fungi and Cyanobacteria	**K2**
CO4	Prepare various culture media, cleaning ofglasswares and sterilization of media	**K3**
CO5	Compute various pure culture techniques and biochemicaltest for identification of bacteria	**K3**

Course Title: FUNDAMENTALS OF BIOCHEMISTRY -I Course Code: 19UMB1AC1		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recite the views of carbohydrates and their classification	**K1**
CO2	Explain the structure of protein	**K2**
CO3	Illustrate an idea about structure and function of nucleic acids	**K2**
CO4	Relate the structure and properties of lipids	**K3**
CO5	Compute view of vitamins and their deficiency diseases	**K3**

CRITERION I **POs and COs**

COURSE TITLE: FUNDAMENTALS OF BIOCHEMISTRY I & II -PRACTICALS **COURSE CODE: 19UMB1AC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Identify the carbohydrate, amino acid, protein, lipid and nucleicacid both quantitatively and quantitatively	**K1**
CO2	Interpret the amount of ascorbic acid present in the biologicalsample.	**K2**

COURSE TITLE: MICROBIAL PHYSIOLOGY **COURSE CODE: 19UMB2CC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	State the Nutritional requirements of microorganisms	**K1**
CO2	Explain the enzyme mechanisms	**K2**
CO3	Describe the Carbohydrate metabolism	**K2**
CO4	Illustrate the Protein and Amino acid Metabolism	**K2**
CO5	Compute the view of Aerobic and Anaerobic Respiration	**K3**

COURSE TITLE: FUNDAMENTALS OF BIOCHEMISTRY-II **COURSE CODE: 19UMB2AC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recall basic haematology	**K1**
CO2	Identify the deficiency diseases associated withendocrine hormones	**K1**
CO3	Explain the structure and functions of hormones	**K2**
CO4	Restate the basic ideas about secondary metabolites	**K2**
CO5	Apply the use of plant hormones and their biological role	**K3**

CRITERION I **POs and COs**

COURSE TITLE: ENVIRORMENTAL STUDIES **COURSE CODE: 19UGES**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Outline the nature and scope of environmental studies	**K2**
CO2	Illustrate the various types of natural resourcesand its importance.	**K2**
CO3	Classification of various types of ecosystemwith its structure and function.	**K2**
CO4	Develop an understanding of various types of pollution and biodiversity.	**K3**
CO5	List out the various types of social issuesrelated with environment.	**K4**

COURSE TITLE: INTRODUCTORY VIROLOGY **COURSE CODE: 19UMB3CC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basic knowledge of Viruses	**K1**
CO2	Select the suitable Purification and Characterization methodsof Viruses	**K1**
CO3	Compare and Contrast Bacteriophages Life cycle	**K2**
CO4	Illustrate impacts of the Plant Viral diseases	**K2**
CO5	Organised views of Animal Viruses	**K3**

COURSE TITLE: INTRODUCTORY VIROLOGY AND IMMUNOLOGY PRACTICALS **COURSE CODE: 19UMB3CC2P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Identify and isolate bacteriophages from sewage.	K1
CO2	Illustrate of various immune haematological techniques.	K2
CO3	Describe the virus cultivation methods.	K2
CO4	Apply knowledge about selected bacterial plant and animal viruses.	K3
CO5	Organized view on bacterial, plant and animal viruses	K3

CRITERION I **POs and COs**

COURSE TITLE: BIOSTATISTICS **COURSE CODE: 19UMB3AC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the basic concepts of biostatistics, functions andlimitations	**K3**
CO2	Classify the data and sampling deign	**K3**
CO3	Compute the measures of central tendency and measuresof dispersion	**K3**
CO4	Apply the concepts of skewness, moments, kurtosis,correlation and regression to solve the problems.	**K4**
CO5	Examine the various testing of hypothesis	**K4**

COURSE TITLE: BIOSTATISTICS AND BIOINFORMATICS PRACTICALS **COURSE CODE: 19UMB3AC2P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Identify and collect various data for representation using biological materials.	**K1**
CO2	Illustrate t' test, 'chi' square, standard error andDeviation using SPSS programme.	**K2**
CO3	Compared views on Nucleic acid sequence databanks	**K3**
CO4	Compute multiple sequence alignment.	**K3**
CO5	Construct nucleic acid and protein structure databases.	**K3**

COURSE TITLE: HERBAL MEDICINE **COURSE CODE: 19UMB3NME1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define ethnomedicine	**K1**
CO2	Recite the knowledge about medicinally important plants.	**K1**
CO3	Describe about tribal medicine and their uses in diseases.	**K2**
CO4	Apply the traditional knowledge of medicinal plants in Tamilnadu	**K3**
CO5	Associate of plants in day-to-day life.	**K4**

CRITERION I **POs and COs**

COURSE TITLE: IMMUNOLOGY **COURSE CODE: 19UMB4CC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the history and types of immunity.	**K4**
CO2	Demonstrate the various antigen-antibody techniques.	**K4**
CO3	Differentiate the structure of MHC, Cytokines and lymphokines.	**K6**
CO4	Explain Immunotechnology and its applications.	**K6**
CO5	Explain the knowledge about hypersensitivity reactions	**K6**

COURSE TITLE: COMPUTER APPLICATION IN BIOLOGY **COURSE CODE: 19UMB4AC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basics of computer	**K1**
CO2	Recite the knowledge about internet	**K1**
CO3	Critique knowledge about bioinformatics	**K4**
CO4	Generalize the structure and classification of protein visualization tools	**K6**
CO5	Expand about the role of computers in biology	**K6**

COURSE TITLE: PHARMACOGNOSY **COURSE CODE: 19UMB4NME2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Outline study of traditional Indian medicine	**K1**
CO2	Explain the needs of crude drugs	**K2**
CO3	Demonstrate the crude and commercial drugs	**K4**
CO4	Compile view of Organoleptic study	**K3**
CO5	Relate the analytical Pharmacognosy of available medicinal plants	**K3**

COURSE TITLE: MUSHROOM TECHNOLOGY COURSE CODE: 19UMB4SBE1A		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Differentiate edible and Poisonous mushrooms	**K5**
CO2	Examine cultivation system of mushroom	**K4**
CO3	Create an nutrient profile of mushroom	**K6**
CO4	Formulation of mushroom food preparation	**K6**
CO5	Determine health benefits of mushroom	**K4**

COURSE TITLE: CLINICAL PARASITOLOGY COURSE CODE: 19UMB4SBE1B		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Generalize diagnostic techniques in parasitology	**K6**
CO2	Examine the clinical significance of *Entamoeba histolytica*	**K4**
CO3	Elaborate the pathogenicity of *Leishmania donovani*	**K6**
CO4	Discuss about the *Plasmodium spp.*	**K6**
CO5	Determine *Taenia solium*	**K4**

Signature Not Verified
Digitally Signed
Signed by: Sujatha.V
Designation: Principal
Reason: NAAC
Location: Tiruchirappalli, Tamil Nadu, India
Date: 30-Sep-2024 10:43:49

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2021-2022 Onwards)

DEPARTMENT OF MICROBIOLOGY

B. Sc – Microbiology

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	Our program will produce graduates to impart skill-oriented education
PEO2	To provide quality education with innovative technology to gain technical expertise
PEO3	To enrich the ambitions of our students to steer with constructive collaboration towards excel.

PROGRAMME OUTCOMES (POs)

POs	Programme Outcome On completion of B. Sc Microbiology Programme, the students will be able to,
PO1	Enable students to acquire expertise in the use and application of various methods used in microbiology
PO2	Provide learning opportunity to be reflective about their role as are researcher
PO3	Handle and independently work on lab protocols involving molecular techniques
PO4	Awareness of ethical issues in Microbiology research and career options.
PO5	Production of substantial original research of significance and quality sufficient for publications.

COURSE OUTCOMES (COs)

Course Title: GENERAL MICROBIOLOGY Course Code: 19UMB1CC1		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recite the Development of Microbiology	**K1**
CO2	Explain the Size and Shape of Microorganisms using Microscope	**K2**
CO3	Illustrate the knowledge about Bacteria and Viruses	**K2**
CO4	Revise the systematic classification of bacteria	**K3**
CO5	Apply various technology for microbial cultivation	**K3**

Course Title: GENERAL MICROBIOLOGY &MICROBIAL PHYSIOLOGY– PRACTICALS Course Code: 19UMB1CC1P		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recall the safety practice in microbiological laboratory	**K1**
CO2	Explain the ubiquitous nature of microorganisms	**K2**
CO3	Understand the isolation and identification of Bacteria,Actinobacteria, Fungi and Cyanobacteria	**K2**
CO4	Prepare various culture media, cleaning of glasswares and sterilization of media	**K3**
CO5	Compute various pure culture techniques and biochemicaltest for identification of bacteria	**K3**

Course Title: FUNDAMENTALS OF BIOCHEMISTRY -I Course Code: 19UMB1AC1		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recite the views of carbohydrates and their classification	**K1**
CO2	Explain the structure of protein	**K2**
CO3	Illustrate an idea about structure and function of nucleic acids	**K2**
CO4	Relate the structure and properties of lipids	**K3**
CO5	Compute view of vitamins and their deficiency diseases	**K3**

CRITERION I **POs and COs**

COURSE TITLE: FUNDAMENTALS OF BIOCHEMISTRY I & II -PRACTICALS **COURSE CODE: 19UMB1AC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Identify the carbohydrate, amino acid, protein, lipid and nucleicacid both quantitatively and quantitatively	**K1**
CO2	Interpret the amount of ascorbic acid present in the biologicalsample.	**K2**

COURSE TITLE: MICROBIAL PHYSIOLOGY **COURSE CODE: 19UMB2CC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	State the Nutritional requirements of microorganisms	**K1**
CO2	Explain the enzyme mechanisms	**K2**
CO3	Describe the Carbohydrate metabolism	**K2**
CO4	Illustrate the Protein and Amino acid Metabolism	**K2**
CO5	Compute the view of Aerobic and Anaerobic Respiration	**K3**

COURSE TITLE: FUNDAMENTALS OF BIOCHEMISTRY-II **COURSE CODE: 19UMB2AC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recall basic haematology	**K1**
CO2	Identify the deficiency diseases associated withendocrine hormones	**K1**
CO3	Explain the structure and functions of hormones	**K2**
CO4	Restate the basic ideas about secondary metabolites	**K2**
CO5	Apply the use of plant hormones and their biological role	**K3**

CRITERION I **POs and COs**

COURSE TITLE: ENVIRORMENTAL STUDIES **COURSE CODE: 19UGES**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Outline the nature and scope of environmental studies	**K2**
CO2	Illustrate the various types of natural resourcesand its importance.	**K2**
CO3	Classification of various types of ecosystemwith its structure and function.	**K2**
CO4	Develop an understanding of various types of pollution and biodiversity.	**K3**
CO5	List out the various types of social issuesrelated with environment.	**K4**

COURSE TITLE: INTRODUCTORY VIROLOGY **COURSE CODE: 19UMB3CC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basic knowledge of Viruses	**K1**
CO2	Select the suitable Purification and Characterization methodsof Viruses	**K1**
CO3	Compare and Contrast Bacteriophages Life cycle	**K2**
CO4	Illustrate impacts of the Plant Viral diseases	**K2**
CO5	Organised views of Animal Viruses	**K3**

COURSE TITLE: Introductory Virology and Immunology Practicals **COURSE CODE: 19UMB3CC2P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Identify and isolate bacteriophages from sewage.	**K1**
CO2	Illustrate of various immune haematological techniques.	**K2**
CO3	Describe the virus cultivation methods.	**K2**
CO4	Apply knowledge about selected bacterial plant and animal viruses.	**K3**
CO5	Organized view on bacterial, plant and animal viruses	**K3**

CRITERION I **POs and COs**

COURSE TITLE: BIOSTATISTICS **COURSE CODE: 19UMB3AC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the basic concepts of biostatistics, functions andlimitations	**K3**
CO2	Classify the data and sampling deign	**K3**
CO3	Compute the measures of central tendency and measuresof dispersion	**K3**
CO4	Apply the concepts of skewness, moments, kurtosis,correlation and regression to solve the problems.	**K4**
CO5	Examine the various testing of hypothesis	**K4**

COURSE TITLE: BIOSTATISTICS AND BIOINFORMATICS PRACTICALS **COURSE CODE: 19UMB3AC2P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	**Identify and collect various data for representation using biological materials.**	K1
CO2	Illustrate t' test, 'chi' square, standard error andDeviation using SPSS programme.	K2
CO3	Compared views on Nucleic acid sequence databanks	K3
CO4	Compute multiple sequence alignment.	K3
CO5	Construct nucleic acid and protein structure databases.	K3

COURSE TITLE: HERBAL MEDICINE **COURSE CODE: 19UMB3NME1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define ethnomedicine	K1
CO2	Recite the knowledge about medicinally important plants.	K1
CO3	Describe about tribal medicine and their uses in diseases.	K2
CO4	Apply the traditional knowledge of medicinal plants in Tamilnadu	K3
CO5	Associate of plants in day-to-day life.	K4

CRITERION I **POs and COs**

COURSE TITLE: IMMUNOLOGY **COURSE CODE: 19UMB4CC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the history and types of immunity.	K4
CO2	Demonstrate the various antigen-antibody techniques.	K4
CO3	Differentiate the structure of MHC, Cytokines and lymphokines.	K6
CO4	Explain Immunotechnology and its applications.	K6
CO5	Explain the knowledge about hypersensitivity reactions	K6

COURSE TITLE: COMPUTER APPLICATION IN BIOLOGY **COURSE CODE: 19UMB4AC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basics of computer	K1
CO2	Recite the knowledge about internet	K1
CO3	Critique knowledge about bioinformatics	K4
CO4	Generalize the structure and classification of protein visualization tools	K6
CO5	Expand about the role of computers in biology	K6

COURSE TITLE: PHARMACOGNOSY **COURSE CODE: 19UMB4NME2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Outline study of traditional Indian medicine	K1
CO2	Explain the needs of crude drugs	K2
CO3	Demonstrate the crude and commercial drugs	K4
CO4	Compile view of Organoleptic study	K3
CO5	Relate the analytical Pharmacognosy of available medicinal plants	K3

CRITERION I **POs and COs**

COURSE TITLE: MUSHROOM TECHNOLOGY **COURSE CODE: 19UMB4SBE1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Differentiate edible and Poisonous mushrooms	K5
CO2	Examine cultivation system of mushroom	K4
CO3	Create an nutrient profile of mushroom	K6
CO4	Formulation of mushroom food preparation	K6
CO5	Determine health benefits of mushroom	K4

COURSE TITLE: CLINICAL PARASITOLOGY **COURSE CODE: 19UMB4SBE1B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Generalize diagnostic techniques in parasitology	K6
CO2	Examine the clinical significance of *Entamoeba histolytica*	K4
CO3	Elaborate the pathogenicity of *Leishmania donovani*	K6
CO4	Discuss about the *Plasmodium spp.*	K6
CO5	Determine *Taenia solium*	K4

COURSE TITLE: MEDICAL MICROBIOLOGY **COURSE CODE: 19UMB5CC5**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Describe and Classify the various pathogens and its Characterization.	K3
CO2	Diagnose the various bacterial pathogens	K4
CO3	Analyze various human viral diseases	K4
CO4	Evaluate and compare the various fungal infections and protozoan diseases	K5
CO5	Identification of pathogens from sample	K6

CRITERION I **POs and COs**

COURSE TITLE: AGRICULTURAL MICROBIOLOGY **COURSE CODE: 19UMB5CC6**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basic view of soil Microorganisms	K1
CO2	Explain the Microbial association in soil & organic forming	K2
CO3	Understand the production of Biofertilizer	K4
CO4	Discuss about Biogeochemical cycles	K6
CO5	Discuss about Plant diseases & Control measures	K6

COURSE TITLE: MOLECULAR BIOLOGY **COURSE CODE: 19UMB5CC7**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	State the Basic concept of Prokaryotic Genes	K1
CO2	Define the Prokaryotic DNA Replication	K1
CO3	Explain the DNA & RNA Transcription in Prokaryotes	K2
CO4	Apply the view of Gene Transfer Mechanisms	K3
CO5	Prepare the Mutation and DNA Repair Mechanisms	K3

