PRAVARA INSTITUTE OF MEDICAL SCIENCES
(DEEMED TO BE UNIVERSITY)
Loni, Tal. Rahata, Dist. Ahmednagar 413736
NAAC Re-accrediated with 'A' Grade

SYLLABUS

UG Programme- MICROBIOLOGY

MBBS- IInd year

(Competency Based Undergraduate Curriculum will be implemented from August 2019, i.e. MBBS batch admitted for first year in 2019)

Course Code	**:**	**Theory Paper I**	**- MU 205**
		Theory Paper II	**- MU 206**
Teaching Hours	**:**		**190 hours**

1. GOALS

The broad goal of the teaching of undergraduate students in Microbiology is to provide an understanding of the natural history of infectious disease in order to deal with the etiology, pathogenesis, laboratory diagnosis, treatment and control of infections in thecommunity.

2. OBJECTIVES

Competencies: The undergraduate learnerdemonstrate:

1. Understanding of role of microbial agents in health anddisease
2. Understanding of the immunological mechanisms in health anddisease
3. Ability to correlate the natural history, mechanisms and clinical manifestationsof infectious diseases as they relate to the properties of microbialagents
4. Knowledge of the principles and application of infection controlmeasures
5. An understanding of the basis of choice of laboratory diagnostic tests and their interpretation, antimicrobial therapy, control and prevention of infectiousdiseases.

INTEGRATION

The teaching should be aligned and integrated horizontally and vertically in organ systems with emphasis on host-microbe-environment interactions and their alterations in disease and clinical correlations so as to provide an overall understanding of the etiological agents, their laboratory diagnosis and prevention .

3. MINIMUM TEACHINGHOURS

NMC No	Specific Learning Objective	Number of competencies	Lecture	Tutorial /SGD	Practical	SDL
MI 1	General Microbiology and Immunity	11	16	8	15	3
MI 2	CVS and Blood	7	9	9	5	1
MI 3	Gastrointestinal and hepatobiliary system	8	10	4	5	0
MI 4	Musculoskeletal system skin and soft tissue infections	3	10	3	5	2
MI 5	Central NervousSystem infections	3	6	7	3	1
MI 6	Respiratory tract infections	3	6	9	7	1
MI 7	Genitourinary & Sexually transmitted infections	3	5	2	4	1
MI 8	Zoonotic diseasesandmiscellaneous	16	11	13	11	1
	TOTAL	**54**	**73**	**55**	**55**	**10**
	CBME Requirement		**70**	**110**		**10**

LEARNING OBJECTIVES

Learning objectives are derived as per the competency given in NMC, CBME manual.

The following instructions may be followed

Topics are numbed as per NMC like MI 1,MI 2, MI 3…..MI 8

Under each topic competency are numbered as per NMC,MI 1.1,MI 1.2 ….MI 8.16

Under each competency sub competencies are numbered as MI 1.1.1.MI 1.1.2……..

4. SYLLABUS

TOPIC: GENERAL BACTERIOLOGY & IMMUNOLOGY

(MI 1.1-1.11)
No of competencies–11
No of procedures requiring certification – 1

MI 1.1 Describe the different causative agents of Infectious diseases, the methods used in their detection, and discuss the role of microbes in health and disease

MI 1.1.1 Introduction to Infectious diseases

- Define: Health, Disease, infectious agents, commensalism, parasite, pathogen andopportunisticpathogen.
- Classify types of infections, Describe chain ofinfection
- Enumerate various types of medically important micro-organisms - bacteria, viruses, parasites,fungi
- Differentiate between pathogen, commensals, andsaprophyte.

MI 1.1.2 Isolation & identification of bacteria

- Describe the classification & morphology of bacteria.
- Describe general pathogenesis and general lab diagnosis of bacterial infections
- Define & classify culture media, applications of **culture media**
- List out and describe different **culture methods**
- Interpretation of various biochemical reactions

MI 1.1.3 Introduction to virology

- Describe the classification & morphology ofvirus
- Describe general pathogenesis and general lab diagnosis of viralinfections

MI 1.1.4 Introduction to mycology

- Describe the classification & morphology of fungi. Describe general pathogenesis and general lab diagnosis of fungalinfections.

MI 1.1.5 Introduction to parasitology

- Describe the classification, morphology ofparasites.
- Describe general pathogenesis and general lab diagnosis of parasitic infections

MI 1.2 Perform and identify the different causative agents of Infectious diseases by Gram Stain, ZN stain and stool routine microscopy

MI 1.3 Describe the **epidemiological basis** of common infectious diseases

- Define: Epidemiology, Describe the various epidemiological patterns of infectious disease.

- Discuss the various microbial factors contributing todisease.
- Discuss the various sources and reservoirs of infections.
- Describe the various modes of transmission ofinfections.

MI 1.4 Classify and describe the different methods of **sterilization and disinfection**. Discuss the application of the different methods in the laboratory, in clinical and surgical practice

MI 1.4.1 Define: Sterilization, disinfection, asepsis, antiseptics, and decontamination.

- Classify & describe various methods of sterilization methods
- Discuss various methods ofdisinfection
- List out Testing of disinfectants. Discuss the application of the different methods in clinical and surgicalpractice.

MI 1.5 Choose the most appropriate method of sterilization and disinfection to be used in specific situations in the laboratory, in clinical and surgical practice

MI1.5.1 Classify the medical devices using Spaulding's classification

- Classifydisinfectants
- Define & applications of Fumigation,fogging
- Describe: Plasmasterilization
- Identify the most appropriate method of sterilization / disinfection in the given cases scenario.

MI 1.6 Describe the mechanisms of **drug resistance**, and the methods of antimicrobial susceptibility testing and monitoring of antimicrobial therapy

MI 1.6.1 Describe the bacterial genetic structures

- Describe bacterial variation – mutation & genetransfer
- Describe the methods of gene transfer inbacteria
- Describe gene transfer by artificialmethods.
- List out mechanism of action of antimicrobialagents

MI 1.6.2 Define drug resistance, List out various mechanisms of antibacterial resistance.MRSA, VRE, ESBL, MBL etc.

