

MICROBIOLOGY
SYLLABUS FOR 2ND PROFESSIONAL
MBBS COURSE

MICROBIOLOGY

(CURRICULUM DESIGNED AS PER AIIMS DELHI)

The goal of teaching microbiology to undergraduate medical student is to provide an understanding of the infectious disease in order to deal with the etiology, pathogenesis, laboratory diagnosis, treatment and control of infections.

OBJECTIVES

(A) Knowledge

At the end of the course, the student shall be able to:

1. State the infective micro-organisms of the human body and describe the host parasite relationship
2. List pathogenic micro-organisms and describe the pathogenesis of the diseases produced by them
3. State or indicate the modes of transmission of pathogenic and opportunistic organisms and their sources, including insect vectors responsible for transmission of infection
4. Describe the mechanisms of immunity to infection
5. Acquire knowledge on suitable antimicrobial agents for treatment of infection and scope of immunotherapy and different vaccine available for prevention of communicable diseases
6. Apply methods of disinfection and sterilization to control and prevent hospital and community acquired infections
7. Recommend laboratory investigations regarding bacteriological examination of food, water, milk and air

(B) Skills

At the end of the course, the students shall be able to:

1. plan and interpret laboratory investigations for the diagnosis of infectious diseases and to correlate the clinical manifestations with the etiological agents
2. identify the common infectious agents with the help of laboratory procedures and use anti microbial sensitivity tests to select suitable anti microbial agents

COURSE CONTENT

S. No	Thrust area	Must Know	Should Know
1.	Introduction to Microbiology History of Microbiology Differences between eukaryotes and prokaryotes Infection –Source and spread of microbes bacteria, fungi, viruses, parasites.	√	
2.	Introduction to Bacteriology The nature of bacteria Morphology Growth requirement Nomenclature and classification Enumeration of bacteria responsible for certain primary diseases.	√	
3.	Host-Parasite relationship Presence of normal flora Enumeration and explanation of various host-parasite interaction Mechanism of pathogenesis adhesion/colonisation/virulence and toxigenicity Host response Koch' s postulates	√	
4.	Bacterial and Viral Genetics Structure and replication of bacterial DNA, Plasmids Transfer of genetic materials and Mutations Viral replication Interactions among viruses (recombination, genetic reactivation, complementation etc). Recombinant DNA technology	√	
5.	Bacterial Staining and Cultivation Microscopy: types and principles Staining: principles Media for growth/bacterial colony Familiarization with materials used	√	
6.	Common Tests for Bacterial identification Various types of staining such as simple, differential staining; different procedures of staining and their principles Motility testing Common sugar fermentation and other biochemical tests such as Catalase/ Coagulase/citrate utilization/nitrate reduction/urease /PPA/OF/Indole etc. Sensitivity testing	√	
7.	Introduction to parasitology Protozoan parasites causing human infection Medically important helminthes. Entomology of Medical importance	√	

8.	Introduction to Virology The Morphology, Nature, Classification and properties of viruses Brief appraisal of pathogenicity of viruses Epidemiology of viral infection	√	
9.	Laboratory Diagnosis of Viral Infection Culture methods Tissue culture methods, Cytopathic effects, Inclusion bodies Animal inoculation Serological test(CFT, HAI, neutrallisation)	√	
10.	Introduction to Mycology Nature of fungi :basic structures and classification Classification of Mycoses Superficial mycoses Subcutaneous mycoses Systemic fungal infections with opportunistic mycoses	√	
11.	Common Laboratory Methods for Diagnosis of Fungal Infections KOH preparation with principles Lactophenol cotton blue preparation Negative staining and procedures Special staining and procedures Culture of fungi Serodiagnosis	√	
12.	Collection of Transport of Samples Collection of clinical samples Transport of various appropriate clinical samples. Transport media Description of container with contents Preliminary processing of clinical samples	√	
13.	Immunity Normal immune system Innate Immunity Antigens–presentation and association in immunity Immuno globulin and their role in immunity Antigen-antibody reactions Cell mediated immunity and their role Hypersensitivity Immunodeficiency Tolerance and Autoimmunity Immunohaematology	√	√
14.	Vaccines	√	
15.	Sterilization and disinfection Principles Various methods Demonstration of equipments and agents used in sterilization	√	

