SYLLABUS FOR 2nd PROFESSIONAL

(3) MICROBIOLOGY :

(i) Goal :

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

(ii) 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 (bacteria, viruses, parasites, fungi) and describe the pathogenesis of the diseases produced by them;

3) State 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 infections;

5) Acquire knowledge on suitable antimicrobial agents for treatment of infections and scope of immunotherapy and different vaccines available for prevention of communicable diseases;

6) Apply methods of disinfections 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 student shall be able to :

(1) plan and interpret laboratory investigation for the diagnosis of infectious diseases and to correlate the clinical manifestations with the etiological agent;

(2) identify the common infectious agents with the help of laboratory procedures and use antimicrobial sensitivity tests to select suitable antimicrobial agents ;

(3) perform commonly employed bed-side tests for detection of infectious agents such as blood film for malaria, filaria, Gram staining and Acid Fast Bacilli(AFB) staining and stool sample for ova cyst etc.,

(4) use the correct method of collection, storage and transport of clinical material for microbiological investigations.

(C) INTEGRATION:

The student shall understand infectious diseases of national importance in relation to the clinical, therapeutic and preventive aspects.

2) **SYLLABUS OF MICROBIOLOGY** :

Sl. No.	Name of the unit (Lectures)	No.of.Hours
1.	General Bacteriology	8
2.	Immunology	20
3.	Parasitology	20
4.	Systemic Bacteriology	25
5.	General Virology AND Systemic Virology	15
6.	Mycology	6
	Total No. of Hours	**94**

TEACHING HOURS CAN BE DIVIDED AS FOLLOWS :

1.	Lectures	94
2.	Practicals	50
3.	Demonstrations	50
4.	Symposia & Seminars	40
5.	Internal assessment	16
	Grand Total	**250**

NOTE : THE DETAILED SYLLABUS IS VIDE ANNEXURE (A)

2) Syllabus of Microbiology :

i) BROAD AREAS OF STUDY

a. General bacteriology : Those aspects of general bacteriology which help the student to understand the bacterial pathogenesis, diagnosis, treatment, prevention and control' should be must know' category.
   1. Introduction to microbes and methods of studying them.
   2. Source and spread of microbes and infection control and containment includingprinciples and use of antimicrobial agents
   3. The pathogenic mechanisms of microbes and pathogenesis of infectious diseases.
   4. Principles and methods of diagnosis of infections and infectious diseases.

b. Immunology : The basic principles of immunity and immunological phenomenon which help to understand the pathogenesis, laboratory diagnosis and control of infectious diseases and non-infectious diseases should be 'must know' category.
   - The immune system and host's response to infection.

c. Systematic microbiology
d. Prevention of infectious diseases
e. Infections and diseases of various systems of the body.

ii) DETAILED SYLLABUS

Chapter 1: Introduction to Microbes and Methods of studying them :

Theory :
Objectives : At the end of the chapter, the student should be able to

a. Describe the unique properties of unicellular organism prokaryote, and viruses in contrast with those of eukaryotes
b. State the rationale of classifying microbes into bacteria, fungi, parasites and viruses.
c. Recall the growth requirements of microbes
d. Use microscopes, media, wire loops, staining procedures & similar equipment and processes
e. The nature of bacteria: morphology
f. Growth requirements of bacteria(includes the study of media); metabolism and genetics
g. Nomenclature and classification of microorganisms
h. Microscopy-types and their principles
i. The biology of Protozoa
j. The nature and properties of viruses, Bacteriophage
k. The laboratory methods of cultivating viruses
l. The nature of fungi: basic structure and classification
m. Growth requirements of fungi

Practical :
Objectives : At the end of the chapter, the student shall be able to

a. identify various morphological forms of bacteria, fungi, viruses and parasites that cause human infections.
b. Perform simple, differential staining and other techniques to demonstrate micro-organisms and also to interpret their results.
c. To identify common laboratory methods used for cultivation and identification of microbes.

Practical exercises :

a. Introduction of media; smear making; simple and differential stains; other basic techniques to demonstrate micro – organism and microscopy
b. The microscope; the morphology of micro-organisms. Bacteria :
c. Cell cultures, cytopathic effect; haemagglutination by viruses; inclusion bodies; animal inoculation.