- Define: Bacteriostatic, bactericidal, pharmacodynamics, pharmacokinetics, adverse reactions.
- List out and describe different methods of antimicrobial susceptibilitytesting
- Discuss MIC, broth dilution, agardilution
- Describe principles of antibiotics selection and monitoringtherapy

MI 1.7 Describe the immunological mechanisms in health

MI 1.7.1 Immunity

- Define & classify Immunity. Describe in detail all types ofImmunity.
- Describe the role of vaccines inImmunity

MI 1.7.2 Immune system - Describe structure and functions of immune system

MI 1.7.3 Antigen & Immunoglobulins

- Define& classify Antigen. Describe characteristics ofAntigens
- Define & classifyImmunoglobulins
- (Antibody).
- Describe in detail all types ofAntibody.

MI 1.7.4 Complement system

- Describe components, general properties cascade androle ofComplement system in health anddisease

MI 1.7.5 Antigen antibody reactions

- Define & classify antigen antibodyreactions
- Discuss the principles of Ag -Abreactions
- Describe the applications of Ag-Ab reactions in the diagnosis ofdiseases.
- Describe the approach to interpretation of Ag-Ab reaction in the diagnosis of diseases.

MI 1.8 Describe the mechanisms of **immunity and response** of the host immune system to infections

MI 1.8.1 Define & classify Immune response

- Describe humoral immune response – Primary response, Secondary response, Td response, T independent response, immunomodulators, monoclonal antibodies

MI 1.8.2 Describe cell mediated immune response

- cytokines, importance of CMI
- Differentiate humoral and cell mediated immuneresponse
- Discuss the theories of immune response of humoralimmunity

MI 1.9 Discuss the immunological basis of **vaccines** and describe the Universal Immunization schedule

- Classify & describe types ofimmunization
- Define & classify types ofVaccines
- Discuss advantages and disadvantages among different types ofvaccines
- Describe National Immunization Schedule(India)
- Importance of passive immunization

MI 1.10 Describe the immunological mechanisms in **immunological**

Disorder (hypersensitivity, autoimmune disorders and immunodeficiency states) and discuss the laboratory methods used in detection.

MI 1.10.1 Hypersensitivity

- Define& classify Hypersensitivity reactions including Gel and Coombsclassification
- Describe the mechanism, clinical features, laboratory evaluation and prevention of type I hypersensitivity
- Describe the mechanism, clinical features, laboratory evaluation and prevention of type II hypersensitivity
- Describe the mechanism, clinical features, laboratory evaluation and prevention of type IIIhypersensitivity
- Describe the mechanism, clinical features, laboratory evaluation and prevention of type IVhypersensitivity
- Discuss tuberculin test, patchtest.

MI 1.10.2 Autoimmunity

- Define & Describe mechanisms of Immunologicaltolerance
- Define & Describe various mechanisms ofautoimmunity
- Describe various clinical manifestations of common autoimmunediseases
- Describe approach for laboratory diagnosis of autoimmunediseases

MI 1.10.3 Immunodeficiency

- Define & Classify immunodeficiencysyndromes
- Describe various immunodeficiencysyndromes.
- Discuss the laboratory methods used in detection of immunodeficiencydiseases.

MI 1.11 Describe the immunological mechanisms of transplantation and tumorimmunity

Transplantation immunity

- Define & Classifytransplantation,
- Define & Discuss the mechanism allograft rejection, prevention ofrejection
- Histocompatibility antigens,MHC,
- Describe types of HLAtyping
- Describe Graft – versus-hostreaction, Tumor immunity
- Define Tumor antigen, immunologicalsurveillance
- Describeimmunosuppression.
- Describe immunotherapy incancer

TOPIC – CVS & BLOOD

(MI 2.1-2.7)

No ofcompetencies-7

No of procedures requiring certification-NIL

MI 2.1 Describe the etiologic agents in rheumatic fever and their diagnosis Rheumatic fever

- Describe the immunological basis of rheumatic fever/ nonsuppurative diseases caused by streptococci
- Classifystreptococcus
- Describe the morphology, pathogenesis, antigenic structures, toxin & virulence factors, clinical features, epidemiology of streptococcuspyogenes
- Discuss the serological test for diagnosis of rheumaticfever.
- Discuss the role of antibiotics in treatment and prevention of rheumaticfever.

MI 2.2 Describe the classification etio-pathogenesis, clinical features and discuss the diagnostic modalities of Infective endocarditis

- Enumerate the organisms causing infectiveendocarditis
- Viridans Streptococcus, Coagulase negative Staph, HACEK groupetc.
- Describe the pathogenesis, clinical features of infectiveendocarditis.
- Discuss the approach to identify the causativeorganism.
- Discuss the importance of multiple samplecollection.
- Discuss automated blood culturesystems.

MI 2.3 Identify the microbial agents causing Rheumatic Heart Disease & infective Endocarditis

- Identify bacteria by observing colony morphology, biochemicalreactions
- Interpret antimicrobial susceptibilitytest.
- Define: Minimum Inhibitory concentration, minimum bactericidalconcentration.
- Discuss other test that can be used fordiagnosis.

MI 2.3.1 Define sepsis, **septicemia,** bacteremia, fungemia, viremia, parasitemia

- Describe etiology, pathogenesis, clinical features, lab diagnosis including prognostic markers and treatment ofsepticemia

MI 2.4 List the common microbial agents causing **anemia**. Describe the morphology, mode of infection and discuss the pathogenesis, clinical

course, diagnosis and prevention and treatment of the common microbial agents causing Anemia

- List the common microbial agents causinganemia.
- Describe the morphology, of the common microbial agents causinganemia.
- Discuss the mode of infection, pathogenesis & clinical course of the common microbial agents causinganemia.
- Discuss the laboratory diagnosis of the common microbial agents Causinganemia
- Discuss the treatment & prevention of the common microbial agents causinganemia.
- infectious agents causing Iron deficiency, megaloblastic, haemolytic anaemia and anaemia of chronicinfections,

MI 2.5 Describe the etio- pathogenesis and discuss the clinical evolution and the laboratory diagnosis of kalaazar, malaria, filariasis and other common parasites prevalent in India

Introduction

- Classify parasites and enumerate parasites prevalent toIndia

MI 2.5.1 Malaria

- Describe the morphology, life cycle, pathogenesis, clinical features of malarial parasite.
- Describe the treatment and prevention ofmalaria.

