

# Microbiology

## Departmental Objectives

Undergraduate medical students after completing the course on Microbiology will become well versed about the behavior and etiology of microbial diseases, their pathogenesis, immunological responses involved and some important clinical illnesses that would enable them to plan and interpret necessary laboratory investigations for the 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 morphology, antigenic structure, aetiopathogenesis of the diseases caused by microbes such as bacteria, virus, parasites and fungi and the diseases caused by them 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.
- understand the antimicrobial resistance and containment of antimicrobial resistance.
- understand infection prevention and control in the hospital and outside.
- understand biosafety and biosecurity measures particularly in the laboratory.
- understand about the medical wastes disposal system.

## 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.
- carryout media preparation, bacterial culture and antimicrobial sensitivity tests.
- perform simple laboratory tests available in Upazila Health Complex.
- Interpret the results of tests and can treat the patients accordingly.
- carry out the techniques of asepsis, antisepsis and sterilization in day to day procedures.
- under take universal precautions in laboratory and clinical practices.

## Attitude:

Students will be able to:

- demonstrate the attitude for further learning, research and continuing medical education for improvement of efficiency and skill in the subject.
- demonstrate good behavior/dealings with the patients, attendances, relatives and other personnel involved in the medical services.

## 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. control infectious diseases in the hospital and outside.
8. manage patients having infectious diseases.
9. know biosafety, biosecurity and biohazards in medical practices.
10. know how to dispose off medical wastes.
11. know antimicrobial resistance and containment of antimicrobial resistance.
12. know and practice antimicrobial stewardship.
13. provide Counseling regarding vaccination against common diseases and chemoprophylaxis
14. appraise the need for research on common microbial diseases encountered in medical practice

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

15. Prepare disinfectants at their own for different purposes.
16. Practice personal protection by hand hygiene, wearing PPE and keeping hospital environment clean from infectious diseases (by practicing universal precautions).

Microbiology is now comprised of 6 subjects such as 1) Bacteriology, 2) Parasitology, 3) Virology, 4) Immunology, 5) Mycology 6) and molecular biology. All these are taught as an independent subject in the developed world. The medical students who are placed in the inpatients and outpatient departments have to know the clinical features, diagnosis of infectious diseases. They have to know the immunopathophysiology of the diseases and treatment (antibiotics, antiviral, anti-parasitic, anti-fungal and immunotherapies and biological therapy). In addition students have to observe the outcome of treatment and can change the treatment accordingly. This is the best way of integrated teaching which are being practiced. Moreover, antibiotic resistance containment program, infection prevention and control program and antibiotic stewardship program are introduced which are best understood while learning in wards with patients. Covid-19 has taught us the importance of emerging infectious diseases.

## Distribution of teaching - learning hours

Lecture	Tutorial	Practical	Total Teaching hours	Integrated teaching hour for Phase II	Formative Exam		Summative exam	
					Preparatory leave	Exam time	Preparatory leave	Exam time
100 hrs	45 hrs	45 hrs	190 hrs	15 hours	10 days	15 days	10 days	15 days
<i>Time for integrated teaching, examination, preparatory leave of formative &amp; summative assessment is common for all subjects of the phase</i>								
Related behavioral, professional & ethical issues will be discussed in all teaching learning sessions								

## 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	Both vertical and horizontal integration	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>

### 2<sup>nd</sup> Professional Examination:

#### Marks distribution of Assessment of Microbiology:

#### Total marks – 300

- Written= 100 (MCQ 20+SAQ & SEQ 70+formative Assessment Marks 10)
- MCQ=20 (Multiple T-F 10 + SBA 10)
- SAQ + SEQ = 70
- Structured oral examination (SOE)=100
- Practical =100 (OSPE-50 +Traditional- 40+ Practical note book-05+ Integrated teaching-05).

[Students will prepare a short case report after each integrated teaching and will submit to all the departments of respective phase. If total 5 classes of integrated teaching occur, students will submit 5 such reports.]

