

Syllabus For
B.Sc. in Medical Microbiology
(BMM)
Academic Programme

Duration : 3 years

DURATION OF COURSE :

- B.Sc. in Medical Microbiology course will be a full time course.
- Duration will be three years.
- This course shall be divided into three professional examinations namely B.Sc. in Medical Microbiology (BMM) Part-I at the end of first academic year. BMM Part-II at the end of second academic year and BMM Part-III at the end of third academic year.

EXAMINATION :

- There shall be an annual university examination at the end of each academic year in the form of theory papers and practical examinations. The candidate shall be required to appear in every subject as specified in the course structure for each year.

Duration of Examination :

- Each theory paper shall be of three hours duration.

Scheme of Examination :

B.Sc. in Medical Microbiology Part-I (First Year) University Examination

S. No.	Subjects	Subject code	THEORY MARKS				PRACTICAL MARKS				Total marks
			Theory Paper	Internal Assessment	Total	Minimum marks	Practical	Internal Assessment	Total	Minimum Marks	
1	Human Anatomy & Physiology	BMM-101	80	20	100	50	80	20	100	50	200
2	General Pathology & General Microbiology	BMM-102	80	20	100	50	80	20	100	50	200
3	Basics of Biochemistry, Instruments & Reagents	BMM-103	80	20	100	50	80	20	100	50	200
4	Quality Control and Biostatistics	BMM-104	80	20	100	50	80	20	100	50	200
Grand Total											800

B.Sc. in Medical Microbiology Part-II (Second Year) University Examination

S. No.	Subjects	Subject code	THEORY MARKS				PRACTICAL MARKS				Total marks
			Theory Paper	Internal Assessment	Total	Minimum marks	Practical	Internal Assessment	Total	Minimum Marks	
1	Heamatology, Immunology & Blood Transfusion	BMM-201	80	20	100	50	80	20	100	50	200
2	Systemic Bacteriology	BMM-202	80	20	100	50	80	20	100	50	200
3	Parasitology	BMM-303	80	20	100	50	80	20	100	50	200
4	Clinical Biochemistry	BMM-304	80	20	100	50	80	20	100	50	200

	Grand Total 800
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B.Sc. in Medical Microbiology Part-III (Third Year) University Examination

S. No.	Subjects	Subject code	THEORY MARKS				PRACTICAL MARKS				Total marks
			Theory Paper	Internal Assessment	Total	Minimum marks	Practical	Internal Assessment	Total	Minimum Marks	
1	Mycology & Virology	BMM-301	80	20	100	50	80	20	100	50	200
2	Applied Microbiology	BMM-302	80	20	100	50	80	20	100	50	200
3	Automation in Medical Microbiology	BMM-303	80	20	100	50	80	20	100	50	200
Grand Total											600

INTERNAL ASSESSMENT

- It will be for theory and practical both.
- It will be done through the whole year.
- Candidate must obtain at least 35% marks in theory and practicals separately in internal assessment to be eligible for the annual university examination.
- Internal assessment (Theory) will be done as follows :

a) Mid-term and term examinations	= 10 marks
b) Assignments/Projects/Class test/Clinical Presentations	= 05 marks
c) Attendance	= 05 marks
Total	= 20 marks

Internal assessment (Practical) will be done as follows :

- | | |
|---------------------------|-------------------|
| a) Laboratory manual | = 10 marks |
| b) Day to day performance | = 05 marks |
| c) Attendance | = 05 marks |
| Total | = 20 marks |

CRITERIA FOR PASSING

- A candidate is declared to have passed University examination in a subject, if he/she secures 50% of the marks in theory and 50% in practicals separately. For computation of 50% marks in theory, the marks scored in the internal assessment (theory) shall be added to the University conducted written examination and for passing in practical the marks scored in University conducted practical examination and internal assessment (practical) shall be added together.

GRACE MARKS:

- If a candidate fails in one subject (theory only) in the annual University examination, five grace marks will be given to the candidate by the University before the declaration of result.
- Candidate failing in practical examination will be considered as failed.

