# छत्रपति शाहू जी महाराज विश्वविद्यालय, कानपुर



### CHHATRAPATI SHAHU JI MAHRAJ UNIVERSITY, KANPUR

(पूर्ववर्ती कानपुर विश्वविद्यालय कानपुर) Formerly Kanpur University, Kanpur – 208024

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## **Programme Outcomes & Course Outcomes**

Under the Criteria - I (Curriculum Design and Development) Key Indicator - 1.1 In

Matric No. – 1.1.1

## **B.Sc. Medical Microbiology**

(Registrar) C.S.J.M.University REGISTRA C.S.J.M. UNIVERSU

inator Internal Quality Assurance Cell

CSJM University, Kanpur

#### **B.Sc. in Medical Microbiology**

#### Program Specific Outcome

Microbiology B.Sc. Microbiology is a branch of science that studies "life" taking an example of microorganisms such as bacteria, protozoa, algae, fungi, bacteria, viruses, etc. These studies integrate cytology, physiology, ecology, genetics and molecular biology, evolution, taxonomy and systematics with a focus on microorganisms; in particular bacteria. The relevance and applications of these microorganisms to the surrounding environment including human life and mother nature becomes part of this branch. Since inception of this branch of science, microbiology has remained a field of actively research and ever expanding in all possible directions; broadly categorized as pure and applied science. Different branches of pure microbiology based on taxonomy are bacteriology, mycology, protozoology and parasitology, phycology and virology; with considerable overlap between these specific branches over each other and also with other disciplines of life sciences, like biochemistry, botany, zoology, cell biology, biotechnology, nanotechnology, bioinformatics, etc. Areas in the applied microbial sciences can be identified as: medical, pharmaceutical, industrial. Knowledge of different aspects of microbiology has become crucial and indispensable to everyone in the society. Study of microbes has become an integral part of education and human progress. Building a foundation and a sound knowledge-base of microbiological principles among the future citizens of the country will lead to an educated, intellectual and scientifically advanced society. Microbiological tools have been extensively used to study different life processes and are cutting edge technologies. There is a continual demand for microbiologists in the work force – education, industry and research. Career opportunities for the graduate students are available in manufacturing industry and research institutes at technical level. Most of the science students aim at professional courses, particularly leading to studies in engineering. Comparatively less number of students opts for degrees in biosciences. For several years now, the first preference of students desiring to enter the field of life sciences has been microbiology, and for last 2 to 3 years it has shifted partly to biotechnology courses. Both these disciplines viz. Microbiology and biotechnology deal with overlapping interests. Microbial sciences focus more on study of the microbial world. The main theme of teaching these courses, however, remains the same i.e. Application of basic principles of life science to develop into technology. Modern biology combines the principles of chemistry and biological sciences (molecular and cellular biology, genetics, and immunology) with technological disciplines (engineering, computer science) to produce goods and services and for environmental management.

Human health – includes pathogenic micro-organisms (bacterial, viral, protozoan and Fungal), therapeutics and pharmaceutical approach towards diseases, diagnostics, vaccine developments, epidemiological characterization of diseases, gene therapy, etc. Agriculture. Research in life-sciences – includes research tools like immunology and molecular biology, developmental biology, evolution, stem cell research, etc. To enrich students' knowledge and train them in the above mentioned areas; we feel certain topics in the present syllabus need to be supplemented and strengthened by inclusion of few additional topics. Areas that need to be introduced in syllabi have been identified as: identification of bacteria · possible utilization of microbial population from extreme environments In addition, we feel that the students should be well acquainted with research methodology which includes different skill developments in scientific

Students are expected to demonstrate proficiency in these areas in order to satisfactorily complete the course. In addition, the extent of a student's mastery of these objectives, will help guide the course evaluation and grade.

The student will be able to identify common infectious agents and the diseases that they cause. Knowledge of the pathogenesis of diseases, interventions for effective treatment, and mechanisms of health maintenance to prevent disease.

