UNIVERSITY OF DELHI

CNC-II/093/1(19)/2021-22/ 337
Dated: 23.11.2022

NOTIFICATION

Sub: Amendment to Ordinances

The following Amendments to Ordinances of the University which have been approved by the Executive Council at its meeting held on 25.03.2022 are notified for information and necessary action, if any, to all the concerned:

1. Amendment to Ordinance V (2) & VII. [EC. Res. 78-7 dated 25.03.2022] regarding course curriculum prepared on competency based UG curriculum for MBBS course - 2nd Professional (New Scheme).

Curriculum document for
MBBS CBME Phase II Batch for Microbiology

(Maulana Azad Medical College, University College of Medical Sciences & Lady Hardinge Medical College New Delhi)

1. VISION

To provide state of the art, reliable diagnostic services and quality medical education that integrates recent advances and research to foster the development of a highly knowledgeable, skilled and competent undergraduate and postgraduate student in the subject of clinical microbiology.

MISSION

- To develop state of art facility, in terms of quality infrastructure and trained manpower so as to enable the students of medical microbiology to appreciate the aetiology, pathogenesis and laboratory diagnosis of infectious diseases.
- To deliver timely and quality diagnostic services to patients.
- To create an environment for need based quality research among faculty and students.

2. OVERALL LEARNING OBJECTIVES FOR UNDERGRADUATE MEDICAL EDUCATION

The objectives are developed to foster the development of an 'Indian Medical Graduate' possessing requisite knowledge, skills and values with regard to infectious diseases as outlined in Competency Based Medical Education curriculum of National Medical Commission.

The undergraduate learner should be able to demonstrate:

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

3. COMPETENCIES: Table 1 and Annexure I

4. COURSE (Topics, theory practical, laboratory clinical): As per CBME curriculum laid down by NMC for Indian medical Graduate: Table 1

5. TEACHING LEARNING METHODS: Table 1

The curriculum is based on NMC Document UG curriculum Part-I (available at https://www.nmc.org.in/wp-content/uploads/2020/01/UG-Curriculum-Vol-I.pdf). The Teaching learning methods, assessment tools, horizontal and vertical integration will be based on the document form NMC.

Subtopics to be taught in Microbiology for fulfillment of competencies

Topics	Topics
Gen Microbiology	**Immunology**
Introduction, history, biosafety, universal precautions	Introduction
Bacteria in health and disease	Structure & Functions of Immune System
Bacterial Morphology & Physiology	Antigen & antibody
Bacterial Genetics	Antigen-Antibody Reaction
Isolation & Identification of Bacteria including Culture Media & Culture Methods	Complement System
Antimicrobial Resistance	Humoral and cellular Immune Response

Bacterial Pathogenicity	Hypersensitivity
Sterilization & Disinfection	Autoimmunity
Gen properties Virus and lab diagnosis	Transplantation & Immunodeficiency
Gen properties of fungi	Tumour Immunology, Immunohematology, Immunoprophylaxis
Gen properties of parasites	**GIT & Hepatobiliary**
CVS & Blood	Diarrhoea & dysentery, Cholera,
Rheumatic fever & Infective endocarditis	Enteric fever
Infections causing anaemia	Food poisoning
Kala Azar & Toxoplasma	Intestinal Protozoal, nematodes & Trematodes infections
Malaria & Filariasis	Helicobacter/APD
Brucella, Borrelia, Listeria, S minor	Viral GI infections including hepatitis
Viral Haemorrhagic fevers	**Respiratory Infections**
HIV	Bacterial URTI
Musculoskeletal system skin and soft tissues infections	Viral pneumonia
Anaerobic infections	Bacterial LRTI
Bone & Joint Infections	**Genitourinary & STD infections**
Skin & soft tissue infections	UTI, E Coli, Proteus, Klebsiella
CNS infections	STD: Syphilis & gonorrhoea
Bacterial meningitis	Gonorrhoea
Viral Meningitis	
Encephalitis	
Zoonotic diseases and miscellaneous	
Zoonotic infections	Emerging and re-emerging infections
Oncogenic virus	Opportunistic infections
Infection control, PPE, BMW & HAI	Environmental microbiology

Table 1: Specific learning objective and topic as per CBME

Session	**SLOs**
General Microbiology & Immunology	
MI1.1Describe the different causative agents of Infectious diseases, the methods used in their detection, and discuss the role of microbes in health and disease	
MI1.1a Introduction – Microbiology & History, Biosafety & standard precautions	1. Describe the scope of clinical Microbiology 2. Describe the different branches of Microbiology with suitable examples 3. Describe Whittaker classification 4. Enumerate important milestones of Medical Microbiology 5. Describe contribution of Louis Pasteur & Robert Koch in

	details 6. Describe the development of Chemotherapy and contributions of Ehrlich and Fleming 7. Describe standard precautions, Biosafety 8. Describe various components, & their use of standard precautions.
MI 1.1b Introduction of Bacteria in health and disease	1. Describe Normal flora and its benefits 2. Differentiate between pathogen, commensals, and saprophyte. 3. Describe opportunistic pathogen 4. Describe the pathogen 5. Define: Health, Disease, infectious agents, commensalism, parasite, pathogen and opportunistic pathogen. 6. Explain the pathogenesis of bacterial infection. 7. Discuss the various microbial factors contributing to disease. 8. Enumerate the Global burden of common infectious diseases 9. Describe common infectious diseases in India
MI 1.1c Bacterial Morphology	1. Describe salient feature of eukaryotic and prokaryotic cell 2. Describe morphology cell structure, different shapes and arrangement of bacterial cells 3. Describe the structure and function of Cell organelles
MI 1.1d Physiology & Metabolism	1. Describe Physiology and metabolism of bacteria. 2. Describe the growth curve of bacteria 3. Describe anaerobiosis
MI 1.1e General principle of identification of Bacteria	1. Microscopy and culture of bacteria 2. Enumerate common culture media and biochemical reactions and its use 3. Describe the use of automation in identification of bacteria 4. Enumerate molecular techniques for identification
MI1.1f Bacterial genetics	1. Discuss Replication, mechanism of gene transfer, mutation and gene rearrangement in bacteria. 2. Describe Principals of genetic engineering.
MI1.1g General Properties and Classification of Viruses (Including Bacteriophages)	1. Describe the general features of virus 2. Describe the structure and symmetry of viruses 3. Describe viral replication 4. Classify viruses 5. Describe bacteriophages, its replication cycles and use
MI1.1h Laboratory Diagnosis of Viral infection	1. Enumerate the technique used in viral lab diagnosis 2. Describe the use of Microscopy and inclusion bodies 3. Describe tissue culture and detection of viral growth in it 4. Describe serological methods for Lab Diagnosis 5. Describe the molecular methods for laboratory diagnosis of viral diseases

MI1.1i General Properties and Classification of Fungi	1. Describe the general features of Fungi 2. Classify fungi on morphological and taxonomical bases 3. Enumerate different mycoses with suitable example 4. Describe lab diagnosis of fungal infections
MI1.1j General Properties and Classification of Parasites	1. Classify parasites giving suitable examples 2. Enumerate common parasitic pathogen 3. Classify protozoa and helminths giving suitable examples 4. Describe various modes of transmission of different parasites. . Enumerate different methods used for laboratory diagnosis of parasitic diseases
MI 1.3 Describe the epidemiological basis of common infectious diseases	
MI 1.3 Describe the epidemiological basis of common infectious diseases	1. Describe host parasite relationship 2. Discuss the various sources and reservoirs of infections. 3. Describe different routes of transmission with suitable examples 4. Enumerate common strategies to prevent infectious disease. 5. Describe the various epidemiological patterns of infectious disease.
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 Sterilization & Disinfection	1. Define: Sterilization, disinfection, asepsis, antiseptics, and decontamination. 2. List different methods of sterilisation and disinfection 3. Describe various methods of sterilization (principle, method, use). 4. Classify disinfectants and describe various methods of disinfection. 5. Explain various monitoring methods applied for individual methods of sterilisation procedures and disinfectants . 6. Enumerate new methods of sterilization
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	
MI 1.5 Sterilization & Disinfection	1. Differentiate between sterilization and disinfection. 2. Describe Spaulding Classification of medical devices. 3. Describe the practical use of disinfectants according to clinical condition. 4. Recommend various methods of sterilization / disinfection for medical devices. 5. Describe the process and functioning of CSSD.
MI1.6 Describe the mechanisms of drug resistance, and the methods of antimicrobial susceptibility testing and monitoring of antimicrobial therapy	

MI 1.6 Antimicrobial agents, mechanisms of antimicrobial resistance and antimicrobial susceptibility testing	1. Classify antimicrobial agents and their mechanism of resistance. 2. Define and classify antimicrobial resistance. 3. List and describe mechanism of action of antimicrobial agents. 4. Describe acquired and intrinsic resistance. 5. Describe various methods of antimicrobial susceptibility testing. 6. Describe disc diffusion methods, E test and MIC methods in detail. 7. Define: Bacteriostatic, bactericidal, pharmacodynamics, pharmacokinetics, MIC, MBC, agar dilution. 8. Describe relevance of AST. 9. Describe antibiotic stewardship program, its utility and principles.
MI1.7 Describe the immunological mechanisms in health	
MI1.7a Introduction to immunity	1. Define and classify immunity 2. Define and contrast innate and acquired immunity 3. Describe mechanisms of innate immunity 4. Define and describe the salient features of active, passive and acquired immunity 5. Define local immunity, herd immunity and adoptive immunity
MI 1.7b Structure and function of immune system	1. Describe the structure and function of Central and peripheral lymphoid organs. 2. Describe the development of T and B lymphocytes 3. Describe the types of T and B lymphocytes 4. Compare and Contrast T cells and B cells 5. Describe morphology and function of macrophage 6. Describe the structure and functions of human MHC gene complex 7. Outline the other cells of Immune System 8. Describe class, properties and functions of important cytokines
MI 1.7c Antigens	1. Define antigen and antigenicity 2. Define and classify epitope & haptens 3. Describe alloantigens, isoantigen, heteroantigen, autoantigen and heterophile antigen. 4. Define immunogenicity and describe the factors affecting it. 5. Describe various determinants of antigenicity 6. Define adjuvant with examples 7. Describe mechanisms of adjuvant 8. Describe T cell dependent/independent antigens and superantigens
MI1.7d Antibody	1. Define antibody 2. Describe the structure and function of antibody

	3. Classify immunoglobulins 4. Describe the structure and functions of IgG, IgM, IgA, IgE and IgD 5. Describe antigenic determinants of immunoglobulins 6. Describe abnormal Immunoglobulins 7. Define the monoclonal antibody 8. Describe the hybridoma technique for production of monoclonal antibody 9. Enumerate various applications of monoclonal antibody
MI 1.7e Antigen Antibody reactions	1. Describe general properties of antigen antibody reactions. 2. Describe lattice hypothesis 3. Classify antigen antibody reactions. 4. Describe the principle, method, types and uses of precipitation, agglutination and neutralization reaction. 5. Describe the principle, method, types and uses of complement fixation test, ELISA, immunofluorescence assay, CLIA. Radioimmuno assay, western blot and rapid tests.
MI 1.7f Complement	1. Define complement and enumerate complement activation pathways. 2. Describe the classical and alternate pathway of complement 3. Compare and contrast Classical and Alternative complement pathways 4. Describe the biological effects of complement 5. Enumerate common complement deficiency and associated diseases
MI 1.8 Describe the mechanisms of immunity and response of the host immune system to infections	
Immune response	1. Define cell mediated and humoral immune response 2. Describe the process of antigen presentation 3. Describe the cell mediated immune response 4. Describe humoral immune response 5. Describe the activation and differentiation of B cells 6. Describe, compare and contrast the events of primary and secondary immune response
MI1.9 Discuss the immunological basis of vaccines and describe the Universal Immunisation schedule	
MI 1.9 Immunoprophylaxis	1. Define immunoprophylaxis 2. Describe the types and explain the scientific basis of vaccines [live attenuated, killed, toxoid, subunit 3. Enumerate commonly used vaccines 4. Describe Universal immunisation program and National Immunisation Schedule 5. Describe the 'Cold Chain System" and the steps involved in vaccine development

	6. Describe the newer approaches for vaccine development

MI1.10 Describe the immunological mechanisms in immunological disorder (hypersensitivity, autoimmune disorders and immunodeficiency states) and discuss the laboratory methods used in detection.

MI 1.10a Hypersensitivity	1. Define hypersensitivity. 2. Classify hypersensitivity and describe their features. 3. Describe the mechanism and clinical presentation of Type I,II,III & IV hypersensitivity
MI 1.10b Autoimmune	1. Define Autoimmunity 2. Describe mechanisms of immune (central and peripheral) tolerance 3. Describe mechanisms of autoimmunity 4. Describe the pathogenesis of common autoimmune diseases 5. Describe laboratory tests of autoimmune diseases 6. Describe the role of Immunofluorescent test in diagnosis of autoimmune diseases. 7. Describe newer approaches for treatment of autoimmune diseases
MI1.10c Immunodeficiency	1. Define and enumerate Immunodeficiency 2. Classify immunodeficiency diseases 3. Describe common immunodeficiency diseases

MI 1.11 Describe the immunological mechanisms of transplantation and tumor immunity

Transplant & tumour immunity	1. Describe the role of Histocompatibility antigens in transplant immunology 2. Describe the types of graft rejection 3. Describe mechanism and factors affecting graft rejection 4. Describe graft versus host reaction 5. Describe approaches for prevention of graft rejection 6. Describe Tumor antigens (TSTA and TATA) 7. Describe mechanism of immune response against tumour cells 8. Describe immune surveillance theory 9. Explain the role of vaccine, monoclonal antibodies and cytokines in cancer immunotherapy.

