MICROBIOLOGY

A	Goal and objectives			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**

II. M.B.B.S. MICROBIOLOGY PRESCRIBED TEACHING HOURS - 250 Hrs.

GOAL :

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

OBJECTIVES:

A) Knowledge

At the end of the course, the student will be able to acquire knowledge in the following:

1) Morphology, classification of bacteria and the virulence mechanisms.
2) The principles and practice of sterilization and disinfection in health care settings
3) The various mechanisms of transfer of genes between bacteria and the genetic mechanisms of antimicrobial resistance.
4) Normal flora of the human body and describe the host parasite relationship
5) List the pathogenic microorganisms (bacteria, viruses, parasites, fungi and describe the Pathogenesis of the disease produced by them with emphasis on diseases of clinical and public health importance
6) Epidemiology and transmission of zoonoses, arthropod borne diseases and opportunistic infections

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7) Basic immunology- Innate immunity, Structure and functions of cells and organs

of immune system, antigen & antibody reactions, complement, antigen

presentation and cell mediated immunity.

Clinical immunological aspects - like hypersensitivity reactions, autoimmune

disorders, immunodeficiency diseases, immunity in infections, principles of

vaccination tumor and transplantation immunology.

8) Principles of laboratory diagnosis of infectious diseases; estimation of diagnostic accuracy of lab tests -sensitivity, specificity and predictive values
9) Antimicrobial agents for treatment of infections and antimicrobial stewardship.
10) Water and Food borne diseases; epidemiology and demonstration of water analysis
11) Health care associated infections and principles of infection control including standard work precautions & biomedical waste management.
12) Principles of infectious diseases surveillance: Investigation of outbreaks including collection of samples and control measures.

B) SKILLS: The following are the skills expected to be acquired by the students at the end of course:

1) Operate the light compound microscope.

2) Common laboratory techniques (as given below) for the direct demonstration of microorganisms from clinical materials and interpret their findings.

(a) Saline and iodine wet mount preparations (stool) for the demonstration of trophozoites, Ova or cysts

(b) Collection of blood by finger prick, preparation of smear and Giemsa/JSB staining and examination for malarial parasites and microfilariae.

(c) Preparation of a smear and performance of Gram stain and interpretation –

A	**Goal and objectives**			
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body fluids, urine, sputum and pus specimens,

(d) Preparation of a smear and performance of Ziehl – Neelsen stain with biosafety

precautions for the demonstration of acid fast bacilli from sputum and

reading with bacterial index.

3) Identification of the common microorganisms isolated from clinical specimens by colony appearance and biochemical tests genus/species level. Interpretation of the results of antimicrobial testing for the diagnosis of common infectious diseases.
4) Identification of some common fungi based on colony morphology and Lactophenol cotton blue microscopy ; KOH wet mount preparation
5) Reading and interpretation of serological tests -Widal, rapid plasma Reagin, , HIV/HBV ELISA /Rapid tests, latex agglutination tests-rheumatoid factor and ASO.
6) Blood collection through venipuncture with aseptic precautions while performing
Blood culture

7) Collection of clinical samples :pus through syringe (aspirate) or swab ;clean catch midstream urine sample ;sputum with minimal contamination by saliva
8) Hand hygiene and standard work precautions.

The T.N. Dr. M.G.R. Medical University II MBBS Microbiology Syllabus

A	**Goal and objectives**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**

B	**Integrated seminars/lectures**

C) INTEGRATION:

The following are some of the topics for integrated lecture/seminar

Sl.No	Name of the topic	Integration	
		Horizontal	Vertical
1.	Tuberculosis	Microbiology, Pathology, Social and preventive medicine, Pharmacology	Anatomy, General medicine, Pulmonology, Pediatrics,
2	malaria	Microbiology, Pathology, Social and preventive medicine, Pharmacology	General medicine, Pediatrics
3.	HIV/AIDS	Microbiology, Social preventive medicine	Dermatology & STD, General medicine, pediatrics,
4	Dengue	Microbiology, Social and preventive medicine, Pharmacology	General medicine, pediatrics,
5	Sexually transmitted infections	Microbiology, Social preventive medicine	Dermatology & STD, General medicine,
6	Respiratory tract infections	Microbiology, Pathology, Pharmacology	Anatomy, Physiology, General medicine, pediatrics, Pulmonology
7	CNS infections	Microbiology, Pathology, Pharmacology	Anatomy, General medicine, Pediatrics, Neurology
8	Gastrointestinal tract infections- acute diarrheal disease & Food poisoning	Microbiology, Social preventive medicine	General medicine, Pediatrics,
9	Urinary tract infections	Microbiology	Anatomy, Physiology, General medicine, Pediatrics, Urology, Nephrology, Obstetrics and

B	**Integrated seminars/lectures**

			gynecology
10	Wound infections & surgical site infections	Microbiology	Surgery, Obstetrics and gynecology, Orthopedics, Plastic Surgery
11	Antimicrobial use & stewardship	Microbiology	General medicine, Pediatrics, Surgery, Obstetrics & gynecology
12	Sterilization & Disinfection	Microbiology	Anesthesiology, surgery, CSSD,
13	Healthcare associated Infections & infection control	Microbiology, Social preventive medicine	General medicine, Pediatrics, Surgery, Obstetrics and gynecology

C 1	**GENERAL BACTERIOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
1	Introduction & History	**Role of Microbiology** in infectious diseases **History** of vaccination, sterilization, antiseptic surgery, virology and immunology Scientists: Louis Pasteur, Robert Koch, Antony von Leeuwenhoek, Alexander Fleming, lie Metchnikoff, Joseph Lister, Paul Ehrlich, Ernst Ruska	Edward Jenner, Ronald Ross, Armaeur Hansen, Frank Burnet Karl Landsteiner History of vaccination, sterilization, tuberculosis	Kary Mullis and PCR Enders at all,
2	Microscopy	**Types of microscope: Simple, Compound**- Bright - field & Dark Field, Fluorescent Microscope, Dissecting (Stereo) microscope		Interference microscope, Confocal Scanning Laser Microscope,
3	Staining Methods	Gram, AFB (Ziehl Neelsen), Giemsa, JSB, Negative staining (India ink), KOH wet mount , Alberts Staining, Lacto-phenol cotton blue, Iodine mount,	AFB (M. leprae), Modified AFB for Nocardia & cryptosporidium, AFB -fluorochrome, Ponder, Trichrome, Neissers,	Flagellar Stain Fontana Silver Impregnation, Calcofluor
4	Morphology of Bacteria Classification of bacteria	**Structure and Functions**: Cell wall, Capsule, Flagella, Fimbriae, Spores Phylogenetic Classification, Intra species Classification, Bacterial Nomenclature	Slime layer, Cytoplasmic Membrane Numerical Taxonomy	Nucleus, Ribosomes Desmosomes, Molecular classification
5	Nutrition and growth of Bacteria	Nutrition, respiration (anaerobic &aerobic) and growth of bacteria, growth curve, factors influencing growth; Fermentation-Glucose, formic acid, butane diol	Bacterial Counts, Biofilms	Bacteriocins, Continuous Culture
6	Culture Media & Cultivation methods	**Solid**: Nutrient, Blood, chocolate, MacConkey, Mueller Hinton, CLED, XLD, TCBS, LJ, Sabourauds, Dextrose, Cary Blair, Amie's, Stuart, Thayer Martin,**Liquid**: peptone water, nutrient broth, brain	Liquid media for M. TB, Potassium Tellurite agar, BACTEC &MGIT- AFB culture using liquid	Chromogenic media

C 1	**GENERAL BACTERIOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
		heart infusion, Tryptone soya broth, Alkaline peptone, Selenite **Culture method**s Aerobic, AFB culture (solid),Anaerobic : Robertson cooked meat and Thioglycollate , Air evacuation system, Gaspack	media	
7	Identification of bacteria	**Cultural Characteristics**: Colony morphology, fermentation of lactose, Hemolysis, CAMP test, **Biochemical Reactions**: Indole , Citrate utilization, urease, triple sugar iron agar, VP-MR, slide and tube coagulase, catalase, oxidase, bacitracin and optochin sensitivity, bile solubility, X-V Factor test	All sugars fermentation and Lysine ornithine arginine metabolism Sero grouping Rapid ID Methods (Automated)	Animal Pathogenicity, Sero Typing of Bacterial Strains Molecular Methods
8	Sterilization & Disinfection	Definition Bacterial death pattern, thermal death time and point, Decidual reduction time. **Methods of Sterilization**, Moist Heat Sterilization-Autoclave in detail Disinfection-High, Intermediate and Low level Chemical disinfectants-phenol, chlorine, Iodine. glutaraldehyde, formaldehyde Sterilization monitoring & Sterilization Controls	ETO, Plasma Sterilization, Central Sterile Supply Department (CSSD) High level disinfectants-Per acetic acid, Hydrogen peroxide Disinfection of critical and semi critical instruments Disinfection of endoscopes	Testing of Disinfectants
9	Bacterial Genetics	Methods of Gene Transfer, Plasmids, transposons, Mutations, Genetic basis of mechanisms of drug resistance Genetic Engineering-cloning &recombinant DNA technology.	DNA Methods-Plasmid finger printing, RFLP, Pulse field Gel Electrophoresis, DNA hybridization, Ribotyping, Polymerase chain reaction (PCR)	Gene sequencing Gene Microarray