Chapter 2: The Source and Spread of Microbes

Theory :
Objectives: At the end of the chapter, the student will be able to

a. define the terms: reservoir, source , exposure, colonization, infection, diseases, vector, fomite, epidemiology, endemicity, epidemic, pandemic, epizootic, incidence, prevalence, zoonosis, attack rate, asepsis, antisepsis, sterilization, disinfections

b. list various routes of exposure to microbes

c. Routes of spread of infections; endogenous vs.exogenous; source and reservoir of infections

d. Sterilization, antisepsis, disinfection and asepsis

e. Hospital acquired infections

Practical
objective : At the end of the chapter, ;the student shall be able to

a. observe the presence of microbes in our environments by studying settle plates

b. observe the presence of normal flora in nose, throat, etc.

c. interpret sterility tests done on various materials

d. sample appropriate clinical materials for tracing the source and spread of both community and hospital acquired infections.

e. Interpret the findings of various 'surveillance' procedures

Practical demonstrations :

a. Demonstration of the equipments and agents used in sterilization and disinfection.

b. Study of microbes in our environment by settle plates; effect of hand washing method

c. Study of normal flora of man by examining throat and nasal swabs and also by cough plate method

d. Visit to the Microbiology Laboratory and Central Sterilization and Supplies Department(CSSD)

Chapter 3 : The pathogenic mechanisms of microbes and pathogenesis of infectious diseases

Theory :
Objectives : At the end of the chapter, the student shall be able to

a. enumerate the variety of interactions between microbes and humans, ranging from commensalism to pathogenesis

b. define words: saprophyte, commensal, carrier state, latency, chronic infection, virulence, opportunism, toxin, invasion, viraemia, bacteriaemia and septicaemia

c. Cite examples of different pathogenic mechanisms of bacterial, fungal, parasitic and viral illness

d. state the principles of quantitation of microbial dose in animal inoculation , such as minimum infectious dose, lethal dose and of neutralization

e. Host parasite interactions- mechanisms of microbial pathogenesis; infection; host response; virulence; toxigenicity

f. Pathogenesis of bacterial infections

g. Pathogenesis of parasitic infestations

h. Pathogenesis of viral infections

i. Pathogenesis of fungal infections

Practical :
Objective : At the end of the chapter, the student shall be able to demonstrate the virulence factors of microorganisms, using simple techniques

Practical demonstrations :

a. demonstration of capsule; coagulase test
b. demonstration of Elek's test; experimental tetanus
c. case study : bacterial diseases viral diseases

Chapter 4 : The immune system and host's response to infection

Theory :
Objectives ::At the end of the chapter the student shall be able to

a. describe the anatomy and physiology of primary and secondary lymphoid organs tissues and cells of immune system
b. describe the terms: natural resistance, immunity, antigen, epitope, hapten, antibody, immunoglobulin, local immunity, systemic immunity, cell mediated immunity, hypersensitivity, autoimmunity, memory and also correlate them with normal physiology and pathology;
c. describe with examples various types of antigen – antibody reactions in vitro and in vivo
d. enumerate the immune deficiency states and their causes
e. describe the tests used to measure the immune functions
f. state the principles of histocompatibility
g. anatomy of immune apparatus
h. Antigens; antigen presentation and cell cooperation in immunity
i. Immunoglobulins and their role in immunity
j. Antigen – Antibody reactions – 1
k. Antigen – Antibody reactions – 2
l. Cell mediated immunity and their role in immunity
m. Complement and its role in immunity
n. Hypersensitivity
o. Measuring immune functions
p. Autoimmunity
q. Immunodeficiency and tolerance
r. Transplantation immunology
s. Immunization
t. Tumour immunology

Practical :
Objectives : At the end of the session, the student shall be able to identify and interpret the results of the following tests:

a. Slide and tube agglutination, latex agglutination and coagglutination; indirect and reverse passive haemagglutination tests
b. Capillary and gel precipitation tests counter immunoelectrophoresis and radial immunodiffusion
c. Complement fixation test
d. ELISA test
e. Various skin tests

Practical:
a. Phagocytosis; opsonization
b. Immunoprecipitation tests
c. Agglutination test
d. Delayed hypersensitivity ; and tests for CMI
e. Rheumatoid factor, antinuclear antibody

Chapter 5: The Principles and methods of diagnosis of infections and infectious diseases and their treatment :

Theory:

Objectives : At the end of the chapter, the student shall be able to

a. List the diagnostic tests used for common and important infections and identify the specimens necessary for each
b. State the principles of isolating/culturing bacteria,viruses & fungi
c. Describe the principles of antigen detection methods
d. List various serological tests and state their principles, applications in diagnosis
e. Demonstrate various microbes / parasites / ova /cysts by direct microscopy
f. collection and transport of clinical samples; culture of microbes
g. Serological methods of diagnosis of bacterial infections
h. Serodiagnosis of fungal infections
i. Serodiagnosis of viral infections
j. Serodiagnosis of parasitic infections
k. Rapid diagnostic methods especially with reference to viruses

Practical :

Objective: At the end of the session, the student shall be able to perform and interpret the following techniques

a. Simple stains, Gram stain, Acid fast staining techniques; saline and iodine preparations for ova & cysts and also concentration methods; peripheral blood smear for parasites; lactophenol cotton blue & KOH preparations for fungi rapid diagnostic methods
b. Be able to collect appropriate clinical material for laboratory diagnosis
c. Be able to do preliminary processing of clinical materials

Practical demonstrations :

a. Demonstration of specimen container, collection of specimens, transport and media; preliminary processing in the laboratory
b. Demonstration of common methods used for demonstration of pathogenic microorgnisms
c. Culture of bacteria, fungi, protozoa, viruses
d. Rapid diagnostic tests for various microorganisms

Chapter 6: Principles and uses of antimicrobial agents

Theory:
Objectives : At the end of the chapter, the student shall be able to

a. list antimicrobial agents and classify them as antibiotics and chemotherapeutic agents.

b. Define the terms : susceptibility, resistance and describe the mechanisms of transferable and nontransferable drug resistance

c. Describe the tests necessary to determine drug susceptibility, antibiotic concentration and serum bactericidal level

d. Antimicrobial resistance

e. Laboratory monitoring of antimicrobial therapy

Practical:
Objectives : At the end of the course, the student should be able to interpret the results of

a. Disc diffusion tests
b. MIC/MBC value, break – points, MIC 50, MIC 90, etc.
c. Assays for antimicrobial levels in body fluids

Practical demonstration :

a. Demonstration of antimicrobial susceptibility tests both diffusion and dilution tests
b. Demonstration of antimicrobial assay

Chapter 7 : Systematic microbiology

Theory:

Objectives: At the end of chapter, the student shall be able to

a. State the basic taxonomy of common and important microorganisms
b. Recall the basic principles of identifying microbes
c. List the basic biological properties of common and important microbes
d. Describe the role of physician in initiating microbiological investigations

Bacteriology

a. Staphylococci
b. Streptococci
c. Neisseria
d. Corynebacteria
e. Mycobacteria
f. Bacillus
g. Clostridium
h. Actinomycetes
i. Haemopilus and Bordetella
j. Enterobacteriaceae
k. Vibrios and Campylobacter
l. Brucella, Francisella and Legionella
m. Pseudomonas and other non-fermenters
n. Spirochaetes – Treponema, Borrelia, Leptospira
o. Rickettsia
p. Chlamydia
q. Nonsporing anaerobic bacteria
r. Mycoplasma and L Forms
s. Helicobacter, Listeria, Ratbite fever, Erysipelothrix, kingella Miscellaneous bacteria – Ref. Ananthanaraayons text book of Microbiology.

Mycology

a. Agents of very superficial mycoses
b. Agents of superficial mycoses; dermatophytoses
c. Agents of subcutaneous mycoses
d. Agents systemic mycoses
e. Opportunistic fungi, Mycotoxicosis.

Virology

RNA Viruses:-

a. Picorna viruses
b. Orthomyxo and Paramyxo
c. Rhabdo viruses
d. Arbo and Robo
e. Slow viruses
f. Retro viruses
g. Oncogenic viruses
h. Viruses causing gastroenteritis
i. Hapatitis viruses

DNA Viruses:-

a. Pox viruses
b. Herpes viruses
c. Adeno viruses
d. Papova Viruses
e. Parvo viruses
f. Oncogenic viruses

Parasitology

a. Entamoeba histolytica and free living amoeba
b. Giardia, Trichomonas, Sarcocystis, and Toxoplasma, cryptosporidium, isospora
c. Leishmania and Trypanosomes.
d. Plasmodia and Babesia
e. Medically important helminths belonging to Cestoda, Trematoda and Nematoda

