

# Microbiology

## Departmental Objectives:

Undergraduate medical students after completing the course on Microbiology will become well versed in the etiology of microbial diseases, their pathogenesis, immunological responses involved and some important clinical features that would enable them to plan and interpret necessary laboratory investigations for diagnosis, treatment and prevention. The department will provide teaching-learning experiences to achieve the following learning objectives.

### KNOWLEDGE

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

- describe and understand the aetiopathogenesis of microbial agents such as bacteria, virus, parasite and fungi commonly prevalent in Bangladesh
- explain the host-parasite relationship, normal flora of the body, pathogens and opportunistic pathogens
- understand the principles and applications of immunology involved in the pathogenesis, diagnosis and prevention of microbial and immunological diseases.
- understand hospital acquired infection and its prevention
- understand the emerging and re-emerging microbial diseases in Bangladesh and their diagnosis, control and prevention
- understand antibiotic resistant pattern and selection of appropriate antibiotics and its rational use.

### SKILL:

Students will be able to:

- plan necessary laboratory investigations selecting appropriate clinical samples at the right time, using the right method of their collection and interpret the results of these laboratory investigations to arrive at laboratory diagnosis of microbial and immunological diseases.
- perform simple laboratory tests available in Upazila Health Complex.
- carry out the techniques of asepsis, antisepsis and sterilization in day to day procedures.
- undertake universal precautions in laboratory and clinical practices.

### ATTITUDE:

Students will be able to:

- demonstrate the attitude for further learning, research and continuing education for improvement of efficiency and skill in the subject.

## List of Competencies to acquire:

After completion of graduation, an MBBS doctor is expected to achieve the following competency in the area of Microbiology. An MBBS graduate will be competent to:

1. perceive the etio-pathogenesis of diseases caused by microbes commonly prevalent in Bangladesh
2. proceed for diagnosing a case caused by microbes in terms of :
  - a. appropriate specimens necessary for diagnosis
  - b. timing of specimen collection and appropriate transport
  - c. appropriate diagnostic tests to advise
3. interpret the values of tests and the test results.
4. identify the basic problems of hospital acquired infection and its prevention
5. select appropriate antimicrobial agents for the treatment of common microbial diseases
6. use of antibiotics rationally
7. provide Counseling regarding vaccination against common diseases and chemoprophylaxis
8. appraise the need for research on common microbial diseases encountered in medical practice

Note: Microbial diseases include: bacteria, parasites, viruses and fungi

### Distribution of teaching - learning hours

Lecture	Tutorial	Practical	Total Teaching hours	Formative Exam		Summative exam	
				Preparatory leave	Exam time	Preparatory leave	Exam time
100 hrs	45 hrs	45 hrs	190 hrs	10 days	15 days	10 days	15 days
<i>(Time for exam, preparatory leave and formative &amp; summative assessment is common for all subjects of the phase )</i>							

### Teaching-learning methods, teaching aids and evaluation

Teaching Methods				Teaching aids	In course evaluation
Large group	Small group	Self learning	Others (integrated teaching)		
Lecture	Tutorial Practical	Assignment, Self study		Computer and Multimedia Bino-ocular and teaching microscope Microscope with projection (magnified) system Multimedia Overhead projector Slide projector , Fixed Learning Module (FLM) Tape slide Video Coloured charts Hand out White board /chalk board	<ul style="list-style-type: none"> <li>• Item Examination</li> <li>• Card final</li> <li>• Term Examination</li> <li>• Term final (written, oral+ practical)</li> </ul>

### **3<sup>rd</sup> Professional Examination:**

#### **Marks distribution of Assessment of Microbiology:**

##### **Total marks – 300**

- Written= 100 (MCQ 20+SAQ 70+formative Assessment Marks 10)
- Structured oral examination=100
- Practical =100 (OSPE-50+Traditional- 50)

##### **Related Equipments:**

Hot air oven, Bunsen burner, slide & cover slip, pipette, Micro pipette, Gram staining, Acid fast staining and other staining materials, different reagent, Bino-ocular and teaching microscope, Microscope with projection, (magnified) system, Centrifuge machine, Colorimeter, Spectrophotometer, Incubator, Balance, Water bath, Cell Counter, Autoclave, Computer, Electrolyte and gas analyzer, Elisa reader, Petri dish, media etc.