C 1	**GENERAL BACTERIOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
10	Antimicrobials & Chemotherapy	**Definitions**: antimicrobial, antibiotic, MIC, synergism, antagonism **Classification**: chemical, mechanism of action & antimicrobial spectrum Antimicrobial susceptibility Testing-Disc diffusion Mechanisms of drug resistance-β lactamase production, Methicillin Resistance in S. aureus; vancomycin resistant enterococci, combination of antimicrobials ,Antimicrobial stewardship	MIC determination Multidrug resistance in Tuberculosis	Molecular method of detection of antimicrobial resistance
11	Normal flora	Introduction - various sites, types role of normal flora in prevention of infections & in drug resistance,	Antimicrobials on normal flora	
13	Microbial pathogenicity	Commensal, pathogenic and opportunistic organisms. Virulence determinants: capsule, fimbriae, exotoxins, enzymes, intracellular parasitism, antigenic variation & extrinsic factors Types of infection: primary, secondary, general, local, natural, nosocomial, iatrogenic, zoonotic.	Mechanisms of action of Exotoxins	

C 2	**IMMUNOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
1	Immunity	Definition of immunity, types of immunity, innate immunity, acquired immunity Components of innate immunity active and passive immunity and local immunity. Opsonization and phagocytosis Natural killer cells	Pathogen associated molecular patterns, Pathogen Recognition Receptors (PRR), Toll like receptors,	Cytokines involved in innate immunity Interferons
2	Antigen	Definition: Antigen, Hapten, immunogen types, antigen determinants, properties of antigen.	Various routes of administration of antigens Methods of preparation of antigens	Recombinant DNA derived protein and Synthetic peptides as antigens for diagnostic tests and vaccination
3	Antibody	Definition, structure of immunoglobulins, immunoglobulin isotypes, immunoglobulin classes, idiotypic antibodies physical and biological properties of immunoglobulins., Functions of antibodies in immune response Detection of IgM and IgG class antibodies in the diagnosis of infectious diseases	Hypo gamma globulinaemia Immuno genetics and antibody diversity Immunoglobulin therapy Monoclonal antibody Hybridoma technology	Ig Class switching Quantitation of immunoglobulins Humanized monoclonal antibody therapy
4	Antigen & Antibody Reaction	Forces binding Antigen and antibody Epitope and paratopes Affinity and Avidity, Immune complex	Western Blot Radial Immuno diffusion, Immuno -electrophoresis	Immune Electron Microscopy Chemi-luminescence
5	Complement system	Complement Pathways Functions of complement Regulation of complement pathway	Complement Deficiency Diseases	Quantitation of Complements

C 2	**IMMUNOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
6	Structure and Functions of the Immune system	Primary & Secondary Lymphoid OrgansB Lymphocytes-Activation and antibody productionT Lymhocytes-CD4+(Helper) and CD8+cytotoxic cellsNK cells, Monocytes & MacrophagesAntigen Presenting Cell & Major Histo compatibility Complex (MHC)-antigen Processing	MALT (Mucosal Associated Lymphoid Tissues), Dendritic Cells, Mast CellsHLA Typing and Applications	------
7	Hypersensitivity Reaction	Definition & Types of Hypersensitivity – I, II, III, IV Immediate Vs Delayed, IgE and IgE receptors,	Desensitization in anaphylaxis type V reaction	Detection of immune complexes
8	Auto Immunity	Mechanisms of tolerance Role of Thymus in tolerance Mechanisms of activation autoreactive T cells Classification & Pathogenesis of Auto immune diseases	Rheumatic Fever Rheumatoid arthritis Systemic Lupus erythematosus, Type-1 diabetes mellitus	Hashimato's thyroiditis Grave's disease Thrombocytopenic purpura, Management of Autoimmune disorders
9	Transplantation Immunology	Types of Grafts, Mechanism of transplant rejection, Acute, hyper acute rejection, Graft Versus Host reaction, Prevention of graft rejection	MHC matching (HLA Typing) Immunosuppression by corticosteroids, cytotoxic drugs and cyclosporine	Kidney & liver transplants Bone marrow transplant
10	Tumour Immunology	Tumour rejection antigens Immune response to tumours	Humanized monoclonal antibody therapy in cancers Immunotoxins	Flow cytometry in the diagnosis of malignancies Vaccines against tumors
11	Immuno Deficiency Disorder	Humoral, Cellular & Combined Immuno Deficiency Defect of Phagocytosis		

C 2	**IMMUNOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
12	Immunohematology	Blood Group antigens, Blood grouping, Cross matching, Coomb's test Rh &ABO incompatibilityRh D immunization		
13	Immuno prophylaxis	National Immunization Schedule (EPI), Vaccines – Killed and subunit & Live attenuated Toxoid and Recombinant DNA derived Vaccines Polio,Diptheria,Pertussis,Tetanus,,Measles,mumps,rubella,Hepatitis B, Japanese Encephalitis ,Rabies, Pneumococcal Immunoglobulin therapy,	Live attenuated varicella Hepatitis A, Haemophilus influenza, Influenza A Cytokine therapy Adverse Events following Immunization	New Vaccine strategies Newer Vaccines: Dengue

C 2	**IMMUNOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
	I.GRAM POSITIVE COCCI			
	1.Staphylococci	Morphology, Cultural and isolation, Pathogenicity, Diseases caused, Virulence factors, Laboratory diagnosis Prevention and control, Methicillin resistant Staphylococcus aureus, Pyogenic infections, Surgical site infection, TSST, Treatment	Biochemical reactions, antigens. MRSA	Typing methods Exotoxins
	2.Streptococci	Morphology, Cultural classification Characteristics, Lancefield grouping, Culture and Identification, Group A & B beta hemolytic streptococci Pathogenicity, Virulence factors. Diseases : Pharyngitis, erysipelas, impetigo, necrotizing fasciitis , Puerperal sepsis Post Streptococcal Sequelae- Rheumatic fever, Acute glomerulo nephritis pathogenesis, clinical features, Laboratory diagnosis & treatment treatment and prevention.	Biochemical reactions, antigens. Subacute bacterial endocarditis	Vancomycin resistant Enterococci Anaerobic streptococci streptococcus viridans
	3.Pneumococci	Morphology, Cultural Characteristics, Pathogenicity, Diseases caused, Virulence factors, Laboratory diagnosis, Quellung reaction	Animal Pathogenicity tests. Immune response, Antigen detection in urine	
	II.GRAM NEGATIVE COCCI			
	1.Neisseria gonorrhoeae	Morphology, Classification of Gram negative cocci Pathogenicity, Epidemiology, Laboratory diagnosis, clinical manifestations, complications , Infertility in male & female, Treatment Prophylaxis,	Culture & Biochemical reactions Immune response. Treatment	Non Gonococcal urethritis

C 2	**IMMUNOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
	2.Neisseria meningitidis	Serotyping based on capsule. Virulence factors, Septicemia, meningitis, lab diagnosis of pyogenic meningitis due to N. meningitidis, Treatment	Chemoprophylaxis Meningococcal vaccines	
	III.GRAM POSITIVE BACILLI1.			
	1.Cornye bacterium diphtheriae	Morphology, Cultural characteristics, pathogenicity due to Toxins, Laboratory diagnosis, Treatment, Prophylaxis, Epidemiology, Diphtheria Vaccine	Classification, Culture and Isolation	Typing
	2.Bacillus anthracis	Type of Infection, Morphology, cultural characteristics, virulence factors, pathogenesis, clinical manifestations, laboratory diagnosis, treatment and prevention	Epidemiology Biochemical reactions	Anthrax bacilli as potential agent for Bioterrorism
	3. Bacillus cereus	Morphology, cultural characteristics, biochemical reactions, Pathogenesis of food poisoning	Laboratory Diagnosis	……. …….
	IV.ANAEROBIC BACTERIA			
	1.Clostridium tetani	Morphology, Culture, Resistance, Pathogenicity, Prophylaxis, laboratory diagnosis and Treatment,	Biochemical reactions	Classification of the clostridia
	2.Clostridium perfringens	Morphology, Pathogenesis of Gas gangrene, Prophylaxis, Nagler's reaction	C. histiolyticum, C. noviyi Biochemical reactions.	…… …… ……
	3.Clostridium botulinum	Morphology, Culture, Resistance, Pathogenicity, Prophylaxis Treatment, laboratory diagnosis, types	…… ……. ……	….. …… ……
	4.Clostridium	Antimicrobials &Pseudomembranous colitis	….. …… ……	….. …… ……

C 2	**IMMUNOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
	difficile			
	5.Non-sporing anaerobes	Classification, diseases caused, laboratory diagnosis, Common anaerobic infections, treatment	Normal anaerobic flora of the human body	
	V. ENTERO-BACTERIACEAE	....	Classification of the Enterobacteriaceae, Biochemical reactions,	....
	1.Escherichia coli	Morphology, cultural characteristics, Virulence factors, Diarrhoeagenic E coli, Pathogenesis of UTI, neonatal meningitis and clinical manifestations, Laboratory diagnosis and treatment	Antigenic structure Extended spectrum Beta Lactamase producing E. coli (ESBL)	....
	2.Klebsiella	Classification Klebsiella pneumoniae: pathogenesis of UTI and	K. oxytoca and K. rhino-scleromatis	....
	3.Proteus	Morphology, Special characteristics, diseases caused	....	....
	4.Shigella	Morphology, Classification, Exotoxins, Pathogenesis of shigellosis, Hemolytic Uremic syndrome, Laboratory diagnosis, Treatment and control	Biochemical reactions Drug resistance in Shigella	....
	5.Salmonella	Morphology, Pathogenicity, Epidemiology, Clinical manifestations of Enteric fever and intestinal Salmonellosis, complications, laboratory diagnosis, Treatment & Prophylaxis ,Drug resistance	Classification, antigenic structure and variations, Serotyping methods Laboratory Diagnosis of carriers,	....
	6.Intestinal Salmonellae	Sources of infection, Pathogenesis, Lab diagnosis	Salmonella septicemia	....