16.	Bacteriology of water	√	
	Bacteriology of air		
17.	Microorganisms associated with Gastrointestinal infections. (Bacteria, parasites, viruses and fungi). Aetiological agents, pathogenesis.	√	
	Gastrointestinal infections caused by parasites Amoebiasis –Entamoeba Amoebiasis and other intestinal protozoal infections (G. lamblia, Cryptosporidia, Isospora etc.)	√	
	Intestinal nematodes (Classification, epidemiology, lifecycles, clinical features and lab diagnosis etc.) — <i>Ascaris lumbricoides</i> , hookworms,	√	
	Intestinal nematodes — <i>S. stercoralis</i> , <i>T. spiralis</i> , <i>T. trichiura</i> , <i>E. vermicularius</i>	√	
	Intestinal cestodes -(Classification, epidemiology, life cycles, clinical features and lab diagnosis etc.) — <i>Taenia solium</i> , <i>Taenia saginata</i> ,	√	
	Intestinal cestodes <i>Echinococcus granulosus</i> , <i>Hymenolepis nana</i> Intestinal trematodes – <i>Fasciola hepatica</i> , and others found in India.	√	
	Enterobacteriaceae (Introduction, common features, classification, infections caused - enumeration only)	√	
	Bacterial diarrhea and dysentery (Focus: E.coli and Shigella)	√	
	Cholera (Bacteriology, virulence, toxins, pathogenesis)	√	
	Cholera (Clinical Features, Epidemiology, lab diagnosis, vaccines)	√	
	Food& Milk Borne Pathogens	√	
	Bacterial food poisoning (Aetiology, toxins, types, etc. include: introduction to staphylococcus and salmonella) <i>B. cereus</i> , <i>Cl. welchi</i>	√	
	<i>Helico bacter pylori</i>	√	
	Viral gastroenteritis (Paediatrics) Enteroviruses	√	
	Infections of liver & lymphatics	√	
	Viral hepatitis (Hepatitis A,B) (Hepatitis C, D, E)	√	
	<i>Echinococcus granulosus</i>	√	
	Filariasis(Introduction to other tissue nematodes)	√	
18.	Infections of there spiratory tract	√	

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	Streptococcal infections (Group A ,B:bacteriology,pathogenesis, infections, lab diagnosis, Sequelae of streptococcal infection), and, introduction to viridians group and pneumococcus, Haemophilus	√	
		√	
	Diphtheria(Bacteriology/ pathogenesis/ lab diagnosis)	√	
	Diphtheria II &whooping cough	√	
	Atypical pneumonia: mycoplasma, chlamydia, pneumocystis	√	
	Misc infections: legionella; listeria		√
	Ortho myxo viruses	√	
	Paramyxo viruses and miscellaneous viruses	√	
	Mycobacteria with special reference to <i>Mycobacterium tuberculosis</i>	√	
	Infections due to Non- tubercular Mycobacteria (NTM)	√	
19.	Urinary tract infection	√	
	Urinary tract infections E coli, Kleb, Proteus	√	
20.	Wound infections/anaerobic infections/fungal infections	√	
	Staphylococcal infections-including bacteriology, pathogenesis and lab diagnosis Pseudomonas,	√	
	Anaerobic infections of clinical importance GNB anaerobes Clostridia	√	
	Laboratory diagnosis of wound infections	√	
	Superficial Mycoses, Dermatophytosis	√	
	Mycetoma & subcutaneous mycosis	√	
	Systemic mycoses	√	
21.	Pyrexia Of Unknown Origin And Other Febrile Illnesses	√	
	Enteric fever	√	
	Malaria .(Transmission, species, life cycle and stages) (Clinical features, lab diagnosis, prevention etc.)	√	
	Leishmaniasis	√	
	Childhood Viral Exanthems (Micro, Paeds) Variola, Vaccinia, Measles	√	