## Learning Objectives and Course Contents in Microbiology

### General Bacteriology

Learning Objectives	Contents	Teaching hours
<p>Students will be able to :</p> <ul style="list-style-type: none"> <li>• describe historical background and outline the scope and importance of Microbiology in medical science.</li>   <li>• describe the prokaryotic and eukaryotic cells.</li> <li>• describe different structures of bacterial cell and their functions.</li>   <li>• classify bacteria based on staining and morphology</li>   <li>• explain the theoretical basis of staining and clinical significance of certain staining including Gram and Z-N staining</li> </ul>	<p><b>CORE:</b>  <b>Introduction of Microbiology:</b></p> <ul style="list-style-type: none"> <li>• Brief historical background</li> <li>• Branches of Microbiology</li> <li>• Concept of medical biotechnology in relation to Microbiology</li> <li>• Importance and scope of microbiology in medical science.</li> </ul> <p><b>Bacterial cell:</b></p> <ul style="list-style-type: none"> <li>• Prokaryotic and Eukaryotic cells with examples</li> <li>• Different structures of bacterial cell and their functions.</li> <li>• Brief description of cell wall of Gram positive and Gram negative bacteria.</li> <li>• Spores structure and clinical importance.</li> <li>• L-forms, protoplast, spheroplast</li> </ul> <p><b>Bacterial classification and staining:</b></p> <ul style="list-style-type: none"> <li>• Nomenclature</li> <li>• Classification by staining and morphology.</li> <li>• Staining- Theoretical basis and clinical significance of Gram and Z-N</li> <li>• Practical on staining: Gram, Z-N staining</li> </ul>	<p>L-1</p> <p>L -2, T - 1</p> <p>L -1, T - 1</p>

NB: L = Lecture. T= Tutorial





Learning Objectives	Contents	Teaching hours
<p>Student will be able to:</p> <ul style="list-style-type: none"> <li>• enumerate the common bacterial agents in Bangladesh: describe epidemiology, their morphology, classification and important cultural characteristics</li> <li>• mention their virulence factors and describe pathogenesis and brief clinical features.</li> <li>• describe the laboratory diagnosis: selection, collection, transportation and preservation of clinical samples, laboratory tests and their interpretation</li> </ul> <ul style="list-style-type: none"> <li>• list the important characteristics and diseases produced by bacteria</li> </ul>	<ul style="list-style-type: none"> <li>• Staphylococci: <i>S. aureus</i>, <i>S. epidermidis</i>, <i>S. saprophyticus</i>.</li> <li>• Streptococci : Gr A and <i>Streptococcus pneumoniae</i></li> <li>• Neisseria: <i>N. gonorrhoea</i>, <i>N. meningitidis</i></li> <li>• <i>Corynebacterium diphtheriae</i></li> <li>• Enterobacteriaceae: Classification, Salmonella, Shigella, and <i>Esch. coli</i>,</li> <li>• <i>Vibrio cholerae</i></li> <li>• <i>Helicobacter pylori</i></li> <li>• Mycobacterium: <i>M. tuberculosis</i>, Atypical mycobacteria and <i>M. leprae</i>.</li> <li>• Anaerobic bacteria: Clostridium: <i>Cl. tetani</i>, <i>Cl. botulinum</i>, <i>Cl. perfringens</i></li> <li>• Spirochaetes: <i>Treponema palladium</i></li> <li>• Important characteristics and diseases produced by: Rickettsia Haemophilus Influenza, <i>Haemophilus ducrey</i>, Mycoplasma, Chlamydia, , Nocardia, Actinomycetes species</li> </ul> <p><b>Additional:</b></p> <ul style="list-style-type: none"> <li>• Strpt. Group B, D</li> <li>• Klebsiella, Proteus , Pseudomonas: <i>Ps. aeruginosa</i> , Aeromonas, Plesiomonas, <i>Campylobacter jejuni</i></li> <li>• Bacteroides species</li> <li>• <i>Clostridium deficile</i></li> <li>• Listeria</li> </ul>	<p>L -2, T - 1</p> <p>L -2, T -2 L -1, T - 1</p> <p>L -1 L -3, T - 2</p> <p>L -1, T - 1 L -1</p> <p>L -3, T - 2</p> <p>L -3, T - 1 L-1, T - 1</p> <p>L-3, T - 2</p> <p>L-2, T - 2</p>