MI 2.5.2 Leishmania

- Describe the morphology, life cycle, pathogenesis, clinical features ofleishmania.
- Describe the laboratory diagnosis forkalaazar
- Describe the treatment and prevention forkalaazar

MI 2.5.3 Trypanosoma

- Describe the morphology, life cycle, pathogenesis, clinical features ofTrypanosoma.
- Describe the laboratory diagnosis for sleepingsickness.
- Describe the treatment and prevention for sleepingsickness

MI 2.5.4 Filarial worm

- Describe the morphology, life cycle, pathogenesis, clinical features of filarialworm.
- Describe the laboratory diagnosis for filarialworm.
- Describe the treatment and prevention for filarialworm.

MI 2.5.5 Schistosomes

- Describe the morphology, life cycle, pathogenesis, clinical features ofSchistosomes.
- Describe the laboratory diagnosis forschistosomiasis.
- Describe the treatment and prevention ofschistosomiasis.

MI 2.6 Identify the causative agent of malaria and filariasis

MI 2.7 Describe the epidemiology, the etio- pathogenesis, evolution complications, opportunistic infections, diagnosis, prevention and the principles of management of HIV

MI 2.7.1 Describe morphology, epidemiology, pathogenesis of HIV

- Describe clinical features ofAIDS

MI 2.7.2 Opportunistic infections in AIDS

MI 2.7.3 Describe the immunological abnormalities in HIV infection

- Describe various methods of laboratory diagnosis ofHIV
- Discuss applications of serologicaltests.
- Discuss laboratory monitoring of HIVinfection
- Discuss the different approaches to the treatment ofAIDS

MI 2.7.4 Discuss NACO guidelines, strategies, pre-test counseling, post- test counseling. Discuss NACO guidelines for post-exposureprophylaxis

MI 2.7.5 Describe various modes of transmission of HIV

MI 2.7.6 Describe prophylactic measures in preventing HIV Transmission Standard precautions, spill management etc

TOPIC: GASTROINTESTINAL &HEAPATOBILIARY SYSTEM

(MI 3.1-3.8)

No ofcompetencies8

No of procedures requiring certification –NIL

MI 3.1. Enumerate the microbial agents causing diarrhea and dysentery. Describe the epidemiology, morphology, pathogenesis, clinical features and diagnostic modalities of these agents.

MI 3.1.1 Introduction of gastrointestinal infections

- Brief structure and immunity ofGIT
- Define diarrohea,dysentery
- Enumerate the various etiological agents of diarrhoea bacterial, viral, parasiticetc.
- Classifythe etiological agents in different age groups, immunocompromised, immunocompetent individuals.
- Discuss the mode of transmission, the pathogenesis, clinical manifestation and laboratory diagnosis ofdiarrhoea

MI 3.1.2 Epidemiology, pathogenesis, laboratory diagnosis of diarrheagenic E.coli,

MI3.1.3 Epidemiology, pathogenesis, clinical features,complications, laboratory diagnosis, treatment & prophylaxis ofCholera

MI 3.1.4 **Antibiotic Associated Diarrhoea** - Clostridiumdifficile

MI 3.1.5 **Viral gastroenteritis** etiological agents, epidemiology, pathogenesis, clinical features and laboratory diagnosis - Rota, Astro, Noro

MI 3.1.6 **Bacillary dysentery** Define dysentery etiological agents, pathogenesis, clinica features and laboratory diagnosis of bacillary dysentery -Shigella. Y. enterocolitica

MI 3.1.7 **Amoebic dysentery** Discuss the morphology, life cycle, mode of transmission, pathogenesis, clinical features, complications and laboratory diagnosis of Amoebic dysentery difference between amoebic and bacillary dysentery – E. histolytica

- Mention briefly about non pathogenic intestinalamoebae

MI 3.1.8 Etiological agents, pathogenesis, clinical manifestations and laboratory diagnosis of Diarrhoea in immunocompromised host- Giardiasis Cryptosporidium, Cyclospora, Isospora, Giardia

MI 3.1.9 Soil transmitted helminthic infections- Ascaris, Enterobius, Trichuris trichiura

MI 3.2 Identify the common microbial agents causing diarrhoea and dysentery

MI 3.3 **Enteric fever** Describe the enteric fever pathogens and discuss the evaluation of clinical course and the laboratory diagnosis of diseases caused by them

- Define, mention the etiological agents, epidemiology, pathogenesis, clinical manifestations, complications, laboratory diagnosis of entericfever

MI 3.4 Identify the different modalities for diagnosis of Enteric fever , choose the appropriate test related to the duration of illness .

MI 3.5 **Food poisoning** Enumerate the causative agents of food poisoning and discuss the pathogenesis ,clinical course and laboratory diagnosis

- Definition, source, pathogenesis, classification of food poisoning etiological agents based on type of food and pathogenesis, clinical manifestation laboratory diagnosis treatment and prophylaxis of food poisoning – Staphylococcus, Bacillus cereus, Clostridium perfringens, Clostridium botulinum, Salmonella typhimurium, halophilic vibriosetc

MI 3.6 **Acid Peptic disease** Describe the etiopathogenesis of Acid peptic disease and the clinical course. Discus the diagnosis and management of the causative agent of Acid peptic disease.

- Etiopathogenesis, clinical features, complications laboratory diagnosis treatment and prophylaxis of Acid peptic disease -H. pylori

MI 3.7 **Viral hepatitis** Describe the epidemiology, the etio- pathogenesis and discuss the viral markers in the evolution of viral hepatitis. Discuss the modalities in the diagnosis and prevention of viralhepatitis

MI 3.7.1 Discuss the pathogenesis, clinical manifestations, complications and laboratory diagnosis, treatment and prophylaxis of enterically transmitted viral hepatitis A & E

MI 3.7. 2 Discuss the pathogenesis, clinical features, laboratory diagnosis treatment and prophylaxis of parenteral transmitted viral hepatitis -Hepatitis B

MI 3.7.3 Discuss the pathogenesis, clinical features, laboratory diagnosis treatment and prophylaxis of parenteral transmitted viral hepatitis C & D

- Note on national programme National Viral Hepatitis Control & Prevention Programme (NVHCP)

TOPIC: INFECTIONS OF SKIN & MUSCULOSKELETAL SYSTEM

(MI 4.1-4.3)

No of competencies–3

No of procedures requiring certification –NIL

MI 4.1 Enumerate the microbial agents causing anaerobic infections. Describe the etiopathogenesis, clinical course and discuss the laboratory diagnosis of anaerobic infections

MI 4.1.1 Introduction to anaerobic infections

- List the normal anaerobic flora of humanbody.
- Enumerate and classify disease causing anaerobic bacteria with disease caused by them.
- Define Anaerobiosis. Describe the types of samples and collection methods for anaerobic culture. Describe the transport of specimen and culture of clinical samples for anaerobic culture. List the antibiotics used to treat anaerobic infections
- Classify Genus Clostridium. Describe the morphology of GenusClostridium
- Discuss the etiopathogenesis, clinical features, laboratory diagnosis, treatment and prophylaxis of **Gasgangrene**.