CVS and Blood
MI2.1 Describe the etiologic agents in rheumatic fever and their diagnosis

MI2.1 Rheumatic fever	1. Define Rheumatic fever and name it's causative agent 2. Classify Streptococcus species 3. Describe the morphology, pathogenesis, toxins, virulence factors, antigenic structures, clinical features, epidemiology of streptococcus pyogenes 4. Describe the infections caused by S pyogenes and list the suppurative and non-suppurative sequelae of Streptococcus pyogenes 5. Describe the pathogenesis, clinical features and complications of Rheumatic fever 6. Describe the laboratory diagnosis of rheumatic fever and of other infection caused by beta haemolytic Streptococci.
MI2.2Describe the classification etio-pathogenesis, clinical features and discuss the diagnostic modalities of Infective endocarditis	
MI 2.2 Infective endocarditis (S. viridans, CONS, HACEK Enterococcus)	1. Classify IE and enumerate the causative organisms 2. Describe the morphology, pathogenesis, virulence factors, antigenic structures, clinical features, epidemiology of S. viridans, CONS, HACEK organisms, Enterococcus 3. Describe the pathogenesis and clinical features of infective endocarditis. 4. Describe the Laboratory diagnosis of IE. 5. Briefly discuss the antimicrobial treatment of IE
MI2.4 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	
MI 2.4 Infections causinganemia: [Trematodes (Schistosoma), Nematodes (Ancylostoma, N. americanus, Trichuris trichuria) , Cestodes (D latum)].	1. Enumerate the microbial agents causing Anaemia 2. Describe morphology, modes of transmission, pathogenicity, life cycle of parasites causing anaemia ([Trematodes (Schistosoma), Nematodes (Ancylostoma, N. americanus, Trichuris trichuria) , Cestodes (D latum)] 3.Discuss clinical course of Anaemia caused by each microbial agent 4.Describe laboratory diagnosis of each microbial agent causing Anaemia. 5. Describe treatment, prevention and control of each microbial agent
MI2.5 Describe the etio-pathogenesis and discuss the clinical evolution and the laboratory diagnosis of kalaazar, malaria, filariasis and other common parasites prevalent in India	

MI2.5a Kala Azar (Leishmania)& sleeping sickness (Trypanosoma)	1. Classify the common Leishmania species causing human disease and the clinical syndromes caused by them 2. Describe the morphology, modes of transmission, pathogenicity, life cycle of Leishmania donovanii and Trypanosoma 3. Discuss the clinical presentation, complications and laboratory diagnosis of kala azar and trypanosomiasis. 4. Describe PKDL 5. Describe treatment, prevention and control of kala azar and trypanosomiasis. 6. Classify the Trypanosomes infecting man and the diseases caused by them
MI2.5b Toxoplasmosis	1. Describe the morphology, modes of transmission, pathogenicity, life cycle of Toxoplasma gondii. 2. Describe the clinical presentation, complications and laboratory diagnosis of Toxoplasmosis. 3. Discuss the treatment, prevention and control of Toxoplasmosis.
MI 2.5c Malaria and Babesia.	1. Enumerate the causative Plasmodium species of human malaria 2. Describe the morphology, modes of transmission, pathogenicity, life cycle of Plasmodium species. 3. Describe the clinical presentation, complications immunity and laboratory diagnosis of malaria. 4. Discuss the treatment, prevention and control of malaria. 5. Describe the morphology, modes of transmission, pathogenicity, life cycle of Babesia. 6. Describe the clinical presentation and laboratory diagnosis of Babesiosis
MI 2.5d Filariasis	1. Enumerate the filarial nematodes causing lymphatic filariasis 2. Describe the morphology, modes of transmission, pathogenicity, life cycle of loaloa, oncocercavololus, Wuchereriabancrofti and Brugiamalayi. 3. Describe the clinical presentation, complications immunity and laboratory diagnosis of filariasis. 4. Discuss the treatment, prevention and control of filariasis. 5. Differentiate between the microfilaria of loaloa, oncocercavololus, Wuchereriabancrofti and Brugiamalayi.
MI2.5e Miscellaneous Infections of blood:Brucella.	1. Describe the epidemiology of Brucella 2. Describe the classification, morphology, and virulence factors of Brucella 3. Describe the epidemiology pathogenesis, mode of transmission, clinical features and laboratory diagnosis of Brucellosis 4. Describe the complications, treatment, prevention and control of Brucellosis.

MI2.5e Miscellaneous Infections of blood: Borrelia, Listeria, Spirillum minor, Parvovirus & EBV.	1. Describe the epidemiology, morphology, virulence factors and pathogenicity of Borrelia, Listeria, Parvovirus and Epstein Barr Virus and spirillum minor. 2. Describe the pathogenesis, clinical features and diagnostic modalities of infections caused by these agents. 3. Describe the complications, treatment, prevention and control of listeriosis, rat bite fever, relapsing fever and Lyme disease.
MI2.5f Viral haemmorhagic fevers: Arboviruses, Filovirus, robovirus	1. Enumerate and classify the viruses causing haemorrahagic fevers. 2. Decribe the morphology, mode of transmission pathogenesis and virulence factors of viral agents causing VHF. 3. Describe the clinical features, complications and laboratory diagnosis of VHF. 4. Describe treatment prevention and control of VHF.
MI2.7 Describe the epidemiology, the etio- pathogenesis, evolution complications, opportunistic infections, diagnosis, prevention and the principles of management of HIV	
MI 2.7 HIV	1. Describe morphology, antigenic structure, pathogenesis, serotypes, replication of HIV. 2. Describe clinical features including WHO clinical staging of HIV/AIDS for adults 3. Describe global and Indian epidemiology of AIDS. 4. Enumerate opportunistic infections occurs in HIV infected people 5. Describe laboratory diagnosis of HIV/AIDS 6. Describe NACO strategy for HIV diagnosis 7. Describe treatment strategies in brief. 8. Describe PEP as per NACP guidelines. 9. List HIV vaccine strategies

GIT Infections
MI3.1 Enumerate the microbial agents causing diarrhea and dysentery. Describe the epidemiology, morphology, pathogenesis, clinical features and diagnostic modalities of these agents

MI3.1a Gastro intestinal tract infections: general, Diarrhoea, Dysentery, Introduction to Enterobacteriaceae, E coli, Shigella, Campylobacter, other Enterobacteriaceae members.	1. Define diarrhoea and dysentery. 2. Describe the epidemiology of diarrhoea and dysentery 3. Enumerate the microbial agents causing diarrhoea and dysentery 4. Describe the pathogenesis, clinical features and complications of diarrhea & dysentery. 5. Differentiate the clinical features of diarrhoea and dysentery. 6. Describe laboratory diagnosis of diarrhoea and dysentery. 7. Describe the epidemiology, morphology, cultural characteristics, virulence markers, identification strategies of diarrheagenic E. coli, Shigella & other Enterobacteriaceae causing diarrhoea and dysentery.
MI3.1b Cholera: Vibrio, Plesiomonas and Aeromonas	1. Define cholera. 2. Describe the epidemiology of cholera 3. Describe the pathogenesis, clinical features and complications of cholera. 4. Describe various methods of clinical and laboratory diagnosis of cholera. 5. Describe the epidemiology, morphology, cultural characteristics, virulence markers, identification strategies of Vibrio cholera, Aeromonas, Plesiomonas 6. Describe the treatment, prevention and control of cholera.
MI3.1c Parasitic Gastro intestinal tract infections: Entamoeba and Giardia	1. Describe the epidemiology, morphology, life cycle, pathogenesis, clinical features and diagnosis of Entamoeba histolytica, Balantidium coli and Giardia 2. Describe the epidemiology, morphology, life cycle, pathogenesis, clinical features and diagnosis of coccidian parasites. 3. Describe the treatment, prevention and control of infections caused by Entamoeba histolytica, Balantidium coli, Giardia and coccidian parasites
MI3.1d Viral GI infections	1. Describe the epidemiology, morphology, pathogenesis, clinical features and diagnostic modalities of viral gastroenteritis. 2. Describe the epidemiology, morphology, pathogenesis, immunity, clinical features,

	diagnosis, prevention and control of gastroenteritis caused by rotavirus, adenovirus, Norwalk agent and norovirus
MI 3.1e Parasitic GI Infections-I & II: Intestinal nematodes (Ascaris, Enterobius Trichinella Strongyloidiasis) Trematodes (Liver fluke etc.)	1. Describe the epidemiology, morphology, life cycle and pathogenesis, of cestodes (Taenia saginata, T. solium, H. nana, Echinococcusgranuloses) 2. Describe the epidemiology, morphology, life cycle, pathogenesis, clinical features and diagnosis of trematodes (Fasciola hepatica & F. buski) 3. Describe the epidemiology, morphology, life cycle, pathogenesis, clinical features and diagnosis of intestinal nematodes. 4. Describe the laboratory diagnosis, treatment, control and prevention of diseases caused by these organisms.
MI 3.3 Describe the enteric fever pathogens and discuss the evolution of the clinical course and the laboratory diagnosis of the diseases caused by them	
MI 3.3 GI Infections: Enteric fever	1. List the various pathogens causing enteric fever. 2. Describe the pathogenesis of Typhoid & paratyphoid fever. 3. Describe the morphology, virulence factors, cultural characteristics and identification strategies for Salmonella Typhi, S. Paratyphi A and B. 4. Describe the laboratory diagnosis of typhoid and paratyphoid fever. 5. Describe clinical course, epidemiology, treatment and complications of enteric fever. 6. Describe multidrug resistant Salmonella 7. Discuss treatment, prevention and control of enteric fever.
MI3.5 Enumerate the causative agents of food poisoning and discuss the pathogenesis, clinical course and laboratory diagnosis	
MI 3.5 Food Poisoning {Staphylococcus aureus Bacillus cereus Clostridium perfringens Bacillus cereus Vibrio cholerae Vibrio parahaemolyticus Enterotoxigenic Escherichia coli	1. Define and classify various types of Food Poisoning. 2. Enumerate and classify the causative agents of food poisoning and commonly incriminated food items 3. Describe the pathogenesis, clinical course with relation to the etiological agent. 4. Describe the laboratory diagnostic of food

Enterohemorrhagic Escherichia coli Non typhoidal Salmonella Shigella spp.}	poisoning.
MI3.6 Describe the etio-pathogenesis of Acid peptic disease (APD) and the clinical course. Discuss the diagnosis and management of the causative agent of APD	
MI 3.6 APD:Helicobacter pylori	1. Describe Acid peptic disease. 2. Describe clinical course of APD. 3. Describe the pathogenesis of APD due to H. pylori 4. Describe the morphology, cultural characteristics, and identification strategies of Helicobacter pylori. 5. Describe diagnosis, treatment, control and prevention of acid peptic disease.
MI3.7 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 viral hepatitis	
MI 3.8a Viral Hepatitis	1. Define and describe viral hepatitis 2. Enumerate and describe the viruses causing hepatitis 3. Describe the epidemiology, pathogenesis and clinical features of hepatitis A, B, C, D, E and G viruses. 4. Discuss the viral markers in the evolution of acute and chronic Viral hepatitis. 5. Describe the modalities in the diagnosis, treatment and prophylaxis of hepatitis A, B, C, D, E and G viruses.
MI3.8 Choose the appropriate laboratory test in the diagnosis of viral hepatitis with emphasis on viral markers	
MI 3.8b Viral Hepatitis	1. Enumerate and describe the viral markers daignostic of viral hepatitis 2. Describe the evolution, rise and fall of various markers. 3. Discuss the viral markers in the evolution of Viral hepatitis (A, B, C, D, E and G). 4. Describe the utility of each marker with respect to clinical stage of hepatitis.

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

MI 4.1a Anaerobes and anaerobic infections including anaerobic culture methods	1. Define anaerobes 2. Describe features of anaerobic infections 3. Enumerate and classify pathogenic anaerobic bacteria 4. Describe the pathogenesis, clinical course, laboratory diagnosis and complications of common anaerobic infection. 5. Describe different methods of anaerobiosis
MI4.1b Tetanus and gas gangrene	1. Define gas gangrene 2. Enumerate the causative agents of gas gangrene 3. Describe the morphology, virulence factors, cultural characteristics of Clostridium perfringens. 4. Describe the pathogenesis, clinical course and laboratory diagnosis of gas gangrene. 5. Describe the treatment, prevention and control of gas gangrene. 6. Define tetanus and name the causative agent 7. Describe the Morphology, virulence factors, cultural characteristics of Clostridium tetani 8. Describe the pathogenesis, clinical course and laboratory diagnosis of tetanus 9. Describe the treatment, prevention and control of tetanus
MI4.1c Botulinum and Miscellaneous anaerobes}	1. Define botulism and its types 2. Describe the morphology, virulence markers, cultural characteristics of Clostridium botulinum. 3. Describe the epidemiology, pathogenesis, clinical manifestations, complications & laboratory diagnosis of botulism 4. Describe role of anaerobic organisms as normal gut flora 5. Describe antibiotic associated colitis and its aetiology 6. Describe the pathogenesis, clinical features and management of antibiotic associated colitis 7. Enumerate non sporing anaerobes 8. Enumerate the diseases caused by common non sporing anaerobes 9. Describe the pathogenesis and clinical features of various infections caused by non sporing anaerobes. 10. Discuss laboratory diagnosis for infections caused by nonsporing anaerobes
MI4.2 Describe the etiopathogenesis, clinical course and discuss the laboratory diagnosis of bone & joint infections	
MI4.2 Joint and bone infections: Osteomylitis & arthritis (Staph aureus, CONS) Parvovirus	1. Enumerate common bacterial and viral agents causing osteomyelitis, septic arthritis, diabetic foot infections 2. Describe the pathogenesis, clinical features and laboratory diagnosis of osteomyelitis and arthritis.

	3. Differentiate between gonococcal and non gonococcal arthritis 4. Define osteomyelitis 5. Enumerate causative agents of osteomyelitis 6. Describe the pathogenesis, clinical features, laboratory diagnosis and management of Osteomyelitis.
MI4.3 Describe the etio-pathogenesis of infections of skin and soft tissue and discuss the clinical course and the laboratory diagnosis	
MI 4.3 a Skin and soft tissue infections: Classification,etiology and general considerations , Parasitic Skin manifestations (Ectoparasites, Larva migrans, PKDL)	1. Enumerate the organisms of normal skin flora 2. Discuss the role of normal flora of skin 3. Define and classify SSTIs 4. Describe the varied clinical presentations with eiological agents of SSTIs 5. Describe the etiopathogenesis, clinical presentation and management of superficial and deep skin infections 6. Describe lab diagnosis of various types of SSTI 7. Enumerate the parasites involved in skin and soft tissue infections. 8. Describe etiology, types, clinical presentation and management of larva migrans. 9. Describe etiology, clinical presentation and management of PKDL
MI 4.3b: Leprosy and NTM	**1.** Define and classify leprosy **2.** Describe morphology and cultural characters of M.leprae **3.** Describe the pathogenesis and clinical presentations in leprosy **4.** Describe the role of immunity in leprosy **5.** Describe lepra reactions **6.** Describe lab diagnosis, treatment and control of leprosy **7.** Describe and classify Non tuberculus Mycobacteria (NTM). **8.** Describe the etiopathogenesis, clinical presentation and management of infections caused by NTM
MI 4.3 c: Viral exanthemas	1. Enumerate the causes of viral exanthematous infections 2. Describe the etiopathogenesis of viral exanthematous infections 3. Describe the morphology, virulence factors, epidemiology and immunity of Measles virus, Chicken pox virus, small pox virus and Rubella virus. 4. Describe the clinical features, complication and diagnosis of measles, small pox, chicken pox and Rubella.