## Immunology

Learning Objectives	Contents	Teaching hours
<p>Students will be able to:</p> <ul style="list-style-type: none"> <li>• explain the importance of history and role of immunology in modern medicine</li> <li>• describe the basic components of immune system</li> <li>• explain the normal defense mechanism</li> <li>• mention the disorders of the immune system</li> <li>• explain the immunological principles involved in different diagnostic tests</li> </ul>	<p><b>CORE:</b></p> <ol style="list-style-type: none"> <li><b>1. Introduction:</b> <ul style="list-style-type: none"> <li>• Brief historical background</li> <li>• Basic concepts of immunity: types and components with examples.</li> </ul> </li> <li><b>2. Immune system:</b> <ul style="list-style-type: none"> <li>• Organs, cells and soluble components</li> </ul> </li> <li><b>3. Antigens and Immunogens:</b> <ul style="list-style-type: none"> <li>• Terms and definitions, criteria of immunogenicity, hapten, epitopes and their clinical significance.</li> </ul> </li> <li><b>4. Major histocompatibility complex (MHC/ HLA):</b> <ul style="list-style-type: none"> <li>• Terms and definitions, types and distribution, clinical and biological significance.</li> </ul> </li> <li><b>5. Immunoglobulins and Antibodies:</b> <ul style="list-style-type: none"> <li>• Terms and definitions, classification, structure, biological properties and functions.</li> </ul> </li> <li><b>6. Complements:</b> <ul style="list-style-type: none"> <li>• Terms and definitions, activation, biological functions and clinical significance.</li> </ul> </li> <li><b>7. Mechanisms of immune response :</b> <ul style="list-style-type: none"> <li>• Antibody and cell mediated immune response.</li> <li>• Primary and secondary immune response</li> </ul> </li> <li><b>8. Hypersensitivity:</b> <ul style="list-style-type: none"> <li>• Terms and definitions, classifications, mechanisms, clinical significance with examples.</li> </ul> </li> <li><b>9. Transplantation and Tumour immunity:</b> <ul style="list-style-type: none"> <li>• Terms and definitions, types and outline of prevention of graft rejection.</li> <li>• Tumour antigens, role in diagnosis and clinical significance.</li> </ul> </li> <li><b>10. Autoimmunity:</b> <ul style="list-style-type: none"> <li>• Terms and definitions, basic concepts</li> </ul> </li> <li><b>11. Immunodeficiency disorders and immunotherapy:</b> <ul style="list-style-type: none"> <li>• Classification with examples</li> </ul> </li> <li><b>12. Agents of immunotherapy</b></li> <li><b>13. Immunodiagnostic tests</b> <ul style="list-style-type: none"> <li>• Terms and definitions, types and applications in diagnostic medicine</li> </ul> </li> </ol>	<p>L-1</p> <p>L-2, T-1</p> <p>L-1</p> <p>L-1</p> <p>L-2, T-1</p> <p>L-1</p> <p>L -1</p> <p>L – 2, T-1</p> <p>L –2, T-1</p> <p>L –1</p> <p>L –1</p> <p>L –1</p> <p>L –1</p>