COURSE TITLE: MEDICAL MICROBIOLOGY, AGRICULTURAL MICROBIOLOGY, MOLECULAR BIOLOGY - PRACTICALS **COURSE CODE: 19UMB5CC3P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Illustrate the isolation procedures	K2
CO2	Explain the symptoms of diseases	K2
CO3	Sketch out the water borne microbes	K3
CO4	Demonstration of auxotrophic mutants	K3
CO5	Analyze agarose gel electrophoresis	K4

CRITERION I **POs and COs**

COURSE TITLE: FUNDAMENTALS OF BOTANY AND ZOOLOGY **COURSE CODE: 19UMB5MBE1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	State the Basic knowledge of Plant Nomenclature	K1
CO2	Describe the Salient features and Economic importance of Monocot and Dicot Plants	K2
CO3	Illustrate the views of Plant Physiology and Reproduction	K2
CO4	Prepare Animal Kingdom and Reproduction	K3
CO5	Prepare the Process of Animal Cell reproduction	K3

COURSE TITLE: ORGANIC FARMING **COURSE CODE: 19UMB5MBE1B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine the origin and importance of organic farming	K4
CO2	Explain the scope of organic farming	K5
CO3	Evaluate the methodology practiced in organic farming	K5
CO4	Generalize the management strategies in crop protection	K6
CO5	Compile the strategies for the commercialization of organic products	K6

COURSE TITLE: BIOFERTILIZER TECHNOLOGY PRACTICAL **COURSE CODE: 19UMB5SBE2AP**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain Biofertilizers and Production technology	K2
CO2	Illustrate Symbiotic Biofertilizers and study the mass cultivation methods	K2
CO3	Analyze Non- Symbiotic Biofertilizers and study the cultivation methods	K4
CO4	Create Knowledge about Phosphate solubilization and study the cultivation methods	K6
CO5	Expand view of Mycorrhizae and Bioinsecticides and study the cultivation methods	K6

COURSE TITLE: SOLID WASTE MANAGEMENT PRACTICAL COURSE CODE: 19UMB5SBE2BP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the Sample collection methods	K2
CO2	Understanding of the Physical characteristics of municipal solid wastes	K4
CO3	Determine the Chemical compounds of solid waste	K4
CO4	Discuss about the Processing techniques of solid waste	K6
CO5	Elaborate Mushroom Cultivation methods by using organic Solid wastes	K6

COURSE TITLE: MEDICAL LABORATORY TECHNOLOGY PRACTICAL COURSE CODE: 19UMB5SBE3AP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the safety practice, anatomy and instrumentation in microbiological laboratory	K2
CO2	Describe the cleaning of glasswares and sterilization of media	K2
CO3	Analyses and estimation of clinical specimen	K4
CO4	Explain blood grouping and Rh typing	K5
CO5	Summarize the serological tests	K6

COURSE TITLE: VERMITECHNOLOGY PRACTICAL COURSE CODE: 19UMB5SBE3BP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain Vermitechnology and Production technology	K2
CO2	Illustrate methods of composting in a limited space and describe the decomposing process	K2
CO3	Analyze and study the biodiversity of local earthworms	K4
CO4	Create and maintain the environment pollution free	K6
CO5	Expand view of using worms to convert decomposing food waste into nutrient-rich fertilizer	K6

CRITERION I **POs and COs**

COURSE TITLE: INDUSTRIAL MICROBIOLOGY **COURSE CODE: 19UMB6CC8**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	List the History and Concept of Strain development	K1
CO2	State the Fermentor and Fermentation media	K2
CO3	Explain the Production and Purification Industrial Important Microbial Products	K2
CO4	Describe the Production of Industrially valuable products.	K2
CO5	Prepare the mass cultivation protocol for Pharmaceutical Products.	K3

COURSE TITLE: FOOD MICROBIOLOGY **COURSE CODE: 19UMB6CC9**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	List the types of nutrition	K1
CO2	State the sources of contamination in food	K2
CO3	Explain the spoilage and preservation of food products	K2
CO4	Describe food borne diseases	K2
CO5	Prepare the physical and chemical methods of food preservation	K3

COURSE TITLE: INDUSTRIAL & FOOD MICROBIOLOGY – PRACTICALS **COURSE CODE: 19UMB6CC4P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Illustrate the immobilization of Yeast cell	K2
CO2	Describe about the Fermentation	K2
CO3	Organized view of industrially important products from microbes	K3
CO4	Critique knowledge about production of fermented foods	K4
CO5	Explain about the isolation of microbes from foods	K5

COURSE TITLE: MICROBIAL BIOTECHNOLOGY COURSE CODE: 19UMB6MBE2A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the primary and secondary screening of microbes.	K3
CO2	Determine the applications of microbes	K4
CO3	Critique knowledge about industrial production	K4
CO4	Outline views of bio control agents	K5
CO5	Expand about Process of Bioremediation	K6

COURSE TITLE: FOOD ADULTERATION COURSE CODE: 19UMB6MBE2B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basics of Food adulteration	K1
CO2	Recite the knowledge about Food Safety and Standards	K1
CO3	Critique knowledge about Standardization of Foods	K4
CO4	Generalize the basic idea of Food additives	K6
CO5	Expand the role of Quality control	K6

COURSE TITLE: RECOMBINANT DNA TECHNOLOGY COURSE CODE: 19UMB6MBE3A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the role of enzymes in rDNA technology	K2
CO2	Sketch the basic techniques of vectors and its biology	K3
CO3	Illustrate the gene cloning strategies in recombinant DNA	K4
CO4	Explain the importance of rDNA techniques	K5
CO5	Summarize the applications of recombinant technology	K6

CRITERION I **POs and COs**

COURSE TITLE: BIOLOGICAL TECHNIQUES **COURSE CODE: 19UMB6MBE3B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recall microscopic techniques.	K1
CO2	Apply the spectroscopic, Spectrophotometric methods & analytical techniques.	K3
CO3	Critique knowledge about chromatographic techniques.	K5
CO4	Revise about electrophoresis & its applications.	K6
CO5	Combine view of molecular techniques.	K6

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2022-2023 Onwards)

DEPARTMENT OF MICROBIOLOGY

B. Sc – Microbiology

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	**LEARNING ENVIRONMENT:** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	**ACADEMIC EXCELLENCE:** To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	**EMPLOYABILITY:** To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY:** To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	**GREEN SUSTAINABILITY:** To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

PROGRAMME OUTCOMES (POs)

POs	Programme Outcome On completion of B. Sc Microbiology Programme, the students will be able to,
PO1	Academic Excellence and Competence: Elicit firm fundamental knowledge in Theory as well as practical for coherent understanding of academic field to pursue multi and interdisciplinary science careers in future.
PO2	Holistic and Social approach: Create novel ideas related to the scientific research concepts through advanced technology and sensitivity towards sustainable Environmental practices as well as social issues.
PO3	Professional ethics and Team Work: Explore professional responsibility through projects, internships, field trip/industrial visits and mentorship Programmes to transmit communication skills.
PO4	Critical and Scientific thinking: Equip training skills in Internships, Research Projects to do higher studies in multidisciplinary path with higher level of specialization to become professionals of high-quality standards.
PO5	Social Responsibility with ethical values: Ensure ethical, social and holistic values in the minds of learners and attain ender parity for building a healthy nation.

COURSE OUTCOMES (COs)

Course Title: GENERAL MICROBIOLOGY

Course Code: 22UMB1CC1

CO Number	CO Statement On the successful completion of the course, students will be able to,	Knowledge Level
CO1	Remember and understand the Development of Microbiology	K1, K2
CO2	Analyze the Size and Shape of Microorganisms using Microscope	K3
CO3	Evaluate the knowledge about Bacteria and Viruses	K4
CO4	Compare the various Preservation Methods for preserving Microbes.	K5
CO5	Create the various applications of Extremophiles	K6

CRITERION I **POs and COs**

Course Title: GENERAL MICROBIOLOGY (P) **Course Code: 22UMB1CC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recall the safety practice in microbiological laboratory	**K1**
CO2	Demonstrate the accuracy of sterilization	**K2**
CO3	Develop skills to observe microbes using microscopes	**K3**
CO4	Competently prepare and cultivate bacteria, fungi and cyanobacteria using media	**K3**
CO5	Explain various pure culture techniques	**K4**

Course Title: FUNDAMENTALS OF BIOCHEMISTRY **Course Code: 22UMB1AC1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Remember and understand the concept of macromolecules	**K1, K2**
CO2	Illustrate an idea about structure and function macromolecules	**K2, K3**
CO3	Categorize the sources of macromolecules	**K4**
CO4	Classify and relate properties o macromolecules	**K3, K4**
CO5	Recommend the daily allowances of vitamins and its significance	**K5**

Course Title: FUNDAMENTALS OF BIOCHEMISTRY (P) **Course Code: 22UMB1AC2P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Identify the carbohydrates, amino acids, proteins present in the given sample	**K1**
CO2	Interpret the amount of glucose present in the given sample by Anthrone method.	**K2**
CO3	Calculate the amount of amino acid present in the given sample by Ninhydrin method	**K2**
CO4	Analyse the amount of protein and cholesterol present in the given sample	**K4**
CO5	Evaluate the amount of DNA present in the given sample by Diphenylamine (DPA) method	**K3**

CRITERION I **POs and COs**

Course Title: MICROBIAL PHYSIOLOGY **Course Code: 22UMB2CC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	State the Nutritional requirements of microorganisms and its uptake	**K1, K2**
CO2	Explain different phases of growth and its assessment	**K2, K3**
CO3	Describe the Carbohydrate metabolism	**K4**
CO4	Illustrate the Protein Metabolism	**K3, K4**
CO5	Compute the importance of Anaerobic Respiration and fermentation pathway	**K5**

Course Title: MICROBIAL PHYSIOLOGY (P) **Course Code: 22UMB2CC2P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Develop the skills to grow microbes in the laboratory	**K1**
CO2	Illustrate effect of pH, temperature and salt on microbes	**K2**
CO3	Measure the growth of microbial cell	**K3**
CO4	Summarize biochemical test to identify the bacteria	**K3**
CO5	Interpret the results of biochemical reaction by microbes	**K4**

Course Title: MICROBIAL DIVERSITY **Course Code: 22UMB2CC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Remember taxonomy and classification of microorganisms	**K1, K2**
CO2	Apply in the field study about viruses classification	**K3**
CO3	Analyze characteristics of different groups of microorganisms	**K4**
CO4	Evaluate applications of diversified microorganisms	**K5**
CO5	Create knowledge on microbial taxonomy and diversity	**K6**

CRITERION I **POs and COs**

Course Title: APPLIED BIOCHEMISTRY **Course Code: 22UMB2AC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Illustrate the basic Concept of Blood and its components, Deficiency Diseases	**K2**
CO2	Explain the various models of cell Membrane and transport mechanisms	**K2**
CO3	List out the Endocrine Glands and their hormones with deficiency diseases	**K3**
CO4	Compare the Plant pigments with their biosynthesis and significance	**K4**
CO5	Determine the structure of Plant hormones with its structure and function	**K5**

COURSE TITLE: ENVIRORMENTAL STUDIES **COURSE CODE: 22UGEVS**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Outline the nature and scope of environmental studies	**K1, K2**
CO2	Illustrate the various types of natural resources and its importance.	**K2**
CO3	Classify various types of ecosystem with its structure and function.	**K2, K3**
CO4	Develop an understanding of various types of pollution and biodiversity.	**K3**
CO5	List out the various types of social issues related with environment and explain protection acts	**K4, K5**

COURSE TITLE: INTRODUCTORY VIROLOGY **COURSE CODE: 19UMB3CC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basic knowledge of Viruses	**K1**
CO2	Select the suitable Purification and Characterization methodsof Viruses	**K1**
CO3	Compare and Contrast Bacteriophages Life cycle	**K2**
CO4	Illustrate impacts of the Plant Viral diseases	**K2**
CO5	Organised views of Animal Viruses	**K3**

CRITERION I **POs and COs**

COURSE TITLE: INTRODUCTORY VIROLOGY AND IMMUNOLOGY PRACTICALS **COURSE CODE: 19UMB3CC2P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Identify and isolate bacteriophages from sewage.	**K1**
CO2	Illustrate of various immune haematological techniques.	**K2**
CO3	Describe the virus cultivation methods.	**K2**
CO4	Apply knowledge about selected bacterial plant and animal viruses.	**K3**
CO5	Organized view on bacterial, plant and animal viruses	**K3**

COURSE TITLE: BIOSTATISTICS **COURSE CODE: 19UMB3AC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the basic concepts of biostatistics, functions andlimitations	**K3**
CO2	Classify the data and sampling deign	**K3**
CO3	Compute the measures of central tendency and measuresof dispersion	**K3**
CO4	Apply the concepts of skewness, moments, kurtosis, correlation and regression to solve the problems.	**K4**
CO5	Examine the various testing of hypothesis	**K4**

COURSE TITLE: BIOSTATISTICS AND BIOINFORMATICS PRACTICALS **COURSE CODE: 19UMB3AC2P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Identify and collect various data for representation using biological materials.	**K1**
CO2	Illustrate t' test, 'chi' square, standard error andDeviation using SPSS programme.	**K2**
CO3	Compared views on Nucleic acid sequence databanks	**K3**
CO4	Compute multiple sequence alignment.	**K3**
CO5	Construct nucleic acid and protein structure databases.	**K3**

CRITERION I **POs and COs**

COURSE TITLE: HERBAL MEDICINE **COURSE CODE: 19UMB3NME1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define ethnomedicine	**K1**
CO2	Recite the knowledge about medicinally important plants.	**K1**
CO3	Describe about tribal medicine and their uses in diseases.	**K2**
CO4	Apply the traditional knowledge of medicinal plants in Tamilnadu	**K3**
CO5	Associate of plants in day-to-day life.	**K4**

COURSE TITLE: IMMUNOLOGY **COURSE CODE: 19UMB4CC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the history and types of immunity.	**K4**
CO2	Demonstrate the various antigen-antibody techniques.	**K4**
CO3	Differentiate the structure of MHC, Cytokines and lymphokines.	**K6**
CO4	Explain Immunotechnology and its applications.	**K6**
CO5	Explain the knowledge about hypersensitivity reactions	**K6**

COURSE TITLE: COMPUTER APPLICATION IN BIOLOGY **COURSE CODE: 19UMB4AC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basics of computer	**K1**
CO2	Recite the knowledge about internet	**K1**
CO3	Critique knowledge about bioinformatics	**K4**
CO4	Generalize the structure and classification of protein visualization tools	**K6**
CO5	Expand about the role of computers in biology	**K6**

CRITERION I **POs and COs**

COURSE TITLE: PHARMACOGNOSY **COURSE CODE: 19UMB4NME2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Outline study of traditional Indian medicine	**K1**
CO2	Explain the needs of crude drugs	**K2**
CO3	Demonstrate the crude and commercial drugs	**K4**
CO4	Compile view of Oraganoleptic study	**K3**
CO5	Relate the analytical Pharmacognosy of available medicinal plants	**K3**

COURSE TITLE: MUSHROOM TECHNOLOGY **COURSE CODE: 19UMB4SBE1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Differentiate edible and Poisonous mushrooms	**K5**
CO2	Examine cultivation system of mushroom	**K4**
CO3	Create an nutrient profile of mushroom	**K6**
CO4	Formulation of mushroom food preparation	**K6**
CO5	Determine health benefits of mushroom	**K4**

COURSE TITLE: CLINICAL PARASITOLOGY **COURSE CODE: 19UMB4SBE1B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Generalize diagnostic techniques in parasitology	**K6**
CO2	Examine the clinical significance of *Entamoeba histolytica*	**K4**
CO3	Elaborate the pathogenicity of *Leishmania donovani*	**K6**
CO4	Discuss about the *Plasmodium spp.*	**K6**
CO5	Determine *Taenia solium*	**K4**