	5. Describe the treatment, prevention and control for viral exanthematous infections.
MI 4.3d Superficial fungal infections	1. Enumerate various surface infections of the skin and its appendages caused by fungal agents, along with their etiology 2. Describe the microscopic and cultural characteristics of fungal agents (Candida, Pityriasis versiclor, Tinea nigra, Piedra, onychomycosis, dermatophytes etc.) causing infections of skin 3. Enumerate various clinical types of dermatophytosis with their causative agents 4. Describe the morphological and cultural characters of dermatophytes. 5. Describe the laboratory diagnosis of superficial fungal infections 6. Describe the management of superficial fungal infections
MI 4.3e Subcutaneous mycosis, mycetoma	1. Define mycetoma 2. Enumerate the microbial agents (Bacteria & Fungi) causing mycetoma and subcutaneous mycosis 3. Describe the pathogenesis, clinical presentation laboratory diagnosis and treatment of subcutaneous mycosis and mycetoma.

CNS Infections	
MI5.1 Describe the etiopathogenesis, clinical course and discuss the laboratory diagnosis of meningitis	
MI 5.1a Infections of CNS: Introduction & Pyogenic meningitis	**1.** Enumerate various infective syndromes of CNS **2.** Define and classify Meningitis . **3.** Differentiate between Acute & Chronic meningitis **4.** Enumerate the bacterial, viral and parasitic causes of acute/pyogenic meningitis according to age. **5.** Describe the morphology, antigenic structure and virulence factors of various etiological agents of pyogenic meningitis. (Neisseria meningitidis, Streptococcus pneumoniae, Haemophilus influenzae).

MI5.1 b Aseptic meningitis	1. Enumerate the bacterial, viral, fungal and parasitic etiological agents of aseptic meningitis. 2. Describe the morphology, antigenic structure and virulence factors of various etiological agents of aseptic meningitis. (Leptospira, Free living amoebae, Enterovirusess (poliovirus, echovirus, Coxsackie), Cryptococcus neoformans). 3. Describe the pathogenesis, clinical presentation, diagnosis, treatment, control and prevention of aseptic meningitis (Leptospira, Free living amoebae,Enterovirusess (poliovirus, echovirus, Coxsackie), Cryptococcus neoformans) 4. Differentiate the clinical findings of pyogenic meningitis and aseptic meningitis.
MI 5.2 Describe the etiopathogenesis, clinical course and discuss the laboratory diagnosis of encephalitis	
MI 5.2a Encephalitis	1. Enumerate common etiological agents causing encephalitis with special reference to India. 2. Describe the morphology, virulence factors, antigenic structure and pathogenesis of causative agents of encepahlitis. (Rabies, Tick borne encephalitis viruses, HSV-2 & Nipah) 3. Describe the epidemiology, clinical features, diagnosis, treatment, control and prevention of Rabies. 4. Describe the epidemiology, clinical features, diagnosis, treatment, control and prevention of tick borne encephalitis. 5. Describe the epidemiology, clinical features, diagnosis, treatment, control and prevention of parasitic encephalitis
MI 5.2b Miscellaneous infections of CNS	1. Define prions and slow virus infections 2. Describe the morphology, virulence factors, antigenic structure and pathogenesis of slow viruses and prions 3. Describe the epidemiology, clinical features, diagnosis, treatment, control and prevention of prion disease.

Respiratory Tract Infections	
MI6.1 Describe the etio-pathogenesis, laboratory diagnosis and prevention of Infections of upper and lower respiratory tract	
MI 6.1a Respiratory tract infections: Introduction	1. Describe the normal defence mechanism of respiratory tract 2. Enumerate various clinical types of respiratory infections with examples. 3. Describe the mode of transmission of upper and lower respiratory tract infections 4. Enumerate the causative agent of various type of respiratory infections. 5. Outline the laboratory diagnosis of patient with respiratory infection.

MI 6.1b Viral URTI including common cold & croup	1. Enumerate the causative viral agents of common cold, pharyngitis, croup, sinusitis, otitis media. 2. Describe classification, morphology, antigenic structure, virulence factor of causative agent (Adeno, Rhino, Mumps, Echo, Par echo, Coxsackie A, RSV, Corona, Influenza & Parainfluenza viruses). 3. Discuss the pathogenesis, epidemiology and immunity of causative agent . 4. Discuss the laboratory diagnosis, treatment and control of common cold, croup, mumps and pharyngitis.
MI 6.1c Tuberculosis	1. Define and classify tuberculosis 2. Classify mycobacteria causing tuberculosis 3. Describe morphology, pathogenesis, virulence factors and cultural characteristics of Mycobacterium tuberculosis. 4. Describe the epidemiology, clinical manifestations, complications and laboratory diagnosis of pulmonary tuberculosis. 5. Discuss the treatment, control and prevention of tuberculosis. 6. Describe the strategies and case management as per RNTCP
MI6.1d Bacterial URTI-I **MI6.1e** Bacterial URTI-II	1. Enumerate the causative bacterial agents of pharyngitis, diphtheria, whooping cough (croup), sinusitis, otitis media. 2. Describe the clinical features, pathogenesis and immunity of diphtheria and whooping cough. 3. Describe the morphology, virulence factors and cultural characteristics of bacterial agents causing pharyngitis. 4. Describe clinical features, pathogenesis, complications and laboratory diagnosis of pharyngitis, diphtheria and whooping cough. 5. Describe the treatment, prevention and control measures for diphtheria, whooping cough and pharyngitis.
MI 6.1f Bacterial pneumonia other than Mycobacteria -I **MI 6.1g** Bacterial pneumonia other than Mycobacteria -II	1. Define the clinical types of Pneumonia [CAP, HAP/VAP & AP] 2. Enumerate the causative bacterial agents of pneumonia (other than Mycobacteria) 3. Describe the morphology, antigenic structure, virulence markers, cultural characteristics of various bacterial agent (S. pneumoniae, Staph. aureus, H. influenzae, Mycoplasma, Chlamydia, Klebsiella, Pseudomonas, Acinetobacter, Legionella). 4. Describe the clinical features, pathogenesis, clinical features, complications and lab diagnosis of bacterial pneumonia. 5. Describe the treatment, prevention and control measures for pneumonia. 6. Describe the clinical features, pathogenesis, clinical course of Atypical pneumonia & legionella pneumonia. 7. Discuss the laboratory diagnosis, treatment, prevention and control of atypical pneumonia.

MI 6.1h Fungal pneumonia	1. Enumerate the various fungal agents of pneumonia 2. Describe the morphology, epidemiology, virulence and cultural characteristics of agent (Candida, Cryptococcus, Dimorphic fungi {Histoplasma, coccidoidies, paarcoccidoides C.immitis, P.brazilliansis} Aspergilus, P.Jeroveci, Penicillium, {Oral thrush, ABPA }) 3. Discuss the predisposing factors and pathogenesis of fungal pneumonia. 4. Describe the clinical features, complications, laboratory diagnosis, treatment, control and preventive methods of fungal pneumonia.
MI 6.1i Viral LRTI-I	1. Enumerate the causative viral agents of pneumonia, ARDS, ILI, SARI. 2. Describe epidemiology, classification, morphology, virulence factors, antigenic structure, immunity of the agent (paramyxovirus, orthomyxovirus, Corona, MERS COV, SARS, SARS-CoV2). 3. Describe the pathogenesis and immunity of viral pneumonia. 4. Define and Classify influenza viruses. 5. Discuss its pathogenesis [antigenic structure and variations] 6. Describe epidemiology including antigenic shift and drift of influenza virus. 7. Describe the clinical features, complications, laboratory diagnosis, treatment, control and preventive methods of viral pneumonia.
MI 6.1j Miscellaneous disorders of lung (Bronchitis, Bronchiectasis, Lung abscess, empyema, pleural effusion	1. Enumerate the causative agents of Bronchitis, Bronchiectasis, Lung abscess, empyema, pleural effusion 2. Enumerate the parasitic agents causing lung infection 3. Describe the pathogenesis & clinical manifestations of Bronchitis, Bronchiectasis, Lung abscess, empyema, pleural effusion 4. Discuss the treatment, prevention & control of Bronchitis, Bronchiectasis, Lung abscess, empyema, pleural effusion 5. Describe the pulmonary manifestations of various parasites causing lung disorder (E.histolytica, E.granulosus) 6. Describe the epidemiology, morphology, life cycle, of P.westermani 7. Describe the pathogenesis, clinical features, complications, treatment and control of paragonimiasis 8. Discuss the laboratory diagnosis of varied lung infections.

Genitourinary system and urinary tract infections
MI 7.1 Describe the etio-pathogenesis and discuss the laboratory diagnosis of infections of genitourinary system

MI 7.1 Genitourinary system infections	1. Enumerate the microorganisms found as part of normal flora of Genitourinary system. 2. Discuss the role of normal flora in health of genitourinary tract. 3. Define and Classify Genitourinary Tract infections, Reproductive Tract infections and Sexually Transmitted Infections 4. Describe the etio-pathogenesis of Genitourinary Tract infections, Reproductive Tract infections and Sexually Transmitted Infections 5. List the clinical syndromes associated with the RTIs 6. Name the etiological agents of the various clinical syndromes 7. Classify Urinary Tract Infections 8. Describe etiopathogenesis of Urinary Tract infections 9. Describe the laboratory diagnosis of Genitourinary infections
MI 7.2 Describe the etio-pathogenesis and discuss the laboratory diagnosis of sexually transmitted infections. Recommend preventive measures	
MI 7.2 a **Painless** Genital ulcers: Syphilis	1. Name the causative agent of Syphilis 2. Classify Treponemes 3. Describe the pathogenesis and clinical manifestations of various stages of Syphilis 4. Describe the morphology, virulence factors and cultural characteristics of Treponema pallidum 5. Describe the laboratory diagnosis of syphilis including congenital syphilis 6. Describe treatment, control and prevention of syphilis
MI 7.2b STD-II Genital ulcers and warts	1. Enumerate the causative agents of genital warts, painful genital ulcer. 2. Classify Herpesviruses 3. Describe the pathogenesis, clinical features and laboratory diagnosis of genital herpes, chancroid, Donovanosis. 4. Describe the epidemiology, morphology & cultural characteristics of Haemophilus ducreyi, HSV, Klebsiella granulomatis 5. Discuss Anogenital Warts and Human Papilloma Virus associated lesions.

MI 7.2c Vaginal/Urethral Discharge -I Urethritis gonococcal and NGU (Gonorrhoea, Chlamydia, Trichomonas, Bacterial vaginosis, ureaplasma, Candida	1. Enumerate the organisms causing vaginal/urethral discharge 2. Describe the morphology, cultural characteristics, methods for identification and antimicrobial susceptibility testing of Neisseria gonorrhoeae 3. Describe the pathogenesis, clinical features, laboratory diagnosis and treatment of gonorrhea 4. Define Non-gonococcal urethritis and cervicitis 5. List the causative agents of NGU, LGV 6. Classify family Chlamydiaceae 7. Describe the morphology, cultivation, typing and life cycle of Chlamydia trachomatis 8. Discuss the pathogenesis, complications and clinical features of genital Chlamydia trachomatis infections 9. Discuss the laboratory diagnosis of genital C. trachomatis infections
MI 7.2d Vaginal/ Urethra Discharge -II (Gonorrhoea, Chlamydia, Trichomonas, Bacterial vaginosis, Candida	1. Describe the morphology, cultural characteristics, methods for identification of Mycoplasma and ureaplasma. 2. Describe the morphology, pathogenesis, life cycle and laboratory diagnosis of Trichomonas vaginalis. 3. Discuss the laboratory diagnosis of NGU and non-gonococcal endocervicitis 4. Enumerate the organisms associated with Bacterial Vaginosis 5. Describe the morphology, pathogenesis, life cycle and laboratory diagnosis of organisms involved in bacterial vaginosis.
MI 7.2e Miscellaneous STI	1. Enumerate the non-sexually transmitted microbial causes of infections of genitourinary system 2. Describe the pathogenesis of these infections (PID, Genital warts (HPV), Molluscum contagiosum, pubic lice, scabies) 3. Describe the clinical features of these infections 4. Discuss the laboratory diagnosis of these infections
MI7.2f Lab diagnosis and syndromic management of STI	1. Describe Syndromic management of STDs and Reproductive Tract Infections 2. Describe treatment, prevention and control of STDs
MI 7.3 Describe the etio-pathogenesis, clinical features, the appropriate method for specimen collection, and discuss the laboratory diagnosis of Urinary tract infections	

MI 7.3 UTI	1. Enumerate the etiological agents causing Urinary Tract Infections 2. Describe the predisposing factors, pathogenesis and clinical features of UTI 3. Describe the laboratory diagnosis of UTI. , 4. Define significant bacteriuria and interpret patients test reports 5. Describe the methods used to differentiate between upper and lower UTI 6. Describe the morphology, cultural characteristics, methods for identification and antimicrobial susceptibility testing of Proteus, Morganella and Providencia

Zoonotic and Miscellaneous Infections	
MI8.1 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	
MI8.1a Zoonotic disease: Introduction, epidemiology and prevention. **MI 8.1b** Entomology and vectors in disease **MI 8.1c** Rickettsia, Bartonella, Coxiella **MI 8.1d** Miscellaneous Zoonosis: Yersinia, Bacillus anthracis, Pasteurella, Franscicella	1. Define: Zoonoses 2. Enumerate the microbial agents and their vectors causing Zoonotic diseases. 3. Describe the morphology, mode of transmission, pathogenesis, clinical course, laboratory diagnosis and prevention of Zoonotic diseases: 4. Describe the morphology, cultural characteristics, methods for identification of Bacillus anthracis, Brucella species, Yersinia pestis, Leptospira, Ricketssia species, Rhabdovirus. 5. Describe the pathogenesis, clinical features, laboratory diagnosis and treatment of Anthrax, Brucellosis, Plague, Leptospirosis, Rickettsia, Rabies,
MI8.2 Describe the etio-pathogenesis of opportunistic infections (OI) and discuss the factors contributing to the occurrence of OI, and the laboratory diagnosis	
MI 8.2a Opportunistic infections: General Bacterial, Parasitic and Virus	1. Define Opportunistic infections 2. Classify and enumerate opportunistic infections. 3. Describe the etiopathogenesis of Opportunistic infections and discuss the factors contributing to opportunistic infections. 4. Describe diagnosis of opportunistic infections
MI 8.2b Opportunistic infections: Mycosis	1. Enumerate fungi causing OI 2. Describe laboratory diagnosis of opportunistic infections
MI8.3 Describe the role of oncogenic viruses in the evolution of virus associated malignancy	