MI 4.1.2 Discuss the pathogenesis, clinical features, laboratory diagnosis, treatment and prophylaxis of **Tetanus.**

MI 4.1.3 Discuss the pathogenesis, clinical features, laboratory diagnosis and treatment of**botulism.**

MI 4.1.4 Discuss the etiopathogenesis, clinical features, laboratory diagnosis and treatment of**pseudomembranous colitis**.

MI 4.1.5 Classification, diseases, laboratory diagnosis & treatment of infections caused by **non sporing anaerobes**

MI 4.1.6 Discuss the pathogenesis, clinical features, lab diagnosis, treatment and prophylaxis of **Actinomycosis &nocardiosis**

MI 4.2 Describe the etiopathogenesis, clinical course and discuss the laboratory diagnosis of bone & jointinfections

- Classify bone & jointinfections
- Enumerate the microorganisms causing infections of bone & joint (infectious
- arthritis, osteomyelitis and orthopedic implant associatedinfections)
- Describe the etiopathogenesis & clinical course of bone & jointinfections
- Discuss the laboratory diagnosis of bone & jointinfections

MI 4.3 Describe the etiopathogenesis of infections of skin and soft tissue and discuss the clinical course and the laboratory diagnosis

MI 4.3.1 Introduction to Skin & Soft Tissue Infections

- Describe the normal anatomy, innate immunity & commensals ofskin

- Define folliculitis, furuncle, carbuncle, macule, papule, nodule, pustule, vesicle, scales, ulcer andbulla.
- List the various organisms causing skin and soft tissue infections - Bacteria, Viruses, Fungi, Parasites
- Describe the pathogenesis, clinical course and laboratory diagnosis of **Staphylococcusaureus**
- Enumerate the etiological agents and laboratory diagnosis of post- operative wound infections & burns woundinfection

MI 4.3.2 Describe the pathogenesis, clinical course and laboratory diagnosis of**Leprosy**

- Describe the pathogenesis, clinical courseandlaboratorydiagnosisof **Atypical mycobacterialinfections**

MI 4.3.3 Enumerate **viruses causing skin and soft tissue lesions**. Discuss in detail Herpes viruses, pathogenesis, clinical features, laboratory diagnosis, treatment and prophylaxis

MI 4.3.3a Viral exanthematous infections - Measles, Rubella, (Coxsackie, Pox, HPV, Molluscum, Hand foot mouth Disease)

MI 4.3.4 List fungi causing **superficial fungal diseases**. Describe their clinical features, laboratory diagnosis, treatment and prophylaxis - Tinea versicolor, piedra, tinea nigra, dermatophytosis, Mucocutaneous candidiasis

MI 4.3.5 **subcutaneous mycosis –** list the fungi causing subcutaneous mycosis. Describe the clinical features, laboratory diagnosis and treatment of subcutaneous mycosis.- Sporotrichosis, Chromoblastomycoses, Rhinosporidiosis, entamophthoromycoses, mycetoma

MI 4.3.6 Enumerate the tissue nematode parasites causing skin and soft tissue lesions with their clinical course and laboratory diagnosis- Filariasis, Onchocerca, Loa loa, Mansonella, Dracunculus, Trichinella and Larvamigrans

MI 4.3.7 Describe the pathogenesis, clinical course and laboratory diagnosis of Diabetic foot & cellulitis- Streptococcus &others

MI 4.3.8 Describe the pathogenesis, clinical course and laboratory diagnosis of cutaneous Anthrax

TOPIC: CENTRAL NERVOUS SYSTEM INFECTIONS

(MI 5.1-5.3)

No ofcompetencies:(3)

No of procedures that require certification:NIL

MI 5.1 Describe the etiopathogenesis, clinical course and discuss the laboratory diagnosis of**meningitis**

- **MI 5.1.1** Describe normal structure of CNS and normal protective mechanisms
- **MI 5.1.2** Define meningitis
- **MI 5.1.3** Classify meningitis based on age group and duration
- **MI 5.1.4**. Enumerate the causative agents of meningitis and classify them based on age group affected, duration of disease and immune status
- **MI 5.1.5**. Describe general pathogenesis and clinical features of meningitis
- **MI 5.1.6.** Discuss the general approach to diagnosis of meningitis
- **MI 5.1.7.** Describe pathogenesis, lab diagnosis, prevention and treatment of meningococcal meningitis
- **MI 5.1.8**. Describe pathogenesis, lab diagnosis, prevention and treatment of pneumococcal meningitis
- **MI 5.1.9**. Describe pathogenesis, lab diagnosis, prevention and treatment of meningitis caused by *Streptococcus agalactiae*
- **MI 5.1.10**. Describe pathogenesis, lab diagnosis, prevention and treatment of meningitis caused by *Haemophilusinfluenzae*
- **MI 5.1.11**. Describe pathogenesis, lab diagnosis, prevention and treatment of Listeria meningitis
- **MI 5.1.12.** Describe pathogenesis, lab diagnosis, prevention and treatment of gram negative bacterial meningitis
- **MI 5.1.13.** Describe pathogenesis, lab diagnosis, prevention and treatment of tubercular meningitis
- **MI 5.1.14**. Describe pathogenesis, lab diagnosis, prevention and treatment of meningitis caused byspirochetes
- **MI 5.1.15.** Describe pathogenesis, lab diagnosis, prevention and treatment of viral meningitis caused by *Herpes viruses, Enteroviruses, Mumpsvirus*, etc
- **MI 5.1.16**. Describe pathogenesis, lab diagnosis, prevention and treatment of meningitis caused by fungi - *Cryptococcus neoformans, Candida Spp., Coccidioides, Histoplasma,etc*