CRITERION I **POs and COs**

COURSE TITLE: MEDICAL MICROBIOLOGY **COURSE CODE: 19UMB5CC5**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Describe and Classify the various pathogens and its Characterization.	**K3**
CO2	Diagnose the various bacterial pathogens	**K4**
CO3	Analyze various human viral diseases	**K4**
CO4	Evaluate and compare the various fungal infections and protozoan diseases	**K5**
CO5	Identification of pathogens from sample	**K6**

COURSE TITLE: AGRICULTURAL MICROBIOLOGY **COURSE CODE: 19UMB5CC6**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basic view of soil Microorganisms	**K1**
CO2	Explain the Microbial association in soil & organic forming	**K2**
CO3	Understand the production of Biofertilizer	**K4**
CO4	Discuss about Biogeochemical cycles	**K6**
CO5	Discuss about Plant diseases & Control measures	**K6**

COURSE TITLE: MOLECULAR BIOLOGY **COURSE CODE: 19UMB5CC7**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	State the Basic concept of Prokaryotic Genes	**K1**
CO2	Define the Prokaryotic DNA Replication	**K1**
CO3	Explain the DNA & RNA Transcription in Prokaryotes	**K2**
CO4	Apply the view of Gene Transfer Mechanisms	**K3**
CO5	Prepare the Mutation and DNA Repair Mechanisms	**K3**

CRITERION I **POs and COs**

COURSE TITLE: MEDICAL MICROBIOLOGY, AGRICULTURAL MICROBIOLOGY, MOLECULAR BIOLOGY – PRACTICALS **COURSE CODE: 19UMB5CC3P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Illustrate the isolation procedures	**K2**
CO2	Explain the symptoms of diseases	**K2**
CO3	Sketch out the water borne microbes	**K3**
CO4	Demonstration of auxotrophic mutants	**K3**
CO5	Analyze agarose gel electrophoresis	**K4**

COURSE TITLE: FUNDAMENTALS OF BOTANY AND ZOOLOGY **COURSE CODE: 19UMB5MBE1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	State the Basic knowledge of Plant Nomenclature	**K1**
CO2	Describe the Salient features and Economic importance of Monocot and Dicot Plants	**K2**
CO3	Illustrate the views of Plant Physiology and Reproduction	**K2**
CO4	Prepare Animal Kingdom and Reproduction	**K3**
CO5	Prepare the Process of Animal Cell reproduction	**K3**

COURSE TITLE: ORGANIC FARMING **COURSE CODE: 19UMB5MBE1B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine the origin and importance of organic farming	**K4**
CO2	Explain the scope of organic farming	**K5**
CO3	Evaluate the methodology practiced in organic farming	**K5**
CO4	Generalize the management strategies in crop protection	**K6**
CO5	Compile the strategies for the commercialization of organic products	**K6**

COURSE TITLE: BIOFERTILIZER TECHNOLOGY PRACTICAL COURSE CODE: 19UMB5SBE2AP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain Biofertilizers and Production technology	**K2**
CO2	Illustrate Symbiotic Biofertilizers and study the mass cultivation methods	**K2**
CO3	Analyze Non- Symbiotic Biofertilizers and study the cultivation methods	**K4**
CO4	Create Knowledge about Phosphate solubilization and study the cultivation methods	**K6**
CO5	Expand view of Mycorrhizae and Bioinsecticides and study the cultivation methods	**K6**

COURSE TITLE: SOLID WASTE MANAGEMENT PRACTICAL COURSE CODE: 19UMB5SBE2BP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the Sample collection methods	**K2**
CO2	Understanding of the Physical characteristics of municipal solid wastes	**K4**
CO3	Determine the Chemical compounds of solid waste	**K4**
CO4	Discuss about the Processing techniques of solid waste	**K6**
CO5	Elaborate Mushroom Cultivation methods by using organic Solid wastes	**K6**

COURSE TITLE: MEDICAL LABORATORY TECHNOLOGY PRACTICAL COURSE CODE: 19UMB5SBE3AP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the safety practice, anatomy and instrumentation in microbiological laboratory	**K2**
CO2	Describe the cleaning of glasswares and sterilization of media	**K2**
CO3	Analyses and estimation of clinical specimen	**K4**
CO4	Explain blood grouping and Rh typing	**K5**
CO5	Summarize the serological tests	**K6**

CRITERION I **POs and COs**

COURSE TITLE: VERMITECHNOLOGY PRACTICAL **COURSE CODE: 19UMB5SBE3BP**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain Vermitechnology and Production technology	**K2**
CO2	Illustrate methods of composting in a limited space and describe the decomposing process	**K2**
CO3	Analyze and study the biodiversity of local earthworms	**K4**
CO4	Create and maintain the environment pollution free	**K6**
CO5	Expand view of using worms to convert decomposing food waste into nutrient-rich fertilizer	**K6**

COURSE TITLE: INDUSTRIAL MICROBIOLOGY **COURSE CODE: 19UMB6CC8**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	List the History and Concept of Strain development	**K1**
CO2	State the Fermentor and Fermentation media	**K2**
CO3	Explain the Production and Purification Industrial Important Microbial Products	**K2**
CO4	Describe the Production of Industrially valuable products.	**K2**
CO5	Prepare the mass cultivation protocol for Pharmaceutical Products.	**K3**

COURSE TITLE: FOOD MICROBIOLOGY **COURSE CODE: 19UMB6CC9**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	List the types of nutrition	**K1**
CO2	State the sources of contamination in food	**K2**
CO3	Explain the spoilage and preservation of food products	**K2**
CO4	Describe food borne diseases	**K2**
CO5	Prepare the physical and chemical methods of food preservation	**K3**

COURSE TITLE: INDUSTRIAL & FOOD MICROBIOLOGY – PRACTICALS COURSE CODE: 19UMB6CC4P		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Illustrate the immobilization of Yeast cell	**K2**
CO2	Describe about the Fermentation	**K2**
CO3	Organized view of industrially important products from microbes	**K3**
CO4	Critique knowledge about production of fermented foods	**K4**
CO5	Explain about the isolation of microbes from foods	**K5**

COURSE TITLE: MICROBIAL BIOTECHNOLOGY COURSE CODE: 19UMB6MBE2A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the primary and secondary screening of microbes.	**K3**
CO2	Determine the applications of microbes	**K4**
CO3	Critique knowledge about industrial production	**K4**
CO4	Outline views of bio control agents	**K5**
CO5	Expand about Process of Bioremediation	**K6**

COURSE TITLE: FOOD ADULTERATION COURSE CODE: 19UMB6MBE2B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basics of Food adulteration	**K1**
CO2	Recite the knowledge about Food Safety and Standards	**K1**
CO3	Critique knowledge about Standardization of Foods	**K4**
CO4	Generalize the basic idea of Food additives	**K6**
CO5	Expand the role of Quality control	**K6**

CRITERION I **POs and COs**

COURSE TITLE: RECOMBINANT DNA TECHNOLOGY **COURSE CODE: 19UMB6MBE3A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the role of enzymes in rDNA technology	**K2**
CO2	Sketch the basic techniques of vectors and its biology	**K3**
CO3	Illustrate the gene cloning strategies in recombinant DNA	**K4**
CO4	Explain the importance of rDNA techniques	**K5**
CO5	Summarize the applications of recombinant technology	**K6**

COURSE TITLE: BIOLOGICAL TECHNIQUES **COURSE CODE: 19UMB6MBE3B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recall microscopic techniques.	**K1**
CO2	Apply the spectroscopic, Spectrophotometric methods & analytical techniques.	**K3**
CO3	Critique knowledge about chromatographic techniques.	**K5**
CO4	Revise about electrophoresis & its applications.	**K6**
CO5	Combine view of molecular techniques.	**K6**

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2023-2024 Onwards)

DEPARTMENT OF MICROBIOLOGY

B. Sc – Microbiology

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	**LEARNING ENVIRONMENT:** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	**ACADEMIC EXCELLENCE:** To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	**EMPLOYABILITY:** To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY:** To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	**GREEN SUSTAINABILITY:** To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

PROGRAMME OUTCOMES (POs)

POs	Programme Outcome On completion of B. Sc Microbiology Programme, the students will be able to,
PO1	Academic Excellence and Competence: Elicit firm fundamental knowledge in Theory as well as practical for coherent understanding of academic field to pursue multi and interdisciplinary science careers in future.
PO2	Holistic and Social approach: Create novel ideas related to the scientific research concepts through advanced technology and sensitivity towards sustainable Environmental practices as well as social issues.
PO3	Professional ethics and Team Work: Explore professional responsibility through projects, internships, field trip/industrial visits and mentorship Programmes to transmit communication skills.
PO4	Critical and Scientific thinking: Equip training skills in Internships, Research Projects to do higher studies in multidisciplinary path with higher level of specialization to become professionals of high-quality standards.
PO5	Social Responsibility with ethical values: Ensure ethical, social and holistic values in the minds of learners and attain ender parity for building a healthy nation.

COURSE OUTCOMES (COs)

Course Title: FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY Course Code: 23UMB1CC1		
CO Number	CO Statement On the successful completion of the course, students will be able to,	Knowledge Level
CO1	Remember and understand the Development of Microbiology	K1, K2
CO2	Analyze the Size and Shape of Microorganisms usingMicroscope	K3
CO3	Evaluate the knowledge about Bacteria and Viruses	K4
CO4	Compare the various Preservation Methods for preservingMicrobes.	K5
CO5	Summarize various modes of classification of microbes	K5

CRITERION I **POs and COs**

Course Title: FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY (P) **Course Code: 23UMB1CC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recall the safety practice in microbiological laboratory	K1
CO2	Demonstrate the pure culture technique	K2
CO3	Develop the microscopic techniques and staining methods	K3
CO4	Determine about preparation of different media	K4
CO5	Discuss different microorganisms in different media	K6

Course Title: BIOCHEMISTRY I **Course Code: 23UMB1AC1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Remember and understand the concept of macromolecules	K1,K2
CO2	Illustrate an idea about structure and function macromolecules	K2,K3
CO3	Categorize the sources of macromolecules	K4
CO4	Classify and relate properties o macromolecules	K3,K4
CO5	Recommend the daily allowances of vitamins and itsSignificance	K5

Course Title: BIOCHEMISTRY I (P) **Course Code: 23UMB1AC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Acquire knowledge about preparation of Buffer, principleof colorimeter	K4
CO2	Analyse the constituents of carbohydrates and proteins	K1
CO3	Analyse the constituents of lipids, Titrimetric estimation of Glucose	K6
CO4	Titrimetric estimation Ascorbic acid and colorimetricestimation of DNA	K6
CO5	Determination of Amino acids by Paper chromatography &Thin layer chromatography	K5

CRITERION I **POs and COs**

Course Title: MICROBIAL PHYSIOLOGY **Course Code: 23UMB2CC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	State nutritional requirements and uptake of microorganisms.	K1, K2
CO2	Explain phases and factors of growth	K3, K4
CO3	Describe the Carbohydrate metabolism	K3, K4
CO4	Compute the importance of Anaerobic Respiration andfermentation pathway.	K4, K5
CO5	Impart knowledge about protein and lipid metabolisms.	K4, K5

Course Title: MOLECULARBIOLOGY **Course Code: 23UMB2CC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basics Prosperities of DNA	K1
CO2	Recite the knowledge about replication of DNA	K1
CO3	Critique knowledge about central dogma of biology	K4
CO4	Generalize the basic idea of Gene transfer mechanisms	K6
CO5	Expand about mutation	K6

Course Title: MICROBIAL PHYSIOLOGYAND MOLECULAR BIOLOGY (P) **Course Code: 23UMB2CC2P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Develop the skills to grow microbes in the laboratory.	**K1**
CO2	Illustrate effect of pH, temperature and salt on microbes.	**K2**
CO3	Evaluate the growth of microbial cell and enzyme hydrolysis reactions.	**K3**
CO4	Analyze biochemical test to identify bacteria.	**K3**
CO5	Interpret isolation and characterization of genomic and plasmid DNA.	**K4**

CRITERION I **POs and COs**

Course Title: BIOCHEMISTRY II **Course Code: 23UMB2AC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Evaluate the basic Concept of Blood and its components,Deficiency Diseases	K2
CO2	Describe the various models of cell Membrane and transport mechanisms	K2
CO3	Discuss the Endocrine Glands and their hormones withdeficiency diseases	K3
CO4	Compare the Plant pigments with their biosynthesis andsignificance	K4
CO5	Explain the structure of Plant hormones with its structure andfunction	K5

COURSE TITLE: ENVIRORMENTAL STUDIES **COURSE CODE: 22UGEVS**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Outline the nature and scope of environmental studies	K1, K2
CO2	Illustrate the various types of natural resources and its importance.	K2
CO3	Classify various types of ecosystem with its structure and function.	K2, K3
CO4	Develop an understanding of various types of pollution and biodiversity.	K3
CO5	List out the various types of social issues related with environment and explain protection acts	K4, K5

COURSE TITLE: VIROLOGY **COURSE CODE: 22UMB3CC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basic knowledge of Viruses	K1,K2, K4
CO2	Select the suitable Purification and Characterizationmethods of Viruses	K1,K2, K3
CO3	Compare and Contrast Bacteriophages Life cycle	K1,K2, K3
CO4	Illustrate impacts of the Plant Viral diseases	K1,K2, K4
CO5	Organised views of Animal Viruses	K1,K2, K4

CRITERION I **POs and COs**

COURSE TITLE: VIROLOGY (P) **COURSE CODE: 22UMB3CC3P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basic knowledge of Viral sample collections	K1,K2, K4
CO2	Select the suitable isolation and Characterizationmethods of Bacteriophages	K1,K2, K3
CO3	Illustrate impacts of the Plant Viral transmission methods	K1,K2, K3
CO4	Understand the suitable Animal virus transmission methods	K1,K2, K4
CO5	Demonstration of Plant, Animal and Bacterial Viruses	K1,K2, K4

COURSE TITLE: MUSHROOM TECHNOLOGY **COURSE CODE: 22UMB3GEC1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Differentiate edible and Poisonous mushrooms	K5
CO2	Examine Spawn preparation	K4
CO3	Illustrate the cultivation of mushroom	K6
CO4	Discuss about nutritional value of mushroom	K6
CO5	Determine medicinal value of mushroom	K4

COURSE TITLE: IMMUNOLOGY **COURSE CODE: 22UMB4CC5**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the history and types of immunity.	K1, K2, K4
CO2	Demonstrate the various antigen- antibody techniques.	K3, K4
CO3	Differentiate the structure of MHC, Cytokines and lymphokines.	K4, K5,K6
CO4	Explain immune technology and its applications.	K4, K6
CO5	Explain the knowledge about hypersensitivity reactions	K5, K6

COURSE TITLE: IMMUNOLOGY (P) **COURSE CODE: 22UMB4CC4P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recall the immunological reactions.	K1
CO2	Demonstrate the advance immunological techniques.	K2
CO3	Develops kills to hem agglutination.	K3
CO4	Competently count blood cells and its differentiation	K3
CO5	Explain various techniques in immunology.	K4

CRITERION I **POs and COs**

COURSE TITLE: BIOINFORMATICS **COURSE CODE: 22UMB4AC6**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basics of bioinformatics	K1
CO2	Recite the knowledge about biological databases	K1
CO3	Critique knowledge about sequences	K4
CO4	Generalize the basic idea of metadata	K6
CO5	Expand the role of molecular biology	K6

COURSE TITLE: BIOFERTILIZER TECHNOLOGY **COURSE CODE: 22UMB4GEC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define and understand importance of biofertilizer	K1, K2
CO2	Analyze and explain mass production of *Rhizobium*	K3, K4
CO3	Determine and apply *Azospirillum* and *Azotobacter* biofertilizer	K3, K4
CO4	Evaluate and categorize Blue green algae biofertilizer	K4, K5
CO5	Criticize and manage production of phosphate biofertilizer andVAM	K5, K6

COURSE TITLE: HERBAL MEDICINE (P) **COURSE CODE: 22UMB4SEC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Cultivation of Medicinal Plants	K1
CO2	Recite the knowledge about medicinally important plants.	K2
CO3	Describe about tribal medicine and their uses in diseases.	K3
CO4	Apply the traditional knowledge of medicinal plants in Tamil nadu	K4
CO5	Associate of plants in day to day life	K5