#### 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, EIISA reader, Petri dish, automated blood culture machine, gene expert, PCR machine 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 as a whole and particularly 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 different aspects including staining and morphology</li> <li>• explain the theoretical basis of staining and clinical significance of certain staining including Gram stain, Z-N stain and Albert stain.</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>• Legends in the field of Microbiology</li> <li>• Koch's postulate, molecular Koch's postulate, the limitations and new adjuncts.</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, Clinical importance of L-form.</li> </ul> <p><b>Bacterial classification and staining:</b></p> <ul style="list-style-type: none"> <li>• Nomenclature of Bacteria.</li> <li>• Classification by staining, morphology, Oxygen requirement, temperature requirement.</li> <li>• Staining- Theoretical basis and clinical significance of Gram and Z-N stain, Albert stain, Auramin-Rodamin stain</li> <li>• Practical on staining: Gram, Z-N staining and Albert stain.</li> </ul>	<p>L-1</p> <p>L -2, T - 2,</p> <p>L -2, T - 2,</p>

NB: L = Lecture. T= Tutorial. P= Practical.

# General Bacteriology

Learning Objectives	Contents	Teaching hours
<p>Students will be able to:</p> <ul style="list-style-type: none"> <li>• describe the general requirements related to microbial growth</li> <li>• classify bacteriological media and describe their uses</li>   <li>• define sterilization, disinfection and antisepsis</li> <li>• describe certain methods of sterilization and disinfection, and outline their application</li> <li>• select appropriate method of sterilization in their clinical practice.</li> <li>• explain the mechanism of action of certain anti-microbial agents and their resistance pattern.</li> <li>• select appropriate antimicrobial agents</li> </ul>	<p><b>Nutrition and Cultivation of bacteria:</b></p> <ul style="list-style-type: none"> <li>• Nutritional requirement for the growth of bacteria.</li> <li>• Growth curve: phases with clinical significance</li> <li>• Common bacteriological media: classification and uses.</li> </ul> <p><b>Sterilization and Disinfection:</b></p> <ul style="list-style-type: none"> <li>• Definition, classification and applications of sterilization, disinfection and antisepsis</li> <li>• Methods of sterilizations: details of autoclaving, hot air oven and chemical methods.</li> <li>• Sterilization of medical equipment and culture media.</li> <li>• Disinfection of body fluid spillage and equipment.</li> <li>• Preparation of disinfectants and their use.</li> </ul> <p><b>Antimicrobial agents:</b></p> <ul style="list-style-type: none"> <li>• Definition of antibiotics, antimicrobial agents, chemotherapeutics, bacteriostatic, bacteriocidal, synergism, antagonism, selective toxicity etc.</li> <li>• Classification of anti microbial agents</li> <li>• Mechanism of action on bacteria with examples</li> <li>• Drug resistance: origin, mechanism, transmission and prevention</li> <li>• Indication of combination of antibiotics in bacterial infection</li> <li>• Hazards of indiscriminate use of antibiotics</li> <li>• Defining MDR, XDR and PDR bacteria.</li> <li>• Definition and importance of ESBL, MBL, MRSA, VRSA, VRE.</li> <li>• Definition and importance of Biofilm.</li> </ul>	<p>L – 1,</p> <p>L – 2, T – 2,</p> <p>L –3, T-1,</p>

## General Bacteriology

Learning Objectives	Contents	Teaching hours
<ul style="list-style-type: none"> <li>• describe the different aspects of host-parasite relationship differentiate between normal, opportunistic and pathogenic bacteria and explain their clinical importance.</li> <li>• enumerate the virulence factors and explain their role in pathogenesis</li> <li>• describe the bacterial genome, DNA, chromosome, plasmid etc.</li> <li>• describe how genetic materials are transferred in bacteria.</li> </ul>	<p><b><u>CORE:</u></b></p> <p><b>Host-Parasite relationship:</b></p> <ul style="list-style-type: none"> <li>• Terms and Definitions.</li> <li>• Parasite and Host attributes</li> <li>• Normal flora, opportunistic pathogens and their clinical importance.</li> </ul> <p><b>Pathogenesis of bacterial diseases:</b></p> <ul style="list-style-type: none"> <li>• Transmission of bacterial agents.</li> <li>• Virulence factors: e.g. antigens, toxins, enzymes, invasiveness and their role in pathogenesis of diseases with examples.</li> </ul> <p><b>Bacterial Genetics:</b></p> <ul style="list-style-type: none"> <li>• Bacterial genome, DNA, chromosome, plasmid, transposon etc.</li> <li>• Gene transfer in bacteria.</li> <li>• Bacterial DNA replication.</li> <li>• DNA recombination, principles of Cloning and genetic engineering.</li> </ul> <p><b>Septic Shock</b></p>	<p style="text-align: center;">L-1</p> <p style="text-align: center;">L - 1</p>