MI 5.2 Describe the etiopathogenesis, clinical course and discuss the laboratory diagnosis of **encephalitis**

- **MI 5.2.1**. Define: Encephalitis
- **MI 5.2.2.** Classify Encephalitis
- **MI 5.2.3**. Enumerate the causative agents of Encephalitis

MI 5.2.4. Describe general pathogenesis of encephalitis
MI 5.2.5. Describe the clinical presentation of Encephalitis
MI 5.2.6. Discuss the approach to diagnosis of viralEncephalitis
MI 5.2.7. Describe morphology of polio virus. Describe pathogenesis, clinical features, labdiagnosis and prevention of poliomyelitis
MI 5.2.8. Describe morphology of rabies virus. Describe pathogenesis, clinical features, lab diagnosis and prevention of rabies
MI 5.2.9. Describe etiology, pathogenesis, clinical features, lab diagnosis and prevention of slow viral infections
MI 5.2.10. Discuss the etiopathogenesis, clinical features and approach to diagnosis of parasitic meningitis andEncephalitis
MI 5.2.11. Discuss the etiopathogenesis, clinical features and approach to diagnosis of brain abscess
MI 5.2.12. Discuss the etiopathogenesis, clinical features and approach to diagnosis of cystic brain lesion-neurocysticercosis, hydatid disease of brain

MI 5.3 Identify the microbial agents causing meningitis
MI 5.3.1. Analyse clinical features, interpret laboratory test results provided to diagnose the clinical condition and identify the causative microorganism.
MI 5.3.2 Describe normal ranges of common CSF parameters
MI 5.3.3. Interpret abnormal results of CSF analysis report provided.
MI 5.3.4 Demonstrate CSF collection in a mannequin

TOPIC: RESPIRATORYTRACTINFECTIONS

(MI 6.1-6.3)

NoofCompetency-3

No of procedures requireCertification-2

MI 6.1 Describe the etio-pathogenesis, laboratory diagnosis and prevention of Infections of upper and lower respiratory tract

- **MI 6.1.1** Describe the structure respiratory system and role of immunity in respiratorysystem
- **MI 6.1.2** Discuss the etiological agents,pathogenesisepidemiology clinical features, complications and laboratory diagnosis ofrhinitis
- **MI 6.1.3** Discuss the classification, etiological agents, pathogenesis, epidemiology clinical features, complications and laboratory diagnosis ofotitis
- **MI 6.1.4** Discuss the etiological agents, pathogenesis, epidemiology, clinical features, complications and laboratory diagnosis if sinusitis.
- **MI 6.1.5** Discuss the etiological agents, pathogenesis, epidemiology, clinical features, complications and laboratory diagnosis if tonsilitis.
- **MI 6.1.6** Discuss the etiological agents, pathogenesis, epidemiology, clinical features, complications and laboratory diagnosis if laryngitis, bronchitis, bronchiolitis.
- **MI 6.1.7** Define & classify pneumonia. Enumerate the etiological agents of pneumonia general laboratory diagnosis and prophylaxis ofpneumonia
- **MI 6.1.8** Discuss pathogenesis, epidemiology clinical features, complications and laboratory diagnosis of community acquired pneumonia-pneumococci
- **MI 6.1.9** Enumerate the etiological agents, pathogenesis, epidemiology clinical features, complications and laboratory diagnosis of hospital acquired pneumonia-Klebsiella, Staphylococci,Legionella
- **MI 6.1.10** Enumerate the etiological agents, pathogenesis, epidemiology clinical features, complications and laboratory diagnosis treatment and prophylaxis of ventilator associated pneumonia- Acinetobacter
- **MI 6.1.11** Enumerate the etiological agents, pathogenesis, epidemiology clinical features, complications and laboratory diagnosis of atypical pneumonia-Mycoplasma,Chlamydia
- **MI 6.1.12** Enumerate the etiological agents, pathogenesis, epidemiology clinical features, complications and laboratory diagnosis of viral respiratory infections – Adeno, RSV,EBV

MI 6.1.13 Enumerate the etiological agents, pathogenesis, epidemiology clinical features, complications and laboratory diagnosis of viral pneumonia – Influenza virus, SARS-corona

MI 6.1.14 Enumerate the etiological agents, pathogenesis, epidemiology clinical features, complications and laboratory diagnosis of pneumonia in immunocompromised host- Pneumocystis jirovecii,CMV

MI 6.1.15 Describe the epidemiology, mode of transmission, pathogenesis, clinical features complications, laboratory diagnosis, treatment and prophylaxis of pulmonarytuberculosis

MI 6.1.16 Discuss the importance of MDR TB, RNTCP HIV TBco-infection

MI 6.1.17 Define and classify the atypical mycobacteria discuss the pathogenesis, clinical features, complications and treatment of pulmonary atypical mycobacterialinfection

MI 6.1.18 Discuss the general characters of dimorphic fungi. Discuss the mode of transmission, pathogenesis, clinical features, complications and laboratory diagnosis of pulmonary mycosis-Histoplasma, coccidioides, Blastomyces,Paracoccidiodies

MI 6.1.19 Discuss mode of transmission, pathogenesis, clinical features laboratory diagnosis of aspergillosis

MI 6.1.20 Parasites affecting lung – Paragonimus westermanii (non core), Loefflers syndrome, amoebic lungabscess

MI 6.1.21 Discuss the immunoprophylaxis for respiratory tractinfections

MI 6.2 Identify the common etiologic agents of upper respiratory tract infections (Gram Stain)

MI 6.2.1 Describe the method of sample collection andtransportation

MI 6.2.2 Explain the steps of gram's staining procedure

MI 6.2.3 Do the grams stainingprocedure

MI 6.2.4 Observe the stainedsmear

MI 6.2.5 Interpret and Report the staining results

MI 6.3 Identify the common etiologic agents of lower respiratory tract infections (Gram Stain & Acid fast stain)