COURSE TITLE: MEDICAL MICROBIOLOGY **COURSE CODE: 19UMB5CC5**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Describe and Classify the various pathogens and its Characterization.	K3
CO2	Diagnose the various bacterial pathogens	K4
CO3	Analyze various human viral diseases	K4
CO4	Evaluate and compare the various fungal infections and protozoan diseases	K5
CO5	Identification of pathogens from sample	K6

CRITERION I **POs and COs**

COURSE TITLE: AGRICULTURAL MICROBIOLOGY **COURSE CODE: 19UMB5CC6**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basic view of soil Microorganisms	K1
CO2	Explain the Microbial association in soil & organic forming	K2
CO3	Understand the production of Biofertilizer	K4
CO4	Discuss about Biogeochemical cycles	K6
CO5	Discuss about Plant diseases & Control measures	K6

COURSE TITLE: MOLECULAR BIOLOGY **COURSE CODE: 19UMB5CC7**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	State the Basic concept of Prokaryotic Genes	K1
CO2	Define the Prokaryotic DNA Replication	K1
CO3	Explain the DNA & RNA Transcription in Prokaryotes	K2
CO4	Apply the view of Gene Transfer Mechanisms	K3
CO5	Prepare the Mutation and DNA Repair Mechanisms	K3

COURSE TITLE: MEDICAL MICROBIOLOGY, AGRICULTURAL MICROBIOLOGY, MOLECULAR BIOLOGY - PRACTICALS **COURSE CODE: 19UMB5CC3P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Illustrate the isolation procedures	K2
CO2	Explain the symptoms of diseases	K2
CO3	Sketch out the water borne microbes	K3
CO4	Demonstration of auxotrophic mutants	K3
CO5	Analyze agarose gel electrophoresis	K4

COURSE TITLE: FUNDAMENTALS OF BOTANY AND ZOOLOGY **COURSE CODE: 19UMB5MBE1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	State the Basic knowledge of Plant Nomenclature	K1
CO2	Describe the Salient features and Economic importance of Monocot and Dicot Plants	K2
CO3	Illustrate the views of Plant Physiology and Reproduction	K2
CO4	Prepare Animal Kingdom and Reproduction	K3
CO5	Prepare the Process of Animal Cell reproduction	K3

COURSE TITLE: ORGANIC FARMING COURSE CODE: 19UMB5MBE1B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine the origin and importance of organic farming	K4
CO2	Explain the scope of organic farming	K5
CO3	Evaluate the methodology practiced in organic farming	K5
CO4	Generalize the management strategies in crop protection	K6
CO5	Compile the strategies for the commercialization of organic products	K6

COURSE TITLE: BIOFERTILIZER TECHNOLOGY PRACTICAL COURSE CODE: 19UMB5SBE2AP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain Biofertilizers and Production technology	K2
CO2	Illustrate Symbiotic Biofertilizers and study the mass cultivation methods	K2
CO3	Analyze Non- Symbiotic Biofertilizers and study the cultivation methods	K4
CO4	Create Knowledge about Phosphate solubilization and study the cultivation methods	K6
CO5	Expand view of Mycorrhizae and Bioinsecticides and study the cultivation methods	K6

COURSE TITLE: SOLID WASTE MANAGEMENT PRACTICAL COURSE CODE: 19UMB5SBE2BP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the Sample collection methods	K2
CO2	Understanding of the Physical characteristics of municipal solid wastes	K4
CO3	Determine the Chemical compounds of solid waste	K4
CO4	Discuss about the Processing techniques of solid waste	K6
CO5	Elaborate Mushroom Cultivation methods by using organic Solid wastes	K6

COURSE TITLE: MEDICAL LABORATORY TECHNOLOGY PRACTICAL COURSE CODE: 19UMB5SBE3AP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the safety practice, anatomy and instrumentation in microbiological laboratory	K2
CO2	Describe the cleaning of glasswares and sterilization of media	K2
CO3	Analyses and estimation of clinical specimen	K4
CO4	Explain blood grouping and Rh typing	K5
CO5	Summarize the serological tests	K6

COURSE TITLE: VERMITECHNOLOGY PRACTICAL COURSE CODE: 19UMB5SBE3BP		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain Vermitechnology and Production technology	K2
CO2	Illustrate methods of composting in a limited space and describe the decomposing process	K2
CO3	Analyze and study the biodiversity of local earthworms	K4
CO4	Create and maintain the environment pollution free	K6
CO5	Expand view of using worms to convert decomposing food waste into nutrient-rich fertilizer	K6

COURSE TITLE: INDUSTRIAL MICROBIOLOGY COURSE CODE: 19UMB6CC8		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	List the History and Concept of Strain development	K1
CO2	State the Fermentor and Fermentation media	K2
CO3	Explain the Production and Purification Industrial Important Microbial Products	K2
CO4	Describe the Production of Industrially valuable products.	K2
CO5	Prepare the mass cultivation protocol for Pharmaceutical Products.	K3

CRITERION I **POs and COs**

COURSE TITLE: FOOD MICROBIOLOGY **COURSE CODE: 19UMB6CC9**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	List the types of nutrition	K1
CO2	State the sources of contamination in food	K2
CO3	Explain the spoilage and preservation of food products	K2
CO4	Describe food borne diseases	K2
CO5	Prepare the physical and chemical methods of food preservation	K3

COURSE TITLE: INDUSTRIAL & FOOD MICROBIOLOGY – PRACTICALS **COURSE CODE: 19UMB6CC4P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Illustrate the immobilization of Yeast cell	K2
CO2	Describe about the Fermentation	K2
CO3	Organized view of industrially important products from microbes	K3
CO4	Critique knowledge about production of fermented foods	K4
CO5	Explain about the isolation of microbes from foods	K5

COURSE TITLE: MICROBIAL BIOTECHNOLOGY **COURSE CODE: 19UMB6MBE2A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the primary and secondary screening of microbes.	K3
CO2	Determine the applications of microbes	K4
CO3	Critique knowledge about industrial production	K4
CO4	Outline views of bio control agents	K5
CO5	Expand about Process of Bioremediation	K6

COURSE TITLE: FOOD ADULTERATION **COURSE CODE: 19UMB6MBE2B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basics of Food adulteration	K1
CO2	Recite the knowledge about Food Safety and Standards	K1
CO3	Critique knowledge about Standardization of Foods	K4
CO4	Generalize the basic idea of Food additives	K6
CO5	Expand the role of Quality control	K6

COURSE TITLE: RECOMBINANT DNA TECHNOLOGY COURSE CODE: 19UMB6MBE3A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the role of enzymes in rDNA technology	K2
CO2	Sketch the basic techniques of vectors and its biology	K3
CO3	Illustrate the gene cloning strategies in recombinant DNA	K4
CO4	Explain the importance of rDNA techniques	K5
CO5	Summarize the applications of recombinant technology	K6

COURSE TITLE: BIOLOGICAL TECHNIQUES COURSE CODE: 19UMB6MBE3B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Recall microscopic techniques.	K1
CO2	Apply the spectroscopic, Spectrophotometric methods & analytical techniques.	K3
CO3	Critique knowledge about chromatographic techniques.	K5
CO4	Revise about electrophoresis & its applications.	K6
CO5	Combine view of molecular techniques.	K6

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2019-2020 Onwards)

DEPARTMENT OF MICROBIOLOGY

M. Sc – Microbiology

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	The Masters in Microbiology programme will address the increasing need for skilled scientific manpower with an understanding of research ethics
PEO2	The laboratory training in addition to theory is included to prepare them for careers in the industry, agriculture, and applied research where biological system is increasingly employed
PEO3	The objective of this programme is to benefit the society by adding skilled scientific workforce across the country and the globe

PROGRAMME OUTCOMES (POs)

POs	Programme Outcome On completion of M. Sc Microbiology Programme, the students will be able to,
PO1	Students will be able to acquire, articulate, retain and apply specialized language and knowledge relevant to microbiology
PO2	Students will acquire and demonstrate competency in laboratory safety including accurately reporting observations and analysis
PO3	Students will communicate scientific concepts, experimental results and analytical arguments clearly and concisely
PO4	Students will inculcate involvement in Research and internship activity
PO5	Graduates develop a broad range of scientific knowledge to meet the current and future expectation of industries at the national and global level

COURSE OUTCOMES (COs)

COURSE TITLE: ESSENTIALS OF MICROBIOLOGY COURSE CODE: 19PMB1CC1		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine the scope of Microbiology	**K4**
CO2	Differentiate the types of Microscopy	**K4**
CO3	Assess the morphological features of Eukaryotic Cell	**K5**
CO4	Generalize view of Prokaryotic Cell Structure	**K6**
CO5	Develop the cultivation methods of microbes	**K6**

COURSE TITLE: BIOLOGICAL MACROMOLECULES COURSE CODE: 19PMB1CC2		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Classification of cell and its structure in prokaryotesand eukaryotes	**K4**
CO2	Analyze the chemical nature and function of biological macromolecules	**K4**
CO3	Explain the concepts of metabolism with detailed pathways	**K5**
CO4	Elaborate the basic concepts of enzyme and itscatalysis	**K6**
CO5	Discuss the concepts of thermodynamics and biological buffers	**K6**

COURSE TITLE: VIROLOGY COURSE CODE: 19PMB1CC3		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Simplified view of viruses	**K4**
CO2	Test for antigen & antibody reactions	**K4**
CO3	Compared views of Bacteriophages.	**K5**
CO4	Predict the structure pathogenesis and control of plantviruses.	**K6**
CO5	Compiled views of animal viruses	**K6**

CRITERION I **POs and COs**

COURSE TITLE: MICROBIAL ECOLOGY **COURSE CODE: 19PMB1CC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Examine basic concept of ecosystem	**K4**
CO2	Determine the microorganisms and their natural habitats	**K4**
CO3	Evaluate environmental pollution	**K5**
CO4	Diagnose waste management system	**K5**
CO5	Extend the biodiversity and its conservation	**K6**

COURSE TITLE: ESSENTIALS OF MICROBIOLOGY, BIOLOGICAL MACROMOLECULES, VIROLOGY AND MICROBIAL ECOLOGY PRACTICALS **COURSE CODE: 19PMB1CC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine the sterilization methods.	**K4**
CO2	Examine the bacterial morphology	**K4**
CO3	Evaluate bacteriophage	**K5**
CO4	Critique knowledge about buffer preparation	**K5**
CO5	Measure the Use of chromatography	**K5**

COURSE TITLE: MICROBIAL METABOLISM **COURSE CODE: 19PMB2CC5**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Select view of cell structure and functions	**K3**
CO2	Explain about carbon assimilation	**K3**
CO3	Analyze the growth phases of microbialpopulations	**K4**
CO4	Criticize about microbial pigments and	**K5**
CO5	Assess about spore structure and functions	**K6**

CRITERION I **POs and COs**

COURSE TITLE: IMMUNOLOGY **COURSE CODE: 19PMB2CC6**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Functions of Immune system	**K4**
CO2	List the various types of Immunoglobulin	**K4**
CO3	Compared view of antigen & antibody reactions	**K5**
CO4	Explain the Hypersensitivity reactions	**K5**
CO5	Constructive view of transplantation immunology	**K6**

COURSE TITLE: MICROBIAL METABOLISM AND IMMUNOLOGY PRACTICALS **COURSE CODE: 19PMB2CC2P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Analyze the Growth nature of *E. coli*	**K4**
CO2	Asses the fermentation strategies	**K5**
CO3	Evaluate on blood groups, Rh typing	**K5**
CO4	Determine WBC & RBC counting.	**K5**
CO5	Compiled view of Serological techniques	**K6**

COURSE TITLE: MICROBIAL TECHNIQUES **COURSE CODE: 19PMB2EC1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	List the various of microscopic techniques.	**K4**
CO2	Analyze the spectroscopic & Spectrophotometer methods	**K4**
CO3	Explain the chromatographic techniques.	**K5**
CO4	Create the knowledge about electrophoresis & itsapplications.	**K6**
CO5	Discuss the need for molecular techniques.	**K6**

COURSE TITLE: ORGANIC FARMING COURSE CODE: 19PMB2EC1B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Analyze the origin and importance of organic farming	**K4**
CO2	Explain the scope of organic farming	**K5**
CO3	Criticize the methodology practiced in organic farming	**K5**
CO4	Develop an idea about biocontrol agents in crop protection	**K6**
CO5	Construct the strategies for the commercialization oforganic products	**K6**

COURSE TITLE: MICROBIAL CYTOLOGY COURSE CODE: 19PMB2EC1C		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Assess the main principles of cell theory	**K5**
CO2	Determine the Prokaryotic cell	**K4**
CO3	Evaluate the Structure and functions of eukaryotic cell	**K5**
CO4	Generalize view of cell division	**K6**
CO5	Examine Microbial cell communication	**K4**

COURSE TITLE: BIOFERTILIZER TECHNOLOGY COURSE CODE: 19PMB2EC2A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the concept of biofertilizers and its significance in plant growth	**K5**
CO2	Perceive the knowledge about biofertilizer production methods	**K5**
CO3	Elaborate the production methods of microbes used as biofertilizers	**K6**
CO4	Discuss about the application methods of produced biofertilizers	**K6**
CO5	Create the knowledge about biocontrol agents and its applications	**K6**

COURSE TITLE: PUBLIC HEALTH MICROBIOLOGY COURSE CODE: 19PMB2EC2B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Examine basic ideas about microbial association	**K4**
CO2	Diagnose the various airborne disease	**K4**
CO3	Determine the water borne diseases and its control	**K4**
CO4	Evaluate the role of microorganisms in food	**K5**
CO5	Extend the diagnosis hospital acquiredinfections	**K6**

CRITERION I **POs and COs**

COURSE TITLE: MARINE MICROBIOLOGY **COURSE CODE: 19PMB2EC2C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine marine microbes and kingdom concepts	**K4**
CO2	Distinguish the Role of microbes in sea water habitats	**K4**
CO3	Assess Biogeochemical processes in marine systems	**K5**
CO4	Expand the application of marine microbial products	**K6**
CO5	Develop Biodegradation methods for marinepollutants	**K6**

COURSE TITLE: MOLECULAR BIOLOGY AND MICROBIAL GENETICS **COURSE CODE: P16MB31**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the basics of molecular biology.	**K2**
CO2	Analyze central dogma of molecular biology.	**K4**
CO3	Interpret nucleotide sequence change and repair mechanism.	**K4**
CO4	Explain the significance of vectors and bacterial genetics.	**K5**
CO5	Discuss gene expression and transposons.	**K6**

COURSE TITLE: IMMUNOLOGY **COURSE CODE: P16MB32**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Functions of Immune system	**K4**
CO2	List the various types of Immunoglobulin	**K4**
CO3	Compared view of antigen & antibody reactions	**K5**
CO4	Explain the Hypersensitivity reactions	**K5**
CO5	Constructive view of transplantation immunology	**K6**

COURSE TITLE: MOLECULAR BIOLOGY AND MICROBIAL GENETICS, IMMUNOLOGY – PRACTICAL **COURSE CODE: P16MB33P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the application of Immobilization.	**K2**
CO2	Determine the Commercial production methods of Microbial Products.	**K3**
CO3	Compare the genomic and plasmid DNA separation methods	**K4**
CO4	Evaluate on blood groups, Rh typing, WBC and RBC counting	**K5**
CO5	Compiled view of Serological techniques	**K6**

CRITERION I **POs and COs**

COURSE TITLE: MEDICAL LABORATORY TECHNOLOGY **COURSE CODE: P16MBE3A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the laboratory safety measures.	**K3**
CO2	Determine the uses of laboratory equipments.	**K4**
CO3	Critique knowledge about sample collection.	**K4**
CO4	Critique thinking of reagent preparation.	**K5**
CO5	Expand about organ function and infection	**K6**