## Systemic Bacteriology

Learning Objectives	Contents	Teaching hrs
<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 and the diseases they produce.</li> <li>describe the laboratory diagnosis: selection, collection, transportation and preservation of clinical samples, laboratory tests and their interpretation.</li> <li>describe in short the management of infectious diseases.</li> </ul>	<ul style="list-style-type: none"> <li>Staphylococci: <i>S. aureus</i>, <i>S. epidermidis</i>, <i>S. saprophyticus</i>, Enterococcus(VRE), MRSA, VRSA.</li> <li>Streptococci : Group A Streptococcus, Streptococcus agalactiae and Streptococcus pneumoniae</li> <li>Neisseria: <i>N. gonorrhoea</i>, <i>N. meningitides</i></li> <li>Corynebacterium diphtheriae</li> <li>Enterobacteriaceae: Classification: Salmonella, Shigella, Esch. Coli and other Enterobacteriaceae, definition and clinical significance of ESBL, MBL and NDM-producing bacteria.</li> <li>Vibrio cholerae</li> <li>Helicobacter pylori</li> <li>Mycobacterium: <i>M. tuberculosis</i>, Atypical mycobacteria and <i>M. leprae</i>. MDR, XDR TB.</li> <li>Anaerobic bacteria: Clostridium: <i>Cl. tetani</i>, <i>Cl. botulinum</i>, <i>Cl. Perfringens</i> and other anaerobic bacteria</li> <li>Bacillus: <i>B. Anthracis</i>, <i>B. Cereus</i>, <i>B. Subtilis</i>..</li> <li>Spirochaetes: Treponema pallidum</li> <li>Important characteristics and diseases produced by: Rickettsia Haemophilus influenzae, Haemophilus ducrey, Mycoplasma, Chlamydia, , Nocardia, Actinomycetes species</li> </ul> <p><b>Additional:</b></p> <ul style="list-style-type: none"> <li>Streptococcus Group D</li> <li>Klebsiella, Proteus , Pseudomonas: <i>Ps. aeruginosa</i> , Aeromonas, Plesiomonas,</li> <li>Campylobacter jejuni</li> <li>Bacteroides species</li> <li>Clostridium deficile</li> <li>Listeria</li> <li>Barkholderia</li> <li>G. vaginalis</li> <li>Probiotics</li> </ul>	<p>L-2, T - 1</p> <p>L-2, T -2 L-1, T - 1</p> <p>L-1</p> <p>L-2, T - 2</p> <p>L-1, T - 1 L-1</p> <p>L-2, T - 2</p> <p>L-3, T - 1</p> <p>L-1, T - 1</p> <p>L-2, T - 2</p>
		<ul style="list-style-type: none"> <li>list the important characteristics and diseases produced by bacteria</li> </ul>