## Parasitology

Learning Objectives	Contents	Teaching hours
<p>Students will be able to:</p> <ul style="list-style-type: none"> <li>• mention the important characteristics and epidemiology of common parasitic diseases</li> <li>• describe pathogenesis</li> <li>• list major complications and laboratory diagnosis of common parasites in Bangladesh.</li> </ul>	<p><b>CORE:</b>  <b>Introduction:</b>            Introduction to parasitology, common parasitic diseases of Bangladesh, Terms and definitions, classifications of parasites according to habitate,  <b>Intestinal, luminal and free living protozoa:</b>  <b>Entamoeba histolytica:</b></p> <ul style="list-style-type: none"> <li>• Classification</li> <li>• Geographical distribution, morphology, disease, clinical features, pathogenesis, laboratory diagnosis</li> </ul> <p><b>Giardia intestinalis and Trichomonas vaginalis:</b></p> <ul style="list-style-type: none"> <li>• Morphology, transmission, disease, clinical features, pathogenesis, laboratory diagnosis</li> </ul> <p><b>Blood and Tissue Protozoa:</b>  <b>Leishmania species:</b>  <b>Leishmania donovani and PKDL:</b>            Geographical distribution            morphology, lifecycle, disease, clinical features, pathogenesis            laboratory diagnosis</p>	<p>L -2, T-1</p> <p>L -2, T-1</p> <p>L -1</p> <p>L -2, T-1</p>

Learning Objectives	Contents	Teaching hours
	<p><b>Plasmodium species:</b> Epidemiology, morphology, lifecycle, disease, clinical features, pathogenesis, complications, laboratory diagnosis</p> <p><b>Cestodes and Trematodes:</b></p> <ul style="list-style-type: none"> <li>• Classify according to habitate with examples</li> <li>• Morphology, lifecycle, diseases, clinical features, pathogenesis, laboratory diagnosis of <i>Taenia saginata</i> and <i>Taenia solium</i>:</li> <li>•</li> </ul> <p><b>Echinococcus granulosus:</b></p> <ul style="list-style-type: none"> <li>• Morphology, lifecycle, disease, clinical features, pathogenesis and laboratory diagnosis</li> </ul> <p><b>Intestinal Nematodes:</b></p> <ul style="list-style-type: none"> <li>• Geographical distribution, morphology, lifecycle, disease, clinical features, pathogenesis, laboratory diagnosis of <i>Ascaris lumbricoides</i>, Hook worm, <i>Trichuris trichiura</i>, <i>Enterobius vermicularis</i>, <i>Strongyloides stercoralis</i> and larva migrans</li> </ul> <p><b>Tissue nematodes:</b></p> <p><b>Wuchereria bancrofti:</b></p> <ul style="list-style-type: none"> <li>• Morphology, lifecycle, disease (classical and occult filariasis, tropical pulmonary eosinophilia), clinical features, pathogenesis, complications, laboratory diagnosis</li> </ul> <p><b>Additional:</b></p> <p>I. Important characteristics and disease produced by:</p> <ul style="list-style-type: none"> <li>• <i>Acanthamoeba</i> and <i>Negleria</i></li> <li>• <i>Toxoplasma gondii</i>, <i>Cryptosporidium</i>, <i>Balantidium coli</i></li> <li>• <i>Hymenolepes nana</i>, <i>Diphyllobothrium latum</i></li> <li>• <i>Trypanosoma</i></li> <li>• <i>Loa loa</i>, <i>Onchocercus volvulus</i></li> <li>• <i>Fasciolopsis buski</i>, <i>Fasciola hepatica</i>: habitate, disease, clinical features, laboratory diagnosis</li> </ul>	<p>L -2, T-2</p> <p>L -1</p> <p>L -1</p> <p>L-3, T- 2</p> <p>L -2, T-1</p> <p>L -2, T-2</p>