Practical: Objectives:

a. Bacteriology: The student shall be able to identify pathogenic bacteria by Gram stain, morphology, colony characters and key biochemical reactions
b. Mycology: the student shall be able to identify pathogenic fungi by their appearance in Lactophenol cotton blue preparation, KOH, Indian Ink preparations, Gram and other staining as well as pertinent colony morphology
c. Parasitology: the student shall be able to identify ova and cysts of common intestinal parasites, identify blood and tissue parasites

Chapter 8 : Prevention of Infectious Diseases

Theory:
Objectives: At the end of the chapter the student shall be able to define terms; passive and active immunity, live and killed vaccine; efficacy of caccine; disease control and eradication

a. Epidemiology of infectious diseases
b. Hygiene and protection of food and water
c. Immunization schedules in India; vaccine efficacy; universal immunization

Practical:
Objectives: At the end of the session, the student shall be able to
a. discuss a case study on an outbreak situation
b. apply principles of asepsis, antisepsis and disinfection in day-to-day clinical practice
c. interpret results of sterility tests done on various materials

Practical demonstrations:
a. Case study of an epidemic/outbreak of nosocomial infection
b. Demonstration of vaccines & toxoids, antisera & infection specific immunoglobulins
c. Bacteriological analysis of water; Pasterization of milk

Chapter 9 : Systemic Microbiology
(Infections & Diseases of the various systems of the Body)

a. List infectious diseases of each system and correlate them with probable aetiological agents
b. Understand the aetiology, pathogenesis and methods of laboratory diagnosis and apply that knowledge in the treatment and prevention of common communicable diseases caused by all types of microorganisms
c. Gastrointestinal infections caused by bacteria; Peptic ulcer disease; enteric fever, gastroenteriti; shigellosis; food poisoning
d. Gastrointestinal infections caused by parasites:
e. Gastrointestinal infections caused by viruses
f. Hepatitis and other infections of liver and biliary tract
g. Upper respiratory tract infections – viruses
h. Acute infections of lower respiratory tract
i. Chronic infections of lower respiratory tract; national TB control program
j. Sexually transmitted diseases; national STD control program
k. Urinary Tract infections
l. Infections of Central Nervous System – bacterial
m. Infections of Central Nervous System – non bacterial
n. Wound infections
o. Superficial fungal infections: dermatomycoses; national leprosy control program
p. Deep mycoses
q. Eye infections: national program for prevention of blindness
r. Septicaemic conditions
s. Bone, joint and related conditions
t. Exanthematous conditions

u. Opportunistic infections
v. Blood and issue parasites; national filariasis control program, national malaria control program

Practical :
Objectives : At the end of the session, the student shall be able to identify the agents causing infections of various systems of the body and the student shall be able to collect appropriate specimens at an appropriate time and send them to the laboratory.

Practical exercises:

a. Viable counts on normal faeces
b. Case study – dysentery; stool with ova and cysts
c. Case study – cholera with demonstrations
d. Case study – typhoid with demonstrations
e. Case study – infective and serum hepatitis with demonstrations
f. Case study – diphtheria with demonstrations
g. Case discussion – diagnosis of tuberculosis
h. Microscopic morphology of agents causing STD; Demonstrations of syphilis and HIV scrology
i. Case study – UTI with demonstrations
j. Microbiology of CNS infections – demonstrations
k. Carrier study of Staphylococcus on skin, throat and nose
l. Diagnosis of dermatomycosis, mycetoma and chromomycosis
m. Laboratory diagnosis of candidiasis and crytococcosis
n. Demonstration of fungi causing deep mycoses
o. Demonstration of agents causing eye infections
p. Case study – endocarditis, Gram negative septicaemia, brucellosis, enteric fever and parasitaemia
q. Case study- acute infections of bone ,etc.

Division of Syllabus paperwise :
PAPER I : General bacteriology, immunology & systemic bacteriology
PAPER II: Parasitology, Virology and Mycology.

Microbiology books recommended :

1. Text book of Microbiology – Dr. R.Anantanarayan – C.J. Paniker
2. Medical Microbiology – Dr.C.P.Baveja
3. Microbiology – Dr.Arora
4. Microbiology – Chakrabarthy
5. Essential Microbiology – Rajesh Bhatia & R.L.Ichpujanti
6. Text book of Microbiology – David Greenwood

Reference Books:

1. Review of Microbiology – Jawetz
2. Essential Immunology – Ivon Roitt
3. Text Book of Parasitology – S.C.Parija (Reference)
4. Text book of Parasitology – C.J.Panicker