## Immunology

Learning Objectives	Contents	Teaching hrs
<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 including classification</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> <li>• explain immunopathogenesis of SLE, RA, AHA, ABO incompatibility</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: Definition, classification, 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: antigen, immunogen, hapten, epitope, paratope. Criteria of immunogenicity.</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> <li>• Monoclonal antibodies.</li> </ul> </li> <li><b>6. Complements:</b> <ul style="list-style-type: none"> <li>• Terms and definitions, activation, biological functions and clinical significance, deficiency disorders.</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> <li>• Atopy, desensitization.</li> <li>• Tests for Type-I reaction: Patch test, RAST, serum IgE assay.</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> <li>• Immunosurveillance</li> </ul> </li> <li><b>10. Tolerance and Autoimmunity:</b> <ul style="list-style-type: none"> <li>• Definition and classification of tolerance</li> <li>• Terms and definitions, basic concepts and mechanism of development of autoimmunity.</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 and biologics.</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> <li>• Agglutination, precipitation, ELISA, Western blot test, PCR and RT-PCR.</li> </ul> </li> </ol>	<p>L-1</p> <p>L-2, T-1</p> <p>L-1</p> <p>L-1</p> <p>L-1, 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>• explain major complications and laboratory diagnosis of common parasites in Bangladesh.</li> <li>• Know the mode of treatment of common parasitic diseases of 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 habitat, Host: definition, classification with examples.  <b>Intestinal, luminal and free living protozoa:</b>  <b>Entamoeba:</b></p> <ul style="list-style-type: none"> <li>• Classification</li> <li>• Geographical distribution, morphology, disease, clinical features, pathogenesis, laboratory diagnosis and treatment.</li> <li>• Extraintestinal amoebiasis.</li> </ul> <p><b><i>Giardia intestinalis</i> and <i>Trichomonas vaginalis</i>:</b></p> <ul style="list-style-type: none"> <li>• Morphology, transmission, disease, clinical features, pathogenesis, laboratory diagnosis and treatment.</li> <li>• Acanthamoeba, Negleria, Balamuthia and Sappinia</li> </ul> <p><b>Blood and Tissue Protozoa:</b>  <b>Leishmania species:</b> Classification, morphology, disease production.  <b><i>Leishmania donovani</i> and PKDL:</b></p> <ul style="list-style-type: none"> <li>• Geographical distribution morphology, lifecycle, disease, clinical features, pathogenesis laboratory diagnosis and treatment.</li> <li>• Cutaneous leishmaniasis: Causative agents, pathogenesis, lab diagnosis and management.</li> <li>• Mucocutaneous leishmaniasis(MCL).</li> </ul>	<p>L –2, T-1</p> <p>L –1, T-1,</p> <p>L –1,</p> <p>L –2, T-1,</p>

## Parasitology

Learning Objectives	Contents	Teaching hrs
	<p><b>Plasmodium species:</b> Epidemiology, morphology, lifecycle, disease, clinical features, pathogenesis, complications, laboratory diagnosis, treatment and prevention.</p> <p><b>Acanthamoeba , Negleria, Balamuthia and Sappinia</b> <b>Toxoplasma gondii, Cryptosporidium, Balantidium coli</b></p> <p><b>Cestodes and Trematodes:</b></p> <ul style="list-style-type: none"> <li>• Classify according to habitat with examples</li> <li>• Common characteristics of Cestodes, Trematodes and Nematodes.</li> <li>• Morphology, lifecycle, diseases, clinical features, pathogenesis, laboratory diagnosis of <i>Taenia saginata</i> and <i>Taenia solium</i>, <i>T. asiatica</i>.</li> </ul> <p><b>Echinococcus: Different species</b></p> <ul style="list-style-type: none"> <li>• Morphology, lifecycle, disease, clinical features, pathogenesis and laboratory diagnosis and treatment.</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>.</li> <li>• Larva migrans and larva currens.</li> <li>• Hyperinfection syndrome</li> </ul> <p><b>Tissue nematodes: Classification, morphology and mode of transmission, diseases produced.</b> <b>Wuchereria bancrofti, Brugia malayi, B. timori</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 and treatment of filariasis. Periodicity of microfilaria. Provocative test.</li> <li>• Parasites associated with cancer.</li> </ul>	<p>L -2, T-2, L -1,  L -1,  L-3, T- 1,  L -2, T-1,</p>

Learning Objectives	Contents	Teaching hrs
	<p><b>Additional:</b></p> <p>1. Important characteristics and disease produced by:</p> <ul style="list-style-type: none"> <li>• Hymenolepes <i>nana</i>, Diphylobothrium <i>latum</i>, <i>Dipylidium</i></li> <li>• Schistosoma</li> <li>• Trypanosoma</li> <li>• <i>Loa loa</i>, <i>Onchocercus volvulus</i></li> <li>• <i>D. medinansis</i></li> <li>• <i>Fasciolopsis buski</i>, <i>Fasciola hepatica</i>: habitat, disease, clinical features, laboratory diagnosis and treatment.</li> <li>• Anisakis</li> <li>• Cyclospora, Cystoisospora, Sarcocystis</li> <li>• Trichinella</li> </ul>	L -2, T-1