The student will be able to evaluate methods used to identify infectious agents in the clinical microbiology lab.

Knowledge of the pathogenesis of diseases, interventions for effective treatment, and mechanisms of health maintenance to prevent disease.

The student will be able to recall microbial physiology including metabolism, regulation and replication.

Knowledge of the pathogenesis of diseases, interventions for effective treatment, and mechanisms of health maintenance to prevent disease

The student will be able to explain general and specific mechanisms by which an infectious agent causes disease.

Knowledge of the pathogenesis of diseases, interventions for effective treatment, and mechanisms of health maintenance to prevent disease.

The student will be able to recognize and diagnose common infectious diseases from the clinical presentation and associated microbiology.

The student will be able to describe the epidemiology of infectious agents including how infectious diseases are transmitted.

The student will be able to assess treatment strategies including the appropriate use of antimicrobial agents and common mechanisms of antimicrobial action and resistance.

The student will be able to explain interventions employed to prevent infectious diseases including infection control measure and vaccines.

#### Program Specific Outcome -

Microbiology B.Sc. Microbiology is a branch of science that studies "life" taking an example of microorganisms such as bacteria, protozoa, algae, fungi, bacteria, viruses, etc. These studies integrate cytology, physiology, ecology, genetics and molecular biology, evolution, taxonomy and systematics with a focus on microorganisms; in particular bacteria. The relevance and applications of these microorganisms to the surrounding environment including human life and mother nature becomes part of this branch. Since inception of this branch of science, microbiology has remained a field of actively research and ever expanding in all possible directions; broadly categorized as pure and applied science. Different branches of pure microbiology based on taxonomy are bacteriology, mycology, protozoology and parasitology, phycology and virology; with considerable overlap between these specific branches over each other and also with other disciplines of life sciences, like biochemistry, botany, zoology, cell biology, biotechnology, nanotechnology, bioinformatics, etc. Areas in the applied microbial sciences can be identified as: medical, pharmaceutical, industrial (fermentation, pollution control), air, water, food and dairy, agriculture (plant pathology and soil microbiology), veterinary, environmental (ecology, geomicrobiology); and the technological aspects of these areas. Knowledge of different aspects of microbiology has become crucial and indispensable to everyone in the society. Study of microbes has become an integral part of education and human progress. Building a foundation and a sound knowledge-base of microbiological principles among the future citizens of the country will lead to an educated, intellectual and scientifically advanced society. Microbiological tools have been extensively used to study different life processes and are cutting edge technologies. There is a continual demand for microbiologists in the work force – education, industry and research. Career opportunities for the graduate students are available in manufacturing industry and research institutes at technical level. M.Sc. Overall picture of student trends (before undergraduate studies) in selecting courses is very typical; most of the science students aim at professional courses, particularly leading to studies in engineering. Comparatively less number of students opts for degrees in biosciences. For several years now, the first preference of students desiring to enter the field of life sciences has been microbiology, and for last 2 to 3 years it has shifted partly to biotechnology courses. Both these disciplines viz. Microbiology and biotechnology deal with overlapping interests. Microbial sciences focus more on study of the microbial world (this limitation needs to be corrected!) While biotechnology focuses more on application of mammalian systems. The main theme of teaching these courses, however, remains the same i.e. Application of basic principles of life science to develop into technology. Modern biology combines the principles of chemistry and biological sciences (molecular and cellular biology, genetics, and immunology) with technological disciplines (engineering, computer science) to produce goods and services and for environmental management. Tools of molecular biology play an important role in preparation of an engineered clone, a recombinant or a genetically manipulated organism (gmo). The board of studies in microbiology has identified the following thrust areas and prospective plans for syllabi reforms at postgraduate level: Microbial technology - includes application of bacteria, fungi, protozoa and viruses intraditional (food, dairy, wine, antibiotics, fermentation, etc.) And biotechnological industries. Human health – includes pathogenic micro-organisms (bacterial, viral, protozoan and Fungal), therapeutics and pharmaceutical approach towards diseases, diagnostics, vaccine developments, epidemiological characterization of diseases, gene therapy, etc. Agriculture includes biofertilizers and biocontrol, ecology and geomicrobiology. Environment - includes cleaner processes that produce less waste and use less energy and water in such industrial sectors as chemicals, pulp and paper, textiles and dyes, food, energy, and metals and minerals, harnessing microbial utilities avoiding the use of caustic chemicals, bioremediation and bioprospecting. Microbial diversity - includes collecting information of diversity, exploration and utilization of diversity to identify and harvest biomolecules for human health improvisation, microorganisms from extreme environments, archeabacteria, etc. Research in life-sciences – includes research tools like immunology and molecular biology, developmental biology, evolution, stem cell research, etc. To enrich students' knowledge and train them in the above mentioned areas; we feel certain topics in the present syllabus need to be supplemented and strengthened by inclusion of few additional topics. Areas that need to