Oncogenic virus	1. Describe oncogenesis 2. Describe the properties of cells transformed by viruses. 3. Enumerate oncogenic DNA and RNA viruses 3. Define and describe Oncogenes/ Proto-oncogenes 4. Describe the mechanism of viral oncogenesis.
MI8.4 Describe the etiologic agents of emerging Infectious diseases. Discuss the clinical course and diagnosis	
Emerging and reemerging Infections	1. Define: Emerging infectious agents. 2. Enumerate emerging infectious agents in world and in India. 3. Describe the factors that contribute to emerging and reemerging infections. 4. Discuss epidemiology of emerging infections with special reference to Indian context. 5. Discuss their clinical course and diagnosis.
MI8.5 Define Healthcare Associated Infections (HAI) and enumerate the types. Discuss the factors that contribute to the development of HAI and the methods for prevention	
HAI	1. Define Healthcare Associated Infections (HAI) 2. Enumerate and describe common types of HAI 3. Enumerate microbial agents responsible for various types of HAI 4. Discuss the factors that contribute to the development of HAI, including sources, mode of transmission and epidemiology of infectious agents 5. Discuss the methods of prevention of HAI
MI 8.6 Describe the basics of Infection control	
MI 8.6 Infection control	1. Define and describe the concept of Hospital/ Healthcare Infection Control 2. Enumerate and describe the concepts and methods of Infection control. 3. Define Standard precautions, transmission based precautions, and contact precautions. 4. Describe the components of Standard precautions, transmission based precautions, and contact precautions. 5. Describe Respiratory etiquettes, sharps safety, safe injection practices, sterilization, disinfection, good housekeeping, PPE donning/doffing, hand hygiene, post-exposure prophylaxis, etc.) 6. Describe the constitution and functions of Hospital Infection Control Committee. 7. Define and classify Biomedical waste. 8. Discuss management of Biomedical Waste as per latest Biomedical Waste Management Rules.

MI 8.8 Describe the methods used and significance of assessing the microbial contamination of food, water and air	
MI 8.8 Milk, food and air Microbiology	1. Enumerate the bacteria that can be found in food, water and air. 2. Describe the methods used and significance of assessing the microbial contamination of water air, food, and milk.
MI 8.13 Choose the appropriate laboratory test in the diagnosis of the infectious disease	
MI 8.13a PUO	1. Define PUO 2. Enumerate the causative agents of PUO 3. Enumerate the samples and describe sample collection techniques and transport 4. Describe blood collection technique 5. Describe the sample processing, identification and confirmation
MI 8.13b Congenital infections	1. Enumerate various congenital infections. 2. Enumerate various test to screen for congenital infections 3. Describe the pathogenesis, complications and screening for congenital infections.
MI 8.13c URTI	1. Enumerate various clinical types of upper respiratory infections with examples. 2. Describe the mode of transmission of upper and lower respiratory tract infections 3. Enumerate the causative agent of various type of respiratory infections. 4. Enumerate the samples and describe sample collection techniques and transport 5. Describe the sample processing, identification and confirmation
MI 8.13d LRTI	1. Enumerate various clinical types of lower respiratory infections with examples. 2. Describe the mode of transmission of upper and lower respiratory tract infections 3. Enumerate the causative agent of various type of respiratory infections. 4. Enumerate the samples and describe sample collection techniques and transport 5. Describe the sample processing, identification and confirmation
MI 8.13e Wound infection	1. Enumerate various clinical types of wound infections. 2. Enumerate the causative agent of various type of wound infections. 3. Enumerate the samples and describe sample collection techniques and transport 4. Describe the sample processing, identification and

	confirmation
MI 8.13f Meningitis	1. Enumerate various clinical types of meningitis. 2. Enumerate the causative agent of various type of meningitis. 3. Enumerate the samples and describe sample collection techniques and transport 4. Describe the sample processing, identification and confirmation
MI 8.13g Eye/ENT infections	1. Enumerate various clinical types of eye and ENT infections. 2. Enumerate the causative agent of various type of Eye and ENT infections. 3. Enumerate the samples and describe sample collection techniques and transport 4. Describe the sample processing, identification and confirmation
MI8.15 Choose and Interpret the results of the laboratory tests used in diagnosis of the infectious disease	
MI 8.15 Lab diagnosis of PUO, URTI, LRTI, Meningitis, wound infections, Eye, ENT infections	1. Enumerate various clinical types of infections with examples. 2. Describe the mode of transmission of infections 3. Enumerate the causative agent of various type of infections. 4. Enumerate the samples and describe sample collection techniques and transport 5. Describe the sample processing, identification and confirmation
MI 8.16 Describe the National Health Programs in the prevention of common infectious disease	
MI 8.16	1. Enumerate various National programs for prevention of infectious diseases. 2. Enumerate the components and strategies of control program. 3. Describe the implementation of National Program at various levels. 4. Describe the evaluation of National Program.

6. Assessment

Student will maintain a log book as given in Annexure II. Practical record book will also be maintained by students to record practical findings for day to day work and assessments. Both theory and practical to be assessed.

(a) Formative

- **First Term**

  Assessments (2): General Microbiology, Immunology & CVS

  End term Exam- January last week to February 1st week.

- **Second Term**

  Assessment (3): Respiratory, GIT 7 Hepatobiliary

  End Term Exam: April last week to May 1st week.

- **Third Term**

  Assessment (2): SDL & Zoonotic, CVS, GUT, Miscellaneous

  Sent Up Examination: August last week to September 1st week.

Section 3: Schedule of Internal assessment (IA) in Microbiology

IA	1st IA (Jan-Feb)	2nd IA (April-May)	Sent up examination	Final Examination
Theory	50	50	Paper 1-100 Paper 2-100	Paper 1-100 Paper 2-100
Practical (including 10 marks log book & practical file)	50	50	100	100
Total	100	100	300	300

b) Internal Assessment

Maintained in card format for all teachers. Feedback given after end of each assessment. Internal assessment is divided in two components. Day to day assessments based on performance in tutorials, seminars, Practical class and skill session will be given weightage of 20%, while term exam assessments, end competency assessments will be included in term assessments given weightage of 80 %. IA sheet will be maintained for each student mentioning the suggested and taken remedial measures.

Theory	**T1**	**T2**	**T3**	**Total %**

Interest in subject (5)				
Active participation (5)				
Scientific attitude (5)				
Any other academic input (SDL, Quiz, Poster, Paper presentation, social service) (5)				
Exams assessment (80)				
Total Theory				
Practical				
Interest in subject (5)				
Attitude (5)				
Bench Work culture (5)				
Behaviour (5)				
Term exams Assessment (60)				
Log Book (10)				
Practical record Book (10)				
Total Practical (100)				
Total IA (Theory + Practical)				
Remarks/ Remedial measures suggested				
Signature Student				
Signature Teacher In charge				
Signature Batch In charge				
Signature HOD				

IA Sheet for monitoring of student's performance

Roll No. **Name:** **Contact no:**

		Attendance (%)		Marks (%)		Signature	Total Marks 100 (%)
S. no.	**Date**	**Theory**	**Practical**	**Theory**	**Practical**		
1st Term							
1.							

2.							
End term							
2nd Term							
3.							
4.							
5							
End term							
Total							
3rd term							
6. SDL							
Sent up Exam							
Log Book							
Remarks/ Remedial measures suggested							

Table 2: Theory distribution layout

Paper Layout			
Types of questions	**Marks per question**	**No. of questions in each paper**	**Total**
MCQ	1	20	20
Short answer	3	10	30
Short Note	5	6	30
Long Question	10	2	20
Total			100

Table 3: Theory paper distribution

PAPER I	Gen Microbiology	Immunology	CVS & Blood	GIT & Hepatobiliary	Total no. of questions
Total Marks (100)	25	30	22	23	38

PAPER II	Musculoskeletal system skin and soft tissues infections	Central Nervous System infections	Respiratory Infections	Genitourinary & Sexually transmitted infections	Zoonotic diseases and miscellaneous	Total no. of questions
Total Marks (100)	20	20	20	20	20	38

Table 4: Term wise assessment pattern for Practical

	Spots	Gram stain & hanging drop with clinical problem	PS for mp/ mf with clinical problem	Log book/ Practical file	Viva related to practical exercises	Total
1st Term	10	10	10	10	10	50
2nd Term	Spots	ZN stain	Stool examination for ova/cyst	Log book/Practical file	Viva related to practical exercises	Total
	10	10	10	10	10	50

Table 5: Complete distribution of Practical examination for final summative exam

Pattern	Exercise	Marks
Microscopic skills*	Gram staining, hanging drop & clinical problem	10 (3+2+2+3) {Identify+Focus+Report+Record observation}
	ZN staining with clinical problem	10 (3+2+2+3) {Identify+Focus+Report+Record observation}
	Stool Examination with clinical vignette	10 (2 findings) (3+2X2) {Identify+Record observations}
Clinical problem	Clinical Problem solving for sample, container and precautions	10
Spots or OSPE with Clinical Problem	Clinical vignette with Peripheral blood smear for MP/MF	5(3+2)
Skill based exercise	Exercise with infection control, PPE & hand hygiene	05
AETCOM Excercise	Clinical Problem with AETCOM competency	05
Spot/OSPE	Culture Medium, biochemical /AST	3(2+1) {Identify +Question}
Spot/OSPE	Instrument, sterilization, disinfection, Biomedical waste	3(2+1) {Identify +Question}
Spot/OSPE	Fungal	3(2+1) {Identify +Question}
Spot/OSPE	Serology/Immunology	3(2+1) {Identify +Question}
Spot/OSPE	Virus, Parasite	3(2+1) {Identify +Question}
Viva based on practical exercises		30

Total		**100**

Note: The students will submit practical file and log book during the Examination.
*Numerical scoring: The steps of the staining procedure and interpretation are scored as follows

Steps Done	Marks allotted
Performing the stain following all the steps (1 mark each) -Primary stain -Decolourisation -Secondary stain	3
Focusing the stained slide with appropriate adjustments of the Microscope	2
Identifying the structures under the Microscope/Observation and inference	3
Diagram and writing the report	2
Total	10

7) ASSESSMENT OF INDIVIDUAL COMPETENCIES: (To be done similarly for each competency)

1) Competency identified: MI 1.2 (a)
2) Name of the activity: Perform and identify the different causative agents of Infectious diseases by Gram Stain
3) Components of the activity:
    a) Practical session to demonstrate the procedure for stain.
    b) Performing the procedure by the student and focussing the slide.
    c) Recording the observation and the inference with a neat labelled diagram
    d) Feedback given on the session.
4) Criteria for successful completion: The student has to perform the activity 5 times and score more than 5/10 in each attempt

Attempt Number	**Date of performing the activity**	**Marks scored out of 10**	**Rating Below Expectations(B); Meets Expectations(M); Exceeds Expectations(E)**	**Signature of faculty**	**Signature of student**
1					
2					

3					
4					
5					

Documentation of activity (diagram and observation and inference) – to be written in the Record book.

Recommended action when unsuccessful : Repeat after discussion

Note:
Keeping the basic structure of internal assessment intact, minor adjustments in unit I and II can be done based on the course covered.
For detailed assessment instructions refer to Assessment Blueprint document for CBME batch 2021

Internal assessment will be calculated for theory (40) marks and practical (20) marks Student will require to get 50 % combined in theory & practical (not less than 40 % in each) for eligibility to appear for university exam.

2. Amendment to Ordinance V (2) & VII. [EC. Res. 78-7 dated 25.03.2022] regarding course curriculum prepared on competency based UG curriculum for MBBS course -2nd Professional (New Scheme).

Pathology

VISION

The broad goal of pathology curriculum is to make undergraduates aware of pathological basis ofdisease, have comprehensive scientific knowledge of the gross and microscopic features of various organs affected in different pathological lesions and their correlation with clinical presentation.

Learning objectives (overall)

At the end of curriculum, student should be able to

a) **KNOWLEDGE**

1. Explain pathological basis of disease.
2. Identify gross and microscopic features of common pathological lesions
3. Know the etiopathogenesis of common clinical conditions
4. Know genetic basis of diseases with knowledge of genetic tools for diagnosis of diseases

b) **SKILL**

At the end of course, student should be able to

1. Make good peripheral smear AND describe the peripheral blood picture
2. Analyze lab reports and its correlation with clinical diagnosis
3. Describe the correct technique to perform blood grouping & cross matching,
4. Identify the etiology of meningitis based on given CSF parameters
5. Interpret liver function and viral hepatitis serology panel and able to differentiate varioustypes of jaundice

c) ATTITUDE AND COMMUNICATIONS

At the end of course, student should be able to

1. Show due respect in handling of specimens, slides and microscope
2. work efficiently in a team
3. Communicate efficiently with teachers and peer groups
4. Develop professional attributes in terms of discipline, punctuality, accountability andrespect to teachers

Competencies

Detailed competencies are shown in annexure 1

Learning objective for each competencies are added in annexure 2

Annexure 1

S.No.	Topic	Competency	Theory/practical/ laboratory/ clinical
1)	Introduction to Pathology	PA 1.1: Describe the role of a pathologist indiagnosis and management of disease: PA1.2: Enumerate common definitions and terms used in Pathology PA 1.3:Describe the history and evolution of Pathology	Theory/practical
2)	Cell Injury and Adaptation	PA2.1:Demonstrate knowledge of the causes, mechanisms, types and effects of cell injury and their clinical significance PA2.2: Describe the etiology of cell injury. Distinguish between reversible-irreversible injury: mechanisms; morphology of cell injury PA2.3:Intracellular accumulation of fats, proteins, carbohydrates, pigments PA2.4:Describe and discuss Cell death-types, mechanisms, necrosis, apoptosis (basic as contrasted with necrosis), autolysis PA2.5:Describe and discuss pathologic calcifications, gangrene PA2.6:Describe and discuss cellular adaptations: atrophy, hypertrophy, hyperplasia, metaplasia, dysplasia PA2.7:Describe and discuss the mechanisms of cellular aging and Apoptosis PA2.8:Identify and describe various forms of cell injuries, their manifestations and consequences in gross and microscopic specimens	Theory/ practical/ laboratory/ clinical