### Virology

<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> <li>• Know the treatment of viral diseases</li> </ul>	<p><b>CORE:</b></p> <p>1. <b>General virology:</b></p> <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>• Lab diagnosis of viral diseases</li> <li>• Antiviral agents</li> </ul> <p>2. <b>Herpes viruses:</b></p> <ul style="list-style-type: none"> <li>• Classification, important characteristics, diseases, important clinical features, transmission, pathogenesis, complications, laboratory diagnosis, treatment and prevention.</li> <li>• Latency and reactivation of Herpes viruses.</li> </ul> <p>3. <b>Orthomyxo and paramyxo viruses</b></p> <ul style="list-style-type: none"> <li>• Important characteristics, diseases, important clinical features, transmission, pathogenesis, complications, laboratory diagnosis and prevention, management.</li> </ul> <p>4. <b>Hepatitis viruses:</b></p> <ul style="list-style-type: none"> <li>• Classification, important characteristics, diseases, transmission, pathogenesis, complications, laboratory diagnosis, prevention and management.</li> </ul>	<p>L -2, T-1</p> <p>L -2, T-1</p> <p>L -2, T-1</p> <p>L -1, T-1</p>
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## Virology

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 and treatment, 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, prevention and treatment</li> </ul> <p>8. <b>HIV:</b></p> <ul style="list-style-type: none"> <li>• Classification, important characteristics, diseases (AIDS), transmission, pathogenesis, laboratory diagnosis, prevention and treatment.</li> </ul> <p>9. <b>Dengue</b></p> <ul style="list-style-type: none"> <li>• Important characteristics, diseases (DHF, DSS), transmission, pathogenesis, laboratory diagnosis, prevention and treatment.</li> </ul> <p>10. <b>Chikungunya:</b> Important characteristics, transmission, epidemiology, pathogenesis, laboratory diagnosis, prevention and treatment.</p> <p>11. <b>Coronavirus:</b> Important characteristics, epidemiology, transmission, pathogenesis, organs involved, clinical features, laboratory diagnosis, prevention and treatment of COVID-19 and other Coronaviruses.</p> <p>12. <b>Other Emerging viral diseases</b>  <b>Avian flue, SARS, MERS, Nipah, Swine flue, Zika, Ebola 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>13. <b>Oncogenic viruses</b></p> <ul style="list-style-type: none"> <li>• Definitions, list of oncogenic viruses with their associated tumours.</li> </ul> <p>14. Latent and chronic viral infections.</p>	<p>L –1</p> <p>L –1</p> <p>L –1, L – 1</p> <p>L – 1</p> <p>L-1</p> <p>L-1</p>

## Mycology

Learning Objectives	Contents	Teaching hours
<p>Students will be able to:</p> <ul style="list-style-type: none"> <li>• describe morphology and classification of 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><u>CORE:</u></b></p> <p><b>1. Introduction:</b></p> <ul style="list-style-type: none"> <li>• Introduction to Mycology, beneficial and detrimental effects, morphology, classification</li> <li>• Difference between fungus and bacteria</li> <li>• Antifungal agents and antifungal drug resistance</li> </ul> <p><b>2. Superficial and cutaneous mycoses:</b></p> <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> <p><b>3. Subcutaneous</b></p> <ul style="list-style-type: none"> <li>• Aetiological agents and diseases</li> <li>• Transmission, pathogenesis and Lab diagnosis.</li> <li>• Rhinosporiodiasis and Madura foot</li> </ul> <p><b>4. Systemic mycoses:</b></p> <ul style="list-style-type: none"> <li>• Aetiological agents and diseases</li> <li>• Transmission, pathogenesis and lab diagnosis.</li> <li>• Histoplasmosis, Cryptococcal meningitis, Candidiasis, <i>Pneumocystis jirovecii</i>, fungus ball, mycotoxin.</li> </ul> <p><b>5. Opportunistic fungal diseases.</b></p>	<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 hrs
<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</li> <li>5. Microbial diseases of CNS.</li> <li>6. Hospital Acquired Infections</li> <li>7. Microbial diseases of Bone and Soft Tissue</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> <li>11. Infectious disease control and prevention.</li> <li>12. Collection, transport, preservation and lab tests of samples collected from COVID-19 patients.</li> <li>13. Use of different types of masks, sanitizers, PPE in the prevention of viral infections.</li> </ol>	<p>L –1, T-1</p> <p>L –2, T-1</p> <p>L –1, T-1</p> <p>L –1, L –1</p> <p>L –1,</p> <p>L –1</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 stain, Z-N stain and Albert stain.</li> <li>• Observe the common bacteriological media with growth of <i>Staphylococcus aureus</i>, <i>Streptococcus pyogenes</i>, <i>Escherechia coli</i>, <i>Salmonella</i>, <i>Shigella</i>, <i>Klebsiella</i>, <i>Proteus</i>, <i>Pseudomonas</i> and MTB.</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> <li>• Doffing and donning</li> <li>• Wearing PPE</li> <li>• Hand wash/sanitization</li> <li>• Preparation of disinfectants and their uses.</li> </ul>	1. Gram’s staining	4
	2. Z-N staining, Albert stain, Auramin-Rodamin stain.	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>Klebsiella</i> , <i>E. coli</i> , <i>Pseudomonas</i> , Mycobacterium.	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
	9. Demonstration of donning and doffing, wearing PPE, hand washing/sanitization.	1
	10. Preparation of disinfectants.	1