COURSE TITLE: BIOINFORMATICS & BIOSTATISTICS **COURSE CODE: P16MBE4A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand scope and popular databases of bioinformatics.	**K4**
CO2	Explain sequence alignment methods.	**K5**
CO3	Explain drug development using bioinformatics.	**K5**
CO4	Compute the measures of central tendency.	**K4**
CO5	Examine the various large sample testing of hypothesis.	**K4**

COURSE TITLE: MEDICAL MICROBIOLOGY **COURSE CODE: P16MB41**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Describe and Classify the various pathogens and its Characterization.	**K3**
CO2	Diagnose the various bacterial pathogens	**K4**
CO3	Analyze various human viral diseases	**K4**
CO4	Evaluate and compare the various fungal infections and protozoan diseases	**K5**
CO5	Identification of pathogens from sample	**K6**

CRITERION I **POs and COs**

COURSE TITLE: BIOPROCESS TECHNOLOGY **COURSE CODE: P16MB42**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	List the Concept and History of Strain	**K1**
CO2	State the Fermentor and Fermentation media	**K2**
CO3	Explain the Fermentation Products	**K2**
CO4	Describe the Production of Pharmaceutical Products	**K2**
CO5	Prepare the Production and Purification Industrial Important Microbial Products	**K3**

COURSE TITLE: MEDICAL MICROBIOLOGY & BIOPROCESS TECHNOLOGY PRACTICAL **COURSE CODE: P16MB43P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Organized view of Industrially important Microbes and their growth nature	**K3**
CO2	Critique knowledge about Production and Estimation of Microbial Products	**K4**
CO3	Calculate the Microbial Product recovery	**K6**
CO4	Explain the techniques involved in Clinical Specimen collection	**K5**
CO5	Discuss the Isolation and Identification of Pathogens from Clinical specimens	**K6**

COURSE TITLE: MICROBIAL BIOTECHNOLOGY **COURSE CODE: P16MBE5A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the primary and secondary screening of microbes.	**K4**
CO2	Determine the applications of microbes	**K4**
CO3	Explain about biocontrol agents and its mode of action	**K6**
CO4	Elaborate the industrial production and preservation techniques	**K6**
CO5	Expand about functions of IPR & Biosafety	**K6**

CRITERION I **POs and COs**

COURSE TITLE: PROJECT **COURSE CODE: P16MBPW**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the research design and problem	**K1**
CO2	Classify collected data.	**K2**
CO3	Examine collected data and associate with statistical tool	**K3**
CO4	Assess and publish papers in reputed research journals.	**K4**
CO5	Develop Proposals to apply for minor research projects.	**K5**

Signature Not Verified
Digitally Signed
Signed by: Sujatha.V
Designation: Principal
Reason: NAAC
Location: Tiruchirappalli, Tamil Nadu, India
Date: 30-Sep-2024 12:00:05

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2020-2021 Onwards)

DEPARTMENT OF MICROBIOLOGY

M. Sc – Microbiology

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	The Masters in Microbiology programme will address the increasing need for skilled scientific manpower with an understanding of research ethics
PEO2	The laboratory training in addition to theory is included to prepare them for careers in the industry, agriculture, and applied research where biological system is increasingly employed
PEO3	The objective of this programme is to benefit the society by adding skilled scientific workforce across the country and the globe

PROGRAMME OUTCOMES (POs)

POs	Programme Outcome On completion of M. Sc Microbiology Programme, the students will be able to,
PO1	Students will be able to acquire, articulate, retain and apply specialized language and knowledge relevant to microbiology
PO2	Students will acquire and demonstrate competency in laboratory safety including accurately reporting observations and analysis
PO3	Students will communicate scientific concepts, experimental results and analytical arguments clearly and concisely
PO4	Students will inculcate involvement in Research and internship activity
PO5	Graduates develop a broad range of scientific knowledge to meet the current and future expectation of industries at the national and global level

COURSE OUTCOMES (COs)

COURSE TITLE: ESSENTIALS OF MICROBIOLOGY COURSE CODE: 19PMB1CC1		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine the scope of Microbiology	**K4**
CO2	Differentiate the types of Microscopy	**K4**
CO3	Assess the morphological features of Eukaryotic Cell	**K5**
CO4	Generalize view of Prokaryotic Cell Structure	**K6**
CO5	Develop the cultivation methods of microbes	**K6**

COURSE TITLE: BIOLOGICAL MACROMOLECULES COURSE CODE: 19PMB1CC2		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Classification of cell and its structure in prokaryotesand eukaryotes	**K4**
CO2	Analyze the chemical nature and function of biological macromolecules	**K4**
CO3	Explain the concepts of metabolism withdetailed pathways	**K5**
CO4	Elaborate the basic concepts of enzyme and itscatalysis	**K6**
CO5	Discuss the concepts of thermodynamics and biological buffers	**K6**

COURSE TITLE: VIROLOGY COURSE CODE: 19PMB1CC3		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Simplified view of viruses	**K4**
CO2	Test for antigen & antibody reactions	**K4**
CO3	Compared views of Bacteriophages.	**K5**
CO4	Predict the structure pathogenesis and control of plantviruses.	**K6**
CO5	Compiled views of animal viruses	**K6**

CRITERION I **POs and COs**

COURSE TITLE: MICROBIAL ECOLOGY **COURSE CODE: 19PMB1CC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Examine basic concept of ecosystem	**K4**
CO2	Determine the microorganisms and their natural habitats	**K4**
CO3	Evaluate environmental pollution	**K5**
CO4	Diagnose waste management system	**K5**
CO5	Extend the biodiversity and its conservation	**K6**

COURSE TITLE: ESSENTIALS OF MICROBIOLOGY, BIOLOGICAL MACROMOLECULES, VIROLOGY AND MICROBIAL ECOLOGY PRACTICALS **COURSE CODE: 19PMB1CC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine the sterilization methods.	**K4**
CO2	Examine the bacterial morphology	**K4**
CO3	Evaluate bacteriophage	**K5**
CO4	Critique knowledge about buffer preparation	**K5**
CO5	Measure the Use of chromatography	**K5**

COURSE TITLE: MICROBIAL METABOLISM **COURSE CODE: 19PMB2CC5**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Select view of cell structure and functions	**K3**
CO2	Explain about carbon assimilation	**K3**
CO3	Analyze the growth phases of microbialpopulations	**K4**
CO4	Criticize about microbial pigments and	**K5**
CO5	Assess about spore structure and functions	**K6**

CRITERION I **POs and COs**

COURSE TITLE: IMMUNOLOGY **COURSE CODE: 19PMB2CC6**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Functions of Immune system	**K4**
CO2	List the various types of Immunoglobulin	**K4**
CO3	Compared view of antigen & antibody reactions	**K5**
CO4	Explain the Hypersensitivity reactions	**K5**
CO5	Constructive view of transplantation immunology	**K6**

COURSE TITLE: MICROBIAL METABOLISM AND IMMUNOLOGY PRACTICALS **COURSE CODE: 19PMB2CC2P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Analyze the Growth nature of *E. coli*	**K4**
CO2	Asses the fermentation strategies	**K5**
CO3	Evaluate on blood groups, Rh typing	**K5**
CO4	Determine WBC & RBC counting.	**K5**
CO5	Compiled view of Serological techniques	**K6**

COURSE TITLE: MICROBIAL TECHNIQUES **COURSE CODE: 19PMB2EC1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	List the various of microscopic techniques.	**K4**
CO2	Analyze the spectroscopic & Spectrophotometer methods	**K4**
CO3	Explain the chromatographic techniques.	**K5**
CO4	Create the knowledge about electrophoresis & itsapplications.	**K6**
CO5	Discuss the need for molecular techniques.	**K6**

COURSE TITLE: ORGANIC FARMING COURSE CODE: 19PMB2EC1B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Analyze the origin and importance of organic farming	**K4**
CO2	Explain the scope of organic farming	**K5**
CO3	Criticize the methodology practiced in organic farming	**K5**
CO4	Develop an idea about biocontrol agents in crop protection	**K6**
CO5	Construct the strategies for the commercialization oforganic products	**K6**

COURSE TITLE: MICROBIAL CYTOLOGY COURSE CODE: 19PMB2EC1C		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Assess the main principles of cell theory	**K5**
CO2	Determine the Prokaryotic cell	**K4**
CO3	Evaluate the Structure and functions of eukaryotic cell	**K5**
CO4	Generalize view of cell division	**K6**
CO5	Examine Microbial cell communication	**K4**

COURSE TITLE: BIOFERTILIZER TECHNOLOGY COURSE CODE: 19PMB2EC2A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the concept of biofertilizers and its significance in plant growth	**K5**
CO2	Perceive the knowledge about biofertilizer production methods	**K5**
CO3	Elaborate the production methods of microbes used as biofertilizers	**K6**
CO4	Discuss about the application methods of produced biofertilizers	**K6**
CO5	Create the knowledge about biocontrol agents and its applications	**K6**

CRITERION I **POs and COs**

COURSE TITLE: PUBLIC HEALTH MICROBIOLOGY **COURSE CODE: 19PMB2EC2B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Examine basic ideas about microbial association	**K4**
CO2	Diagnose the various airborne disease	**K4**
CO3	Determine the water borne diseases and its control	**K4**
CO4	Evaluate the role of microorganisms in food	**K5**
CO5	Extend the diagnosis hospital acquiredinfections	**K6**

COURSE TITLE: MARINE MICROBIOLOGY **COURSE CODE: 19PMB2EC2C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine marine microbes and kingdom concepts	**K4**
CO2	Distinguish the Role of microbes in sea water habitats	**K4**
CO3	Assess Biogeochemical processes in marine systems	**K5**
CO4	Expand the application of marine microbial products	**K6**
CO5	Develop Biodegradation methods for marinepollutants	**K6**

COURSE TITLE: INDUSTRIAL MICROBIOLOGY **COURSE CODE: 19PMB3CC7**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	List the Concept and History of Strain development	**K1**
CO2	State the Fermentor and Fermentation media	**K2**
CO3	Explain the Fermentation Products	**K2**
CO4	Describe the Production of Pharmaeutical Products	**K2**
CO5	Prepare the Production and Purification Industrial Important Microbial Products.	**K3**

CRITERION I **POs and COs**

COURSE TITLE: CLINICAL MICROBIOLOGY **COURSE CODE: 19PMB3CC8**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Describe and Classify the various pathogens.	**K3**
CO2	Diagnose the various bacterial pathogens	**K4**
CO3	Examine and differentiate the various fungal infections	**K4**
CO4	Analyse various human viral diseases.	**K6**
CO5	Examine and Categorize different types of parasitic diseases	**K6**

COURSE TITLE: INDUSTRIAL MICROBIOLOGY AND CLINICAL MICROBIOLOGY PRACTICAL **COURSE CODE: 19PMB3CC3P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Organized view of Industrially important Microbes and their growth nature	**K3**
CO2	Critique knowledge about Production and Estimation of Microbial Products	**K4**
CO3	Calculate the Microbial Product recovery	**K6**
CO4	Explain the techniques involved in Clinical Specimen collection	**K5**
CO5	Discuss the Isolation and Identification of Pathogens from Clinical specimens	**K6**

COURSE TITLE: RECENT TRENDS IN MICROBIOLOGY **COURSE CODE: 19PMB3EC3A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the taxonomy principles and concepts	**K5**
CO2	Understanding the basics of inheritance Biology	**K2**
CO3	Extend the Knowledge about microbes in Agriculture	**K2**
CO4	Understand the basic concepts of cell development and its impacts	**K5**
CO5	Expand the knowledge about Bio-nano-informatics	**K6**

CRITERION I **POs and COs**

COURSE TITLE: FOOD ADULTERATION **COURSE CODE: 19PMB3EC3B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the properties of Biomolecules	**K3**
CO2	Determine the common food contaminants	**K4**
CO3	Critique knowledge about microbial food poisoning	**K4**
CO4	Compare various regulations of food safety agencies	**K5**
CO5	Expand about food preservation methods	**K6**

COURSE TITLE: BIOMEDICAL LABORATORY TECHNOLOGY **COURSE CODE: 19PMB3EC3C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the laboratory safety measures.	**K3**
CO2	Determine the uses of laboratory equipments	**K4**
CO3	Critique knowledge about sample collection	**K4**
CO4	Critique thinking of reagent preparation	**K5**
CO5	Expand about organ function and infection	**K6**

COURSE TITLE: RECOMBINANT DNA TECHNOLOGY **COURSE CODE: 19PMB3EC4A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the steps in recombinant DNA/RNA modifying enzymes	**K2**
CO2	Infer the features of various types of gene cloning vectors	**K4**
CO3	Analyze the gene cloning strategies in recombinant DNA	**K4**
CO4	Explain the techniques involved in genetic engineering	**K5**
CO5	Discuss the problem solving aspect of recombinant technology	**K6**

CRITERION I **POs and COs**

COURSE TITLE: MICROBES IN SOLID WASTE MANAGEMENT **COURSE CODE: 19PMB3EC4B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the Types of Wastes	**K2**
CO2	Analyze the methods of different waste collection	**K4**
CO3	Classify the nuclear wastes	**K4**
CO4	Explain the techniques involved in biomedical wastes management	**K5**
CO5	Discuss the problem solving of hazardous wastes	**K6**

COURSE TITLE: MICROBIAL NANOTECHNOLOGY **COURSE CODE: 19PMB3EC4C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basics of bio nanotechnology	**K1**
CO2	Acquire the knowledge about microbial nanotechnology	**K1**
CO3	Critique knowledge about characterization of nanoparticles	**K4**
CO4	Explain the application of nanoparticles	**K5**
CO5	Expand about merits and demerits of nanoparticles	**K6**

COURSE TITLE: MICROBIAL BIOTECHNOLOGY **COURSE CODE: 19PMB4CC9**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the primary and secondary screening of microbes.	**K4**
CO2	Determine the applications of microbes	**K4**
CO3	Explain about biocontrol agents and its mode of action	**K6**
CO4	Elaborate the industrial production and preservation techniques	**K6**
CO5	Expand about functions of IPR& Biosafety	**K6**

CRITERION I **POs and COs**

COURSE TITLE: MOLECULAR BIOLOGY AND MICROBIAL GENETICS **COURSE CODE: 19PMB4CC10**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the basics of molecular biology	**K2**
CO2	Analyze central dogma of molecular biology	**K4**
CO3	Interpret nucleotide sequence change and repair mechanism	**K4**
CO4	Explain the significance of vectors and bacterial genetics	**K5**
CO5	Discuss gene expression and transposons	**K6**

COURSE TITLE: BIOINFORMATICS AND BIOSTATISTICS **COURSE CODE: 19PMB4EC5A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand scope and popular databases of bioinformatics	**K4**
CO2	Explain sequence alignment methods	**K5**
CO3	Explain drug development using bioinformatics	**K5**
CO4	Compute the measures of central tendency	**K4**
CO5	Examine the various large sample testing of hypothesis	**K4**

COURSE TITLE: ENTREPRENEURIAL MICROBIOLOGY **COURSE CODE: 19PMB4EC5B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Outline study of Entrepreneurial Microbiology	**K1**
CO2	Explain the composting process & biofertilizer production	**K2**
CO3	Prepare and formulate microbial metabolites	**K2**
CO4	Compile on types of fermented foods	**K3**
CO5	Relate on various mushroom production	**K3**

CRITERION I **POs and COs**

COURSE TITLE: MOLECULAR TAXONOMY AND PHYLOGENY **COURSE CODE: 19PMB4EC5C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine the methods of taxonomy	**K4**
CO2	Critique the levels of structural organization	**K4**
CO3	Evaluate the taxa and phylogenetic concepts	**K5**
CO4	Generalize the gene regulations and genetic map	**K6**
CO5	Compile & analyse phylogenetics	**K6**

COURSE TITLE: MICROBIAL BIOTECHNOLOGY, MOLECULAR BIOLOGY & MICROBIAL GENETICS- PRACTICALS **COURSE CODE: 19PMB4CC4P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the application of Immobilization	**K3**
CO2	Determine the Commercial production methods of Microbial Products	**K4**
CO3	Compare the genomic and plasmid DNA separation methods	**K5**
CO4	Expand the knowledge about PCR, Restriction digestion and ligation of DNA	**K6**
CO5	Critique knowledge about protein Separation method	**K6**