3)	Amyloidosis	PA3.1: Describe the pathogenesis and pathology of amyloidosis PA3.2: Identify and describe amyloidosis in a pathology specimen	Theory/practical/ laboratory/clinical
4)	Inflammation	PA4.1: Define and describe the general features of acute and chronic inflammation including stimuli, vascular and cellular events PA4.2: Enumerate and describe the mediators of acute inflammation PA4.3: Define and describe chronic inflammation including causes, types non- specific and granulomatous; and examples of each PA4.4: Identify and describe acute and chronic inflammation in gross and microscopic specimens	Theory/practical/ laboratory/clinical
5)	Healing and repair	PA5.1:Define and describe the process of repair and regeneration including wound healing and its types	Theory/practical/ laboratory/ clinical
6)	Hemodynamic disorders	PA6.1: Define and describe edema, its types, pathogenesis and clinical correlation PA6.2: Define and describe hyperemia, congestion, hemorrhage PA6.3: Define and describe shock, its pathogenesis and its stages PA6.4: Define and describe normal haemostasis and the etiopathogenesis and consequences of thrombosis PA6.5: Define and describe embolism and its causes and common types PA6.6:Define and describe Ischaemia /infarction its types, etiology, morphologic changes and clinical effects PA6.7: Identify and describe the gross	Theory/practical/ laboratory/ clinical

		and microscopic features of infarction in a pathologic specimen	
7)	Neoplastic disorders	PA7.1: Define and classify neoplasia. Describe the characteristics of neoplasia including gross, microscopy, biologic, behaviour and spread. Differentiate between benign from maignantneoplasm PA7.2:Describe the molecular basis of cancer PA7.3:Enumerate carcinogens and describe the process of Carcinogenesis PA7.4:Describe the effects of tumor on the host including paraneoplastic syndrome PA7.5: Describe immunology and the immune response to cancer	Theory/practical/ laboratory/ clinical
8)	Basic diagnostic cytology	PA8.1: Describe the diagnostic role of cytology and its application in clinical care PA8.2: Describe the basis of exfoliative cytology including the technique & stains used PA8.3: Observe a diagnostic cytology and its staining and interpret the specimen DOAP	Theory/practical/ laboratory/ clinical
9)	Immunopathology and AIDS	PA9.1: Describe the principles and mechanisms involved in immunity PA9.2: Describe the mechanism of hypersensitivity reactions PA9.3: DESCRIBE HLA SYSTEM and immune systems Involved in transplant and mechanism of transplant rejection PA9.4: Define autoimmunity. Enumerate autoimmune disorders	Theory/practical/ laboratory/ clinical

		PA9.5: Define and describe the pathogenesis of systemic Lupus Erythematosus PA9.6: Define and describe the pathogenesis and pathology of HIV and AIDS PA9.7: Define and describe the pathogenesis of other common autoimmune diseases	
10)	Infections and Infestations	PA10.1:Define and describe the pathogenesis and pathology of malaria PA10.2:Define and describe the pathogenesis and pathology of Cysticercosis PA10.3:Define and describe the pathogenesis and pathology of leprosy PA10.4:Define and describe the pathogenesis and pathology of common bacterial, viral, protozoal and helminthic diseases	Theory/practical/ laboratory/ clinical
11).	Genetic and paediatric diseases	PA11.1:Describe the pathogenesis and features of common cytogenetic abnormalities and mutations in childhood PA11.2:Describe the pathogenesis and pathology of tumor and tumourlike conditions in infancy and childhood PA11.3:Describe the pathogenesis of common storage disorders in infancy and childhood	Theory/practical/ laboratory/ clinical
12)	Environmental and nutritional diseases	PA12.1:Enumerate and describe the pathogenesis of disorders caused by air pollution, tobacco and alcohol PA12.2:Describe the pathogenesis of disorders caused by protein calorie malnutrition and starvation PA12.3:Describe the pathogenesis of obesity and its consequences	Theory/practical/ laboratory/clinic al

13)	Introduction to haematology	PA13.1:Describe hematopoiesis and extramedullary hematopoiesis PA13.2:Describe the role of anticoagulants in hematology PA13.3:Define and classify anemia PA13.4:Enumerate and describe the investigation of anemia PA13.5:Perform, Identify and describe the peripheral blood picture in Anemia	Theory/practical/ laboratory/ clinical
14)	Microcytic anemia	PA14.1:Describe iron metabolism PA14.2:Describe the etiology, investigations and differential diagnosis of microcytic hypochromic anemia PA14.3:Identify and describe the peripheral smear in microcytic anemia	Theory/practical/ laboratory/ clinical
15)	Macrocytic anemia	PA15.1:Describe the metabolism of Vitamin B12 and the etiology and pathogenesis of B12 deficiency PA15.2:Describe laboratory investigations of macrocytic anemia PA15.3:Identify and describe the peripheral blood picture of macrocytic Anemia PA15.4:Enumerate the differences and describe the distinguishing features of megaloblastic and non-megaloblastic macrocytic anemia	Theory/practical/ laboratory/ clinical
16)	Hemolytic anemia	PA16.1: Define and classify hemolytic anemia PA16.2: Describe the pathogenesis and clinical features and hematologic indices of hemolytic anemia PA16.3: Describe the pathogenesis, features, hematologic indices and peripheral blood picture of sickle cell anemia and thalassemia PA16.4: Describe the etiology pathogenesis, hematologic indices and peripheral blood picture of Acquired hemolytic anemia PA16.5: Describe the peripheral blood picture in different hemolyticanemia PA16.6: Prepare a peripheral blood smear and identify hemolytic anaemia	Theory/practical/ laboratory/ clinical

		from it PA16.7: Discribe the correct technique to perform a cross match	
17)	Aplastic anemia	PA17.1: Enumerate the etiology, pathogenesis and findings in aplastic anemia PA17.2: Enumerate the indications and describe the findings in bone marrow aspiration and biopsy	Theory/practical/ laboratory/clinical
18)	Leucocytic disorders	PA18.1: Enumerate and describe the causes of leucocytosis leucopenia lymphocytosis and leukemoid reactions. PA18.2: Describe the etiology, genetics, pathogenesis classification, features, hematologic features of acute and chronic leukemia	Theory/practical/ laboratory/clinical
19)	Lymph node and spleen	PA19.1: Enumerate the causes and describe the differentiating features of lymphadenopathy PA19.2: Describe the pathogenesis and pathology of tuberculous lymphadenitis PA19.3: Identify and describe the features oftuberculous lymphadenitis in a gross and microscopic specimen PA19.4: Describe and discuss the pathogenesis, pathology and the differentiating features of Hodgkin's and non-Hodgkin'slymphoma PA19.5: Identify and describe the features of Hodgkin's lymphoma in a gross and microscopic specimen PA19.6: Enumerate and differentiate the causes of splenomegaly PA19.7: Identify and describe the gross specimen of an enlarged spleen	Theory/practical/ laboratory/ clinical

20)	Plasma cell disorders	PA20.1: Describe the features of plasma cell myeloma	Theory/practical/ laboratory/clinical
21)	Hemorrhagic disorders	PA21.1: Describe normal hemostasis PA21.2: Classify and describe the etiology, pathogenesis and pathology of vascular and platelet disorders including ITP and haemophilia PA21.3: Differentiate platelet from clotting disorders based on the clinical and hematologic features PA21.4: Define and describe disseminated intravascular coagulation, its laboratory findings and diagnosis of disseminated intravascular coagulation PA21.5: Define and describe disseminated intravascular coagulation AND VIT K DEFICIENCY	Theory/practical/ laboratory/clinical
22)	Blood banking and transfusion	PA22.1:Classify and describe blood group systems (ABO and RH) PA22.2:Enumerate the indications, describe the principles, enumerate and demonstrate the steps of compatibility testing PA22.4:Enumerate blood components and describe their clinical uses PA22.5:Enumerate and describe infections transmitted by blood Transfusion PA22.6:Describe transfusion reactions and enumerate the steps in the investigation of a transfusion reaction PA22.7: Enumerate the indications and describe the principles and procedure of autologous transfusion	Theory/practical/ laboratory/clinical

23)	Clinical Pathology	PA23.1:Describe abnormal urinary findings in disease states and identify and describe common urinary abnormalities in a clinical specimen PA23.2:Describe abnormal findings in body fluids in various disease States PA23.3:Describe and interpret the abnormalities in a panel containing semen analysis, thyroid function tests, renal function tests or liver function tests	Theory/practical/ laboratory/clinical
24)	Gastrointestinal tract	PA24.1:Describe the etiology, pathogenesis, pathology and clinical features of oral cancers PA24.2:Describe the etiology, pathogenesis, pathology, microbiology, clinical and microscopic features of peptic ulcer disease PA24.3:Describe and identify the microscopic features of peptic ulcer PA24.4:Describe and etiology and pathogenesis and pathologic features of carcinoma of the stomach PA24.5:Describe and etiology and pathogenesis and pathologic features of Tuberculosis of the intestine PA24.6:Describe and etiology and pathogenesis and pathologic and distinguishing features of Inflammatory bowel disease PA24.7:Describe the etiology, pathogenesis, pathology and distinguishing features of carcinoma of the colon	Theory/practical/ laboratory/clinical

25)	Hepatobiliary system	PA25.1:Describe bilirubin metabolism, enumerate the etiology and pathogenesis of jaundice, distinguish between direct and indirect hyperbilirubinemia PA25.2:Describe the pathophysiology and pathologic changes seen in hepatic failure and their clincial manifestations, complications and consequences. PA25.3:Describe the etiology and pathogenesis of viral and toxic hepatitis: distinguish the causes of hepatitis based on the clinical and laboratory features. Describe the pathology, complications and consequences of hepatitis PA 25.4: Describe the pathophysiology, pathology and progression of alcoholic liver disease including cirrhosis 25.5:Describe the etiology, pathogenesis and complications of portal hypertension SDL PA25.6 : Interpret liver function and viral hepatitis serology panel. Distinguish obstructive from non- obstructive jaundice based on clinical features and liver function tests	Theory/practical/ laboratory/clinical
26)	Respiratory system	26.1:Define and describe the etiology, types, pathogenesis, stages, morphology and complications of pneumonia 26.2:Describe the etiology, gross and microscopic appearance and complications of lung abscess PA26.3:Describe the etiology, types, pathogenesis, stages, morphology and complications and evaluation of Obstructive airway disease (OAD) and bronchiectasis PA26.4;Define and describe the etiology, types, pathogenesis, stages, morphology microscopic appearance and	Theory/practical/ laboratory/clinical

		complications of tuberculosis PA26.5:Define and describe the etiology, types, exposure, environmental influence, pathogenesis, stages, morphology, microscopic appearance and complications of Occupational lung disease PA26.6: Define and describe the etiology, types, exposure, genetics environmental influence, pathogenesis, stages, morphology, microscopic appearance, metastases and complications of tumors of the lung and pleura PA26.7:Define and describe the etiology, types, exposure, genetics environmental influence, pathogenesis, morphology, microscopic appearance and complications of mesothelioma	
27)	Cardiovascular system	PA27.1: Distinguish arteriosclerosis from atherosclerosis. Describe the pathogenesis and pathology of various causes and types of arteriosclerosis PA27.2:Describe the etiology, dynamics, pathology types and complications of aneurysms including aortic aneurysms PA27.3:Describe the etiology, types, stages pathophysiology, pathology and complications of heart failure PA27.4:Describe the etiology, pathophysiology, pathology, gross and microscopic features, criteria and complications of rheumatic fever PA27.5:Describe the epidemiology, risk factors, etiology, pathophysiology, pathology, presentations, gross and microscopic features, diagnostic tests and complications of ischemic heart disease PA27.6:Describe the etiology,	Theory/practical/ laboratory/clinical

		pathophysiology, pathology, gross and microscopic features, diagnosis and complications of infective endocarditis PA27.7:Describe the etiology, pathophysiology, pathology, gross and microscopic features, diagnosis and complications of pericarditis and pericardial effusion PA27.8:Interpret abnormalities in cardiac function testing in acute coronary syndromes PA27.9:Classify and describe the etiology, types, pathophysiology, pathology, gross and microscopic features, diagnosis and complications of cardiomyopathies PA27.10:Describe the etiology, pathophysiology, pathology features and complications of syphilis on the cardiovascular system	
28)	Urinary Tract	PA28.1:Describe the normal histology of the kidney PA28.2:Define, classify and distinguish the clinical syndromes and describe the etiology, pathogenesis, pathology, morphology, clinical and laboratory and urinary findings, complications of renal failure PA28.3:Define and describe the etiology, precipitating factors, pathogenesis, pathology, laboratory urinary findings, progression and complications of acute renal failure PA28.4:Define and describe the etiology, precipitating factors, pathogenesis, pathology, laboratory urinary findings progression and complications of chronic renal failure PA28.5: Define and classify glomerular	Theory/practical/ laboratory/clinical

		diseases. Enumerate and describe the etiology, pathogenesis, mechanisms of glomerular injury, pathology, distinguishing features and clinical manifestations of glomerulonephritis PA28.6: Define and describe the etiology, pathogenesis, pathology, laboratory, urinary findings, progression and complications of IgA nephropathy PA28.7: Enumerate and describe the findings in glomerular manifestations of systemic disease PA28.8: Enumerate and classify diseases affecting the tubular Interstitium PA28.9: Define and describe the etiology, pathogenesis, pathology, laboratory, urinary findings, progression and complications of acute tubular necrosis PA28.10: describe the itiology, pathophysiology, lab findings and distinguishing features progression and complications of acute and chronic pyelonephritis and reflux nephropathy PA28.11: Define classify and describe the etiology, pathogenesis pathology, laboratory, urinary findings, distinguishing features progression and complications of vascular disease of the kidney PA28.12: Define classify and describe the genetics, inheritance, etiology, pathogenesis, pathology, laboratory, urinary findings, distinguishing features, progression and complications of cystic disease of the kidney PA28.13: Define classify and describe the etiology, pathogenesis, pathology, laboratory, urinary findings, distinguishing features progression and complications of renal stone disease and obstructive	

		uropathy PA28.14: Classify and describe the etiology, genetics, pathogenesis, pathology, presenting features, progression and spread of renal tumors PA28.15: Classify and describe the etiology, genetics, pathogenesis, pathology, presenting features, progression and spread of renal tumors PA28.16: Describe the etiology, genetics, pathogenesis, pathology, presenting features and progression of urothelial tumors	
29)	Male Genital Tract	PA29.1: Classify testicular tumors and describe the pathogenesis, pathology, presenting and distinguishing features, diagnostic tests, progression and spread of testicular tumors PA29.2: Describe the pathogenesis, pathology, presenting and distinguishing features, pathogenesis and spread of carcinoma of the penis PA29.3: Describe the pathogenesis, pathology, hormonal dependency presenting and distinguishing features, urologic findings & diagnostic tests of benign prostatic hyperplasia PA29.4: Describe the pathogenesis, pathology, hormonal dependency presenting and distinguishing features, diagnostic tests, progression and spread of carcinoma of the prostate PA29.5: Describe the etiology, pathogenesis, pathology and progression of prostatitis GROSS	Theory/practical/ laboratory/clinical