C 2	**IMMUNOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
	VI. VIBRIO			
	1.Vibrio cholerae 2. Halophilic vibrios	Morphology, Cultural characteristics, transport media used, resistance, Epidemiology, Pathogenesis, Clinical features, Laboratory diagnosis, Prophylaxis, Treatment : Oral rehydration therapy	Biological typing Serotyping, V. cholerae O139	Vibrio mimicus
	3.Aeromonas and plesiomonas	…… …… ……	Clinical features, Laboratory diagnosis, Prophylaxis, Treatment	…… ……..
	VII.PSEUDOMONAS			
	1.Pseudomonas aeruginosa	Morphology, cultural characteristics, Resistance to Antimicrobials, Pathogenicity, clinical manifestations, Laboratory diagnosis, Treatment: antipseudomonal drugs	Nosocomial infections: Ventilator Associated Pneumonia, Wound infections	…… ……
	2.Stenotrophomonas maltophila 3. Burkholderia cepacia 4. Burkholderia mallei and Glanders 5. Burkholderia pseudo mallei and melioidosis	…… …… ……	Epizootology, zoonotic infections, clinical manifestations. Treatment and control	…… ……

C 2	**IMMUNOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
	VIII.OTHER GRAM NEGATIVE BACTERIA			
	1.Yersinia pestis	Morphology, Cultural characteristics, Antigens, toxins and virulence factors Epidemiology & Epizootology, Rodents, Rat fleas, Pathogenesis of Plague, Clinical manifestations, Laboratory Diagnosis, Treatment.	Prophylaxis, Plague surveillance and control	Yersinia enterocolitica
	2.Pasteurella multocida	……. ……. ……	Pathogenesis, clinical presentations, laboratory diagnosis treatment.	……. ……. ……
	3.Francisella tularensis	…. ……. ……	Tularemia in man: pathogenesis, clinical features, treatment and prophylaxis	……. ……. ……
	IX.HEMOPHILUS			
	1H. influenzae.	Morphology, cultural characteristics, resistance, pathogenesis, clinical presentations, laboratory diagnosis treatment, Vaccines	Biochemical reactions Antigenic properties	……. ……. ……
	2.H. aegypticus & H. para-influenzae, H. aphrophilus, HACEK	…. ……. ……	Pathogenesis, clinical presentations, laboratory diagnosis treatment. HACEK induced endocarditis	……. ……. ……
	3.H. ducreyi	Sexually transmitted infections, clinical features, treatment	…. ……. ……	……. ……. ……

C 2	**IMMUNOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
	X. BORDETELLA 1.B. pertussis	Morphology, cultural characteristics, virulence factors, pathogenesis, clinical presentations, laboratory diagnosis treatment, prophylaxis	Biochemical reactions Pertussis vaccines	Other Bordetella species viz. B. parapertussis and B. bronchiseptica
	XI. **BRUCELLA**	Morphology, cultural characteristics, pathogenesis, clinical presentations, laboratory diagnosis treatment, Prevention and control	Epidemiology, Antigenic structure	…… ……. …….
	XII. MYCOBACTERIUM M. tuberculosis	Epidemiology, Morphology, virulence determinants & pathogenicity Resistance, cultural characteristics, clinical presentations, Pathogenesis of Pulmonary and Extra pulmonary tuberculosis, HIV/TB coinfection laboratory diagnosis: AFB microscopy and Multi drug anti tuberculous treatment, prophylaxis RNTCP -- DOTS, Multidrug Resistance (MDRT)	Drug susceptibility testing methods: solid media and liquid media Molecular methods of diagnosis of MDRT Standards of TB care	Latent TB Management of TB contacts Extremely Drug Resistant Tuberculosis New anti TB drugs
	2.M. leprae and Leprosy	Epidemiology, Morphology, classification pathogenesis, clinical features, Laboratory Diagnosis: AFB microscopy	Cultivation of M. leprae in mouse footpad	Multi drug therapy,
	3.Non-Tuberculous Mycobacteria	Classification, Diseases caused by NTM		Biochemical reactions
	XIII.SPIROCHETES			

C 2	**IMMUNOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
	1.Treponema pallidum & Syphilis	Epidemiology, Morphology, Cultural characteristics, pathogenicity, Stages and Clinical features: Primary, Secondary, Tertiary, Congenital Laboratory diagnosis: Dark field microscopy, Serological Tests-rapid Plasma Rapid Reagin, Specific Treponema antibody tests Treatment and Prevention and control	Non venereal treponematoses, Yaws, Pinta and Endemic syphilis	Nonpathogenic treponemes
	2.Borrelia recurrentis Relapsing fever	Morphology, pathogenicity, laboratory diagnosis, treatment	Cultural characteristics Antigenic properties Vincent's angina	…… ……
	4.Borrelia burgdorferi	Lyme's disease, Vector involved, Clinical features, Laboratory diagnosis		
	5.Leptospira	Epidemiology, Epizootology, Morphology, Classification, Isolation, pathogenesis of leptospirosis and complications, clinical features, lab diagnosis: Genus specific and serovar specific tests, treatment, Prevention and control	Silver impregnation staining Microscopic Agglutination Test PCR in the diagnosis of leptospirosis Antigenic structure	Leptospirosis in animals
	XIV Ricketssiae			
	Rickettsia ricketsii R. prowazekii R. typhi Orientia tsutsugamuzhi	Epidemiology, morphology, cultural characteristics, pathogenesis, Laboratory diagnosis: Weil Felix Test, IgM ELISA, Clinical features and treatment. Indian tick typhus, epidemic typhus, Murine Typhus, Scrub Typhus, Q fever	Emerging Rickettsial infections in India Rocky mountain spotted fever	…….. …….

C 2	**IMMUNOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
	Coxiella burnetii			
	XV Mycoplasma & Chlamydia			
	1.Mycoplasma pneumoniae & hominis	Morphology, pathogenesis, L forms, clinical features: Atypical pneumonia, Non gonococcal urethritis and cervicitis, laboratory diagnosis, Cell culture contamination by mycoplasma, treatment.	Epidemiology Cultural characteristics, Biochemical properties, Antigenic properties	Classification, Ureaplasma urealyticum,
	2.Chlamydia trachomatis C. pneumoniae, C. psittaci & TWAR agents	Morphology, pathogenesis, Reticulate bodies, clinical features: Trachoma, Inclusion conjunctivitis, Non gonococcal urethritis and cervicitis, Lymphogranuloma venereum, Atypical pneumonia, laboratory diagnosis; Gram stain, Detection of Antigen, real time PCR & treatment.	Cell culture	…….. …….
	1.Anaerobic actinomycetes & Actinomycosis	Morphology, Clinical features, Laboratory diagnosis, treatment	Actinomycetes causing COPD, farmer's lung	…….. …….
	2.Nocardia	Morphology, Staining characteristics, Clinical features: Opportunistic infections, Lab diagnosis and Treatment	Culture of Nocardia Nocardiosis in HIV/AIDS	…….. …….
	XVI. MISCELLANEOUS BACTERIA			

C 2	**IMMUNOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable to Know**	**Nice to Know**
	1.Listeria monocytogenes	Listeriosis – clinical features: Food poisoning, Neonatal meningitis due to Listeria, Listeria opportunistic infections in HIV/AIDS, lab diagnosis, treatment,	…….. …….	…….. …….
	Klebsiella granulomatis	Granuloma inguinale- clinical features, lab diagnosis and treatment	…….. …….	…….. …….
	Streptobacillus moniliformis and spirillum minus	Rat bite fever: clinical features, lab diagnosis and management	…….. …….	…….. …….
	Campylobacter	Epidemiology, Morphology, cultural characteristics, Classification, pathogenesis, and lab diagnosis and treatment.	Gullain baare syndrome and campylobacteriosis	…….. …….
	Helicobacter pylori	Disease caused, pathogenicity, laboratory diagnosis and treatment	…….. …….	…….. …….
	Legionella pneumophila	Morphology, cultural characteristics, Pathogenesis, Clinical features: Atypical pneumonia, Hospital Acquired Infections and treatment	…… …….	……. …….

C 4	**PARASITOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**

	Parasitology			
Sl No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
1.	**GENERAL PARASITOLOGY - INTRODUCTION**	**Definitions**- types of hosts, parasites, types of host parasite relationships, sources of infections, portals of entry, modes of transmission of parasitic diseases, **Life cycles** of parasites, pathogenicity, immunity to parasitic infections, **Laboratory diagnosis** of parasitic infections- principles Specimen collection,- Stool and Blood Stool Direct saline & iodine mount, Concentration Techniques in Stool exam Blood thick and thin smear ; Rapid Antigen Detection Serological Tests-IgM and IgG detection	Polycarbonate filters to concentrate microfilariae	Ectoparasites Recent Advances in the Lab diagnosis of Parasites Parasitic opportunistic infections
2. 2.	**PROTOZOA**	Classification & General characteristics of Protozoa		
3.	**INTESTINAL AMOEBAE**	**Entamoeba histolytica** Habitat, morphology, life cycle, pathogenicity, clinical manifestations, intestinal & extra intestinal- amoebiasis, laboratory diagnosis of intestinal & extra intestinal amoebiasis, Treatment and Prevention	Entamoeba dispar, Entamoeba coli, Entamoeba hartmanni, Iodamoeba butschlii, Endolimax nana	Histo pathology of amoebic lesions