COURSE TITLE: PROJECT **COURSE CODE: 19PMB4PW**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the research design.	**K1**
CO2	Describe research problem.	**K2**
CO3	Classify collected data.	**K3**
CO4	Examine collected data and associate with statistical tool.	**K4**
CO5	Assess and publish papers in reputed research journals.	**K5**
CO6	Develop Proposals to apply for minor research projects.	**K6**

Signature Not Verified
Digitally Signed
Signed by: Sujatha.V
Designation: Principal
Reason: NAAC
Location: Tiruchirappalli, Tamil Nadu, India
Date: 30-Sep-2024 12:00:05

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2021-2022 Onwards)

DEPARTMENT OF MICROBIOLOGY

M. Sc – Microbiology

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	The Masters in Microbiology programme will address the increasing need for skilled scientific manpower with an understanding of research ethics
PEO2	The laboratory training in addition to theory is included to prepare them for careers in the industry, agriculture, and applied research where biological system is increasingly employed
PEO3	The objective of this programme is to benefit the society by adding skilled scientific workforce across the country and the globe

PROGRAMME OUTCOMES (POs)

POs	Programme Outcome On completion of M. Sc Microbiology Programme, the students will be able to,
PO1	Students will be able to acquire, articulate, retain and apply specialized language and knowledge relevant to microbiology
PO2	Students will acquire and demonstrate competency in laboratory safety including accurately reporting observations and analysis
PO3	Students will communicate scientific concepts, experimental results and analytical arguments clearly and concisely
PO4	Students will inculcate involvement in Research and internship activity
PO5	Graduates develop a broad range of scientific knowledge to meet the current and future expectation of industries at the national and global level

COURSE OUTCOMES (COs)

COURSE TITLE: ESSENTIALS OF MICROBIOLOGY COURSE CODE: 19PMB1CC1		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine the scope of Microbiology	**K4**
CO2	Differentiate the types of Microscopy	**K4**
CO3	Assess the morphological features of Eukaryotic Cell	**K5**
CO4	Generalize view of Prokaryotic Cell Structure	**K6**
CO5	Develop the cultivation methods of microbes	**K6**

COURSE TITLE: BIOLOGICAL MACROMOLECULES COURSE CODE: 19PMB1CC2		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Classification of cell and its structure in prokaryotesand eukaryotes	**K4**
CO2	Analyze the chemical nature and function of biological macromolecules	**K4**
CO3	Explain the concepts of metabolism withdetailed pathways	**K5**
CO4	Elaborate the basic concepts of enzyme and itscatalysis	**K6**
CO5	Discuss the concepts of thermodynamics and biological buffers	**K6**

COURSE TITLE: VIROLOGY COURSE CODE: 19PMB1CC3		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Simplified view of viruses	**K4**
CO2	Test for antigen & antibody reactions	**K4**
CO3	Compared views of Bacteriophages.	**K5**
CO4	Predict the structure pathogenesis and control of plantviruses.	**K6**
CO5	Compiled views of animal viruses	**K6**

CRITERION I **POs and COs**

COURSE TITLE: MICROBIAL ECOLOGY **COURSE CODE: 19PMB1CC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Examine basic concept of ecosystem	**K4**
CO2	Determine the microorganisms and their natural habitats	**K4**
CO3	Evaluate environmental pollution	**K5**
CO4	Diagnose waste management system	**K5**
CO5	Extend the biodiversity and its conservation	**K6**

COURSE TITLE: ESSENTIALS OF MICROBIOLOGY, BIOLOGICAL MACROMOLECULES, VIROLOGY AND MICROBIAL ECOLOGY PRACTICALS **COURSE CODE: 19PMB1CC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine the sterilization methods.	**K4**
CO2	Examine the bacterial morphology	**K4**
CO3	Evaluate bacteriophage	**K5**
CO4	Critique knowledge about buffer preparation	**K5**
CO5	Measure the Use of chromatography	**K5**

COURSE TITLE: MICROBIAL METABOLISM **COURSE CODE: 19PMB2CC5**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Select view of cell structure and functions	**K3**
CO2	Explain about carbon assimilation	**K3**
CO3	Analyze the growth phases of microbialpopulations	**K4**
CO4	Criticize about microbial pigments and	**K5**
CO5	Assess about spore structure and functions	**K6**

CRITERION I **POs and COs**

COURSE TITLE: IMMUNOLOGY **COURSE CODE: 19PMB2CC6**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Functions of Immune system	**K4**
CO2	List the various types of Immunoglobulin	**K4**
CO3	Compared view of antigen & antibody reactions	**K5**
CO4	Explain the Hypersensitivity reactions	**K5**
CO5	Constructive view of transplantation immunology	**K6**

COURSE TITLE: MICROBIAL METABOLISM AND IMMUNOLOGY PRACTICALS **COURSE CODE: 19PMB2CC2P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Analyze the Growth nature of *E. coli*	**K4**
CO2	Asses the fermentation strategies	**K5**
CO3	Evaluate on blood groups, Rh typing	**K5**
CO4	Determine WBC & RBC counting.	**K5**
CO5	Compiled view of Serological techniques	**K6**

COURSE TITLE: MICROBIAL TECHNIQUES **COURSE CODE: 19PMB2EC1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	List the various of microscopic techniques.	**K4**
CO2	Analyze the spectroscopic & Spectrophotometer methods	**K4**
CO3	Explain the chromatographic techniques.	**K5**
CO4	Create the knowledge about electrophoresis & itsapplications.	**K6**
CO5	Discuss the need for molecular techniques.	**K6**

CRITERION I **POs and COs**

COURSE TITLE: ORGANIC FARMING **COURSE CODE: 19PMB2EC1B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Analyze the origin and importance of organic farming	**K4**
CO2	Explain the scope of organic farming	**K5**
CO3	Criticize the methodology practiced in organic farming	**K5**
CO4	Develop an idea about biocontrol agents in crop protection	**K6**
CO5	Construct the strategies for the commercialization oforganic products	**K6**

COURSE TITLE: MICROBIAL CYTOLOGY **COURSE CODE: 19PMB2EC1C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Assess the main principles of cell theory	**K5**
CO2	Determine the Prokaryotic cell	**K4**
CO3	Evaluate the Structure and functions of eukaryotic cell	**K5**
CO4	Generalize view of cell division	**K6**
CO5	Examine Microbial cell communication	**K4**

COURSE TITLE: BIOFERTILIZER TECHNOLOGY **COURSE CODE: 19PMB2EC2A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the concept of biofertilizers and its significance in plant growth	**K5**
CO2	Perceive the knowledge about biofertilizer production methods	**K5**
CO3	Elaborate the production methods of microbes used as biofertilizers	**K6**
CO4	Discuss about the application methods of produced biofertilizers	**K6**
CO5	Create the knowledge about biocontrol agents and its applications	**K6**

CRITERION I **POs and COs**

COURSE TITLE: PUBLIC HEALTH MICROBIOLOGY **COURSE CODE: 19PMB2EC2B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Examine basic ideas about microbial association	**K4**
CO2	Diagnose the various airborne disease	**K4**
CO3	Determine the water borne diseases and its control	**K4**
CO4	Evaluate the role of microorganisms in food	**K5**
CO5	Extend the diagnosis hospital acquiredinfections	**K6**

COURSE TITLE: MARINE MICROBIOLOGY **COURSE CODE: 19PMB2EC2C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine marine microbes and kingdom concepts	**K4**
CO2	Distinguish the Role of microbes in sea water habitats	**K4**
CO3	Assess Biogeochemical processes in marine systems	**K5**
CO4	Expand the application of marine microbial products	**K6**
CO5	Develop Biodegradation methods for marinepollutants	**K6**

COURSE TITLE: INDUSTRIAL MICROBIOLOGY **COURSE CODE: 19PMB3CC7**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	List the Concept and History of Strain development	**K1**
CO2	State the Fermentor and Fermentation media	**K2**
CO3	Explain the Fermentation Products	**K2**
CO4	Describe the Production of Pharmaeutical Products	**K2**
CO5	Prepare the Production and Purification Industrial Important Microbial Products.	**K3**

CRITERION I **POs and COs**

COURSE TITLE: CLINICAL MICROBIOLOGY **COURSE CODE: 19PMB3CC8**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Describe and Classify the various pathogens.	**K3**
CO2	Diagnose the various bacterial pathogens	**K4**
CO3	Examine and differentiate the various fungal infections	**K4**
CO4	Analyse various human viral diseases.	**K6**
CO5	Examine and Categorize different types of parasitic diseases	**K6**

COURSE TITLE: INDUSTRIAL MICROBIOLOGY AND CLINICAL MICROBIOLOGY PRACTICAL **COURSE CODE: 19PMB3CC3P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Organized view of Industrially important Microbes and their growth nature	**K3**
CO2	Critique knowledge about Production and Estimation of Microbial Products	**K4**
CO3	Calculate the Microbial Product recovery	**K6**
CO4	Explain the techniques involved in Clinical Specimen collection	**K5**
CO5	Discuss the Isolation and Identification of Pathogens from Clinical specimens	**K6**

COURSE TITLE: MICROBIOLOGY FOR COMPETITIVE EXAMINATIONS **COURSE CODE: 20PMB3EC3A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the taxonomy principles and concepts	**K5**
CO2	Understanding the basics of inheritance Biology	**K2**
CO3	Extend the Knowledge about microbes in Agriculture	**K2**
CO4	Understand the basic concepts of cell development and its impacts	**K5**
CO5	Expand the knowledge about Bio-nano-informatics	**K6**

CRITERION I **POs and COs**

COURSE TITLE: FOOD ADULTERATION **COURSE CODE: 19PMB3EC3B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the properties of Biomolecules	**K3**
CO2	Determine the common food contaminants	**K4**
CO3	Critique knowledge about microbial food poisoning	**K4**
CO4	Compare various regulations of food safety agencies	**K5**
CO5	Expand about food preservation methods	**K6**

COURSE TITLE: BIOMEDICAL LABORATORY TECHNOLOGY **COURSE CODE: 19PMB3EC3C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the laboratory safety measures.	**K3**
CO2	Determine the uses of laboratory equipments	**K4**
CO3	Critique knowledge about sample collection	**K4**
CO4	Critique thinking of reagent preparation	**K5**
CO5	Expand about organ function and infection	**K6**

COURSE TITLE: RECOMBINANT DNA TECHNOLOGY **COURSE CODE: 19PMB3EC4A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the steps in recombinant DNA/RNA modifying enzymes	**K2**
CO2	Infer the features of various types of gene cloning vectors	**K4**
CO3	Analyze the gene cloning strategies in recombinant DNA	**K4**
CO4	Explain the techniques involved in genetic engineering	**K5**
CO5	Discuss the problem solving aspect of recombinant technology	**K6**

CRITERION I **POs and COs**

COURSE TITLE: MICROBES IN SOLID WASTE MANAGEMENT **COURSE CODE: 19PMB3EC4B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the Types of Wastes	**K2**
CO2	Analyze the methods of different waste collection	**K4**
CO3	Classify the nuclear wastes	**K4**
CO4	Explain the techniques involved in biomedical wastes management	**K5**
CO5	Discuss the problem solving of hazardous wastes	**K6**

COURSE TITLE: MICROBIAL NANOTECHNOLOGY **COURSE CODE: 19PMB3EC4C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basics of bionanotechnology	**K1**
CO2	Acquire the knowledge about microbial nanotechnology	**K1**
CO3	Critique knowledge about characterization of nanoparticles	**K4**
CO4	Explain the application of nanoparticles	**K5**
CO5	Expand about merits and demerits of nanoparticles	**K6**

COURSE TITLE: MICROBIAL BIOTECHNOLOGY **COURSE CODE: 19PMB4CC9**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the primary and secondary screening of microbes.	**K4**
CO2	Determine the applications of microbes	**K4**
CO3	Explain about biocontrol agents and its mode of action	**K6**
CO4	Elaborate the industrial production and preservation techniques	**K6**
CO5	Expand about functions of IPR& Biosafety	**K6**

CRITERION I **POs and COs**

COURSE TITLE: MOLECULAR BIOLOGY AND MICROBIAL GENETICS **COURSE CODE: 19PMB4CC10**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the basics of molecular biology	**K2**
CO2	Analyze central dogma of molecular biology	**K4**
CO3	Interpret nucleotide sequence change and repair mechanism	**K4**
CO4	Explain the significance of vectors and bacterial genetics	**K5**
CO5	Discuss gene expression and transposons	**K6**

COURSE TITLE: BIOINFORMATICS AND BIOSTATISTICS **COURSE CODE: 19PMB4EC5A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand scope and popular databases of bioinformatics	**K4**
CO2	Explain sequence alignment methods	**K5**
CO3	Explain drug development using bioinformatics	**K5**
CO4	Compute the measures of central tendency	**K4**
CO5	Examine the various large sample testing of hypothesis	**K4**

COURSE TITLE: ENTREPRENEURIAL MICROBIOLOGY **COURSE CODE: 19PMB4EC5B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Outline study of Entrepreneurial Microbiology	**K1**
CO2	Explain the composting process & biofertilizer production	**K2**
CO3	Prepare and formulate microbial metabolites	**K2**
CO4	Compile on types of fermented foods	**K3**
CO5	Relate on various mushroom production	**K3**

CRITERION I **POs and COs**

COURSE TITLE: MOLECULAR TAXONOMY AND PHYLOGENY **COURSE CODE: 19PMB4EC5C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine the methods of taxonomy	**K4**
CO2	Critique the levels of structural organization	**K4**
CO3	Evaluate the taxa and phylogenetic concepts	**K5**
CO4	Generalize the gene regulations and genetic map	**K6**
CO5	Compile & analyse phylogenetics	**K6**

COURSE TITLE: MICROBIAL BIOTECHNOLOGY, MOLECULAR BIOLOGY & MICROBIAL GENETICS- PRACTICALS **COURSE CODE: 19PMB4CC4P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the application of Immobilization	**K3**
CO2	Determine the Commercial production methods of Microbial Products	**K4**
CO3	Compare the genomic and plasmid DNA separation methods	**K5**
CO4	Expand the knowledge about PCR, Restriction digestion and ligation of DNA	**K6**
CO5	Critique knowledge about protein Separation method	**K6**

COURSE TITLE: PROJECT **COURSE CODE: 19PMB4PW**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the research design.	**K1**
CO2	Describe research problem.	**K2**
CO3	Classify collected data.	**K3**
CO4	Examine collected data and associate with statistical tool.	**K4**
CO5	Assess and publish papers in reputed research journals.	**K5**
CO6	Develop Proposals to apply for minor research projects.	**K6**

Signature Not Verified
Digitally Signed
Signed by: Sujatha.V
Designation: Principal
Reason: NAAC
Location: Tiruchirappalli, Tamil Nadu, India
Date: 30-Sep-2024 12:00:05

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2022-2023 Onwards)

DEPARTMENT OF MICROBIOLOGY

M. Sc – Microbiology

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	**LEARNING ENVIRONMENT:** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	**ACADEMIC EXCELLENCE:** To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	**EMPLOYABILITY:** To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY:** To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	**GREEN SUSTAINABILITY:** To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

CRITERION I **POs and COs**

PROGRAMME OUTCOMES (POs)

POs	Programme Outcome On completion of M. Sc Microbiology Programme, the students will be able to,
PO1	Scientific Management and Career Opportunities: Master the scientific and applied aspect of the subject for employment opportunities.
PO2	Explore Creativity and Intelligence: Employ novel ideas with conceptual thinking to secure self-discipline and independence to foster scientific attitude by exploration of Science.
PO3	Team Building and Scientific Temperament: Inculcate training, internships and team spirit with leadership skills through academic projects and transmit complex scientific and technical information and contribute to the scientific community.
PO4	Innovative Learning and Technological Advancement: Perceive research in the specialized areas and to engage in life-long learning to keep pace with emerging trends in academics, research and technology.
PO5	Personality Development with Social Responsibility: Achieve ethical, social and holistic values with social responsibility to develop a healthy life.