30)	Female Genital Tract	PA30.1: Describe screening, diagnosis and progression of carcinoma of the cervix PA30.2: Describe the pathogenesis, etiology, pathology, diagnosis and progression and spread of carcinoma of the endometrium PA30.3: Describe the pathogenesis, etiology, pathology, diagnosis and progression and spread of carcinoma of the leiomyomas and leiomyosarcomas PA30.4: Classify and describe the etiology, pathogenesis, pathology, morphology, clinical course, spread and complications of ovarian tumors PA30.5: Describe the etiology, pathogenesis, pathology, morphology, clinical course, spread and complications of gestational trophoblastic neoplasms PA30.6: Describe the etiology and morphologic features of cervicitis (Non core) PA30.7: Describe the etiology, hormonal dependence, features and morphology of endometriosis PA30.8: Describe the etiology and morphologic features of adenomyosis PA30.9: Describe the etiology, hormonaldependence and morphology of endometrial hyperplasia	Theory/practical/ laboratory/clinical
31)	Breast	PA31.1: classify and describe the types, etiology, pathogenesis, of benign breast disease PA31.2: classify and describe the epidemiology, pathogenesis, classification, morphology, prognostic factors, hormonal dependency, staging and spread of carcinoma of the breast	Theory/practical/ laboratory/clinical

		PA31.3: Describe and identify the morphologic and microscopic features of carcinoma of the breast (P) PA31.4: Enumerate and describe the etiology, hormonal dependency and pathogenesis of gynecomastia (NON CORE)	
32)	Endocrine system	PA32.1: Enumerate, classify and describe the etiology, pathogenesis, pathology and iodine dependency of thyroid swellings PA32.2: Describe the etiology, cause, iodine dependency, pathogenesis, manifestations, laboratory and imaging features and course of thyrotoxicosis PA32.3: Describe the etiology, pathogenesis, manifestations, laboratory and imaging features and course of thyrotoxicosis/ hypothyroidism AND THYROID TUMORS PA32.4: Classify and describe the epidemiology, etiology, pathogenesis, pathology, clinical laboratory features, complications and progression of diabetes mellitus PA32.5: Describe the etiology, genetics, pathogenesis, manifestations, laboratory and morphologic features of hyperparathyroidism PA32.6: Describe the itiology , laboratory, morphologic features, complications and metastases of pancreatic cancer PA32.7: Describe the etiology, pathogenesis, manifestations, laboratory, morphologic features, complications of adrenal insufficiency PA32.8: Describe the etiology, pathogenesis, manifestations, laboratory,	Theory/practical/ laboratory/clinical

		morphologic features, complications of Cushing's syndrome PA32.9: Describe the etiology, pathogenesis, manifestations, laboratory and morphologic features of adrenal neoplasms	
33)	Bone and soft tissue	PA33.1: Classify and describe the etiology, pathogenesis, manifestations, radiologic and complications of osteomyelitis PA 33.2: Classify and describe the etiology, pathogenesis, manifestations, radiologic and morphologic features and complications and metastases of bone tumors PA 33.3: Classify and describe the etiology, pathogenesis, manifestations, radiologic and morphologic features and complications and metastases of soft tissue tumors PA 33.4: Classify and describe the etiology, pathogenesis, manifestations, radiologic and morphologic features and complications of Paget's disease of the bone PA 33.5: Classify and describe the etiology, immunology, pathogenesis, manifestations, radiologic and laboratory features, diagnostic criteria and complications of rheumatoid arthritis	Theory/practical/ laboratory/clinical
34)	Skin	PA34.1: Describe the risk factors pathogenesis, pathology and natural history of squamous cell carcinoma of the skin PA34.2: Describe the risk factors pathogenesis, pathology and natural history of basal cell carcinoma of the skin PA34.3: Describe the distinguishing	Theory/practical/ laboratory/clinical

		features between a nevus and melanoma. Describe the etiology, pathogenesis, risk factors morphology clinical features and metastases of melanoma PA34.4: Identify, distinguish and describe common tumors of the skin	
35)	Central Nervous System	PA 35.1Describe the etiology, types and pathogenesis, differentiating factors, CSF findings in meningitis PA35.2:Classify and describe the etiology, genetics, pathogenesis, pathology, presentation sequelae and complications of CNS tumors PA35.3: Identify the etiology of meningitis based on given CSF parameters (P)	Theory/practical/ laboratory/clinical
36)	Eye	PA36.1: Describe the etiology, genetics, pathogenesis, pathology, presentation, sequelae and complications of retinoblastoma	Theory/practical/ laboratory/clinical

Holidays and exams :

Term	Exam	Vacations/preparatory leaves
1	05/1-10/1	17/12-31/12
2	20/4-26/4 theory 7 days practical till 08/5	16/6-30/6
3	9/8-15/8 theory 16/8-23/8 practicals	
University exams	5/9 onwards	

Teaching learning methods

1. Didactic lectures
2. Small group teaching
3. Self directed learning by arranging seminars and symposium
4. Problem card based learning
5. Practical –
    - Performing hematological exercises –TLC, DLC, Peripheral smear making and staining
    - Performing urine examination and interpreting various lesions
    - Analyse lab reports and its correlation with clinical diagnosis
    - Perform the correct technique of blood grouping and cross matching
6. Identifying gross pathology of various organs
7. Study of histopathology slides of various diseases
8. AETCOM

Annexure 2

Paper I: General principles of Pathology, Clinical Pathology and Hematology

Sl.No.	Topic	Approximate weight-age
1	Cell injury and adaptation	10
2	Inflammation and repair	10
3	Hemostasis/ Circulatory disturbances	8
4	Immunopathology	6
5	Infectious pathology	8
6	Genetic and Environmental diseases	4
7	Neoplasia	10
8	Childhood diseases	4
9	RBC Disorders	10
10	WBC disorders	10
11	Lymphoreticular system	4
12	Diseases of Coagulation & Bleeding	8
13	Blood Banking	4
14	Clinical pathology incl cytopathology	4
		100

Guidelines for assessment: 20% MCQ 80% SAQ

30% of Questions should be on etiopathogenesis

30% on morphology preferably with clinical correlation

40% Problem based / lab diagnosis/reasoning

Variations in the scheme as per the consensus of examiners and moderator

Part I

1. Structured essay Question — 8 marks
2. Differentiate between — 4 questions x 4 = 16 marks

Part II

3. Structured essay Question — 8 marks
4. Short notes; — 4 questions x 5 = 20 marks

Part III

5. Structured essay Question — 8 marks
6. Short notes — 4 questions x 5 = 20 marks

Paper II Systemic Pathology

S.no	Topic	Approximate weight age
1	Cardiovascular	10
2	Respiratory	10
3	Gastrointestinal Tract	15
4	Hepatic and Biliary Tract, exocrine pancreas	15
5	Endocrine system	8
6	Urinary tract	10
7	Male genital tract	6
8	Female genital tract	8
9	Breast	6
10	CNS	4
11	Skin and soft tissue	4
12	Bone & Joints	4
		100

Guidelines for assessment: 20% MCQ 80% SAQ

30% of Questions should be on etiopathogenesis

30% on morphology preferably with clinical correlation

40% Problem based/lab diagnosis/reasoning

Variation in the scheme as per the consensus of examiners/ moderator

Part I

1 Structured essay Question	8 marks
2.Differentiate between	4 questions x 4 = 16 marks

Part II

3. Structured essay Question	8 marks
4. Short notes ;	4 questions x 5 = 20 marks

Part III

5. Structured essay Question	8 marks
6. Short notes	4 questions x5 = 20 marks

Eligibility for appearing in examination and pass criteria as per NMC guidelines

PATHOLOGY PRACTICAL EXAMINATION

Pattern & Marks Distribution **MAX MARKS : 100**

Observation and reasoning

S. No.	Activity	Marks
1	Examine Three histopathology slides, identify the parent tissue, write microscopic features, give diagnosis and make a labelled diagram	3x5= 15
2	Examine the stained peripheral smear provided, do DLC, give the report and three causes of the findings	1 x 5 = 5

3	Study the case history provided. Examine the given peripheral smear/ bone marrow smear, write your observations and give your diagnosis.	1 x 5 = 5
4	Test for Hemoglobin by Sahli's hemoglobinometer orTLC by Neubauer's chamber. Write observation, inference. Performance of this test will be observed by 1 examiner	1 x 5 = 5
5	With the given blood sample, prepare and stain the peripheral smear and focus the smear. Performance of this test will be observed by 1 examiner for smear making and staining.	5+ 5 = 10
6	Urine Chemical Test: (Test for Protein/sugar/ketone bodies): perform urine chemical test by conventional method. Student has to write the result, inference and give answer to additional questions asked. Performance of this test will be observed by 1 examiner	15
7	OSPE: • Three gross – specimens • Two Instrument identification & related Questions • One observation and interpretation of test: Blood group identification by Slide method • One urine sediment/ PAP stain • One parasite • Two clinical case histories and lab findings for diagnosis	10
8	Viva voce : Analytical skill-Case based discussion / Interpretation to assess clinical application; based on case histories discussion on approach to diagnosis, reasoning based on test findings/ specimens /images	30

	/instruments / charts/ lab data	
9	AETCOM	5
	Total	**100**

Internal assessment (IA)

Chapter end assessment, approx 10 : 10x10 =

100 (Total 50 for Theory & 50 for OSPE/ Spotting -
to be added in term examinations theory & practical respectively)

Should include short essay questions, objective questions, ospe , practicals and practical logbook

Exam	Theory		Practical	
	Academic knowledge	Other* academic activities	Academic knowledge	Other** academic activities
Chapter end assessment (10x10=100)	40	10	40	10
Term I	40	10	40	10
Term II	80	20	80	20
Term III	200		100	
Total	400		300	

Term I Theory: 50= (40+10 MCQ) Practical : 50

Term II Theory: 100= (80 + 20 MCQ) Practicals : 100

Term III : same format as university exam

As per CBME recommendations, upto 20% marks of IA should be from log book assessment.
It has been recommended that 80% of both theory and practical IA should be from Academic knowledge and rest 20% from other academic activities

*Other academic activities for Theory include: Interst in subject, Active participation, Scientific attitude, other acadmic activity participation (e.g.quiz, poster making, etc) and Logbook.
**Other academic activities for Practical include: Assignment completion (Practical notebook etc), Attitude, Ethical work habits, Communication and Logbook.

IA taken during the whole tenure will be added

Internal assessment: all above (Theory 400; Practicals : 300) added and IA calculated for Theory (40) and Practical (20)

Eligibility as per NMC guidelines: Learners must secure at least 50% marks of the total marks (Combined theory and Practical marks; not less than 40% marks in theory and practical seperately) assigned for internal assessment.

Eligibility for appearing in examination and pass criteria as per NMC guidelines

3. Amendment to Ordinance V (2) & VII. [EC. Res. 78-7 dated 25.03.2022] regarding course curriculum prepared on competency based UG curriculum for MBBS course -2nd Professional (New Scheme).

Revised Pharmacology Curriculum (CBME) 2020 Onwards

CURRICULUM OF PHARMACOLOGY FOR MEDICAL STUDENTS

Preamble

Pharmacology is the science of medicines. The knowledge of the molecular basis of drug action, its therapeutic applications, the adverse effects caused by the medications, their prevention and treatment and the effects of administering two or more drugs to a patient will be learnt in the context of its clinical application and not just as facts. The use of medicines for treating patients with the required medications, at the right dose, in the right way, for the right duration and at a appropriate cost, with consideration for all

social, environmental and economic factors that may impact the therapy. The emphasis will be on clinical relevance of pharmacology knowledge.

1. **VISION / GOAL**

The broad goal of teaching pharmacology to under graduate students is to inculcate rational and scientific basis of therapeutics. To provide knowledge of pharmacology based on evidence and to foster the development of a highly knowledgeable, skilled and competent Indian Medical Graduates imbued with the concept of rational Pharmaco-therapeutics. Simultaneously focus is to impart requisite skills, attitudes, values and responsiveness, so that the students are able to function appropriately and effectively as doctors at the community level while being globally relevant.

2. LEARNING OBJECTIVES (overall)

i. To equip the Indian Medical Graduate (IMG) with the knowledge of scientific basis of therapeutics and the skills of rational prescribing.
ii. The student should acquire knowledge of the principles and application of Pharmacotherapy.
iii. The student should be able to demonstrate appropriate use of medicines in disease with consideration to its efficacy, safety, suitability and cost for the individual and mass therapy.
iv. The student should have an understanding of general considerations of antimicrobial resistance and antibiotic stewardship program

Access knowledge about medicines through reliable resources to enable the students to fulfill their roles of an Indian Medical Graduate as a clinician, leader, communicator, lifelong learner and professional

3. COMPETENCIES

The student during the training program should acquire the following competencies:

(a) Knowledge /Cognitive Domain

At the end of the course the learner shall be able to:

1. Understand the general principles of drug action and handling of drugs by the body in all the individuals including children, elderly, lactating and pregnant women and those having a renal and/or hepatic disease and genetic variations.

2. Prescribe drugs rationally by:
   a. Understanding the importance of both the non pharmacological (non-drug) and pharmacological (drug) treatment
   b. Selection of drugs based on suitability, tolerability, efficacy and cost.

3. Apply pharmacokinetic principles in clinical practice pertaining to the drugs used in commonly encountered conditions, National Health Programmes and emergency medical conditions.

4. Foresee, prevent and manage adverse drug events and drug/food/traditional medicine interactions.

5. Use antimicrobials judiciously for therapy and prophylaxis, understanding the rapid development of Antimicrobial resistance (AMR).

6. Understand and implement the concepts of essential medicines, pharmacoeconomics and evidence-based medicine for improving the community health care.

7. Describe the clinical presentation and management of common poisoning including bites and stings.

8. Understand the basic concepts of new drug development with emphasis on design and conduct of clinical trials and interpretation of their results.