	Viral haemorrhagic fever	√	
	Rickettsial infection with special reference to Indian rickettsial infection (Indian tick typhus, murine typhus, endemic typhus, scrub typhus)	√	
	Spirochetal infections other than <i>Treponema pallidum</i>	√	
	Septicaemia/Bacteraemia	√	
22.	Central Nervous system Infections	√	
	Meningitis (Etiology, Lab diagnosis Pathogenesis) <i>Haemophilus</i> , <i>N. meningitidis</i>	√	
	Free living Amoeba	√	
	Encephalitis, Trypanosomes	√	
	Poliomyelitis	√	
	Rabies	√	
	Cysticercosis and other CNS Parasitic diseases by Neurology (Microbiology)	√	
	Slow and Oncogenic viruses and prions		√
23.	Sexually Transmitted Diseases	√	
	STD (incl. bacteriology of <i>Neisseria gonorrhoeae</i> and other organisms) - <i>T. vaginalis</i>	√	
	STD (clinical features and lab diagnosis)	√	
	Syphilis	√	
	Herpes viruses	√	
	Human Immuno deficiency virus	√	
24.	Congenital infections	√	
	Congenital infections <i>Toxoplasma</i>	√	
25.	Miscellaneous	√	
	Hospital infection, Universal precautions (ICU) and waste management	√	
	Zoonoses (Bacterial, viral, parasitic, fungal) Anthrax, Plague, Brucella,	√	
26.	Opportunistic infections (Bacterial, Viral, Fungal and Parasitic)	√	
27.	Misc GNB and GP Bacteria, <i>Mycobacterium leprae</i> , Actinomycetes, Oncogenic viruses, Other trematodes: Schistosomes etc.	√	

May Know:

- Principle methods of preparation, administrations of vaccines information technology (Computers) in microbiology.
- Gene cloning.
- Molecular techniques as applicable to microbiology.
- Automation in microbiology.
- Statistical analysis of microbiological data and research methodology.
- Animal and human ethics involved in microbiological work.
- Tests for Beta-lactamase production.
- Inoculation of infective material by different routes in animals.
- Bleeding techniques of animals including sheep.
- Performance of autopsy of animals and disposal of animals. Animal Pathogenicity/toxigenicity tests for *C. diphtheriae*, *C. tetani*, *S. pneumoniae*, *S. typhimurium*, *K. pneumoniae* etc. care and breeding of laboratory animals viz. mice, rats, guinea pigs, rabbits etc.
- Testing of disinfectants-Phenol co-efficient and “in use” tests.
- Quantitative analysis of urine by pour plate method and semi quantitative analysis by standard loop tests for finding significant bacteriuria.
- Bacteriological tests for water, air and milk.
- Maintenance and preservation of bacterial cultures.
- Exotic diseases in India

PRACTICALS SCHEDULE

S No.	Practical topics	Hours	Able to do independently	Able to do under guidance
1.	Introduction to Microbiology	2	-	
2.	Biological waste management	2	√	
3.	Microscopy and Micrometry	2		
	<ul style="list-style-type: none"> — Introduction to microscopes — Focusing slides under low/high power and oil immersion. — Principles and demonstration of various types of microscopes 		√	
4.	Sterilization and disinfection	4		
	<ul style="list-style-type: none"> — Visit to media and sterilization room (demonstration of autoclave and hot air oven, filters and articles for sterilization) — Visit to CSSD/ Chemical agents 			√
5.	Stool examination	14		