COURSE OUTCOMES (COs)

COURSE TITLE: ESSENTIALS OF MICROBIOLOGY **COURSE CODE: 22PMB1CC1**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Remember and understand the scope, history and basics of microbiology	**K1, K2**
CO2	Analyze the principles of Microscopy and able to understand the characteristics of different microbes	**K1, K2, K3**
CO3	Locate and classify and bacteria, fungi, algae and virus	**K2, K4**
CO4	Explain Microbial growth and recall methods of reproduction	**K1, K5**
CO5	Construct and revise cultivation and preservation methods of microbes	**K5, K6**

CRITERION I **POs and COs**

COURSE TITLE: BIOLOGICAL MACROMOLECULES **COURSE CODE: 22PMB1CC2**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Remember and understand the basic structure of cell and it's various components	**K1, K2**
CO2	Analyze and understand the basic concepts of enzyme and it's catalysis	**K2, K3**
CO3	Categorize the Various types of Macro molecules examine their structure, properties & Function	**K3, K4**
CO4	Explain the basic concepts of thermodynamics and list out the various types of transport mechanisms	**K4, K5**
CO5	Discuss the various metabolic pathways and interpret the ATP Production and regulation	**K5, K6**

COURSE TITLE: CLINICAL VIROLOGY **COURSE CODE: 22PMB1CC3**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Describe General Characters and Classification of viruses	**K1, K2, K3**
CO2	Aware different Diagnostic methods adopted for viruses	**K2, K3, K4**
CO3	Understand the replicative cycles of Viruses	**K2, K3, K4, K5**
CO4	Analyze the pathogenesis and symptoms of Viruses	**K3, K4, K5, K6**
CO5	Examine and Categorize different types of preventive measures Of Viruses	**K3, K4, K5, K6**

COURSE TITLE: ESSENTIALS OF MICROBIOLOGY, BIOLOGICAL MACROMOLECULES AND CLINICAL VIROLOGY PRACTICAL **COURSE CODE: 22PMB1CC1P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Learn and recall basic microbiological methods	**K1**
CO2	Understand fundamental techniques involving staining, Micrometry, sterilization, disinfection, culturing etc.	**K2**
CO3	Demonstrate various methods to study viruses and bacteria	**K3**
CO4	Evaluate and quantify the biological macromolecules	**K5**
CO5	Create and apply various standard operating procedures for handling microbes	**K6**

CRITERION I **POs and COs**

COURSE TITLE: BIOLOGICAL TECHNIQUES **COURSE CODE: 22PMB1DSE1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Describe and compare various instrumentation protocols.	**K1, K2**
CO2	Illustrate the working principles of biological techniques	**K3**
CO3	Analyze the results of biological techniques.	**K4**
CO4	Summarize the advantages of assorted techniques	**K6**
CO5	Formulate the applications of instrumentation biology.	**K6**

COURSE TITLE: ORGANIC FARMING **COURSE CODE: 22PMB1DSE1B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define and understand the origin and importance of organic farming	**K1, K2**
CO2	Analyze and apply the methods in Organic Crop Production	**K3, K4**
CO3	Determine and Explain the methodology practiced in organic farming	**K3, K4**
CO4	Evaluate and categorize various organic farming system and crop protection practices	**K4, K5**
CO5	Criticize and manage the commercialization of organic products	**K5, K6**

COURSE TITLE: MICROBIAL CYTOLOGY **COURSE CODE: 22PMB1DSE1C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Remember and analyze the main principles of cells theory	**K1, K4**
CO2	Outline view of cells	**K2**
CO3	Identify the Structural and functions of cells	**K3**
CO4	Analyze and compare the cell division and its functions	**K4, K5**
CO5	Discuss about the Microbial cell Communication	**K6**

CRITERION I **POs and COs**

COURSE TITLE: BACTERIOLOGY AND MYCOLOGY **COURSE CODE: 22PMB2CC4**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the principles of microbial growth kinetics and methods to measure growth	**K2**
CO2	Analyze the archaebacterial domain on the basis of cell content and phylogeny	**K3**
CO3	Categorize the cell wall composition for the classification of bacteria	**K4**
CO4	Determine Fungal Classification and culture media preparation	**K5**
CO5	Assess the criteria used for classification of fungi	**K6**

COURSE TITLE: IMMUNOLOGY AND IMMUNOTECHNOLOGY **COURSE CODE: 22PMB2CC5**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the basics of immunology	**K2**
CO2	Illustrate the hypersensitivity reaction	**K3**
CO3	Categorize auto immunity and auto immune disease	**K4**
CO4	Interpret transplantation and tumor immunology	**K5**
CO5	Discuss molecular immunology and immuno diagnosis	**K6**

COURSE TITLE: MICROBIAL METABOLISM **COURSE CODE: 22PMB2CCC1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define and understand the basic concepts of metabolism	**K1,K2**
CO2	Explain and analyze about the growth phases of Microbial populations	**K3, K4**
CO3	Analyze about Microbial respiration	**K3, K4**
CO4	Criticize about bacterial photosynthesis	**K5, K6**
CO5	Assess about microbial biosynthesis	**K5, K6**

COURSE TITLE: ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY COURSE CODE: 22PMB2CCC1B		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basic view of air Microorganisms	**K1**
CO2	Explain the Microbial association in water	**K2**
CO3	Discuss about water pollution and water quality	**K6**
CO4	Understand the production of Biofertilizer	**K4**
CO5	Discuss about Plant diseases & Control measures	**K6**

COURSE TITLE: MICROBIAL ECOLOGY COURSE CODE: 22PMB2CCC1C		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Examine basic concept of ecosystem	**K4**
CO2	Determine the microorganisms and their natural habitats	**K4**
CO3	Evaluate the environmental pollution	**K5**
CO4	Diagnose waste management system	**K5**
CO5	Extend the biodiversity and its conservation	**K6**

COURSE TITLE: BACTERIOLOGY, MYCOLOGY, IMMUNOLOGY AND IMMUNOTECHNOLOGY (P) COURSE CODE: 22PMB2CC2P		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Analyze the Growth nature of organisms	**K4**
CO2	Assess the staining techniques	**K5**
CO3	Evaluate on bacterial motility	**K5**
CO4	Determine ABO blood grouping	**K5**
CO5	Compiled view of immune techniques	**K6**

CRITERION I **POs and COs**

COURSE TITLE: BIOFERTILIZER TECHNOLOGY **COURSE CODE: 22PMB2DSE2A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain and state the concept of biofertilizers, characteristics, advantages	**K1, K5**
CO2	Perceive and analyze the knowledge about bacterial biofertilizer production methods	**K4, K5**
CO3	Elaborate and discuss the production methods of fungal biofertilizer	**K2, K6**
CO4	Discuss and summarize about the production and application of algal biofertilizer	**K2, K6**
CO5	Create and summarize the knowledge about biocontrol agents and its applications	**K5, K6**

COURSE TITLE: PUBLIC HEALTH MICROBIOLOGY **COURSE CODE: 22PMB2DSE2B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define and examine the basic ideas about microbial association	**K1,K4**
CO2	Diagnose and analyze various airborne disease	**K3,K4**
CO3	Determine the water borne diseases and its control	**K1,K4**
CO4	Evaluate and discuss about the role of microorganisms in food	**K3,K5**
CO5	Extend the diagnosis hospital acquired Infections	**K2,K6**

COURSE TITLE: MARINE MICROBIOLOGY **COURSE CODE: 22PMB2DSE2C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define and understand the marine microbes and kingdom concepts	**K1, K2**
CO2	Analyze and apply the role of microbes in seawater habitats	**K3, K4**
CO3	Determine and Explain the Biogeo chemical processes in marine systems	**K3, K4**
CO4	Evaluate and categorize various application of marine microbial products	**K4, K5**
CO5	Criticize and manage the Biodegradation methods for marine pollutants	**K5, K6**

CRITERION I **POs and COs**

COURSE TITLE: INDUSTRIAL MICROBIOLOGY **COURSE CODE: 19PMB3CC7**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	List the Concept and History of Strain development	**K1**
CO2	State the Fermentor and Fermentation media	**K2**
CO3	Explain the Fermentation Products	**K2**
CO4	Describe the Production of Pharmaeutical Products	**K2**
CO5	Prepare the Production and Purification Industrial Important Microbial Products.	**K3**

COURSE TITLE: CLINICAL MICROBIOLOGY **COURSE CODE: 19PMB3CC8**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Describe and Classify the various pathogens.	**K3**
CO2	Diagnose the various bacterial pathogens	**K4**
CO3	Examine and differentiate the various fungal infections	**K4**
CO4	Analyse various human viral diseases.	**K6**
CO5	Examine and Categorize different types of parasitic diseases	**K6**

COURSE TITLE: INDUSTRIAL MICROBIOLOGY AND CLINICAL MICROBIOLOGY PRACTICAL **COURSE CODE: 19PMB3CC3P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Organized view of Industrially important Microbes and their growth nature	K3
CO2	Critique knowledge about Production and Estimation of Microbial Products	K4
CO3	Calculate the Microbial Product recovery	K6
CO4	Explain the techniques involved in Clinical Specimen collection	K5
CO5	Discuss the Isolation and Identification of Pathogens from Clinical specimens	K6

CRITERION I **POs and COs**

COURSE TITLE: MICROBIOLOGY FOR COMPETITIVE EXAMINATIONS **COURSE CODE: 20PMB3EC3A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the taxonomy principles and concepts	**K5**
CO2	Understanding the basics of inheritance Biology	**K2**
CO3	Extend the Knowledge about microbes in Agriculture	**K2**
CO4	Understand the basic concepts of cell development and its impacts	**K5**
CO5	Expand the knowledge about Bio-nano-informatics	**K6**

COURSE TITLE: FOOD ADULTERATION **COURSE CODE: 19PMB3EC3B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the properties of Biomolecules	**K3**
CO2	Determine the common food contaminants	**K4**
CO3	Critique knowledge about microbial food poisoning	**K4**
CO4	Compare various regulations of food safety agencies	**K5**
CO5	Expand about food preservation methods	**K6**

COURSE TITLE: BIOMEDICAL LABORATORY TECHNOLOGY **COURSE CODE: 19PMB3EC3C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the laboratory safety measures.	**K3**
CO2	Determine the uses of laboratory equipments	**K4**
CO3	Critique knowledge about sample collection	**K4**
CO4	Critique thinking of reagent preparation	**K5**
CO5	Expand about organ function and infection	**K6**

CRITERION I **POs and COs**

COURSE TITLE: RECOMBINANT DNA TECHNOLOGY **COURSE CODE: 19PMB3EC4A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the steps in recombinant DNA/RNA modifying enzymes	**K2**
CO2	Infer the features of various types of gene cloning vectors	**K4**
CO3	Analyze the gene cloning strategies in recombinant DNA	**K4**
CO4	Explain the techniques involved in genetic engineering	**K5**
CO5	Discuss the problem solving aspect of recombinant technology	**K6**

COURSE TITLE: MICROBES IN SOLID WASTE MANAGEMENT **COURSE CODE: 19PMB3EC4B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the Types of Wastes	**K2**
CO2	Analyze the methods of different waste collection	**K4**
CO3	Classify the nuclear wastes	**K4**
CO4	Explain the techniques involved in biomedical wastes management	**K5**
CO5	Discuss the problem solving of hazardous wastes	**K6**

COURSE TITLE: MICROBIAL NANOTECHNOLOGY **COURSE CODE: 19PMB3EC4C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basics of bionanotechnology	**K1**
CO2	Acquire the knowledge about microbial nanotechnology	**K1**
CO3	Critique knowledge about characterization of nanoparticles	**K4**
CO4	Explain the application of nanoparticles	**K5**
CO5	Expand about merits and demerits of nanoparticles	**K6**

CRITERION I **POs and COs**

COURSE TITLE: MICROBIAL BIOTECHNOLOGY **COURSE CODE: 19PMB4CC9**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the primary and secondary screening of microbes.	**K4**
CO2	Determine the applications of microbes	**K4**
CO3	Explain about biocontrol agents and its mode of action	**K6**
CO4	Elaborate the industrial production and preservation techniques	**K6**
CO5	Expand about functions of IPR& Biosafety	**K6**

COURSE TITLE: MOLECULAR BIOLOGY AND MICROBIAL GENETICS **COURSE CODE: 19PMB4CC10**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the basics of molecular biology	**K2**
CO2	Analyze central dogma of molecular biology	**K4**
CO3	Interpret nucleotide sequence change and repair mechanism	**K4**
CO4	Explain the significance of vectors and bacterial genetics	**K5**
CO5	Discuss gene expression and transposons	**K6**

COURSE TITLE: BIOINFORMATICS AND BIOSTATISTICS **COURSE CODE: 19PMB4EC5A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand scope and popular databases of bioinformatics	**K4**
CO2	Explain sequence alignment methods	**K5**
CO3	Explain drug development using bioinformatics	**K5**
CO4	Compute the measures of central tendency	**K4**
CO5	Examine the various large sample testing of hypothesis	**K4**

CRITERION I **POs and COs**

COURSE TITLE: ENTREPRENEURIAL MICROBIOLOGY **COURSE CODE: 19PMB4EC5B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Outline study of Entrepreneurial Microbiology	**K1**
CO2	Explain the composting process & biofertilizer production	**K2**
CO3	Prepare and formulate microbial metabolites	**K2**
CO4	Compile on types of fermented foods	**K3**
CO5	Relate on various mushroom production	**K3**

COURSE TITLE: MOLECULAR TAXONOMY AND PHYLOGENY **COURSE CODE: 19PMB4EC5C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine the methods of taxonomy	**K4**
CO2	Critique the levels of structural organization	**K4**
CO3	Evaluate the taxa and phylogenetic concepts	**K5**
CO4	Generalize the gene regulations and genetic map	**K6**
CO5	Compile & analyse phylogenetics	**K6**

COURSE TITLE: MICROBIAL BIOTECHNOLOGY, MOLECULAR BIOLOGY & MICROBIAL GENETICS- PRACTICALS **COURSE CODE: 19PMB4CC4P**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the application of Immobilization	**K3**
CO2	Determine the Commercial production methods of Microbial Products	**K4**
CO3	Compare the genomic and plasmid DNA separation methods	**K5**
CO4	Expand the knowledge about PCR, Restriction digestion and ligation of DNA	**K6**
CO5	Critique knowledge about protein Separation method	**K6**

CRITERION I **POs and COs**

COURSE TITLE: PROJECT **COURSE CODE: 19PMB4PW**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the research design.	**K1**
CO2	Describe research problem.	**K2**
CO3	Classify collected data.	**K3**
CO4	Examine collected data and associate with statistical tool.	**K4**
CO5	Assess and publish papers in reputed research journals.	**K5**
CO6	Develop Proposals to apply for minor research projects.	**K6**

Signature Not Verified
Digitally Signed
Signed by: Sujatha.V
Designation: Principal
Reason: NAAC
Location: Tiruchirappalli, Tamil Nadu, India
Date: 30-Sep-2024 12:00:05

Key Indicator - 1.1 Curriculum Design and Development

1.1.1 Curricula developed and implemented have relevance to the local, regional, national and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes (COs) of the Programmes offered by the institution

Programme Outcomes (POs) and Course Outcomes (COs) – (2023-2024 Onwards)

DEPARTMENT OF MICROBIOLOGY

M. Sc – Microbiology

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	**LEARNING ENVIRONMENT:** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	**ACADEMIC EXCELLENCE:** To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	**EMPLOYABILITY:** To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY**: To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	**GREEN SUSTAINABILITY:** To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

PROGRAMME OUTCOMES (POs)

POs	Programme Outcome On completion of M. Sc Microbiology Programme, the students will be able to,
PO1	Scientific Management and Career Opportunities: Master the scientific and applied aspect of the subject for employment opportunities.
PO2	Explore Creativity and Intelligence: Employ novel ideas with conceptual thinking to secure self-discipline and independence to foster scientific attitude by exploration of Science.
PO3	Team Building and Scientific Temperament: Inculcate training, internships and team spirit with leadership skills through academic projects and transmit complex scientific and technical information and contribute to the scientific community.
PO4	Innovative Learning and Technological Advancement: Perceive research in the specialized areas and to engage in life-long learning to keep pace with emerging trends in academics, research and technology.
PO5	Personality Development with Social Responsibility: Achieve ethical, social and holistic values with social responsibility to develop a healthy life.