(b) Skills/ Psychomotor Domain

At the end of the course the learner shall be able to perform and interpret following Skills

1. Write a correct, complete and legible prescription for common ailments including those in the National health Programmes and emergency medical conditions. And should be able to modify the prescription in case of drug interactions.

2. Calculate the drug dosage using appropriate formulae for an individual patient.

3. Administer the required dose of different drug formulations using appropriate devices and techniques (e.g injections, inhalers, transdermal patches etc.).

4. Advice and interpret the therapeutic monitoring reports of important drugs.

5. Identify, analyze and report adverse drug reactions to appropriate authorities.

6. Retrieve drug information from appropriate sources including the electronic resources.

7. Analyse critically drug promotional literature in terms of pharmacological actions of the ingredients, rational/irrational nature of the preparation, economics of the use and claims by the pharmaceutical companies.

(c) Communication affective attitude Domain

1. Effectively explain to patients, the effects and side effects of drugs, including the need for medication adherence.
2. Communicate effectively with pharmacological reasoning with health care team on rational use of drugs and improving spontaneous reporting of adverse events.
3. Motivate patients with chronic diseases to adhere to the line of management as outlined by the health care provider.
4. Demonstrate respect in interactions with peers, and other healthcare professionals.
5. Demonstrate ethical behavior and integrity in one's work.
6. Demonstrate ability to generate awareness about the use of generic drugs in patients.
7. Understand the legal and ethical aspects of prescribing drugs.
8. Acquire skills for self-directed learning to keep up with developments in the field and to continuously build to improve on skills, expertise and perpetual professional development.

4. COURSE

Course content for detailed competencies given below in Appendix 1

PH	Competency
1.1	Define and describe the principles of pharmacology and pharmacotherapeutics
1.2	Describe the basis of Evidence based medicine and Therapeutic drug monitoring
1.3	Enumerate and identify drug formulations and drug delivery systems
1.4	Describe absorption, distribution, metabolism & excretion of drug
1.5	Describe general principles of mechanism of drug action
1.6	Describe principles of Pharmacovigilance & ADR reporting systems
1.7	Define, identify and describe the management of adverse drug reactions (ADR)
1.8	Identify and describe the management of drug interactions
1.9	Describe nomenclature of drugs i.e. generic, branded drug
1.10	Describe parts of a correct, complete and legible generic prescription. Identify errors in prescription and correct appropriately
1.11	Describe various routes of drug administration, eg. oral, SC, IV, IM, SL
1.12	Calculate the dosage of drugs using appropriate formulae for an individual patient, including children, elderly and patient with renal

	dysfunction
1.13	Describe mechanism of action, types, doses, side effects, indications and contraindications of adrenergic and anti-adrenergic drugs
1.14	Describe mechanism of action, types, doses, side effects, indications and contraindications of cholinergic and anticholinergic drugs
1.15	Describe mechanism/s of action, types, doses, side effects, indications and contraindications of skeletal muscle relaxants
1.16	Describe mechanism/s of action, types, doses, side effects, indications and contraindications of the drugs which act by modulating autacoids, including: anti-histaminic, 5-HT modulating drugs, NSAIDs, drugs for gout, anti-rheumatic drugs, drugs for migraine
1.17	Describe the mechanism/s of action, types, doses, side effects, indications and contraindications of local anesthetics
1.18	Describe the mechanism/s of action, types, doses, side effects, indications and contraindications of general anesthetics, and preanesthetic medications
1.19	Describe the mechanism/s of action, types, doses, side effects, indications and contraindications of the drugs which act on CNS, (including anxiolytics, sedatives & hypnotics, anti-psychotic, antidepressant drugs, anti-maniacs, opioid agonists and antagonists, drugs used for neurodegenerative disorders, anti-epileptics drugs)
1.20	Describe the effects of acute and chronic ethanol intake
1.21	Describe the symptoms and management of methanol and ethanol poisonings
1.22	Describe drugs of abuse (dependence, addiction, stimulants, depressants, psychedelics, drugs used for criminal offences)
1.23	Describe the process and mechanism of drug deaddiction
1.24	Describe the mechanism/s of action, types, doses, side effects, indications and contraindications of the drugs affecting renal systems including diuretics, antidiuretics- vasopressin and analogues
1.25	Describe the mechanism/s of action, types, doses, side effects, indications and contraindications of the drugs acting on blood, like anticoagulants, antiplatelets, fibrinolytics, plasma expanders
1.26	Describe mechanisms of action, types, doses, side effects, indications and contraindications of the drugs modulating the renin-angiotensin and aldosterone system
1.27	Describe the mechanisms of action, types, doses, side effects, indications and contraindications of antihypertensive drugs and drugs used in shock
1.28	Describe the mechanisms of action, types, doses, side effects, indications and contraindications of the drugs used in ischemic heart disease (stable, unstable angina and myocardial infarction), peripheral vascular disease

1.29	Describe the mechanisms of action, types, doses, side effects, indications and contraindications of the drugs used in congestive heart failure
1.30	Describe the mechanisms of action, types, doses, side effects, indications and contraindications of the antiarrhythmics
1.31	Describe the mechanisms of action, types, doses, side effects, indications and contraindications of the drugs used in the management of dyslipidemias
1.32	Describe the mechanism/s of action, types, doses, side effects, indications and contraindications of drugs used in bronchial asthma and COPD
1.33	Describe the mechanism of action, types, doses, side effects, indications and contraindications of the drugs used in cough (antitussives, expectorants/ mucolytics)
1.34	Describe the mechanism/s of action, types, doses, side effects, indications and contraindications of the drugs used as below: 1. Acid-peptic disease and GERD 2. Antiemetics and prokinetics 3. Antidiarrhoeals 4. Laxatives 5. Inflammatory Bowel Disease 6. Irritable Bowel Disorders, biliary and pancreatic diseases
1.35	Describe the mechanism/s of action, types, doses, side effects, indications and contraindications of drugs used in hematological disorders like: 1.Drugs used in anemias 2.Colony Stimulating factors
1.36	Describe the mechanism of action, types, doses, side effects, indications and contraindications of drugs used in endocrine disorders (diabetes mellitus, thyroid disorders and osteoporosis)
1.37	Describe the mechanisms of action, types, doses, side effects, indications and contraindications of the drugs used as sex hormones, their analogues and anterior Pituitary hormones
1.38	Describe the mechanism of action, types, doses, side effects, indications and contraindications of corticosteroids
1.39	Describe mechanism of action, types, doses, side effects, indications and contraindications the drugs used for contraception
1.40	Describe mechanism of action, types, doses, side effects, indications and contraindications of 1. Drugs used in the treatment of infertility, and 2. Drugs used in erectile dysfunction
1.41	Describe the mechanisms of action, types, doses, side effects, indications and contraindications of uterine relaxants and stimulants

1.42	Describe general principles of chemotherapy
1.43	Describe and discuss the causes, extent and burden of Antimicrobial Resistance (AMR). Rational use of antimicrobials including antibiotic stewardship program
1.44	Describe the first line antitubercular dugs, their mechanisms of action, side effects and doses.
1.45	Describe the drugs used in MDR and XDR Tuberculosis
1.46	Describe the mechanisms of action, types, doses, side effects, indications and contraindications of antileprotic drugs
1.47	Describe the mechanisms of action, types, doses, side effects, indications and contraindications of the drugs used in malaria, KALA-AZAR, amebiasis and intestinal helminthiasis
1.48	Describe the mechanisms of action, types, doses, side effects, indications and contraindications of the drugs used in UTI/ STD and viral diseases including HIV
1.49	Describe mechanism of action, classes, side effects, indications and contraindications of anticancer drugs
1.50	Describe mechanisms of action, types, doses, side effects, indications and contraindications of immunomodulators and management of organ transplant rejection
1.51	Describe occupational and environmental pesticides, food adulterants, pollutants and insect repellents
1.52	Describe management of common poisoning, insecticides, common sting and bites
1.53	Describe heavy metal poisoning and chelating agents
1.54	Describe vaccines and their uses
1.55	Describe and discuss the following National Health Programmes including Immunisation, Tuberculosis, Leprosy, Malaria, HIV, Filaria, Kala Azar, Diarrhoeal diseases, Anaemia & nutritional disorders, Blindness, Non-communicable diseases, cancer and Iodine deficiency
1.56	Describe basic aspects of Geriatric and Pediatric pharmacology
1.57	Describe drugs used in skin disorders
1.58	Describe drugs used in Ocular disorders
1.59	Describe and discuss the following: Essential medicines, Fixed dose combinations, Over the counter drugs, Herbal medicines
1.60	Describe and discuss Pharmacogenomics and Pharmacoeconomics
1.61	Describe and discuss dietary supplements and nutraceuticals
1.62	Describe and discuss antiseptics and disinfectant
1.63	Describe Drug Regulations, acts and other legal aspect
1.64	Describe overview of drug development, Phases of clinical trials and Good Clinical Practice
	CLINICAL PHARMACY

2.1	Demonstrate understanding of the use of various dosage forms (oral/local/parenteral; solid/liquid)
2.2	Prepare oral rehydration solution from ORS packet and explain its use
2.3	Demonstrate the appropriate setting up of an intravenous drip in a simulated environment
2.4	Demonstrate the correct method of calculation of drug dosage in patients including those used in special situations
	CLINICAL PHARMACOLOGY
3.1	Write a rational, correct and legible generic prescription for a given condition and communicate the same to the patient
3.2	Perform and interpret a critical appraisal (audit) of a given prescription
3.3	Perform a critical evaluation of the drug promotional literature
3.4	To recognise and report an adverse drug reaction
3.5	To prepare and explain a list of P-drugs for a given case/condition
3.6	Demonstrate how to optimize interaction with pharmaceutical representative to get authentic information on drug
3.7	Prepare a list of essential medicines for a healthcare facility
3.8	Communicate effectively with a patient on the proper use of prescribed medication
	EXPERIMENTAL PHARMACOLOGY
4.1	Administer drugs through various routes in a simulated environment using mannequins
4.2	Demonstrate the effects of drugs on blood pressure (vasopressor and vaso-depressors with appropriate blockers) using computer aided learning
	COMMUNICATION
5.1	Communicate with the patient with empathy and ethics on all aspects of drug use
5.2	Communicate with the patient regarding optimal use of a) drug therapy, b) devices and c) storage of medicines
5.3	Motivate patients with chronic diseases to adhere to the prescribed management by the health care provider
5.4	Explain to the patient the relationship between cost of treatment and patient compliance
5.5	Demonstrate an understanding of the caution in prescribing drugs likely to produce dependence and recommend the line of management
5.6	Demonstrate ability to educate public & patients about various aspects of drug use including antimicrobials as prescription drugs, drug dependence and OTC drugs
5.7	Demonstrate an understanding of the legal and ethical aspects of prescribing drugs

RECOMMENDED HOURS of Pharmacology Teaching

Total	**- 230 hours**
Lectures	**- 80 hours**
Practicals	**- 138 hours**
Self Directed Learning	**- 12 hours**

5. TEACHING LEARNING METHODS

Teaching Learning methods used would include both for large group teaching and small group teaching. Approximately one third of time will be for didactic lectures.

Large group -Any instructional large group method including traditional lecture and interactive lecture.

Small Group – Any instructional method involving small groups of students in an appropriate learning context. These topics included are those where more intensive and interactive learning sessions are required.

Will be as follows

-Demonstration-Observation-Assistance-Performance (DOAP) - Sessions: A practical session that allows the student to observe a demonstration, assist the performer, perform in a simulated environment, perform under supervision or perform independently.
Demonstration of different routes of drug administration i.e. Intravenous, Intramuscular, subcutaneous, Inhalation, Drug formulation exercises (Clinical Pharmacy).

- Problem based learning for Small Group Discussions - Drug nomenclature, Home remedies and house hold measures, Fixed dose drug combinations, Prescription writing, Rational Use of Medicines, Drug Advertisement, Drug dose calculation, Drug interaction, Drug food interactions and interaction of drugs of modern & traditional medicines, Antimicrobial Stewardship Program & Rational Use of antimicrobials, Essential Medicine concept, P Medicine exercises for treatment of common disease conditions, Monitoring drug therapy, Ethics in Human Volunteer Experiment, Adverse Drug Reaction (ADR) form filling exercise.

-Computer Assisted Learning - Experiments showing effects of drugs on physiological systems. For example Effect of drugs on Rabbit Eye, Effect of drugs on Dog Blood Pressure, Effect of drugs on Frog Rectus abdominis muscle.

-Student Presentations - Evolution of Medicine and Pharmacology, Sources of Medicines, Drug formulations, Pharmacological basis of House hold remedies, Indian Systems of Medicines , Systemic Pharmacology etc.

-Preparation of Charts and Models - Evolution of Medicine and Pharmacology, House hold remedies, Drug dosage forms.

-Clinical Exposure - Clinical case discussions on common disease conditions, ADR monitoring and reporting.

-Self Directed Learning - A process in which individuals take the initiative, with or without the help of others in diagnosing their learning needs, formulating learning goals, identifying human and material sources for learning, choosing and implementing appropriate learning methods.

Preparation for seminars, projects, student presentations on areas of interest and relevant to learning of Pharmacology.

6. ASSESSMENT

a) Formative Assessment: Formative assessment shall be done periodically throughout the course.

b) Internal Assessment:

i) No less than three internal assessment exams shall be conducted during the course.

ii) Certifiable competencies: Achievement of certifiable competencies would also be recorded in logbooks. The student must have completed the required certifiable competencies and completed the log book to be eligible for appearing at the final university examination. (Appendix 2: List of Certifiable competencies)

iii) Log Book: Log book is to be maintained to record all activities like Drug formulations, Computer Assisted Learning exercises, Experimental Pharmacology, Clinical Pharmacology and other academic activities. It has to be submitted to the department regularly and would be assessed regularly (Appendix 3).

Internal assessment will be calculated for Theory (40) marks & Practical (20) marks.

50% combined in theory and practical (not less than 40% in each) for eligibility for appearing for University Examinations.

c) Summative theory practical and Viva voice pattern with distribution of marks :

At the end of the course a final examination will be conducted by the University.

University (Professional) examination: There will be a Theory and Practical + Viva examination .

i) THEORY PAPERS
There shall be two theory papers.
Each paper shall be of 03 hours duration and of 100 marks.