MI 6.3.1 Enumerate the organisms causingLRTI

MI 6.3.2 Describe the method of samplecollection

MI 6.3.3 Recap the Gram's staining procedure andrepetition

MI 6.3.4 Explain the Acidfast staining procedure

MI 6.3.5 Perform the Acid fast stainingprocedure

MI 6.3.6 Interpret and Report the staining results

TOPIC: - GENITOURINARY & SEXUALLY TRANSMITTED INFECTIONS

(MI 7.1-7.3)

No of competencies–3

No of procedures requiring certification –NIL

MI 7.1 Describe the etiopathogenesis and discuss the laboratory diagnosis of infections of genitourinary system

- **MI 7.1.1** Describe the normal anatomy and innate defense mechanisms in the male and female genital tract
- **MI 7.1.2** Enumerate the various infections of genitourinary tract
- **MI 7.1.3** Describe the etiology and pathogenesis of Genitourinary tract infections in general
- **MI 7.1.4** Discuss the clinical features, sample collection and laboratory diagnosis of genitourinary infections in general
- **MI 7.1.5** Discuss the effect/ complications of genitourinary infections in pregnancy (Maternal & fetal)

MI 7.2 Describe the etiopathogenesis and discuss the laboratory diagnosis of **Sexually Transmitted Infections**. Recommend preventive measures

- **MI 7.2.1** Enumerate the bacterial, viral, fungal and parasitic agents causing Sexually Transmitted infections
- **MI 7.2.2** Describe the pathogenesis, clinical features, laboratory diagnosis and treatment of pathogens causing ulcerative lesions in the genital tract (Syphilis, Haemophilus ducreyi, LGV, Calymmatobacterium granulomatis, Herpes Virus)
- **MI 7.2.3** Describe the pathogenesis, clinical features, laboratory diagnosis and treatment of pathogens causing Urethral syndrome/ white discharge per vagina (Gonococci, Candida spp, Trichomonas vaginalis, Bacterial vaginosis)
- **MI 7.2.4** Describe the pathogenesis, clinical features, laboratory diagnosis and treatment of Mycoplasma spp
- **MI 7.2.5** Describe non gonococcal urethritis. Enumerate the agents causing the same
- **MI 7.2.6** Differentiate between bacterial vaginosis & bacterial vaginitis
- **MI 7.2.7** Discuss the various measure for prevention of Sexually Transmitted infections
- **MI 7.2.8** Discuss the importance of confidentiality in reporting Sexually transmitted diseases
- **MI 7.2.9** Discuss the role of counselling in management of Sexually transmitted diseases
- **MI 7.2.10** Enumerate the pathogens causing congenital infections. Discuss the pathogenesis, lab diagnosis, prophylaxis, prevention and treatment of these infections.

MI 7.3 Describe the etiopathogenesis, clinical features, the appropriate method for specimen collection and discuss the laboratory diagnosis of **Urinary tract infections**

- **MI 7.3.1** Describe the normal anatomy, physiology and Innate defense mechanisms of the urinary tract
- **MI 7.3.2** Mention the types of Urinary tract infections (upper and lower)
- **MI 7.3.3** Mention the causative agents of urinary tract infection
- **MI 7.3.4** Enumerate the predisposing factors in Urinary Tract infections
- **MI 7.3.5** Discuss the pathogenesis of urinary tract infection
- **MI 7.3.6** Discuss the clinical features of Urinary tract infections (Difference between upper and lower urinary tract infections)
- **MI 7.3.7** Describe the methods of collection of urine from infant, adult men/women, and catheterized patients
- **MI 7.3.8** Discuss the concept of significant bacteriuria
- **MI 7.3.9** Discuss about asymptomatic bacteriuria & conditions these are seen
- **MI 7.3.10** Describe about sterile pyuria and enumerate the disease causing sterile pyuria
- **MI 7.3.11** Define Catheter associated urinary tract infection. Enumerate the predisposing factors, prevention, diagnosis and treatment of CAUTI
- **MI 7.3.12** Discuss the laboratory diagnosis and treatment of Urinary tract infections

TOPIC- ZOONOTIC DISEASES & MISCELLANEOUS

(MI 8.1-8.16)
No of competencies-16
No of procedures requirecertification-1

MI 8.1 Enumerate the microbial agents and their vectors causing **Zoonotic diseases**. Describe the morphology, mode of transmission, pathogenesis and discuss the clinical course laboratory diagnosis and prevention

Introduction-Define zoonotic infections. Enumerate organisms causing zoonotic infections in man and the mode of transmission/vectors transmittingthem

MI 8.1.1 **Anthrax**-Describe the morphology, mode of transmission, pathogenesis and discuss the clinical course laboratory diagnosis and prevention of Anthrax

MI 8.1.2 **Plague-** Describe the morphology, mode of transmission, pathogenesis and discuss the clinical course laboratory diagnosis and prevention plague

MI 8.1.3 **Brucellosis**-Describe the morphology, mode of transmission, pathogenesis and discuss the clinical course laboratory diagnosis and prevention brucellosis

MI 8.1.4 **Leptospirosis**-Describe the morphology, mode of transmission, pathogenesis and discuss the clinical course laboratory diagnosis and prevention leptospirosis

MI 8.1.5 **Rickettsia-** Describe the morphology, mode of transmission, pathogenesis and discuss the clinical course laboratory diagnosis and prevention Rickettsial and miscellaneous zoonoses

MI 8.1.6 **Arboviral**-Describe the morphology, mode of transmission, pathogenesis and discuss the clinical course laboratory diagnosis and prevention of Arboviral infections- Dengue,chikungunya,KFD

MI 8.1.7 **Toxoplasma & Balantidium**-Describe the morphology, mode of transmission, pathogenesis and discuss the clinical course laboratory diagnosis and prevention of toxoplasmosis & balantidiasis

MI 1.8.8 **Taeniasis**-Describe the morphology, mode of transmission, pathogenesis and discuss the clinical course laboratory diagnosis and prevention of taeniasis

MI 1.8.9 **Hydatid disease**-Describe the morphology, mode of transmission, pathogenesis and discuss the clinical course laboratory diagnosis and prevention of hydatid cyst disease

MI 1.8.10 **Rabies**-Describe morphology of Rabies virus. Describe pathogenesis, clinical features, lab diagnosis and prevention of rabies

MI 8.2 Describe the etio-pathogenesis of **Opportunistic Infections** (OI) and discuss the factors contributing to the occurrence of OI, and the laboratory diagnosis