be introduced in syllabi have been identified as:  $\cdot$  eukaryotic cellular organization  $\cdot$  eukaryotic gene expression e.g. Yeast genetics  $\cdot$  determinants of microbial pathogenecity  $\cdot$  immunopathology, immunopharmacology and cancer biology  $\cdot$  protein stability, conformation and folding  $\cdot$  over expression of recombinant proteins  $\cdot$  biocontrol  $\cdot$  bioinformatics  $\cdot$  molecular tools for characterization, identification of bacteria  $\cdot$  possible utilization of microbial population from extreme environments In addition, we feel that the students should be well acquainted with research methodology which includes different skill developments in scientific writing, data handling and processing, development of research ideas and planning / designing of research projects. The skill sets thus evolved will help the students in academic and applied research.

#### **PROGRAM OUTCOME**

#### Medical Microbiology

The following are the learning outcomes : Medical Microbiology course.

Students are expected to demonstrate proficiency in these areas in order to satisfactorily complete the course. In addition, the extent of a student's mastery of these objectives, will help guide the course evaluation and grade.

Objective	Mapped UCI School of Medicine Program Outcome		Sub Competency Core Competency
The student will be able to identify common infectious agents and the diseases that they cause.	A-2. Knowledge of the pathogenesis of diseases, interventions for effective treatment, and mechanisms of health maintenance to prevent disease	Disease Pathogenesis and Treatment	Knowledgeable
The student will be able to evaluate methods used to identify infectious agents in the clinical microbiology lab.	A-2. Knowledge of the pathogenesis of diseases, interventions for effective treatment, and mechanisms of health maintenance to prevent disease	Disease Pathogenesis and Treatment	Knowledgeable
The student will be able to recall microbial physiology including metabolism, regulation and replication.	A-2. Knowledge of the pathogenesis of diseases, interventions for effective treatment, and mechanisms of health maintenance to prevent disease	Disease Pathogenesis and Treatment	Knowledgeable
The student will be able to explain general and specific mechanisms by which an infectious agent causes disease.	A-2. Knowledge of the pathogenesis of diseases, interventions for effective treatment, and	Disease Pathogenesis and Treatment	Knowledgeable

	mechanisms of health maintenance to prevent disease		
The student will be able to recognize and diagnose common infectious diseases from the clinical presentation and associated microbiology.	B-3. The ability to articulate a cogent, accurate assessment and plan, and problem list, using diagnostic clinical reasoning skills in all the major disciplines	Patient Management	Skillful