C 4	**PARASITOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
4. 4	**FREE - LIVING AMOEBAE**	**Free living amoeba:** Naegleria fowleri, Acanthamoeba species, Morphology, life cycle, pathogenicity, clinical manifestations, lab diagnosis, Treatment and Prevention		Newer free living amoebae Sappinia diploid
5.	**INTESTINAL, ORAL & GENITAL FLAGELLATES**	**Intestinal Flagellates Giardia** lamblia Habitat, Morphology, life cycle, pathogenicity, clinical manifestations, lab diagnosis, prevention & treatment	Immune response recent advance in laboratory diagnosis of Giardiasis other intestinal flagellates	Trichomonas tenax Trichomonas hominis
6. 5		**Genital flagellates**Trichomonas vaginalis: Habitat, Morphology, life cycle, pathogenicity, clinical manifestations, lab diagnosis, prevention & treatment		
7. 6	**BLOOD PARASITES**	**Trypanosoma**		
		African trypanosomiasis. brucei gambiense &T. brucei rhodesiense South American trypanosomiasis: T. cruzi Habitat, Morphology, life cycle, pathogenicity, clinical manifestations, lab diagnosis, prevention & treatment	Antigenic variation in Trypanosomiasis	Newer Parasites & Opportunistic Parasitic Infections
9. 7		**Leishmania**		

C 4	**PARASITOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
10. 8		**Old world Leishmaniasis**: Leishmania donovani L. tropica - Epidemiology, Habitat, Morphology, cultivation, life cycle, pathogenicity, clinical manifestations: Kala azar, Post kala azar Leishmaniasis, lab diagnosis – specific and nonspecific tests, prevention & treatment	Virulence factors Immunology HIV and Leishmania Co-infection Rapid diagnostic tests Control measures	Xeno diagnosis Other species: L. major L. peruviana ; L. chagasi
11.		**New world leishmaniasis** L. brazilensis complex & L. Mexicana complex Habitat, Morphology, life cycle, pathogenicity, clinical manifestations, lab diagnosis, prevention & treatment		
12.		**PLASMODIUM SPECIES** P. falciparum, P. vivax : Epidemiology, Life cycle, Morphology, Pathogenesis, Clinical features , complications, Laboratory diagnosis of Malaria : Thick and Thin blood smear-Blood collection, Giemsa staining/JSB staining, Identification of P. vivax and P. falciparum Rapid Detection Tests, Treatment of malaria Control measures & National programs In Malaria control	P. ovale & P. malariae	Drug resistance in malarial parasites
		BABESIA: Habitat, Morphology, Life cycle, Pathogenesis, Clinical features, Laboratory		

C 4	**PARASITOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
		diagnosis, treatment		
14.	**COCCIDIAN PARASITES**	**TOXOPLASMA**Morphology, Life cycle, Pathogenesis, modes of transmission, Clinical manifestations- congenital toxoplasmosis, toxoplasmosis in immuno -compromised, Laboratory diagnosis and treatment **Cryptosporidium parvum** Morphology, Life cycle, Pathogenesis, clinical manifestations, Laboratory diagnosis, treatment **Balantidium coli**	Diagnosis of CNS toxoplasmosis in HIV/AIDS	
15. 10	**MICRO-SPORIDIA**		MICROSPORIDIA	
	HELMINTHS			
16. 11	**CESTODES**	Classification of Cestodes systematic & habitat based General characteristics of cestodes **TAENIA SOLIUM & TAENIA SAGINATA** Morphology, Life cycle, Pathogenesis, modes of transmission Clinical manifestations, neurocysticercosis Laboratory diagnosis, Prophylaxis treatment	Epidemiology of neurocysticercosis Spirometra, Hymenolepis diminuta	Taenia multiceps, Echinococcus vogeli

C 4	**PARASITOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
17. 12		**Diphyllobothrium latum** **Hymenolepis nana** **Echinococcus granulosa** Morphology, Life cycle, Pathogenesis, modes of transmission Clinical manifestations- Laboratory diagnosis, prophylaxis treatment		
18. 13	**TREMATODES**	**Schistosomes- blood flukes; Fasciola hepatica (Liver fluke); Paragonimus westermani (Lung fluke)** Epidemiology, Morphology, Lifecycle, Clinical Features, Pathogenesis, Lab diagnosis, Prevention& Treatment.	Schistosomiasis in India	Heterophyes -heterophyes Watsonius watsoni Opisthorchis felineus Metagonimus yoogawi
19. 14		**Opisthorchis (Clonorchis) sinensis**: Morphology, Lifecycle Clinical Features, Pathogenesis, Lab diagnosis Treatment Prevention		
20. 15	**NEMATODES**	**Ascaris lumbricoides**: Habitat, morphology; Life cycle, pathogenicity of adult worms, pathogenicity of migrating larvae clinical manifestations, lab diagnosis, Prevention and Treatment, visceral larva migrans	Free living Species	……. ……

C 4	**PARASITOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
21. 16		**Strongyloides stercoralis** morphology; Life cycle, pathogenicity of adult worms, pathogenicity of migrating larvae clinical manifestations, Hyper infection, lab diagnosis, Prevention and Treatment , larva currens	Strongyloidiasis in HIV AIDS	……. ……
22.		**Ankylostoma duodenale:** habitat, morphology; Life cycle, pathogenicity of adult worms, pathogenicity of migrating larvae clinical manifestations, microcytic hypochromic anemia, lab diagnosis, Prevention and Treatment	Pseudo hook worms Ankylostoma brazilensis	……. ……
23.		**Necator americanus** Differentiating features between Ankylostoma and Necator Cutaneous larva migrans	……. ……	……. ……
24.		**Enterobius vermicularis & Trichuris trichiura** habitat, Morphology, Lifecycle Clinical Features, Complication-appendicitis, Pathogenesis, Lab diagnosis Treatment Prevention	Gnathostoma species	
25.		**Dracanculensis medinensis** habitat, Morphology, Lifecycle Clinical Features, Pathogenesis, Lab diagnosis, Treatment, Prevention	Anisakiasis	

C 4	**PARASITOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
26.	**FILARIAL NEMATODES**	**LYMPHATIC FILARIAL PARASITES: Wuchereria bancrofti & Brugia malayi** Epidemiology, Habitat, morphology,Life cycle, pathogenicity, clinical manifestations, laboratory diagnosis- conventional and rapid diagnostic tests, Anti filarial treatment,Mass prophylaxis with DEC	Occult filariasis Loa loa, Oncocerca volvulus Mansonella species infecting human	Ivermectin
27.	**LABORATORY DIAGNOSTIC PARASITOLOGY PROCEDURES**	1.Blood for Malarial parasites and Microfilariae: Thick and thin blood smear 2.Stool saline and iodine wet mounts 3.Stool concentration methods, 4. Microscopic techniques in stool examination for diagnosis of parasitic diseases. 5. Examination of urine in parasitic diagnosis (Schistosomiasis) 6. Examination of sputum (Paragonimiasis) 7. Examination of aspirates(Leishmaniasis) 8. Examination of CSF; Serologic diagnostic methods (Toxoplasmosis)	Quantification of malarial parasites	Culture methods in parasitology Molecular methods in parasitic diagnosis

C 5	**VIROLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**

S No	**VIRUSES**	**MUST KNOW**	**DESIRABLE TO KNOW**	**NICE TO KNOW**
1	GENERAL PROPERTIES OF VIRUSES	**History of virology;** definition of virus; Structure and Symmetry; Classification; Characterization of viruses; Electron microscopy -Negative staining and cryo electron microscopy; Viral Replication strategies; Susceptibility to physical and chemical gents Resistance. Cultivation of Viruses; Viral Hemagglutination	Viral Multiplication: Cell culture & Viral growth. Shell vial culture Identification of viral cultures using Haemadsorption inhibition, neutralization test, Immunofluorescence and ELISA	Virus Titre estimation using neutralization method (Plaque count)
2	LABORATORY DIAGNOSIS OF VIRAL INFECTIONS	**1.Specimen collection and transportation** i) Blood (serum) for immunoassays volume blood(3-5ml), whole blood and serum, plasma. Timing of specimen is critical ; standard precautions and PPE ; Transportation at 4 ^{0} C ii).Naso pharyngeal swab or aspirate for Antigen detection & nucleic acid **:** Trans-portation in in VTM at 4 ^{0} C using gel pack or wet ice iii).Specimens for Nucleic acid : CSF,	**Nucleic acid test** qualitative and quantitative by real time PCR for diagnosis and prognosis respectively **Diagnostic accuracy of laboratory tests** : (sensitivity, specificity, positive predictive value, negative predictive value) for immunoassays and nucleic acid tests for each viral infection	**1.Virus Isolation** nasopharyngeal swab & CSF); Specimen processing for viral culture ; Incubation time ; .