	<ul style="list-style-type: none"> — Collection and transport of stool sample for parasites — Direct examination of normal stool — Identification of cysts (saline and iodine preparations) — Identification of ova of intestinal nematodes and cestodes — Identification of adult worms and larvae 		√	
	Concentration of stool for parasites			√
6.	Motility tests and biochemical tests for bacterial identification	4		
	<ul style="list-style-type: none"> — Hanging drop method for motility testing — Important biochemical tests: principles and interpretation 		√	
7.	Serological tests (ELISA, Latex agglutination test, RPR, WIDAL)	2		√
8.	Direct demonstration of bacteria by staining	6		
	<ul style="list-style-type: none"> — Gram staining — Albert's staining — Acid fast staining 		√	
9.	Culture media used in Bacteriology	4	√	
10	Culture and isolation methods	2		√
11	Enterobacteriaceae	2		
	<ul style="list-style-type: none"> — Common media and biochemical tests — Culture characteristics of members of Enterobacteriaceae 		√	
12	Laboratory diagnosis of E.coli infection and shigellosis	4		
	<ul style="list-style-type: none"> — Stool examination for pus cells and RBCs — Processing of stool specimen for bacterial culture — Cultural characteristics, tests for E.coli and its virulence factors — Cultural characteristics of Shigella and its identification (incl. slide agglutination test) 		√	
13	Laboratory diagnosis of cholera	2		
	<ul style="list-style-type: none"> — Collection and transport of specimen — Culture media and characteristics — Identification (incl. motility, oxidase and other tests) 		√	
	— Biotyping and serotyping			√
14	Laboratory diagnosis of food poisoning	2		
	— Laboratory diagnosis of salmonellosis		√	
15	Laboratory diagnosis of enteric fever	2		
	<ul style="list-style-type: none"> — Sample collection methods and transport — Blood culture (in detail) — Stool and urine culture for Salmonella — Widal test — Identification tests and slide agglutination for 		√	

	Salmonella			
16	Laboratory diagnosis of UTI	2		
	— Collection, storage and transport of urine. — Significant bacteriuria and quantitative/semi quantitative methods of culture — Media: including CLED — E.coli/ Klebsiella (revision) — Focus on: Identification of Proteus and Pseudomonas-cultural characteristics like swarming, pigment production; and tests like OF and oxidase		√	
17	Laboratory diagnosis of wound infections	2		
	Focus on: Staphylococcus (culture/identification including tests like catalase and coagulase)		√	
18	Laboratory diagnosis of upper respiratory infections	2		
	— Focus on: laboratory diagnosis of Streptococcus infection — Albert's stain — Media,		√	
	— Identification and toxin of Corynebacterium (demonstration)			√
19	Laboratory diagnosis of lower respiratory tract infections	2		
	— Focus on: Klebsiella and Streptococcus pneumonia		√	
	— Viral respiratory infection (demonstration of diagnostic methods)			√
20	Laboratory diagnosis of tuberculosis	2		
	— Collection of specimens (focus: sputum) — Concentration methods — Acid fast staining — LJ medium and culture characteristics		√	
	— Differentiation between MTB and NTM (basic concept/demonstration)			√
21	Laboratory diagnosis of anaerobic infections	2		
	— Demonstration of collection of samples for anaerobic culture — Methods of anaerobiasis- RCMB, anaerobic jar — Demonstration of media and culture for Clostridium, smears showing sporing and non-sporing GPB			√
22	Laboratory diagnosis of fungal infections	2		
	— Collection and transport of specimens — Gram stain, KOH preparation, India ink preparation for direct demonstration — Sabouraud's dextrose agar/media — Lactophenol cotton blue for identification			√
23	Laboratory diagnosis of meningitis	2		

	— Collection, aliquoting and transport of CSF — Other useful specimens — Direct smear examination			√
	— Culture media, growth characteristics and identification tests (focus: Neisseria, Haemophilus and Streptococcus pneumoniae) — Chronic meningitis: pathogens (demonstration e.g. India ink for Cryptococcus)			√
24	Laboratory diagnosis of STD	2		
	— Collection and transport of specimens — Direct demonstration — Serological tests (focus: syphilis, HIV)			√ √
25	Laboratory diagnosis of malaria	2		
	— Preparation, staining and examination of peripheral blood smear for malaria parasite — Identification of various species and stages		√	
	— Thick smear — Demonstration of vector and newer methods			√
26	Laboratory diagnosis of leishmaniasis	2		
	— Sample collection — Demonstration of LD bodies — Demonstration of vector, culture methods and serological tests — Revision of peripheral blood smears examination			√
27	Laboratory diagnosis of filariasis	2		
	— Direct examination/staining for microfilaria — Demonstration of other aspects of filariasis-including vector			√
28.	Investigation of an outbreak –Community and Hospital	2		√
	TOTAL	80		

TEACHING HOURS:

Theory: Minimum hours - 120 hours

Practical: Minimum hours– 80 hours

TEACHING AND LEARNING METHODOLOGY

Theory

Teaching microbiology to undergraduate medical student is provided with the help of Didactic Lectures, Intradepartmental Seminars (IS), and Tutorials that deal with the etiology, pathogenesis, laboratory diagnosis, treatment and control of infections.