- Define opportunistic infections
- Enumerate organisms causing opportunisticinfections
- Discuss factors contributing to development of opportunisticinfections

Viralagents

- Describe pathogenesis, clinical features, laboratory diagnosis and prevention of viral opportunistic infections - Herpse group, human papillomavirus,

Fungal Opportunistic Infections

- Describe pathogenesis, clinical features, laboratory diagnosis and prevention of candidiasis
- Describe pathogenesis, clinical features, laboratory diagnosis and prevention of Cryptococcosis
- Describe pathogenesis, clinical features, laboratory diagnosis and prevention of mucormycosis

Parasitic Opportunistic Infections

- Describe pathogenesis, clinical features, laboratory diagnosis and prevention of opportunistic parasitic infections - coccidian intestinal parasitic infections, strongyloidiasis

MI 8.3 Describe the role of **oncogenic viruses** in the evolution of virus associated malignancy

- Define oncogenicviruses
- Enumerate oncogenicviruses
- Describe pathogenesis of viraloncogenesis
- Describe laboratory diagnosis of oncogenic viralinfections
- Describe methods of prevention of oncogenic viralinfections

MI 8.4 Describe the etiologic agents of **Emerging Infectious diseases.**

- Discuss the clinical course anddiagnosis
- Define emerging infectiousagents.
- Enumerate agents causing emerginginfections
- Describe factors contributing to emerginginfections.
- Discuss clinical course and laboratory diagnosis of emerginginfections
- Describe the Indian scenario of emerging infectiousagents

MI 8.5 Define **Healthcare Associated Infections (HAI)** and enumerate the types. Discuss the factors that contribute to the development of HAI and the methods for prevention

- Define Healthcare Associated Infections(HAI)
- Enumerate the types ofHAI
- Discuss the factors that contribute to the development of and methods to prevent catheter associated urinary tract infection(CAUTI)
- Discuss the factors that contribute to the development of and methods to prevent central line associated blood stream infection(CLABSI)
- Discuss the factors that contribute to the development of and methods to prevent ventilator associated pneumonia(VAP)
- Discuss the factors that contribute to the development of and methods to prevent surgical site infection(SSI)
- Describe principles and application of antibioticstewardship

MI 8.6 Describe the basics of **PANDEMIC MANAGEMENT (Infection control)**

- Define Standardprecautions
- List the components of Standard precautions
- Describe the various transmission-basedprecautions.
- Describe the constitution and functions ofHICC.
- Define Biomedical waste
- Classify biomedical waste and describe methods of segregation, decontamination and disposal of each type as per Biomedical waste managementrule
- Describe appropriate management of needle stick injury in healthcaresetting
- Managebio-spill
- Describe vaccines that are useful in healthcareworkers

MI 8.7 Demonstrate Pandemic management (Infection control) practices and use of **Personal Protective Equipment (PPE)**

MI 8.8 Describe the methods used and significance of assessing the microbial contamination of food, water and air

- Describe the methods used and significance of assessing the microbial contamination offood.
- Describe the methods used and significance of assessing the microbial contamination of water.
- Describe the methods used and significance of assessing the microbial contamination ofair.

MI 8.9 Discuss the appropriate method of **collection of samples** in the performance of laboratory tests in the detection of microbial agents causing Pandemic (infectious diseases)

- Discuss methods of sample collection for laboratory diagnosis of upper respiratory infections
- Discuss methods of sample collection for laboratory diagnosis of lower respiratory infections
- Discuss methods of sample collection for laboratory diagnosis of CVS and blood stream infections
- Discuss methods of sample collection for laboratory diagnosis of CNSinfections
- Discuss methods of sample collection for laboratory diagnosis of gastrointestinal infections
- Discuss methods of sample collection for laboratory diagnosis of infections of skin and softtissues
- Discuss methods of sample collection for laboratory diagnosis of musculoskeletal infections
- Discuss methods of sample collection for laboratory diagnosis of infections eye, nose andear
- Discuss methods of sample collection for laboratory diagnosis of genitourinary infections

MI 8.10 Demonstrate the appropriate method of collection of samples in the performance of laboratory tests in the detection of microbial agents causing Pandemic (Infectiousdiseases)

MI 8.11 Demonstrate respect for patient samples sent to the laboratory for performance of laboratory tests in the detection of microbial agents causing Infectious diseases

MI 8.12 Discuss confidentiality pertaining to patient identity in laboratory results

- Discuss the rights and responsibility ofpatients
- Discuss the rights and responsibility of laboratory with respect to confidentiality of laboratory results
- Discuss the ethical issues involved in confidentiality pertaining to patientidentity.
- Discuss the medicolegal consequences of breach inconfidentiality

MI 8.13 **Choose the appropriate laboratory test** in the diagnosis of the infectious disease

- Identify the clinical condition based on the historyprovided.
- Choose the appropriate laboratory tests in the diagnosis

of given infectious disease.
- Justify why a particular laboratory test was chosen to diagnose a given infectious disease

MI 8.14 Demonstrate **confidentiality** pertaining to patient identity in laboratory results
- Demonstrate the understanding of importance of confidentiality with respect to patient's laboratory testresults
- Identify situations where confidentiality needs to be maintained regarding patient's laboratory test results and where it can bebypassed
- Demonstrate confidentiality pertaining to patient identity in laboratoryresults.
- Counsel the patient about the test results in simulatedsetting

MI 8.15 Choose and **Interpret the results** of the laboratory tests used in diagnosis of the infectious diseases
- Choose appropriate laboratory test(s) in the diagnosis of the infectious disease based on the case scenario and the order in which they need to be performed, if applicable
- Interpret the results of the laboratory tests used in diagnosis of the given infectious diseasescenario

MI 8.16 Describe the **National Health Programs** in the prevention of common infectious disease (for information purpose only as taught inCM)
- Enumerate all the National Health Programs regarding common infectious diseases in India
- Describe the goals of the various National Health Programs in the prevention of common infectious disease.
- Describe laboratory diagnostic tools used in the National Programs related to infectiousdiseases
- Describe general immunoprphylactic and chemoprophylactic measures used in the National Programs related to infectiousdiseases