C 5	**VIROLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
		Blood whole ,plasma, serum: Transportation at 4 ^{0} C using gel pack or wet ice <u>without VTM.</u> 2.**Methods**- A) Microscopy (Tzank smear) B) Antigen & Antibody detection using Immuno fluorescence, ELISA, Rapid tests (Dot -blot and immuno chromatography): **IgM , IgG** detection		
3	VIRUS -HOST INTERACTIONS	Receptors used by viruses; Cell & tissue tropism; Mechanisms virus entry into the cell ; Viral replication-Cell injury-Cytopathic effect & Inclusion bodies; persistence of viruses ; viruses and cancer; **<u>Host response</u>**: <u>Innate immunity</u>: Natural killer cells, & Interferons. <u>Adaptive immunity</u>: MHC1 restricted CD 8 + T cell cytotoxicity, central role of CD 4+ T cell (TH_1 &TH_2) helping the CD8+ and B-cells, ; Neutralization of viruses ; ADCC ; Iimmunoprophylaxis (vaccines) ;Primary and secondary immune response	Innate immunity : **Viral PAMPs**: single-stranded (ss)RNA, dsRNA, and DNA; **PRRs**: Toll-like receptors (TLRs) and the cytosolic nucleic acid sensors Immunopathogenetic mechanisms (e.g. HIV/AIDS,RSV)	

C 5	**VIROLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
4	BACTERIOPHAGES	Morphology & Life cycle. Significance of Phages Phage typing	Bacteriocins	Bacteriophages in molecular cloning
5	POX VIRUSES	Classification; Variola virus, Vaccinia virus – morphology cultivation host range. Small pox pathogenesis, clinical findings, Small pox eradication programe Cow pox. Milker's nodes Orf , Molluscum Contagiosum. Small pox eradication	History of small pox vaccine	Vaccinia virus as a vector for candidate antigens in the field of vaccinology.
6	PAPOVAVIRUS	Classification. Human papilloma virus(HPV): Morphology, mechanisms of oncogenesis HPV serotypes and lesions produced, pathogenesis of skin lesions, (wart) carcinoma cervix Lab diagnosis : (Papanicolou smear) ,treatment & HPV vaccines .	Molecular diagnosis of HPV infection using real time PCR	HPV vaccines in the prevention of Carcinoma cervix
7	PARVO VIRUS	Human Parvo Virus B 19: Epidemiology, Structure, pathogenesis, clinical manifestations, treatment.	Congenital infection and management	

C 5	**VIROLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
8	**HUMAN HERPES VIRUSES** HERPES SIMPLEX VIRUSES VARICELLA ZOSTER VIRUS CYTOMEGALO VIRUS EPSTEIN BARR VIRUS	**Human Herpes viruses**: **HSV**: Epidemiology, Types of HSV, pathogenesis, Latency, Primary, initial, recurrent infections, **Clinical(syndromes)**: HSV1: Orofacial, HSV keratitis, Encephalitis & Disseminated HSV; HSV2 : Genital Herpes, Aseptic meningitis, Congenital and neonatal HSV Laboratory diagnosis**:** Direct microscopy: Tzank smear in orofacial & Genital Herpes, Virus isolation, Antigen detection by immuno- fluorescence, IgM and IgG detection; Real time PCR in HSV encephalitis; Treatment : Acyclovir and Valacyclovir therapy of primary, initial and recurrent infections. HSV encephalitis & chemo-prophylaxis.	HSV in HIV/AIDS Acyclovir: mechanism of action, pharmacodynamics and pharmacokinetics	HSV Latency Associated Transcription
	Varicella Zoster Virus(VZV)	**Varicella Zoster virus**: Epidemiology, Pathogenesis clinical manifestations: Chickenpox, CNS complications, Pneumonia, and Herpes Zoster; laboratory diagnosis of VZV, treatment, Vaccines	Herpes Zoster in HIV/AIDS VZV in pregnancy & Congenital infection	Post Herpetic Neuralgia

C 5	**VIROLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
	Cytomegalo virus (CMV)	Epidemiology, Pathogenesis, CMV inclusion bodies, clinical manifestations: CMV in pregnancy, Congenital CMV, CMV infections in HIV/AIDS & complications (CMV encephalitis and retinitis), lab diagnosis, treatment.	CMV infections renal, liver & bone CMV infections in renal, liver, & bone marrow transplant recipients; Ganciclovir & Valganciclovir therapy & Prophylaxis in transplant recipients	New antiviral drugs: Cidofovir
	Epstein Barr Virus (EBV)	Epidemiology, EBV Antigens, Pathogenesis: Infection of the pharyngeal & and B cells, immortalization of B cells; Clinical: Infectious mononucleosis & encephalitis; Lab diagnosis Paul Bunnel and EBV specific ELISA tests and treatment,	EBV associated lymphomas. pharyngeal carcinoma, EBV in HIV/AIDS	…… …….
	HUMAN HERPES VIRUSES-HHV 6 HHV 7 & KSHV (HHV8) Herpes B virus	Epidemiology, pathogenesis, clinical features: HHV6 & 7: Exanthema subitum, infantile fever and seizures, encephalitis KSHV: Kaposi Sarcoma in HIV/AIDS Herpes B virus: Epidemiology, pathogenesis, clinical manifestations & Post exposure prophylaxis with valacyclovir	…….. ……..	…… …….

C 5	**VIROLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
9.	PICORNA VIRUSES	Classification of picornaviridae family Enterovirus genus classification and Polio virus antigenic types, P**olio virus**: epidemiology, pathogenesis, clinical manifestations Acute flaccid paralysis, laboratory diagnosis: isolation of polio virus from stool, Polio Vaccines –Oral Polio (live) & Inactivated (advantages & disadvantages) dose, Immunization schedule, Mass pulse Polio vaccination. **Other Enteroviruses**: Coxsackie A and B , ECHO viruses , pathogenesis, clinical manifestations , laboratory diagnosis, treatment Rhino viruses General characteristics, Serotypes, pathogenesis & clinical manifestations	Polio Surveillance and eradication Switch from OPV to IPV Vaccine associated AFP; Acute Encephalitis due to Non polio entero viruses	……. …….
10	ORTHOMYXOVIRUSES	Classification, Structure, Antigenic variation, Influenza A: Epidemiology, pathogenesis, Clinical features-mild to severe influenza and complications such as acute respiratory distress syndrome, Laboratory diagnosis : viral isolation, real time RT PCR in the diagnosis of encephalitis treatment & prevention .	Pandemics due to Influenza A Genetic mechanism of antigenic drift and shift Bird Flu, Influenza A vaccine	Influenza B & C
11	PARAMYXOVIRUSES	Paramyxoviridae: Introduction, Antigenic Structure, classification. **Mumps virus** : Pathogenesis, Clinical manifestations, complications, Lab		

C 5	**VIROLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
		Diagnosis , Prevention : live mumps vaccine **Measles (Rubella)** History, epidemiology, Pathogenesis, Clinical manifestations : measles exanthemas, complications: pneumonia, encephalitis, post infectious encephalitis, SSPE, Lab Diagnosis , Prevention , Prophylaxis. **Respiratory Syncytial Virus (**RSV): Epidemiology, Pathogenesis; Risk factors for severe disease; Clinical manifestations: Acute bronchitis, bronchiolitis & complications, Laboratory Diagnosis: Antigen detection by immunofluorescence& real time PCR, Treatment: Ribavirin therapy **Parainfluenza viruses** 1-4: Pathogenesis, clinical manifestations: Stridor due to acute trachea bronchitis (Croup), Treatment		
12	ARBOVIRUSES	**General**: Introduction, Definition, taxonomical classification, Epidemiology, Ecology, Entomology clinical syndromes: Fever with rashes, fever with hemorrhage, fever with arthritis, Encephalitis Lab Diagnosis: Antibody (IgM/&IgG) by ELISA Prevention and entomological control measures. **Dengue** : WHO/NVBDC clinical classification and management, lab	Yellow fever; Sandfly fever Chandipura fever ; Aedes agyptii : Habitat, Trans ovarian transmission ;	Hanta HF, argentine HF, Bolivian HF, Crimean-Congo HF, Lassa fever, Rift valley Fever, Viral isolation in vitro using vero cell and insect cell lines

C 5	**VIROLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
		diagnosis : NS1 antigen IgM detection ; Aedes mosquito Control measures ; Source reduction and larvicidal **Japanese encephalitis** : Epidemiology, general ; Clinical : asymptomatic to encephalitis syndrome; lab diagnosis : IgM from CSF and serum ; prevention with the new JE live vaccine **Kyasanur Forest Disease** **Chikungunya**		Dengue vaccines Xeno diagnosis
13	RHABDOVIRUSES	Structure, Symmetry, Susceptibility to physical and chemical agents of disinfection, Antigenic Properties. Natural life cycle in animals, Transmission, Pathogenesis, Pathology: Rabies inclusion (Negri) bodies, Clinical features, Laboratory diagnosis of rabies: ante and post mortem, clinical manifestations, Prophylaxis- Pre exposure and post exposure Prophylaxis. Control of Rabies in domestic dogs and cats	History of Rabies vaccine Cell culture derived rabies vaccines Control of wild rabies	Rabies related viruses
14	CORONAVIRUS	Classification, & SARS Transmission, clinical manifestation, lab diagnosis, treatment, Prophylaxis	MERS CoV	

C 5	**VIROLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
16	SLOW VIRUSES	Slow virus disease definition: classification : Prion diseases ,Subacute Sclerosing Pan encephalitis SSPE and Progressive multifocal leukoencephalopathy (PML) **Prion**; susceptibility to physical agents; classification of slow viral diseases, pathogenesis of Prion mediated disease clinical manifestation , diagnosis treatment & prevention Human Prion diseases : Kuru, Creutzfeldt-Jakob disease (CJD) encephalopathy, **SSPE** : Pathogenesis ,clinical features, Lab diagnosis & prognosis	Prion Protein (PrP). Sterilization and disinfection methods that are effective against Prion PML	Gerstmann-Straüssler-Scheinker Syndrome (GSSS)
17	REO VIRUSES	Rota viruses: Epidemiology, structure, Subtypes, pathogenesis clinical manifestations, diagnosis: Antigen detection from stool: ELISA, Latex agglutination-Treatment of diarrhoea & prevention : Rotavirus vaccines		
18	ADENOVIRUSES	Adeno virus Structure, classification, Pathogenicity, Clinical manifestations: Upper and respiratory tract infections, conjunctivitis, and enteritis. Lab diagnosis	Epidemic keratoconjunctivitis Oncogenecity of adeno virus	Adenovirus infection in immuno compromised ; Haemorrhagic cystitis

C 5	**VIROLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
20	ONCOGENIC VIRUSES	Classification of Oncogenic Viruses ; Mechanisms of oncogenesis in virus infected cells; Viruses associated With Human cancer;	Human papilloma virus and carcinoma cervix EBV and Burkitt's lymphoma	Antiviral therapy in virus asssociated tumors