## Virology

Learning Objectives	Contents	Teaching hours
<p>Students will be able to:</p> <ul style="list-style-type: none"> <li>• differentiate the basic structure of virus from bacteria.</li> <li>• mention epidemiology, diseases, important clinical features, pathogenesis and laboratory diagnosis of common viral diseases</li> <li>• identify the appropriate measures for prevention.</li> </ul>	<p><b>CORE:</b></p> <ol style="list-style-type: none"> <li>1. <b>General virology:</b> <ul style="list-style-type: none"> <li>• Introduction to virology, common viral diseases in Bangladesh.</li> <li>• Basic structure of virus</li> <li>• Outline of viral replication</li> <li>• Classification</li> <li>• Antiviral agents</li> </ul> </li> <li>2. <b>Herpes viruses:</b> <ul style="list-style-type: none"> <li>• Classification, important characteristics, diseases, important clinical features, transmission, pathogenesis, complications, laboratory diagnosis and prevention</li> </ul> </li> <li>3. <b>Orthomyxo and paramyxo viruses</b> <ul style="list-style-type: none"> <li>• Important characteristics, diseases, important clinical features, transmission, pathogenesis, complications, laboratory diagnosis and prevention</li> </ul> </li> <li>4. <b>Hepatitis viruses:</b> <ul style="list-style-type: none"> <li>• Classification, important characteristics, diseases, transmission, pathogenesis, complications, laboratory diagnosis and prevention</li> </ul> </li> </ol>	<p>L -2, T-1</p> <p>L -2, T-1</p> <p>L -2, T-1</p> <p>L -1, T-1</p>

Learning Objectives	Contents	Teaching hours
	<p>5. <b>Polio virus</b></p> <ul style="list-style-type: none"> <li>• Important characteristics, diseases, transmission, pathogenesis, laboratory diagnosis and prevention</li> <li>• Merits and demerits of oral and injectable polio vaccine</li> </ul> <p>6. <b>Rabies virus:</b></p> <ul style="list-style-type: none"> <li>• Important characteristics, diseases, transmission, pathogenesis, laboratory diagnosis and prevention, merits and demerits of different types of vaccines</li> </ul> <p>7. <b>Rota virus:</b></p> <ul style="list-style-type: none"> <li>• Diseases, transmission, pathogenesis, laboratory diagnosis and prevention</li> </ul> <p>8. <b>HIV:</b></p> <ul style="list-style-type: none"> <li>• Classification, important characteristics, diseases (AIDS), transmission, pathogenesis, laboratory diagnosis and prevention</li> </ul> <p>9. <b>Dengue</b></p> <ul style="list-style-type: none"> <li>• Important characteristics, diseases (DHF, DSS), transmission, pathogenesis, laboratory diagnosis and prevention</li> </ul> <p>10. <b>Emerging viral diseases</b> <b>Avian flue, SARS, Nipah, Swine flue, etc.</b></p> <ul style="list-style-type: none"> <li>• Important characteristics of virus, important clinical features, transmission, pathogenesis, laboratory diagnosis and prevention</li> </ul> <p>11. <b>Oncogenic virus</b></p> <ul style="list-style-type: none"> <li>• Definitions, list of onchogenic viruses with their associated tumours</li> </ul>	<p>L -1</p> <p>L -1 (+7)</p> <p>L -1</p> <p>L - 1</p> <p>L - 2 (+ 11)</p>