AETCOM

Module 2.3	:	Health care as a right	:	2 Hrs
		Participatory students' seminar	:	2 Hrs
Module 2.7	Bioethics	Case studies on autonomy & decision making	:	5 Hrs
		Introduction of case	:	1 Hr
		Self-directed learning	:	2 Hrs
		Anchoring lecture	:	1 Hr
		Discussion and closer of the case	:	1Hr

5. EVALUATION

A. UNIVERSITY EXAMINATION& PRELIMINARY EXAMINATION MARK DISTRIBUTION

Type of exam		**Maximum marks**	**Minimum Marks**
SUMMATIVE			
Theory (Two Papers)	Paper I	100	40
	Paper II	100	40
	Total	200	100
Practicals		100	50
Total		**300**	**150**

B. PATTERN OF THEORY EXAMINATION IN FINAL EXAMINATION INCLUDING DISTRIBUTION OF MARKS, QUESTIONS, AND TIME

i.	Two theory papers	:	100 marks each
ii	Total duration	:	3 hrs each (There will be 2 sections in each.)
iii	Paper I	:	General Microbiology, immunology, infections of blood and cardiovascular system, Gastrointestinal tract and hepatobiliary system
iv	Paper II	:	Infections of skin, soft tissue & musculoskeletal system, Central nervous system, Respiratory system, Genitourinary & sexually transmitted infections, hospital infection and control, zoonotic and miscellaneous infections, AETCOM modules 2.3 & 2.7

C. QUESTION PAPER PATTER

Paper I- General Microbiology, immunology, infections of blood and cardiovascular system, Gastrointestinal tract and hepatobiliary system

Section	Question No	Type	No of Questions	Marks
A	Question 1.	MCQ	10	20
B	Question 2	Long Answer Question	1	12
	Question 3	Short Notes	3 / 4	18
	Question 4	Short Answer Question	5 / 6	10
C	Question 5	Long Answer Question	1	12
	Question 6	Short notes	3 / 4	18
	Question 7	Short Answer Question	5 / 6	10

Paper II- Infections of skin, soft tissue & musculoskeletal system, Central nervous system, Respiratory system, Genitourinary & sexually transmitted infections, hospital infection and control, zoonotic and miscellaneous infections, AETCOM modules 2.3 & 2.7

Section	Question No	Type	No of Questions	Marks
A	Question 1.	MCQ	10	20
B	Question 2	Long Answer Question	1	12
	Question 3	Short Notes	3 / 4	18
	Question 4	Short Answer Question	5 / 6	10
C	Question 5	Long Answer Question	1	12
	Question 6	Short notes	2 / 3	12
	Question 7	Short Answer Question	5 / 6	10
	Question 8	Short notes (ATECOM module)	1	6

D. PRACTICAL EXAMINATION:

1	Staining	:	20 Marks
2	Stool examination/ PS- MP	:	20 marks
3	PPE – Hand Hygiene	:	10 marks
4	Spot/ OSPE	:	20 Marks
5	Viva I	:	15 marks
6	Viva II	:	15 Marks
	Total Marks		100 Marks

E. INTERNAL EXAMINATION I and II

1. Theory and Practical including Viva Mark Distribution

Internal Assessment	Theory	40	16
	Practical	40	16
	Log Book	20	08
	Total	**100**	**50**

2. Theory Examination Pattern

Question No	Type	No of Questions	Marks
Question 1.	MCQ	10	10
Question 2	Long Answer Question	1	12
Question 3	Short Notes	3 / 4	18
Question 4	Short Answer Question	5 / 6	10

3. Practical Examination:

For Ist and IInd term examinations

1	Staining	:	10 Marks
2	Stool examination/ PS- MP/ PPE	:	10 marks
3	Spots/ OSPE	:	20 marks
4	Viva	:	10 marks
	Total Marks		50

Log Book:

Sr. No	Head of activity	Marks
1	Day to day assessment	7
2.	Journal completion	3
3	Reflection on ATECOM module 2.3 and 2.7	4
4	Activities like seminar, symposia, quiz, block end exam & other academic activities	3
5	Achievement of certifiable competencies.	3
Total		20

Mark distribution for Theory and Practical Exam

Exam	Examination Head			Total
	Theory	Practical	Log Book	
Internal Examination I	50	50		
Internal Examination II	50	50		
Preliminary Examination	200	100		
Total No. of marks	300	200		
To be converted to	40	40	20	100
Minimum marks for eligibility	16	16	08	50

F. PLAN FOR INTERNAL ASSESSMENT:

1. There will be 3 internal assessment examinations in Microbiology. The structure of the internal assessment theory examinations will be similar to the structure of University Examinations.
2. It is mandatory for the students to appear for all the internal assessment examinations.
3. There will be only one additional examination for absent students (due to genuine reason) after approval by the Institutional Grievances Committee. It shall be taken after preliminary examination and before submission of internal assessment marks to the University.
4. Internal assessment marks for theory will be out of 300 and practical will be out of 200.
5. Total theory internal assessment will be reduced to 40 marks and total practical internal assessment will be reduced to 40 marks.
6. Log Book will have 20 marks. It will include day to day assessment, Journal completion, Reflection on ATECOM module 2.3 and 2.7, all activities like seminar, symposia, quizzes and other academic activities and Achievement of certifiable competencies.
7. Students must secure at least 50% marks of the total marks 100 of internal assessment **(combined in theory, practical and Log Book; not less than 40 % marks in theory, practical or Log Book)** to be eligible for appearing University examination
8. Internal assessment marks will reflect as separate head of passing at the summative examination.
9. Internal assessment marks will not to be added to marks of the University examinations and will be shown separately in mark list.
10. If any candidate fails in internal assessment, his / her result will be withheld by university and one theory and one Practical exam will be conducted within 60 days of result as internal exam.

6. RECOMRNDED TEXT AND REFEREAL BOOKS

1. Microbiology – Topley & Wilson
2. Medical Microbiology – Green wood
3. Essentials of Medical Microbiology – Apurba Sastry
4. Text book of Microbiology – Ananthanarayanan
5. Text book of Microbiology – Baveja
6. Parasitology – Chatterjee
7. Text book of parasitology – Chakraborty
8. Medical parasitology – Rajesh Karyakarte
9. Immunology – Roit
10. Mycology – Jagdish chandar

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