C 6	**MYCOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**

	II MBBS CURRICULUM MYCOLOGY			
	TOPICS	MUST KNOW	DESIRABLETO KNOW	NICE TO KNOW
	I General Aspects of fungi	General characteristics of Pathogenic fungi. Clinical Classification of fungus infections; Dimorphic fungi; Pathogenicity and virulence; laboratory mycology-specimen collection, direct examination using KOH, Calcofluor- KOH, Gram stain, Culture and isolation from specimens; Serology and NAAT; Antifungal agents- Topical and systemic	Histopathological diagnosis: Haematoxylin-Eosin, PAS, gomori's methenamine Blue, Gridley's fungal stain of mycotic diseases Real time PCR in the diagnosis of fungi	Antifungal susceptibility testing; Azole resistance
	II Superficial Mycoses	Tinea nigra, Piedras-white and black, Pitryasis versicolor Dermatophytes- General characteristics, classification, Pathogenicity Clinical aspects of dermatophytoses :Tinea corporis & cruris, Tinea pedis & manuum, Tinea barbae, Tinea ungium, Tinea capitis. Superficial candidiasis Laboratory diagnosis: Direct KOH & culture and identification of colonies Treatment : Topical Azole derivatives & Systemic Griseofulvin & Azole therapy	WOOD's lamp and its applications. Identification methods of the Dermatophytes: In vitro hair perforation ,urea production and hydrolysis	Treatment of Drug resistant dermatophytes with Terbinafine

C 6	**MYCOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
	III Subcutaneous Mycoses	Types of subcutaneous mycoses : Eumycetoma, Sporotrichosis, Chromoblastosis and entomophthorosis **1.Eumycetoma** :Fungi : Curvularia geniculata & lunata ; Exophiala jeanselmei ; Fusarium falciforme ; Leptosphaeria senegalensis Madurella grisea & mycetomatis; Phaeoacremonium spp_ epidemiology & transmission ,clinical features, Lab diagnosis : direct examination of the granules and culture **2.Sporotrichosis**- Causative agent, clinical features, laboratory diagnosis and treatment **3.Rhinosporidiosis**-Structure and morphology; life cycle of Rhinospoidium seeberi ;epidemiology, clinical features, Lab diagnosis and treatment	Chromoblastomycosis	Entomophthoromycosis - due to Entomophthorale fungi- Electron microscopic structure of R.seeberi NAAT in the diagnosis of Eumycetoma
	IV Systemic and Opportunistic Mycoses	**Systemic mycoses** : Causative agents : *Histoplasma capsulatum, Coccidioides spp , Paracoccidioides brasilensis, Blastomyces dermatidis* epidemiology & transmission, clinical features,Lab diagnosis and Treatment **Opportunistic mycoses** : Causative agent, pathogenesis,clinical features,Lab diagnosis and Treatment : Aspergillosis,Penicillosis,Zygomycosis, Candidiasis, Cryptococcosis and	…….. ……..	

C 6	**MYCOLOGY**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
		Pneumocystis jirovecii pneumonia		
	V. Miscellaneous Topics	Oculomycosis: Causative Agents (*Aspergillus , Fusarium , Scedosporium, Paecilomyces, Acremonium* species) ; Clinical features -keratitis, conjunctivitis Lab diagnosis and treatment Otomycosis & Mycotic poisoning	…….. ……..	Protothecosis Pythiosis Lobamycosis

C 6	MYCOLOGY			
Sl.No	Content	Must Know	Desirable To Know	Nice to Know

C 7		**Applied microbiology**			
Sl.No		**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
1		COLLECTION & TRANSPORT OF SPECIMENS	Specimen : type ,timing of sample collection ,containers, volume and Labelling Requisition forms: Filling the test order forms with identifiers & relevant clinical details, Appropriate instructions (specimen wise Aseptic precautions during blood and body fluid collection laboratory specimen log/register specimen rejection criteria Transport of specimen within the hospital and to the reference laboratory ;transport media Amie's, Stuart, Cary Blair	1.Newer safe blood collection devices such as vacutainers and self-locking needles 2. Specimen transport to overseas following IATA rules. 3.transport media- Amie's for Gonococci and Cary Blair for Vibrio cholerae 4. Sputum collection in Falcon tubes for MDR TB culture/molecular diagnosis 5. Nasopharyngeal swab for Influenza A	1.Viral transport medium 2. Cold chain maintenance of specimen during transport for viral cultures and molecular diagnosis 3.Storage of specimens and cultures long term. 4.New Dried blood spot (DBS) collection system
2		NORMAL MICROBIAL FLORA OF THE HUMAN BODY	1.Normal flora of skin, Oropharynx, Intestinal tract, genital tract 2. Normal flora as Innate immunity component 3. Interference of normal flora with the pathogens during culture	1.Criteria (macroscopic and microscopic) to identify specimens contaminated with normal flora 2. Selective media for minimizing the interference by normal flora 3.Interpretation of cultures positive for pathogens that form part of normal flora	Broad spectrum antimicrobials altering the normal flora

C 7	**Applied microbiology**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
3	IMMUNOPROPHYLAXIS	1.Active and passive immunization 2. Killed and live vaccines 3. Adjuvants & Routes of administration 4. National immunization schedule 5. Cold Chain maintenance 6. Bacterial, and viral vaccines 7.Rabies post exposure vaccination principles 8.Adverse events following immunization (AEFI)	1.Health care workers immunization; Hepatitis B, Tetanus, Varicella-Zoster,Rabies Influenza A, 2.Japanese encephalitis vaccine in endemic region 3.Vaccine management peripheral level 4.Mass Polio vaccination ;Switch from Trivalent OPV to bivalent OPV	1.Newer vaccines-rotavirus, Pertussis acellular vaccines, inhalation based measles vaccine 2. New strategies of vaccination -DNA vaccines;
4	HEALTHCARE ASSOCIATED INFECTIONS & STANDARD PRECAUTIONS	1.Health care –Associated Infections -definition 2. Categories of HAI -Catheter associated UTI, Surgical site infection, Blood stream infection(BSI); Ventilator associated pneumonia (VAP), 3.Implications of HAI -morbidity, mortality and financial 4.**Prevention of HAI** : **Hand Hygiene** importance , practice and monitoring	1.Specific prevention measures **UTI** : Catheter administration policy, Asepsis during procedure, weaning policy & administration of antimicrobials **SSI** : Contact precautions, Theatre asepsis, Good surgical practices **BSI**: Strict aseptic protocols for central vein cannulation, Change of CVC during infection, **VAP** : Aseptic handling of Ventilator conduits ; Weaning of ventilator etc.	1.Infection control committee 2. Surveillance of HAI 3. Antibiotic Stewardship 4.Antimicrobial prophylaxis 5.Central Sterile supply department 6.Operation room disinfection

C 7	**Applied microbiology**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
5	BIOMEDICAL WASTE MANAGEMENT	1.**Definition** &Importance of BMWM for Health care workers' safety; Infectious and noninfectious hazards associated with BMW 2. Categories of biomedical waste and disposal mechanisms BMW lifecycle: 1. Generation 2. Segregation,34. Disinfection, 4. transportation to the common storage section 5. Transportation to the common treatment facility, 8.Treatment and Disposal by suitable methods : incineration, autoclaving, deep burial, sharp burial pit, Effluent treatment plant for liquid waste Biomedical waste handling rules .	Bio medical waste treatment- incineration, Deep burial	Common Treatment Facility Functions
6	Clinical microbiology	**1.Direct Microscopy** : Gram's stain, ZN / Fluorescent AFB sputum microscopy and RNTCP grading, Thick and thin Giemsa smear for malaria 2.**Culture &anti-microbial susceptibility** (AST) : Urine, blood, pus ,CSF, Sputum, 3.**Serological tests**; Widal, RPR (VDRL), ASO, Rheumatoid Factor, HIV Rapid 4.**ELISA** : HBsAg, anti HCV, ,IgM Dengue,NS1 Ag 5.Interpretation of culture results correlating with Gram stain findings;	1.ELISA: IgM HAV, IgM HEV, IgM TORCH , IgM JE, IgM Chikungunya, 2.Malaria Rapid Detection Test, CRP	Molecular Tests: **Real time PCR** Influenza A, Cartridge based PCR for TB (CBNAAT), real time PCR (qualitative and Quantitative) for HCV and HIV

C 7	**Applied microbiology**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
7	URINARY TRACT INFECTIONS	List of potential pathogens causing community acquired UTI, Pathogenesis of Ascending and descending UTI and Catheter associated UTI Instructions to the patients for getting -Clean catch midstream urine samples; Sterile Collection containers ; Collection of urine from urinary catheters (CAUTI) direct Gram Stain examination of non-centrifuged urine for pyuria & bacteriuria Culture of urine, antimicrobial susceptibility testing & interpretation of culture results .	1.Sterile pyuria, 2. Asymptomatic bacteriuria 3. Examination of centrifuged urine for pus cells, leukoesterase & nitrate reductase rapid tests to detect pyuria and bacteriuria respectively 4. Prostatitis 5. Aseptic collection of urine through supra pubic puncture.	1.Specific preventive measures for the prevention of Heath care associated UTI

C 7	**Applied microbiology**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
8	BLOOD STREAM INFECTIONS	**1.Indications for blood culture**: Typhoid fever, Infective endocarditis (Acute and sub-acute) Meningitis, meningococcemia, pneumonia, acute osteomyelitis, septicemia, Health care associated infections -Blood stream infections & nosocomial pneumonia 2. **List of bacteria causing bacteremia**: S. typhi, S. paratyphi A & B Group D streptococci, Pneumococci, group A and B beta hemolytic streptococci, H. influenzae, S. aureus, Coagulase negative staphylococci, enterococci, enterobacteriaceae etc., 3.**Blood culture method** : time of collection of specimens, site of collection, Culture media (aerobic and anaerobic containing sodium polyanenthol sulphonate) ,volume of blood to be inoculated -infants, children, adults, Strict asepsis during collection & transport of samples to the laboratory. Incubation time (7-10 days), Interpretation of the pathogenicity of the isolate & AST	1.Automated blood culture system and antimicrobial susceptibility system 2. Biphasic medium for blood culture 3. Anaerobic blood culture	Fungal blood culture using Isolator blood collection system