## Mycology

Learning Objectives	Contents	Teaching hours
<p>Students will be able to:</p> <ul style="list-style-type: none"> <li>• describe morphology, medically important fungal agents and the diseases caused by them</li> <li>• describe pathogenesis, important clinical features and laboratory diagnosis of superficial, cutaneous, subcutaneous and systemic mycosis</li> </ul>	<p><b>CORE:</b></p> <ol style="list-style-type: none"> <li>1. <b>Introduction:</b> <ul style="list-style-type: none"> <li>• Introduction to Mycology, beneficial and detrimental effects, morphology, classification</li> <li>• Difference between fungal and bacterial spores</li> </ul> </li> <li>2. <b>Superficial and cutaneous mycoses:</b> <ul style="list-style-type: none"> <li>• Aetiological agents and diseases</li> <li>• Transmission and pathogenesis, laboratory diagnosis of <i>Pityriasis versicolor</i>, Dermatophytosis, Candidiasis.</li> </ul> </li> <li>3. <b>Subcutaneous</b> <ul style="list-style-type: none"> <li>• Aetiological agents and diseases</li> <li>• Transmission and pathogenesis</li> <li>• Laboratory diagnosis of Rhinosporidiosis and Madura foot</li> </ul> </li> <li>4. <b>Systemic mycoses</b> (Primary and opportunistic ): <ul style="list-style-type: none"> <li>• Aetiological agents and diseases</li> <li>• Transmission and pathogenesis</li> <li>• Laboratory diagnosis of histoplasmosis, cryptococcal meningitis, candidiasis</li> <li>• Brief description of pneumocystis jirovecii, fungus ball, mycotoxin</li> </ul> </li> </ol>	<p>L-1</p> <p>L -2, T-1</p> <p>L -1</p> <p>L - 2, T-1</p>

## Clinical Microbiology

Learning Objectives	Contents	Teaching hours
<p>Student will be able to:</p> <ul style="list-style-type: none"> <li>• know organisms causing diseases, plan and select appropriate investigation for diagnosis</li> <li>• interpret the findings of the investigations</li> <li>• design appropriate steps for antimicrobial therapy and prevention</li> </ul>	<p><b><u>CORE:</u></b></p> <ol style="list-style-type: none"> <li>1. Collection of samples, transportation and storage</li> <li>2. Microbial diseases of Gastrointestinal and Hepatobiliary diseases and Food poisoning</li> <li>3. Microbial diseases of Genito-Urinary system</li> <li>4. Microbial diseases of upper and lower Respiratory Tract infections</li> <li>5. Microbial diseases of CNS infection</li> <li>6. Hospital Acquired Infections</li> <li>7. Microbial diseases of Bone and Soft Tissue infection</li> <li>8. Microbial diseases of Cardiovascular System</li> <li>9. Microbial diseases of eye, ear, nose and throat</li> <li>10. Pyrexia of unknown origin (Microbial cause with emphasis on blood culture).</li> </ol>	<p>L -1, T-1</p> <p>L -2, T-1</p> <p>L -2, T-1</p> <p>L -1</p> <p>L -2</p> <p>L -1</p> <p>L -1</p> <p>L -1</p> <p>L -1</p> <p>L - 1, T-1</p> <p>L- 1, T-1</p>

## Practical

Learning Objectives	Contents	Teaching hours
<p>Students will be able to:</p> <ul style="list-style-type: none"> <li>• perform and interpret Gram's and Z-N stain.</li> <li>• Observe the common bacteriological media with growth of <i>Staphylococcus aureus</i>, <i>Streptococcus pyogenes</i>, <i>Escherichia coli</i>, <i>Salmonella</i>, <i>Shigella</i>, <i>Klebsiella</i>, <i>Proteus</i> and <i>Pseudomonas</i></li> <li>• Observe the drug sensitivity test of bacteria.</li> </ul> <p>Students will be demonstrated:</p> <ul style="list-style-type: none"> <li>• autoclave and Hot air oven.</li> </ul>	1. Gram's staining	4
	2. Z-N staining	4
	3. Demonstration of culture media namely Nutrient agar, Blood agar, Chocolate agar, MacConkey's agar, Lowenstein Jensen, Robertson's cooked meat media, Blood culture media, transport media (Carry-Blair/Stuart/Peptone water) with and without bacterial growth	5
	4. Demonstration of colony morphology of common bacteria: <i>Staphylococci</i> , <i>Streptococcus</i> Lactose fermenters, Lactose nonfermenters, <i>Proteus</i> , <i>Pseudomonas</i> .	3
	5. Demonstration of inoculation, incubation (aerobic, CO <sub>2</sub> and Anerobic condition) and plate reading.	2
	6. Demonstration of catalase, coagulase, and oxidase, TSI, MIU and Simmon's citrate tests	4
	7. Demonstration of in vitro antibiotic sensitivity test by disk diffusion method,	4
	8. Demonstration of sterilization by chemical agents autoclaving and hot air oven.	2