The student will be able to describe the epidemiology of infectious agents including how infectious diseases are transmitted.	A-4. Knowledge of population health, epidemiology principles and the scientific basis of research methods relevant to healthcare	Population Health and Epidemiology	Knowledgeable
The student will be able to assess treatment strategies including the appropriate use of antimicrobial agents and common mechanisms of antimicrobial action and resistance.	<ul> <li>A-2. Knowledge of the pathogenesis of diseases, interventions for effective treatment, and mechanisms of health maintainence to prevent disease</li> <li>B-3. The ability to articulate a cogent, accurate assessment and plan, and problem list, using diagnostic clinical reasoning skills in all the major disciplines</li> </ul>	Disease Pathogenesis and Treatment Patient Management	Knowledgeable Skillful

The student will be able to explain interventions employed to prevent infectious diseases including infection control measure and vaccines	B-5. The ability to practice effective preventive medicine by identifying,	Patient Management	Skillful Knowledgebale
	addressing and advocating for strategies to maintain health	Population	
	and	Health and	
	well-being, to identify and treat	Epidemiology	
	disease early where appropriate and to advise on lifestyle practices A-4.		
	Knowledge of population health, epidemiology principles and the scientific basis of research methods relevant to		
	healthcare		

### B.Sc. in Medical Microbiology IST YEAR HUMAN ANATOMY AND PHYSIOLOGY (BMM 101)

#### Course Outcomes

- Students will be able to learn the terminology of the subject.
- To Provide basic knowledge of cells, tissues, blood and to understand anatomy and physiology of human body.
- This subject will develop an understanding of the structure and function of organs and organ systems in normal human body.
- To provide knowledge about terminology and comprehensive knowledge of Human Anatomy & Physiology.

### GENERAL PATHOLOGY AND GENERAL MICROBIOLOGY (BMM 102) Course Outcomes:

To provide knowledge of bacteria, Sterilization etc.

## BASICS OF BIOCHEMISTRY INSTRUMENTS AND REAGENTS (BMM 103) Course Outcome:

- To provide general insight and basic knowledge of basics of biochemistry.
- The students will be given the basic of knowledge of chemistry and metabolism of various metabolites.

### QUALITY CONTROL AND BIOSTATICS (BMM 104)

#### Course Outcome:

• To train students in both theoretical and practical in the field of medical

biochemistry.

### B.Sc. in Medical Microbiology II YEAR

### HEMATOLOGY, IMMUNOLOGY AND BLOOD TRANSFUSION (BMM 201) Course Outcomes:

- To prepare the students for understanding of composition of blood.
- Students will learn basic haematoogical techniques. Students must be able to collect, preserve and process blood samples.
  - Students will be able to perform routine investigations in clinical hematology laboratories.

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### SYSTEMIC BACTERIOLOGY (BMM 202)

#### **Course Outcomes:**

- To provide information about the different type of bacterial culture procedures and test used for identification of medically important bacteria.
  - To identify the indications for basic procedures, culture media and their

preparations.

#### PARASITOLOGY (BMM 203)

#### **Course Outcomes :**

• To provide brief knowledge of parasites involved in human infections.

• To understand the life cycle and lab diagnosis of various important human parasites.

#### CLINICAL BIOCHEMISTRY (BMM 204)

#### Course Outcomes

- To identify the indications for basic procedures and perform them in appropriate manner.
- Subject will provide complete procedural knowledge used in Clinical Biochemistry.

### B.Sc. in Medical Microbiology III YEAR MYCOLOGY (BMM 301)

#### Course Outcomes:

• To provide brief introduction of general characteristics of medically important

fungi.

• To provide laboratory diagnosis of various medically important fungi. To provide complete procedural investigation procedures of fungi causing human diseases

#### APPLIED MICROBIOLOGY (BMM 302)

#### Course Outcomes:

- 1. Urinary tract infections
- 2. Nosocomial infections/Health Care Associated Infections
- 3. Pyrexia of unknown origin
- 4. Immunization

#### AUTOMATION IN MEDICAL MICROBIOLOGY (BMM 303)

#### **Course Outcomes:**

• To provide brief knowledge (both theoretical and practical) about handling of diagnostic instruments.

• To make aware to students about latest technology used for various investigations.