C 7	**Applied microbiology**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
9	RESPIRATORY TRACT INFECTIONS	Etiology, Clinical features and differentiation of Viral and bacterial respiratory tract infections **Otitis media**: Pathogens involved- Pneumococci, H, influenzae, and M. catarrhalis, specimen collection **Pharyngitis** : Viral : Parainfluenza, RSV , Influenza viruses Bacterial : Beta hemolytic Group A streptococci **Pneumonia (community acquired)** ; List of bacterial pathogens: Pneumococci, Influenzae, and M. catarrhalis; Pul.TB **Nosocomial** : S.aureus, Pseudomonas aeruginosa and Acinetobacter, etc., **Pulmonary Tuberculosis** : AFB microscopy -Ziehl- Neelsen and Auramine (fluorescent stain);biosafety in sample collection, staining, Reading and interpretation . Interpretation of Culture report correlating with Gram smear	**Throat swab Culture** and identification for Group A Beta hemolytic streptococci using blood agar and bacitracin susceptibility testing **Sputum culture** : indications, instructions for collection of sputum with minimal contamination of saliva and biosafety precautions;Wide mouth plastic containers Quality assessment of sputum for culture with Gram stained smear; Culture media ; Identification of Pneumococci by Optochin susceptibility testing and AST **Real time PCR for influenza A** -indications.	AFB culture for M. tb and biochemical identification Nucleic acid amplification tests (Xpert Gene and Line probe assay) in the detection of M.tb organism and MDRT
10	PYREXIA OF UNKNOWN ORIGIN	Definition in adults and children List of pathogens causing PUO Lab diagnosis & antimicrobial treatment		

C 7	**Applied microbiology**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
11	MENINGITIS	1.Definition of meningitis and encephalitis 2.List of pathogens causing meningitis: Pneumococci, H. influenzae and Meningococci 3.Neonatal meningitis : Group B streptococci, Escherichia coli and Listeria monocytogenes 4.Rapid Gram stained smear examination of centrifuged / non-centrifuged (when the sample volume <1ml) CSF 5.Giemsa stain: for study of inflammatory cells (neutrophils and lymphocytes) 6.Differentiation of viral and bacterial meningitis through CSF findings	Lumbar puncture and collection of CSF Contraindications for collection of CSF Isolation and identification using blood, chocolate (5% CO2) & MacConkey media and biochemical reactions; Optochin sensitivity, factor X, V, XV dependent growth test for H. influenzae	1.Rapid Antigen detection tests using latex agglutination
12	Sexually transmitted Infections	1.STI : Syphilis, Gonorrhea, chancroid , Granuloma inguinale, Herpes simplex genital infection, Lympho-granuloma Venereum, bacterial vaginosis BV, Trichomoniasis, Human papilloma virus infection , HIV,HBV 2..HIV and Coinfection with other STI -implications 3.Microscopy: Direct Gram smear vaginal smear for BV; Saline wet mount of vaginal exudate for Trichomonas vaginalis ; Gram smear of urethral and cervical discharge for gonococci; Tzank smear for Herpes simplex ; Papanicolou smear 3.RPR and Specific Treponema antibody	1.Culture of urethral and cervical exudate for Gonococci using Amies charcoal transport medium and selective Thayer martin culture medium 2.Public Health aspects-syndromic approach	1.Chlamydial antigen detection and Real time PCR for chlamydiae 2. Real time PCR for HPV

C 7	**Applied microbiology**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
		tests; HBSAg test 4.Rapid HIV antibody tests : Counselling, Test strategies, window period & Interpretation of tests		
13	Skin & Soft tissue Infections	1.Cellulitis, Abscess, carbuncle, impetigo, ulcer, necrotizing fasciitis Surgical site infection, 2.List of Pathogens: S. aureus, beta hemolytic Group A streptococci, Enterococci, Pseudomonas aeruginosa , Escherichia coli, Proteus sp, atypical mycobacteria 3. Specimen: exudate by aspiration, and swabs with minimal contamination by normal flora and colonizers of the wound 4. Direct Gram smear examination, culture and AST & Interpretation of culture report .	Anaerobic culture of exudate from deep seated abscess MRSA	
14	ZOONOSES	1.Definition; WHO classification of zoonoses; 2.List of Bacterial ,Viral ,Parasitic and Fungal zoonoses 3.Zoonoses of clinical & public health importance in India : e.g. Leptospirosis, Anthrax, Plague, Rabies, Influenza A, Japanese encephalitis, toxoplasmosis, echinococcosis, Taeniasis, KFD	Prevention and control of rabies in animals	Surveillance of Zoonoses : Plague , Japanese encephalitis ;

C 7	**Applied microbiology**			
Sl.No	**Content**	**Must Know**	**Desirable To Know**	**Nice to Know**
15	DIARRHOEA & FOOD POISONING	**1.List of Pathogens causing infectious diarrhoea** poisoning; , Vibrio spp. Salmonella serotypes; Shigella spp. Campylobacter spp; Diarrhoeagenic Escherichia coli (EHEC;EPEC; ETEC; EIEC; EAEC;STEC) & C. difficile; 2.**Preformed toxin mediated** : 1)S.aureus; 2) B.cereus;3) C.botulinum 3. Specimens to be subjected for culture of enteric pathogen 1.Stool/rectal swab in Caryblair ; 2.Suspected food transported in cold chain	1.Aeromonas spp; P. shigelloides; Y. enterocolitica ;Listeria mono-cytogenes (rare); Clostridium perfringens; 2.Steps in the Investigation an outbreak of food poisoning : 3.Food hygiene and safety	1.ELISA for the detection of exotoxins . 2.Molecular diagnostic tools to detect foodborne pathogens like Diarrhoeagenic E.coli

D	**Teaching methodology**

PRACTICAL SYLLABUS

A.Laboratory biosafety

B.Microscopy -Handling & maintenance of light microscope

C.Gram Stain – Principles and procedure of Grams stain demonstration followed by hands on exercise ; Examination and interpretation of Direct Gram smear of clinical specimens : pus,urine, CSF,sputum

D.Special Stains – 1)Acid fast staining-instructions for sputum collection with biosafety precautions, importance of sputum quality, role of AFB stain in the RNTCP program principles of staining, procedure and demonstration of AFB from sputum specimen. Hands on exercise : staining, examination and reporting

2) Albert stain -Demonstration

E. Demonstration of motility by Hanging drop

F. Demonstration of culture media / methods

G. Demonstration of sterilization and disinfection techniques : 1. Autoclave: equipment operation and monitoring; methods of packing; indicators of sterilization and visit to Central sterile supply department. 2. Hot air oven : Operation and use

H : Systematic bacteriology– Identification of the pathogen from the given clinical material

D	**Teaching methodology**

based on Gram stain, cultural characters and biochemical tests ; Demonstration of antimicrobial susceptibility testing by disc diffusion method

I : Immunology – Blood collection and separation of serum ;Demonstration & discussion principles of the serological tests, methods, reading and interpretation of the following tests:

Widal, Non treponemal Rapid Plasma Reagin test, ELISA for HIV antibody and HBSAg

Latex agglutination : rheumatoid factor, anti streptolysin

Demonstration : Rapid Tests and various strategies in HIV testing;

Rapid Antigen detection tests in malaria

F: Parasitology –

1)Stool examination; Saline and iodine preparation, Direct and concentration techniques;

Demonstration of normal constituents, cysts and trophozoites of Entamoeba histolytica, Giardia gamblia ; ova of Ascaris lumbricoides, Ankylostoma duodenale, eggs of Taenia solium

2) finger prick blood collection and making of thick and thin smears: Giemsa/JSB staining for malarial parasites demonstration and examination of various stages of P. falciparum and P. vivax.

3) Demonstration of microfilariae

G: Applied Microbiology:

Demonstration and discussion of specimen collection-blood, urine, CSF, throat swab, exudates, sputum ,BAL bronchial aspirates

Demonstration and hands on hand Hygiene :Hand washing and Hand rub

Demonstration of Personal protective equipments and Biomedical waste management

NO	THEORY : TOPICS	NUMBER OF HOURS TO BE DEDICATED			
		Didactic	Integrated seminar		125
D	**Teaching methodology**				
1	General Microbiology	12	4		
2	Immunology	14	…		
3	Systematic Bacteriology	28	2		
4	Virology	18	4		
5	Mycology	10			
6	Parasitology	12	2		
7	Applied Microbiology	7	12		
	Total	101	24		
	PRACTICALS	**Demonstration**	**Hands on exercise**	**Other activity (Tutorial)**	**125**
	General instructions & Laboratory biosafety	2	…..	….	
2	**Microscopy**: Handling &Examination	2	1	1	
2	**Gram's Stain** : Making smears from colony, heat fixation, staining &examination;Direct Gram smear examination of clinical specimen	4	6	1	
3	Demonstration of motility by hanging drop	2	…..	….	
4	Sterilization & Disinfection &	4	…..	2 (Visit	

G METHODOLOGY

D | **Teaching methodology**

E	**Internal Assessment and Medical Ethics**

Theory Question Paper Pattern

Exam. Category	**No. of Questions**	**Marks**
1. Essay	1 x 10 marks	= 10
2. Brief answers	6 x 4 marks	= 24
3 Short answers	6 x 1 marks	= 6
	Total	40

The above pattern is to be implemented from February 2018 onward

PRACTICAL EVALUATION

The TN Dr. M.G.R. Medical University Microbiology II M.B.B.S Practical Examination Format with exercises and marks distribution.