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 and others..</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 cells, RBCs, casts and parasites in urine.</li> <li>• Know about slit skin smear for <i>M. leprae</i>.</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, RBCs, casts and parasites.</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>• Examination of throat swab by Albert stain.</li> <li>• Microscopic examination of sputum and urine by Z-N stain for AFB.</li> <li>• Modified Z-N stain for Cryptosporidium in stool.</li> <li>• Immunological tests: Demonstration and interpretation of Widal test, RPR, ICT for HBsAg, Dengue, Chikungunya, HIV, HCV, COVID-19, Plasmodium, LD body and Filaria.</li> <li>• Microscopic examination of skin scrapping for demonstration of fungal elements (dermatophytes and candida).</li> <li>• PCR and RT-PCR.</li> </ul>	<p>4</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>



## Consolidated teaching hours for Microbiology

Subject	Theoretical		Practical	Total
	Lecture	Tutorial		
1. General Bacteriology	13	7	15	35
2. Systemic Bacteriology	20	15	15	50
3. Immunology	16	4	1	21
4. Parasitology	17	8	6	31
5. Virology	14	4	1	19
6. Mycology	6	2	1	9
7. Clinical Microbiology	14	5	6	25
<b>Total</b>	<b>100</b>	<b>45</b>	<b>45</b>	<b>190</b>

1 <sup>st</sup> Term Allotted time (106 Hours)				2 <sup>nd</sup> Term Allotted time (In 84 Hours)			
Subject	Lecture 49 hours	Tutorial 26 hours	Practical 31 hours	Subject	Lecture 51hours	Tutorial 19 hours	Practical 14 hours
General bacteriology	13	7	15	Parasitology	17	8	6
Systemic Bacteriology	20	15	15	Virology	14	4	1
Immunology	16	4	1	Mycology	6	2	1
				Clinical Microbiology	14	5	6

**Grand Total = 1<sup>st</sup> Term 106 hours + 2<sup>nd</sup> Term 84 hours = 190 hours**

## Academic Calendar for Microbiology

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

### ITEM CARDS

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

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

**DEPARTMENT OF MICROBIOLOGY  
..... MEDICAL COLLEGE  
ITEM CARD**

Batch : Tut. Batch Roll (Write in the boxes)

**Student's Profile**

Name: .....

Contact Phone No: .....

Address: .....

Guardian: .....

Contact Phone No: .....

Address: .....

A passport sized recent photograph of the student to be attached here

**GENERAL BACTERIOLOGY (First assessment Exam)**

	Topic	Marks	Signature
1	Prokaryote and eukaryote, components of bacteria, cell wall of Gram positive and Gram negative bacteria, capsule, flagella, spore, classification of bacteria		
2	Growth and death of bacteria, growth requirements, classification of bacteria according to oxygen requirement, growth curve, generation time		
3	Pathogenesis of bacterial disease, exotoxin and endotoxin, Koch's postulates, their limitations, new adjuncts, molecular Koch's Postulates. Host defense against bacterial disease		
4	Sterilization, disinfection, antiseptics, different methods, their principles and uses		
5	Practical bacteriology: Use of microscope. Gram staining, Ziehl-Neelsen staining. Culture media – types, commonly used media with their use		
6	Antimicrobial drugs, their mechanism of action, resistance, selective toxicity, antibiotic combination, chemoprophylaxis, susceptibility test Bacterial genetics – plasmid, transposons, mutation, transfer of gene,		

	Multidrug resistant (MDR). Extensively drug resistant (DXR) and Pandrug resistant (PDR) bacteria.		
7	Normal flora		
8	Biosafety and biosecurity, Biomedical waste disposal		