EVALUATION OF STUDENTS

- A. Formative assessment: MCQ, Objective Structured Practical Examination (OSPE)
- B. Summative assessment: Internal assessment and Professional examination

EXAMINATION AND MARKS DISTRIBUTION**Total Marks: 200****Internal Assessment: 100** (Internal assessment will contribute to 50% of the total for both theory and practical)**Professional Examination: 100**

INTERNAL ASSESSMENT						
		Theory marks	weightage (%)	Practical marks	weightage (%)	Course distribution for Exam
III Semester	Mid Term	50	25%	50	25%	Topics covered till the Mid term exam
	End Term	50	25%	50	25%	Topics covered after Mid term exam till the 1 st End term exam
IV Semester	End Term	50	25%	50	25%	Topics covered after 1 st End term exam till the 2 nd End term exam
V Semester	Preliminary	100	25%	50	25%	All topics. 40% of questions will be from topics of V semester. Theory and Practical examination would be conducted as per the final examination pattern
Total		50			50	

PROFESSIONAL EXAMINATION		
Theory Examination	Content	Marks
Paper I (MCQ)	General Microbiology including Immunology, Parasitology ,applied and clinical	50
Paper II(MCQ)	Systemic-Bacteriology, Mycology, Virology, applied and clinical	50
Total		100 marks
Marks reduced to		50 marks
Practical Examination	Content	Marks
Practical	Practical examination include <ul style="list-style-type: none"> • OSPE, • Bacterial culture plate • Stool examination • Special staining procedures 	50
Total		50 marks

To qualify for appearing in Final Professional Examination the students have to fulfil minimum Attendance and Internal Assessment requirement as per rules and regulations at AIIMS Rishikesh.

THEORY EXAMINATION:

Theory paper of Internal Assessment: 3 hours duration and 50 marks.

Preliminary exam and Final Professional exam will have 2 Theory papers of 3 hours each and of 50 marks each. Marks obtained in both papers out of 100 will be reduced to 50%.

PRACTICAL EXAMINATION

S No.	Practical Exercise	Marks	
1.	OSPE	General Microbiology, Immunology, Bacteriology Mycology, Virology, Mycology, Parasitology. Questions will be based on <ol style="list-style-type: none"> 1. Sterilization and disinfection-1 2. Stained Microscopic slides-2 3. Mounted specimens-1 4. Antigen antibody reactions-1 5. Media-1 6. Biochemical tests-1 7. KOH/LPCB mounts of fungus-1 8. Instruments/Equipment-1 9. Problem based questions-reasoning, recall-1 	25
2.	Bacterial culture plate	Gram staining, Hanging drop and Identification of bacterial isolate and performing rapid identification tests	10
3.	Special stain	Performing AFB/Albert staining	05
4.	Stool examination	Focusing two abnormal ova and cyst	05
5.	RECORD		05

Student has to pass in theory and practical examination separately

**PROFESSIONAL EXAMINATION
DISTRIBUTION OF MICROBIOLOGY TOPICS**

Paper I (MCQ)

S No.	Name of the topic	No. of MCQ to be set
1.	General Microbiology	60
2.	Immunology	40
3.	Parasitology	60
4.	Applied and clinical Microbiology, Parasitology, Immunology	40

S No.	Name of the topic	No. of MCQ to be set
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Paper II(MCQ)

1.	Systemic-Bacteriology	90
2.	Systemic-Mycology	20
3.	Systemic-Virology	50
4.	Applied and clinical - Bacteriology Mycology Virology	40