SUPPLEMENTARY EXAMINATION:

- A candidate failing in a subject but securing at least 30% aggregate marks will be required to appear in the university examination after 3 months in that subject/ subjects while attending classes of next year. Those who secure less than 30% aggregate marks will be required to appear in all the subjects.

- If the candidate fails in supplementary examination his/her session will be shifted by one year. The candidate will have to take admission in the previous year and pay the tuition fee for the academic year. He/she will have to appear in all the subjects in the examination.
- Supplementary examination will be held not earlier than 3 months and later than 6 months from the date of annual University examination.

DIVISION:

- Candidate will be awarded division at the end of 3rd academic year as follows:
 - Distinction - 75% and above marks in any subject.
 - First division - 60% and above in the aggregate of marks of all subjects.
 - Second division- 50% or more but less than 60% in the aggregate of marks of all subjects.

DEGREE:

- The degree of B.Sc. in Medical Microbiology course of the University shall be conferred on the candidates who have pursued the prescribed course of study for not less than three academic years and have passed examinations as prescribed under the relevant scheme.

COURSE OF STUDY

B.Sc. in Medical Microbiology Part-I (First Year)

Sl.	Subjects	Teaching hours		
		Theory	Practicals	Total
1	Human Anatomy & Physiology	100	100	200
2	General Pathology & General Microbiology	100	100	200
3	Basics of Biochemistry, Instruments & Reagents	100	100	200
4	Quality Control and Biostatistics	80	60	140

B.Sc. in Medical Microbiology Part-II (Second Year)

Sl.	Subjects	Teaching hours		
		Theory	Practicals	Total
1	Heamatology, Immunology & Blood Transfusion	100	100	200
2	Systemic Bacteriology	80	80	160
3	Parasitology	60	60	120
4	Clinical Biochemistry	100	100	200

B.Sc. in Medical Microbiology Part-III (Third Year)

Sl.	Subjects	Teaching hours		
		Theory	Practicals	Total
1	Mycology & Virology	80	80	160
2	Applied Microbiology	60	60	120
3	Automation in Medical Microbiology	60	100	160

B.Sc. in Medical Microbiology (BMM) First Year

Human Anatomy & Physiology

Subject Code : BMM-101

Min. Hrs - Theory : 100 Hrs & Practical : 100 Hrs.

THEORY

HUMAN ANATOMY :

1. General Anatomy

- a) Cell - structure & function
- b) Tissue
 - Epithelium
 - Connective
 - Sclerous
 - Muscular
 - Nervous
- c) Lymphatic System

2. Systemic

Basic Features of :

- a) Cardiovascular system
- b) Respiratory system
- c) Digestive system
- d) Excretory system
- e) Genital (Male & Female) system
- f) Nervous system

HUMAN PHYSIOLOGY

1. Cell : Structure & function.

2. Blood

- a) Blood cells
- b) Haemoglobin
- c) Blood groups
- d) Coagulation Factors
- e) Anaemia & Immunoglobulins

3. Cardiovascular system

Heart rate, cardiac cycle, cardiac output, blood pressure, hypertension, radial pulse

4. Respiratory System

- a) Ventilation
- b) Functions
- c) Lungs Volumes and capacities

5. Gastrointestinal System

Process of digestion in various parts

6. Endocrinology

- a) List of Endocrine Glands
- b) Hormones : Their secretion and functions (in brief)

7. Excretion system

- a) Structure of nephron
- b) Urine formation

8. Central Nervous System

- a) Parts
- b) Sliding Filament Theory
- c) Neuro Muscular Junction
- d) Wallerian Degeneration
- e) Motor Nervous system
 - Upper motor neuron system
 - Lower motor neuron system
- f) Sensory nervous system
- g) Sympathetic Nervous system
- h) Parasympathetic nervous system

9. Skin - Function & Structure

10. Muscular System

Classification of muscles & their functions

11. Special Senses - Eye & ear (in brief)

PRACTICAL

HUMAN ANATOMY

1. Identification and description of all anatomical structures.
2. The learning of Anatomy is by demonstration only through dissected parts, slides, models, charts etc.
3. Demonstration of dissected parts (upper extremity, lower extremity, thoracic & abdominal viscera, face and brain).
4. Demonstration of skeleton - articulated and disarticulated.