#### IMMUNOLOGY (First assessment Exam)

	Topic	Marks	Signature
1	Immunity, its type, components of innate immunity, comparison between active and passive immunity, immunocompetent cells		
2	Immunogen, antigen, properties of an ideal antigen, hapten		
3	Immunoglobulin, antibody, its structure, types, function		
4	Complements, major histocompatibility complex		
5	Cytokines, mechanism of immune response, primary and secondary immune response		
6	Tolerance, hypersensitivity, autoimmune diseases		
7	Tumour immunity, transplantation, immunodeficiency		
8	Immunological reactions- basic principles and examples		

#### MOLECULAR BIOLOGY (First assessment)

	Topic	Marks	Signature
1	Principle of PCR, RT-PCR, Realtime PCR,		
2	Definition of DNA Cloning, DNA recombination, Genetic engineering, biotechnology, gene therapy		

#### MYCOLOGY (Second assessment)

	Topic	Marks	Signature
1	Basic structure of fungi, classification of fungi, antifungal drugs		
2	Superficial & cutaneous fungi- <i>Malassezia furfur</i> , dermatophytes, <i>Candida</i> .		
3	Subcutaneous, deep & opportunistic fungi- <i>Mycobacterium</i> , <i>Rhizopus</i> , <i>Cryptococcus</i> , <i>Aspergillus</i> .		

#### VIROLOGY (Second assessment)

	Topic	Marks	Signature
1	Basic virology, basic structure of a virus, defective virus, prion, replication, pathogenesis of viral disease, host defense against viral infection, antiviral drugs, general scheme of lab diagnosis of viral diseases, common viral infections in Bangladesh		
2	Herpesvirus, orthomyxovirus, paramyxovirus, rubella virus		
3	Hepatitis viruses, oncogenic viruses		
4	Human immunodeficiency virus		
5	Polio virus, rabies virus, dengue virus, rotavirus, chikungunya virus, Zika virus		
6	COVID-19		

#### PARASITOLOGY (First assessment Exam)

	Topic	Marks	Signature
1	Basic concepts of host, parasites and their types, classification of medically important protozoa		
2	Entamoeba, free living amoeba, Giardia, Balantidium		
3	Leishmania, Trichomonas, Trypanosoma		
4	Plasmodium, Toxoplasma, Babesia		
5	Basic structure and classification of helminthes Cestode: Taenia, Echinococcus, Diphyllbothrium Trematodes: Schistosoma, Fasciolopsis		
6	Nematodes: Ascaris, Enterobius, Strongyloides, Trichuris		
7	Nematodes : Hookworm, Filariasis, Onchocerca Volvulus		

**SYSTEMIC BACTERIOLOGY (Second assessment)**

	<b>Topic</b>	<b>Marks</b>	<b>Signature</b>
1	Staphylococcus		
2	Streptococcus		
3	Neisseria, causes of pyogenic meningitis		
4	Corynebacterium, Bacillus		
5	Mycobacterium		
6	Enterobacteriaceae – General properties & classification, Escherichia coli, Shigella		
7	Salmonella		
8	Vibrio, Campylobacter		
9	Pseudomonas, Proteus, Klebsiella		
10	Haemophilus, Helicobacter, Bordetella, Bacillus		
11	Anaerobic bacteria, anaerobic culture		
12	Spirochetes, sexually transmitted disease		
13	Rickettsia, Chlamydia, Mycoplasma		

**CLINICAL MICROBIOLOGY (Second Assessment Exam)**

	<b>Topics</b>	<b>Marks</b>	<b>Signature</b>
1	Examination of stool, morphology of common parasites found in stool, diarrhea- causes and diagnosis		
2	Examination of urine, urinary tract infection- causes and diagnosis		
3	Examination of CSF, meningitis- causes and diagnosis		
4	Blood culture, pyrexia of unknown origin		
5	Examination of sputum, throat swab, pus, wound swab, pleural fluid, ascetic fluid, genital specimen. Causes of pneumonia, sore throat, wound infection, pleural effusion, ascites, vaginal discharge, urethral discharge,		
6	Basics of Hospital Acquired Infection		
7	Infection prevention and control, hand washing, donning and doffing, Preparation of disinfectants, Disposal of Medical wastes		