Learning Objectives	Contents	Teaching hours
<p>Students will be able to:</p> <ul style="list-style-type: none"> <li>• prepare stool smear and examine under microscope</li> <li>• observe cyst/trophozoites of intestinal and luminal protozoa namely Entamoeba histolytica, Giardia intestinalis, Trichomonas</li> <li>• observe ova of <i>A. lumbricoides</i>, <i>T. trichiuria</i>, Hook worms</li> <li>• observe pus cell, macrophage and RBC in stool sample</li> <li>• examine blood slide under microscope for demonstration of Plasmodium species and microfilaria</li> <li>• examine bone marrow smear for LD body</li> <li>• Observe and interpret the results of immunological tests</li> <li>• Observe skin scrapping for fungus.</li> <li>• observe pus cell and RBC in urine</li> </ul>	<p><b>Demonstration</b></p> <ul style="list-style-type: none"> <li>• Microscopic examination of stool for demonstration of cyst/trophozoites of protozoa, ova/larva of intestinal helminthes, pus cells, macrophage and RBC.</li> <li>• Microscopic examination of urine for demonstration of epithelial cells, pus cells, RBC, etc.</li> <li>• Examination of blood smear for demonstration of malarial parasites</li> <li>• Examination of bone marrow smear for LD body</li> <li>• Microscopic examination of Gram stain smear of throat swab, wound swab, urethral discharge.</li> <li>• Microscopic examination of Z-N smear of sputum for AFB</li> <li>• Immunological tests: Demonstration and interpretation of Widal, RPR, ICT for HBsAg, Dengue and Plasmodium</li> <li>• Microscopic examination of skin scrapping for demonstration of fungal elements ( dermatophytes and candida)</li> </ul>	<p>6</p> <p>2</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>2</p> <p>2</p>



## Consolidated teaching hours for Microbiology

Subject	Theoretical		Practical	Total
	Lecture	Tutorial		
1. General Bacteriology	10	5	12	26
2. Systemic Bacteriology	23	15	02	41
3. Immunology	17	04	05	25
4. Parasitology	18	10	14	43
5. Virology	13	4	00	16
6. Mycology	6	2	2	10
7. Clinical Microbiology	13	5	10	29
<b>Total</b>	<b>100</b>	<b>45</b>	<b>45</b>	<b>190</b>

1 <sup>st</sup> Term Allotted time ( 92 Hours)				2 <sup>nd</sup> Term Allotted time (In 98 Hours)			
Subject	Lecture – 49 hours	Tutorial– 24 hours	Practical- 19 hours	Subject	Lecture – 51 hours	Tutorial – 21 hours	Practical - 26 hours
General bacteriology	9	05	12	Parasitology	19	10	14
Systemic Bacteriology	24	15	02	Virology	12	04	00
Immunology	16	04	05	Mycology	06	02	02
				Clinical Microbiology	14	05	10

**Grand Total** = 92+98 = 190 hours

## Academic Calendar for Microbiology

4th Year (In months)											
1	2	3	4	5	6	7	8	9	10	11	12
<b>General Bacteriology</b>			<b>Preparation + 1<sup>st</sup> Internal Assessment</b>	<b>Parasitology</b>			<b>Preparation + 2nd Internal Assessment</b>	<b>Preparatory leave</b>	<b>3rd Professional Exam</b>		
<b>Systemic Bacteriology</b>				<b>Virology</b>							
<b>Immunology</b>				<b>Mycology</b>							
				<b>Clinical Microbiology</b>							

**There will be 2 (two) Cards**

1. **Item card 1:** General Bacteriology, Systemic Bacteriology and Immunology
2. **Item card 2:** Parasitology, Virology, Mycology and Clinical Microbiology