THEORY PAPER - PHARMACOLOGY
Theory (200 marks) (Paper I – 100, Paper II – 100)

PAPER – I (100 Marks)
Topics: General Pharmacology, Drugs acting on Autonomic nervous system, Drugs acting on Central nervous system, Drugs acting on Peripheral nervous system, Drugs acting on Cardio vascular system, Drugs acting on Kidney, Drugs acting on Respiratory system.

PAPER – II (100 Marks)
Topics: Chemotherapy of infective, parasitic disorders and malignancy, Drugs acting on Reproductive system, Drugs related to Endocrinal system, Drugs acting on Gastrointestinal system, skin and mucous membrane, Autacoids, Drugs affecting Blood and blood formation, Vitamins, Antiseptics and disinfectant, Diagnostic agents, Chelating agents, Vaccines and sera, Environmental pollutants.

THEORY QUESTION PAPER FORMAT
Each paper will have three Parts. Part 1 of 20 marks, & Part II of 40 marks each.
Each part will have two questions

Each paper 100 marks

Part I **20 marks**
Objective type questions

Q1. Multiple type questions of inferential, reasoning type (5 x 2 marks=10)
Q2. State True or False / Fill in the blanks, Match the following (5 x 2 marks =10)
Mechanism of action/Therapeutic uses/ adverse effects of drugs,
Drug of choice type of questions

Part II **40 marks**
Q 3. Explain why (rationale of) giving suitable examples (5 x 4 marks= 20 marks)
Q 4. a)Long structured question based on a Case scenario (10 marks)
b)Short notes (2 x 5 =10 marks)

Part III **40 marks**

Q5. Discuss the therapeutic status of a medicine (4 x 5 marks = 20 marks)
Q6. Discuss giving the therapeutic goals the drug treatment of a medical condition (2 x 10 marks= 20 marks)

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ii) PRACTICALS & VIVA
Total marks -100 marks
Practical -70 marks
Viva-voce 30 marks

Practical (70 marks)

1. Clinical Pharmacy	20 marks
2. Clinical Pharmacology	30 marks
3. Attitude, Ethics ,Communication	10 marks
4. Experimental Pharmacology	10 marks

7. RECOMMENDED READING

(A) TEXT

1. Essentials of Medical Pharmacology by K.D. Tripathi latest ed. Jaypee brothers, Medical Publishers, India.
2. Sharma and Sharma's Principles of Pharmacology latest ed. by H. L. Sharma and K. K. Sharma Publishers: Paras Medical Publishers, New Delhi
3. Basic & Clinical Pharmacology Bertram G. Katzung, Susan B. Masters, Anthony J. Trevor, latest ed. McGraw-Hill Companies.

(B) REFERENCE BOOKS

1. Lippincott's Illustrated Reviews : Pharmacology : by Mary J Mycek, Richard A Harvey, Pamela C Champe latest ed Lippincott Williams & Wilkins.
2. Goodman & Gilman's the Pharmacological Basis of Therapeutics by Joel Griffith Hardman, Alfred Goodman Gilman, Lee Limbird, Theodore W. Rall latest ed, McGraw-Hill Professional.

(C) AETCOM module

1. Johnson AR, Siegler M, Winslade WJ. Clinical Ethics: A Practical Approach to Ethical Decisions in Clinical Medicine. New York: Mc Graw Hill Inc, 2015 (latest edition).

2. Timms O. Biomedical Ethics. Elsievier India, 2019 (latest edition)

8. ELECTIVES

May be offered to students in the subject. A student has a choice of four weeks of elective posting after 3rd MBBS part I Professional examination. The departments can offer options for a student to do the same in Pharmacology.

REFERENCES

1. Syllabus Of Pharmacology For Undergraduate Medical Students. https://www.fmsc.ac.in/curriculum/Curriculum%20for%20UG%20Pharmacology.pdf
2. Assessment Module for Undergraduate Medical Education 2019. https://www.nmc.org.in/wp-content/uploads/2020/01/Module_Competence_based_02.09.2019.pdf
3. Competency Based Undergraduate Curriculum For The Indian Medical Graduate 2018. https://www.nmc.org.in/wp-content/uploads/2020/01/UG-Curriculum-Vol-II.pdf

Appendix 1

(I) Concepts of General and Clinical Pharmacology

1. Introduction: definition, historical perspective, branches and scope of the subject of pharmacology and its relation with other medical disciplines.
2. Nature and sources of Drugs, Drug nomenclature and dosage forms.
3. Routes of drugs' administration; advantages and disadvantages of different routes.
4. Pharmacokinetic considerations: drug absorption, distribution, bio transformations and excretion.
5. Pharmacokinetic concepts of bioavailability, apparent volume of distribution (aVd), half life (t½), and clearance (CL) that are used to decide the doses and rational dosing during the drug treatment.
6. Pharmacodynamics; site and mechanism of drug action, drug receptors and receptor regulation, concepts of agonists, antagonists, partial agonist and inverse agonist drugs
7. Quantitative aspect of drug action: analysis of dose response curve and therapeutic index (safety index).
8. Factors affecting drug action and doses, how to prolong or shorten the drug action and effects.
9. Drug interactions and concept of pharmacogenomics/-genetics in drug action, effects and ADRs.
10. Adverse drug reactions (ADRs) and role of pharmacovigilance activity in ADR monitoring.
11. Concept of evidence-based medicine, essential medicines, pharmacoeconomics, Pdrugs and rational prescribing.
12. Development of new drugs : pre-clinical and clinical phases of drug evaluation.
13. Scope and relevance of Clinical Pharmacology.
14. Essential medicine, rationality of fixed dose combinations.
15. Drug regulation acts and other legal aspects.

(b) Systemic Pharmacology – Drug oriented teaching
(Here a core information about drugs is to be given that should include pharmacological actions, mechanism of action, indications, contraindications, side effects, drug interactions, precautions etc.)

(II) Drugs Affecting Autonomic Nervous System (ANS)
16. Introduction to Pharmacology of ANS
17. Cholinergic drugs: cholinoceptor agonist and cholinesterase inhibiting drugs
18. Anticholingergic drugs: cholinoceptor blocking agents
19. Adrenergic drugs: adrenoceptor agonist and sympathomimetic drugs
20 Anti-adrenergic drugs: adrenoceptor antagonists and sympatholytic agents

(III) Drugs Affecting Peripheral Nervous System (PNS)
21. Local anaesthetics
22. Skeletal muscle relaxants

(IV) Drugs Affecting Cardiovascular System (CVS)
23. Drugs affecting vascular tone and volume of circulation, renin angiotensin system and other mechanisms affecting this system
24. Antihypertensive drugs
25. Anti-anginal drugs, management of Myocardial Infarction
26. Drugs for heart failure
27. Anti-arrythmic agents
28. Anti-dyslipidemic agents, drugs used in peripheral vascular disease
29. Nitric oxide donors and inhibitors and basic concepts of treatment of shock

(V) Drugs Affecting Autacoids, Inflammation and Gout
30. Histamine, serotonin & their antagonists, treatment of migraine
31. Prostaglandins, Leukotrienes, Platelet activating factor
32. Non Steroidal Anti inflammatory Drugs
34. Drug treatment of gout, rheumatoid arthritis & other autoimmune diseases

(VI) Drugs Affecting Kidney Function
35. Diuretics
36. Antidiuretics

(VII) Drugs Affecting Respiratory System
37. Antitussives, expectorants, mucolytics
38. Drug treatment of bronchial asthma, Chronic Obstructive Pulmonary disease

(VIII) Drugs Affecting Gastro-intestinal System
39. Drugs for gastric acidity, peptic ulcer & Gastro esophageal reflux disease

40. Antiemetic and prokinetic agents
41. Drugs for constipation and Inflammatory Bowel Disease
42. Antidiarrhoeal agents

(IX) Drugs Acting on Blood
43. Agents used to treat anemias and haematopoietic growth factors
44. Coagulants and anticoagulants
45. Antiplatelet drugs
46. Fibrinolytic, antifibrinolytic, plasma expanders

(X) Drugs Affecting Central Nervous system
47. Introduction and basic concepts of drugs affecting CNS activity: Neurotransmitters and their pathways and important sites of Central Nervous System effect of drugs
48. Sedative hypnotic drugs
49. General anaesthetics with preanaesthetic medications
50. Antiepileptic drugs
51. Antipsychotic drugs
52. Antianxiety drugs
53. Antidepressant and antimaniac drugs
54. Opioid analgesic and antagonists
55. Antiparkinsonian drugs and drugs for other neurodegenerative and movement disorders
56. Pharmacology of ethyl alcohol and other alcohols
57. Pharmacology of CNS stimulants, psychomimetic drugs, drug dependence and substance abuse

(XI) Drugs Affecting Endocrine System and its Diseases
58. Pharmacology of pituitary and hypothalamic hormones
59. Thyroid hormones and antithyroid drugs
60. Estrogen, progesterone and inhibitors
61. Oral contraceptives & Hormone replacement therapy
62. Androgen
63.Drugs for diabetes mellitus: Insulin and oral antidiabetic agents
65. Corticosteroids
66. Parathyroid hormones and drugs affecting calcium balance
67. Drugs acting on uterus
68. Drug treatment for infertility and erectile dysfunctions

(XII) Pharmacology of Chemotherapeutic Agents
69. Introduction and basic principles of chemotherapy of infection, infestation and neoplastic diseases and concepts of resistance to chemotherapeutic agents
70.Sulfonamides
71. Quinolones

72. Beta lactam antibiotics
73. Aminoglycosides
74. Macrolides and ketolides
75. Tetracycline and chloramphenicol
76. Oxazolidinones, streptogramin and other antibiotics
77. Antimycobacterial drugs, antitubercular drugs; treatment of MDR and XDR tuberculosis
78. Antileprosy drugs
79. Antifungal drugs
80. Antimalarial drugs
81. Antiamoebic and other antiprotozoal drugs
82. Drugs used in filariasis and kalaazar
83. Anthelmintic agents
84. Antiviral, anti-AIDS drugs
85. Chemotherapy of Urinary tract infection & Sexually transmitted diseases
86. Basic principles of cancer chemotherapy

(XIII) Immunopharmacology

87. Vaccines, immunomodulators and treatment of transplant rejection disorders

(XIV) Miscellaneous Topics

88. Drugs acting on skin and mucous membrane
89. Vitamins, nutraceuticals and probiotics
90. Pharmacology of Diagnostic agents
91. Paediatric pharmacology
92. Geriatric pharmacology
93. Pharmacology of chelating agents
94. Indian Systems of Medicines

Appendix 2. Certifiable Competencies

	Certifiable competencies	**Number required to certify**
3.1	Write a rational, correct and legible generic prescription for a given condition and communicate the same to the patient	5
3.2	Perform and interpret a critical appraisal (audit) of a given prescription	3
3.3	Perform a critical evaluation of the drug promotional literature	3
3.5	To prepare and explain a list of P-drugs for a given case/condition	3

Appendix 3

M.B.B.S. STUDENT'S LOG BOOK (PHARMACOLOGY)

GENERAL INSTRUCTIONS

1. This logbook is a record of the academic/co-curricular activities in Pharmacology of the designated student.

2. The student is responsible for getting the entries in the logbook verified by the faculty in-charge in the next class.

3. Entries in the Logbook will reflect the activities undertaken in the department of Pharmacology during your course.

4. The student has to get this logbook verified by the mentor and the Head of the department before submitting the application of the University examination.

The log book must have
1) Details of Students
   Name
   Roll Number
2) Details of attendance
3) Details of all skill based exercises done
4) Details of Certifiable skills
5) Details of group discussions/ presentations
6) Details of any project work done
7) Any other Cocurricular activity related to the subject

A format for **Certifiable skill**

Skill: PH 3.1 Write a rational, correct and legible generic prescription for a given condition and communicate the same to the patient

Domain: Skills
Level of competency: Perform
Core: Yes

The student has to perform this activity- Present **five** prescription for common diseases for certification.

Exercise name	Date	Completed		Rating		
		Yes	No	Below expectations	Meet expectations	Exceed expectations

LOG BOOK CERTIFICATE

This is to certify that the candidate Ms _____ Reg No. _____, admitted in the year _____in the _____Medical college, New Delhi, has satisfactorily completed / has not completed all assignments /requirements mentioned in this logbook for Second year MBBS course in the subject of Pharmacology during the period from _____ to _____. She/ is/is not eligible to appear for the summative (University) assessment as on the date given below.

_____

Signature of Faculty Name and Designation

Countersigned by Head of the Department

4. Amendment to Ordinance VI (Clause M. Evaluation and Assessment (19) vide E.C Res. No. 78-9/- dated 25.03.2022]

Existing

Recommendation	Examiner 1	Examiner 2	Examiner 3	Action suggested
Event 1	Accept	Accept	Accept	Viva-Voce
Event 2	Accept	Accept	Minor Correction	Revise thesis in Consultation with Supervisor followed by Viva-voce
Event 3	Accept/ Resubmission	Accept/ Resubmission	Resubmission	Resubmission within one year after incorporating suggestion. Thesis to be sent to all examiners again.
Event 4	Accept	Accept	Reject	Thesis to be sent to fourth examiner whose recommendation shall be final and binding
Event 5	Accept/ Resubmission	Reject	Reject	Reject and cancel registration

For any cases that need special consideration, a special Committee consisting of the Vice-Chancellor/ Pro-Vice-Chancellor, Chairperson of Research Council, Dean of Examination, Chairman of the concerned Board of Research Studies, Head of the concerned department, the Supervisor/s of the candidate, and three Professors of the University of Delhi nominated by the Vice-Chancellor may be referred to for a decision in the matter.

Amended

Recommendation	Examiner 1	Examiner 2	Examiner 3	Action suggested
Event 1	Accept	Accept	Accept	Viva-Voce
Event 2	Accept	Accept	Minor Correction	Revise thesis in consultation with supervisor followed by Viva-Voce
Event 3	Accept/ Resubmission	Resubmission	Resubmission	Resubmission within one year after incorporating suggestion. Thesis to be sent to all examiners again.
Event 4	Accept	Accept	Resubmission	Thesis to be sent to fourth examiner whose recommendation shall be final. If 4th examiner recommends for revision, thesis will be sent to same examiner after revision. Resubmission within one year after incorporating suggestion.
Event 5	Accept	Accept	Reject	Thesis to be sent to fourth examiner. If 4th examiner rejected the thesis, registration of the student shall be closed/ cancelled.
Event 6	Accept/ Resubmission	Reject/ Resubmission	Reject	Reject and cancel registration

For any cases that need special consideration, a special committee consisting of the Vice-Chancellor, Dean of Examination, Dean (Academic), Controller of Examination (If any) may be referred to for a decision in the matter.

REGISTRAR