S.No:	Name of the Exercise	Procedure& Observation	Identification	Interpretation& Discussion	Time	Total
1	Gram's Staining15	1.5		1.5	15	3
2	Acid Fast Staining20	1.5		1.5	20	3
3	Stool Examination10	1.5		1.5	10	3
4	Bacterial Culture Identification10		1.5	1.5	10	3

E	**Internal Assessment and Medical Ethics**					
5	Immunoserology10		1.5	1.5	10	3
6	Spotters10		5		10	5
7	OSPE :10 1)5 stations 1 mark each General bacteriology-1;Systematic bacteriology-1;virology-1;applied microbioloigy-1; mycology-1; 2)One of the exercises may be testing of skills for e.g., .hand hygiene . 3.To be carried out in the practical session 4.To identify the particular clinical scenario or picture or photograph and answer three question of clinical or microbiological importance related to the particular topic 5.Marks can be distributed according to the questions. Key question : 0.5 mark; Two questions : 0.25 mark each 6.Answer keys have to be provided to the examiners. 7.Ambiquous questions have to be avoided.					5
	Total					**25**

Viva Voce :

E	**Internal Assessment and Medical Ethics**

Internal Assessment Scheme for II MBBS Microbiology

Students come into the II year in the third week of October and the protocol for IA is as follows :**THEORY SCHEDULES.No.**	**Tentative Month**	**Portions**
1.	December	General Microbiology
2.	March	Immunology
3.	May	Protozoalogy
4.	July	Helminthology
5.	August	Systematic Bacteriology – I (Staphylococcus upto Nonsporing anaerobes)
6.	September	Systematic bacteriology II (Escherichia coli upto Mycobacterium tuberculosis)
7.	October first week	Systematic bacteriology III

E	**Internal Assessment and Medical Ethics**

		(Mycobacterium leprae upto Chlamydia)
8.	October last week	Virology I (Introduction to virology to Paramyxoviruses)
		rology II (Arboviruses upto HIV)
		ycology
		plied Microbiology Seminars
		odel Exams as per University pattern

S.No.	TOPIC	MARKS
1.	General Bacteriology & immunology.	4
2.	Systematic Bacteriology	4
3.	Virology & Applied Microbiology	4
	Parasitology & Mycology	3
	Total	15

E	**Internal Assessment and Medical Ethics**

1.The questions can be structured i.e. sets of questions with answer keys can be prepared and given to the examiners in each topic. This can make the oral examination fairly uniform and objective similar to OSPE. Multiple sets of questions may be prepared to avoid monotony.

2.Questions of reasoning type are preferred to recall type of questions.

Laboratory Record

1.The record can have standard instructions for the particular procedure for g., Gram stain to maintain uniformity in the hands on practical

2.Excercises in the form of Questions that are reasoning type with clinical orientation can be asked at the end of each exercise.

3.The records have to be periodically checked by the staff and included in the formative assessment.

4.The students are expected to complete the documentation of the exercises and submitted for the formative assessment

Record should be followed as recommended by the University

1.Internal Assessment can be sent to the University in 6 terms of 3 months each. The assessment has to be submitted on or before 15th day of the following term .The following are the methods and topics for formative assessment .The methods except seminar/symposium have to be uniformly applied to all terms.

E	**Internal Assessment and Medical Ethics**

Formative assessment methods	I term September to December	II term- January to April	III term-May to August	IV term-September to December	Percentage of total assessment
	General Bacteriology, Immunology,	Systematic Bacteriology I&II	Virology, Mycology.	Parasitology, Applied Microbiology	
1.Participation in Seminar/symposia	At least 1 seminar/symposium per student throughout the course				10
2.Asssignment in topics of clinical or public health importance	1	1	1	1	10
3.Tutorials/Group discussion	1	1	1	1	10
4.Theory : written test & Viva voce	2	2	2	2	40
5.Practicals : A. Group discussion B. Objective type questions C. Hands on assessment D.OSPE	1.Microscopy 2.Gram's Staining 3.Sterilization &Disinfection 4.Biomedical waste management	1.Acid Fast Staining 2.Bacterial Culture Identification 3.Immunoserology-I -Widal, RPR	1.Stool Examination 2.Immunoserology-II – ASO,RF,CRP & ELISA	1.Fungal culture Identification 2.Applied microbiology	30

The TN Dr. M.G.R. Medical University Microbiology II M.B.B.S Medical Ethics :

1.Definition of Ethics :

Medical ethics is a compilation of moral principles that apply values and judgments to the practice of medicine and govern the professional and personal conduct of all students and staff of the institution .As a scholarly discipline, medical ethics encompasses its practical application in clinical settings as well as work on its history, philosophy, and sociology. The medical ethics

inspire the professionals to become the most honorable ideals. Besides medical ethical guidelines direct the students, doctors and other staff to act with ethical reasoning.

2.Ethical Reasoning

1. **The problem**: Identification and understanding the problem. for e.g. diagnosis of pulmonary tuberculosis by x- ray chest without doing sputum microscopy. As the X-ray findings -shadows is not specific for tuberculosis there will be over diagnosis of pulmonary tuberculosis which is ethically not acceptable as the wrong diagnosis can lead to unnecessary mental agony and stigma to the patient.

2. Information: Collection of right information relevant for the clinical diagnosis is very important for the diagnosis of infectious diseases of clinical and public health importance -for example, Dengue fever - fever and duration , body ache, headache, vomiting, complete blood examination, platelets count ,positive tourniquet test duration, are important clinical and laboratory features one should try to elicit from the patient to assess the severity of the illness and thereby preventing the patient going for severe dengue which in turn will prevent mortality. Failure to collect relevant epidemiological data especially in a case of fever may lead to delay in the diagnosis of falciparum malaria as early diagnosis is very critical for the prevention of life threatening cerebral malaria that can occur rapidly and cause mortality. This is ethically unacceptable as there is an effective therapy available.

3**. Options**. The various options available for the diagnosis, treatment and prevention have to be considered in each patient depending upon the accuracy of the diagnostic test, cost of the test, and the equipment. For example, In the diagnosis of multidrug resistant Tuberculosis, the options available are : AFB Culture and molecular diagnostic tools such as line probe assay and realtime PCR multiplex Tuberculosis .However for the benefit of the patient either line probe assay or the real time PCR assay (CBNAAT) is the best option .Though the tests are costly the molecular tests are cost effective in terms of early diagnosis of MDRT.

E	**Internal Assessment and Medical Ethics**

The treatment options based on the suitability, cost, adverse reactions for e.g., treatment of community acquired urinary tract infections due to E.coli susceptible to many antimicrobials including with locally & systemically acting drugs .The best option is treatment with locally acting urinary antiseptics as they will not cause adverse reactions encountered during intake of systemically acting drugs.

Consider all available reasonable options, choices and/or actions under the circumstance which you can apply to solve the problem. The goal is to do the right thing at the right time.

4.Ethical issues in the laboratory :

1. Maintenance of confidentiality of laboratory test results: The maintenance of confidentiality is very important for the laboratory to gain confidence from the clients of the laboratory. Generally the results are conveyed to the clients who inturn will convey the results to the treating professional .in some cicumstances the laboratory may have to convey the results directly to the treating physician for management purpose. Maintenance of the confidentiality is mandatory in certain tests like HIV testing as the results may lead to alienation from the family thus causing mental agony to the client.

Counselling has to be given both before and after testing in HIV /AIDS setting as the results may lead to sometimes suicides .Besides the spouse and the partner also have to be counselled to facilitate the process of antiretroviral treatment that will definitely prolong the survival of the patient.

E	**Internal Assessment and Medical Ethics**

Consent from the patient: Written consent has to be always obtained from the patient for any procedure that can potentially harm the individual particularly invasive techniques. All research scholars should get clearance from the institutional ethical committee before any study involving the patients. The consent has to be obtained always in the local language.

F **Internal Assessment & University Exam Marks Distribution pattern**

INTERNAL ASSESSMENT : 30 Marks

Theory: 15 Marks

Practical and viva voce: 10 Marks

Record-5 marks

Total: 30 Marks

NB: Each Lecture class will be of one hour duration only; Each Practical class will be for 2 hours duration only; Applied and Clinical Microbiology are to be dealt by problem based learning methods

F	**Internal Assessment & University Exam Marks Distribution pattern**

Recommended Text Books :.

a) Text Book of Microbiology 9th edition by Ananthanarayan and Paniker

b) Medical Microbiology by David Greenwood - 18th edition

c) Medical microbiology by Jawetz-27th edition

d) Medical microbiology by Murray 2015 edition

e) **PRESCOTT'S MICROBIOLOGY – 2014 EDITION BY JOANNE WILLEY**

f) Review of Medical Microbiology and Immunology2014 by Warren Leviinson

g) Immunology by Donald Weir 8 th edition

h) Essential Immunology by I.M.Roitt 12 th edition

i) Parasitology by K.D. Chatterjee - 13th edition

j) Textbook of Medical Parasitology: Protozoology and Helminthology 4th edition S.C. Parija

Reference books :

k) Topley and Wilson's microbiology and microbial infections 10th edition-8 vol

l) District laboratory practice in tropical counties-second edition 2 volumes (practical)

m) Textbook Of Practical Microbiology Paperback – 29 Mar 2007 by Subhash Chandra Parija

n) Harrisons principles of internal medicine 19th edition

o) Principles and Practice of infectious diseases 9th edition-Mandell and Douglas

p) Kuby immunology- 8th edition

q) Cellular & molecular immunology, Abbas litchman