COURSE OUTCOMES (COs)

COURSE TITLE: GENERAL MICROBIOLOGY AND MICROBIAL DIVERSITY COURSE CODE: 23PMB1CC1		
CO Number	CO Statement On the successful completion of the course, students will be able to,	Knowledge Level
CO1	Define and understand the history and principles of Microscopy	K1, K2
CO2	Analyze and explain bacteria, fungi, algae, protozoa and virus	K3, K4
CO3	Determine and apply pure culture techniques and sterilizationmethods.	K3, K4
CO4	Evaluate and categorize microbial biodiversity and kingdomconcepts	K4, K5
CO5	Criticize and manage Extremophiles and conservation ofmicrobial diversity.	K5, K6

COURSE TITLE: BIOLOGICAL MACROMOLECULES COURSE CODE: 23PMB1CC2		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the structure and functions biological molecules.	**K1**
CO2	Recite the interrelationship between various biomolecules and consequences of any deviation from normal.	**K1**
CO3	Critique knowledge about the structure and functions of blood,hormones and phytohormones.	**K4**
CO4	Generalize the basic idea of metabolic regulators' characteristic features.	**K6**
CO5	Expand the interrelationships among biological energy, functions and health.	**K6**

COURSE TITLE: MOLECULAR BIOLOGY AND MICROBIAL GENETICS COURSE CODE: 23PMB1CC3		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain about molecular genetics of prokaryotes.	**K2**
CO2	Illustrate transcription and translation.	**K3**
CO3	Summarize about organization of gene in prokaryotes andeukaryotes.	**K4**
CO4	Illustrate fundamental details on gene transfer mechanisms.	**K5**
CO5	Discuss about the processes behind mutations and other geneticchanges.	**K6**

COURSE TITLE: GENERAL MICROBIOLOGY AND MICROBIAL DIVERSITY, BIOLOGICAL MACROMOLECULES, MOLECULAR BIOLOGY AND MICROBIAL GENETICS (P) COURSE CODE: 23PMB1CC1P		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand fundamental techniques of microscopy, staining and sterilization.	**K1, K2**
CO2	Illustrate the preparation of bacterial growth media, plating and growth measurement techniques.	**K2, K3**
CO3	Analyze and quantify the biological macromolecules.	**K2, K3, K4**
CO4	Interpret DNA extraction and gene transfer mechanisms, analyzeand identify by gel electrophoresis.	**K3, K4, K5**
CO5	Discuss isolation of mutants and separation of proteins.	**K4, K5, K6**

CRITERION I **POs and COs**

COURSE TITLE: BIOLOGICAL INSTRUMENTATION **COURSE CODE: 23PMB1DSE1A**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the principles and working mechanisms of laboratory instruments.	**K1, K2**
CO2	Discuss chromatography techniques and molecular biologytechniques.	**K3, K4**
CO3	Illustrate molecular techniques in biological applications.	**K4, K5**
CO4	Acquire knowledge on spectroscopic techniques	**K5, K6**
CO5	Demonstrate the use of radio isotopes in various techniques.	**K5, K6**

COURSE TITLE: MICROALGALTECHNOLOGY **COURSE CODE: 23PMB1DSE1B**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define and understand the different groups of algae	**K1, K2**
CO2	Analyze and explain about the cultivation and harvesting of algae	**K3, K4**
CO3	Determine and apply commercial applications of various algal products	**K3, K4**
CO4	Evaluate and categorize microalgae for environmental applications	**K4, K5**
CO5	Criticize and manage microalgae as alternate fuels	**K5, K6**

COURSE TITLE: MOLECULAR TAXONOMYAND PHYLOGENY **COURSE CODE: 23PMB1DSE1C**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define and Understand the basics of taxonomy	**K1, K2**
CO2	Analyze the Chemotaxonomy	**K3, K4**
CO3	Determine and Explain the DNA hybridization	**K3, K4**
CO4	Evaluate and categorize the Sequence alignment	**K4, K5**
CO5	Criticize and manage Sequence alignment	**K5, K6**

COURSE TITLE: BACTERIOLOGY AND MYCOLOGY COURSE CODE: 23PMB2CC4		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Determine the host – parasite relationship	**K2, K3, K4**
CO2	Diagnose the various bacterial pathogens	**K3, K4**
CO3	Illustrate the *Chlamydia trachomatis*	**K4, K5**
CO4	Describe and Classify the various fungi and its Characterization	**K5, K6**
CO5	Discuss the fungal diseases	**K1, K6**

COURSE TITLE: IMMUNOLOGY AND IMMUNOTECHNOLOGY COURSE CODE: 23PMB2CC5		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the basics of immunology	**K2**
CO2	Illustrate the hypersensitivity reaction	**K3**
CO3	Categorize autoimmunity and autoimmune disease	**K4**
CO4	Interpret trans plantation and tumor immunology	**K5**
CO5	Discuss molecular immunology and immune diagnosis	**K6**

COURSE TITLE: MICROBIAL METABOLISM COURSE CODE: 23PMB2CCC1A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define and understand the basic concepts of metabolism	**K1,K2**
CO2	Explain and analyze about the growth phases of Microbialpopulations	**K3, K4**
CO3	Analyze about Microbial respiration	**K3, K4**
CO4	Criticize about bacterial photosynthesis	**K5, K6**
CO5	Assess about microbial biosynthesis	**K5, K6**

COURSE TITLE: MICROBIAL PHYSIOLOGY COURSE CODE: 23PMB2CCC1B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	To impart among the learners the fundamental principles ofmicrobial physiology	**K1, K2, K4**
CO2	To provide the role / functions of various enzymes of bacterial cell.	**K1, K2, K3**
CO3	To understand the route of a cell to metabolize carbohydrate,protein and fatty acids.	**K1, K2, K3**
CO4	To highlight the microbial enzymes' profiles and their activity.	**K1, K2, K4**
CO5	Attain insight about aerobic respiration and Photosynthesis ofGreen, Purple bacteria and Cyanobacteria.	**K1, K2, K4**

COURSE TITLE: MICROBIAL GROWTH AND NUTRITION COURSE CODE: 23PMB2CCC1C		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Examine the properties of a good culture medium.	**K3,K4**
CO2	Determine the microorganisms of Pure culture methods	**K4,K5**
CO3	Evaluate the nutritional categories of microorganismson the basis of carbon and energy source	**K4, K5**
CO4	Illustrate the microbial Transport	**K5,K6**
CO5	Demonstrate the microbial Growth	**K6,K5**

COURSE TITLE: BACTERIOLOGY, MYCOLOGY, IMMUNOLOGYAND IMMUNOTECHNOLOGY(P) COURSE CODE: 23PMB2CC2P		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Analyze the Growth nature of organisms	**K4**
CO2	Assess the staining techniques	**K5**
CO3	Evaluate on bacterial identification	**K5**
CO4	Determine ABO blood grouping	**K5**
CO5	Compiled view of immune techniques	**K6**

COURSE TITLE: MEDICAL MICROBIOLOGY COURSE CODE: 23PMB2DSE2A		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Remember the basics of medical microbiologyand Epidemiology	**K1**
CO2	Understand various types of infection	**K2**
CO3	Apply to know host parasite relationship and virulence factors associated with the pathogen.	**K3**
CO4	Analyze diseases caused by bacterial and protozoa	**K4**
CO5	Evaluate on various viral and fungal diseases	**K5**

COURSE TITLE: PUBLIC HEALTH MICROBIOLOGY COURSE CODE: 23PMB2DSE2B		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define and examine the basic ideas about microbial association	**K1, K4**
CO2	Diagnose and analyze various airborne disease	**K3, K4**
CO3	Determine the water borne diseases and its control	**K1, K4**
CO4	Evaluate and discuss about the role of microorganisms in food	**K3, K5**
CO5	Extend the diagnosis hospital acquired Infections	**K2, K6**

COURSE TITLE: MEDICAL PARASITOLOGY COURSE CODE: 23PMB2DSE2C		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define and understand diagnostic techniques in parasitology	**K1, K2**
CO2	Analyze and explain clinical significance of *Entamoebahistolytica*	**K3, K4**
CO3	Determine and apply the treatment of *Leishmania donovani*	**K3, K4**
CO4	Evaluate and categorize the *Plasmodium* spp.	**K4, K5**
CO5	Criticize and manage *Taenia solium*	**K5, K6**

COURSE TITLE: MOLECULAR BIOLOGY AND MICROBIAL GENETICS COURSE CODE: 22PMB3CC6		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define and Understand the basics of molecular biology	**K1, K2**
CO2	Analyze and apply central dogma of molecular biology	**K3, K4**
CO3	Determine and Explain the nucleotide sequence change and repair mechanism	**K3, K4**
CO4	Evaluate and categorize the significance of vectors and bacterial genetics	**K4, K5**
CO5	Criticize and manage gene expression and transposons	**K5, K6**

COURSE TITLE: FOOD AND DAIRY MICROBIOLOGY COURSE CODE: 22PMB3CC7		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define and Understand the basics of food microbiology	**K1, K2**
CO2	Analyze the food borne diseases	**K3, K4**
CO3	Determine and Explain the food contamination and preservation	**K3, K4**
CO4	Evaluate and categorize the microbial products	**K4, K5**
CO5	Criticize and manage quality control and assurance of products	**K5, K6**

COURSE TITLE: MICROBIAL GENE TECHNOLOGY COURSE CODE: 22PMB3CCC2B		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the gene analysis and Techniques	**K2,K3**
CO2	Illustrate Restriction enzymes	**K3,K4**
CO3	Summarize the DNA sequence analysis	**K4,K5**
CO4	Interpret Nature of vectors	**K5,K6**
CO5	Discuss about application of gene	**K5,K6**

COURSE TITLE: BIOSAFETY AND INTELLECTUAL PROPERTY RIGHTS COURSE CODE: 22PMB3CCC2C		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Describe fundamentals of biosafety	**K1,K2**
CO2	Illustrate guidelines of biosafety	**K2,K3**
CO3	Explain importance of Intellectual rights	**K3,K4**
CO4	Interpret basics of patents and concept of prior art	**K4,K5**
CO5	Discuss patent filling code of conduct	**K5,K6**

COURSE TITLE: MOLECULAR BIOLOGY AND MICROBIAL GENETICS, FOOD AND DAIRY MICROBIOLOGY (P) COURSE CODE: 22PMB3CC3P		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Predict the application of Immobilization	**K3**
CO2	Determine the Commercial production methods of Microbial Products	**K4**
CO3	Compare the genomic and plasmid DNA separation methods	**K5**
CO4	Expand the knowledge about PCR, Restriction digestion and ligation of DNA	**K6**
CO5	Critique knowledge about microbial isolation from spoiled food	**K6**

COURSE TITLE: MICROBIOLOGY FOR COMPETITIVE EXAMINATION COURSE CODE: 22PMB3DSE3A		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the taxonomy principles and concepts	**K1, K5**
CO2	Understanding the basics of inheritance biology	**K2,K3**
CO3	Extend the Knowledge about microbes in Agriculture	**K4,K5**
CO4	Understand the basic concepts of cell development and its impacts	**K5,K6**
CO5	Expand the knowledge about Bio-Nano-informatics	**K5,K6**

COURSE TITLE: FOOD ADULTERATION COURSE CODE: 22PMB3DSE3B		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basics of Food adulteration	**K1,K2**
CO2	Recite the knowledge about Food Safety and Standards	**K1,K2**
CO3	Critique knowledge about Standardization of Foods	**K4,K5**
CO4	Generalize the basic idea of Food additives	**K5,K6**
CO5	Expand the role of Quality control	**K5,K6**

COURSE TITLE: Biomedical Laboratory Technology COURSE CODE: 22PMB3DSE3C		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand the basic human biology	**K1, K2**
CO2	Interpret the features of basic equipment's of laboratory	**K2, K3**
CO3	Analyze the metabolism and classification of biomolecules	**K3, K4**
CO4	Interpret the significance of haematology and blood bank	**K4, K5**
CO5	Discuss the significance of microbiology, clinical pathology and histopathology	**K5, K6**

COURSE TITLE: FOOD QUALITY TESTING COURSE CODE: 22PMB3GEC1		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Explain the basics of food quality	**K2, K3**
CO2	Illustrate the nutritional value of foods	**K3, K4**
CO3	Summarize the Concepts of quality management	**K4, K5**
CO4	Interpret Food Quality Laws and Regulations	**K5, K6**
CO5	Discuss about HACCP system	**K5, K6**

COURSE TITLE: BIOPROCESS TECHNOLOGY COURSE CODE: 22PMB4CC8		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	List the Concept and History of Strain development	**K1, K2**
CO2	State the Fermentor and Fermentation media	**K3, K4**
CO3	Explain the Fermentation Products	**K3, K4**
CO4	Describe the Production of Pharmaeutical Products	**K4, K5**
CO5	Prepare the Production and Purification Industrial Important Microbial Products.	**K5, K6**

COURSE TITLE: BIOINFORMATICS AND BIOSTATISTICS COURSE CODE: 22PMB4CCC3A		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand scope and popular databases of bioinformatics	**K2, K3**
CO2	Explain sequence alignment methods	**K4, K5**
CO3	Explain drug development using bioinformatics	**K5, K6**
CO4	Compute the measures of central tendency	**K4, K6**
CO5	Examine the various large sample testing of hypothesis	**K4, K5**

COURSE TITLE: COMPUTATIONAL BIOLOGY COURSE CODE: 22PMB4CCC3B		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Understand scope and popular sequence of statistics	**K1, K2**
CO2	Explain multiple sequence alignment methods	**K3, K4**
CO3	Explain protein 3-D structure alignment	**K3, K4**
CO4	Compute neural network concepts	**K4, K5**
CO5	Examine the analysis and prediction of regulatory regions	**K5, K6**

COURSE TITLE: MICROBIAL NANOTECHNOLOGY COURSE CODE: 22PMB4CCC3C		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Apply the basics of Nanoscience, able to differentiate particles at macro, micro and nano level	**K4, K5**
CO2	Know how to synthesize nano particles on a laboratory scale	**K2, K5**
CO3	Critique knowledge about characterization of nanoparticles	**K3, K4**
CO4	Explain the application of nanoparticles	**K3, K5**
CO5	Expand about merits and demerits of nanoparticles	**K5, K6**

COURSE TITLE: BIOPROCESS TECHNOLOGY (P) COURSE CODE: 22PMB4CC4P		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Illustrate media preparation, sterilization	**K2**
CO2	Describe about the Ethanol production	**K2**
CO3	Organized view of industrially important products from microbes	**K3**
CO4	To isolate the industrially important microorganisms.	**K4**
CO5	Explain about the isolation of microbes from foods.	**K5**

COURSE TITLE: ENTREPRENEURIAL MICROBIOLOGY COURSE CODE: 22PMB4GEC2		
CO Number	**CO Statement On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the basics of entrepreneur development	**K1**
CO2	Recite the knowledge about fermentation products	**K1**
CO3	Critique knowledge about mushroom cultivation	**K4**
CO4	Generalize the basic idea of patents	**K6**
CO5	Expand the role of brewing	**K6**

CRITERION I **POs and COs**

COURSE TITLE: PROJECT **COURSE CODE: 22PMB4PW**		
CO Number	**CO Statement** **On the successful completion of the course, students will be able to,**	**Knowledge Level**
CO1	Define the research design.	**K1**
CO2	Describe research problem.	**K2**
CO3	Classify collected data.	**K3**
CO4	Examine collected data and associate with statistical tool.	**K4**
CO5	Assess and publish papers in reputed research journals.	**K5**
CO6	Develop Proposals to apply for minor research projects.	**K6**

Signature Not Verified
Digitally Signed
Signed by: Sujatha.V
Designation: Principal
Reason: NAAC
Location: Tiruchirappalli, Tamil Nadu, India
Date: 30-Sep-2024 12:00:06