HUMAN PHYSIOLOGY

1. Measurement of pulse, blood pressure
2. Elicitation of Reflexes & jerks.
3. Identification of blood cells by study of peripheral blood smear.

GENERAL PATHOLOGY & GENERAL MICROBIOLOGY

Subject Code : BMM-102

Min. Hrs - Theory : 100 Hrs & Practical : 100 Hrs.

GENERAL PATHOLOGY

1. Cell Injury and Cellular Adaptations.

- a) Normal Cell
- b) Cell Injury- types of cell injury, etiology of cell injury, morphology of cell injury, cellular swelling (in brief).
- c) Cell death : types- autolysis, necrosis, apoptosis & gangrene.
- d) Cellular adaptations-atrophy, hypertrophy, hyperplasia & dysplasia.

2. Inflammation

- a) Acute inflammation - vascular event, cellular event, inflammatory cells.
- b) Chronic Inflammation - general features, granulomatous inflammation, tuberculoma.

3. Haemodynamic Disorders :

Oedema, hyperemia, congestion, haemorrhage, circulatory disturbances, thrombosis, ischaemia & infarction.

4. Neoplasia :

Definition, how does it differ from hyperplasia, difference between benign tumor and malignant tumor.

5. Healing

Definition, different phases of healing, factors influencing wound healing.

GENERAL MICROBIOLOGY

1. General characters and classification of Bacteria.

2. Characteristics of Bacteria

Morphology- Shape, Capsule, Flagella, Inclusion, Granule, Spore.

3. Growth and Maintenance of Microbes

Bacterial division, Batch Culture, Continuous culture, bacterial growth- total count, viable count, bacterial nutrition, oxygen requirement, CO₂ requirement, temperature, pH, light.

4. Sterilization and Disinfection.

Physical agents- Sunlight, Temperature less than 100⁰C, Temperature at 100⁰C, steam at atmospheric pressure and steam under pressure, irradiation, filtration.

Chemical Agents- Alcohol, aldehyde, Dyes, Halogens, Phenols, Ethylene oxide.

5. Culture Media

Definition, uses, basic requirements, classification, Agar, Peptone, Transport Media, Sugar Media, Anaerobic Media, Containers of Media, Forms of Media

6. Staining Methods

Simple, Grams staining, Ziehl-Neelsen staining or AFB staining, Negative Impregnation

7. Collection and Transportation of Specimen

General Principles, Containers, Rejection, Samples- Urine, Faeces, Sputum, Pus, Body fluids, Swab, Blood.

8. Care and Handling of Laboratory Animals

Fluid, Diet, Cleanliness, Cages, ventilation, Temperature, Humidity, handling of Animals, Prevention of disease.

9. Disposal of Laboratory/Hospital Waste

Non-infectious waste, Infected sharp waste disposal, infected non-sharp waste disposal.

PRACTICAL

GENERAL PATHOLOGY

1. Components & setting of the Compound microscope.
2. Focusing of object.
3. Use of low & high power objectives of microscope.
4. Use of oil immersion lens.
5. Care and Maintenance of the microscope.
6. Different types microscopy -
 - Dark field microscopy
 - Fluorescence Microscopy
7. Electronic Microscopy in brief.

GENERAL MICROBIOLOGY

1. Preparation of swabs/sterile tubes & bottles.
2. Preparation of smear.
3. Staining.: Gram & Ziehl -Neelsen staining.
4. Identification of Culture Media.
5. Identification of instruments.
6. Identification of common microbes.

BASICS OF BIOCHEMISTRY, INSTRUMENTS & REAGENTS

Subject Code : BMM-103

Min. Hrs - Theory : 100 Hrs & Practical : 100 Hrs.

THEORY

1. Chemistry of carbohydrates & their related metabolism -

Introduction, definition, classification, biomedical importance & properties.

Brief outline of metabolism :

Glycogenesis & glycogenolysis (in brief), Glycolysis, citric acid cycle & its significance, HMP shunt & Gluconeogenesis (in brief), regulation of blood glucose level.

2. Amino acids - Definition, classification, essential & non essential amino acids.

3. Chemistry of Proteins & their related metabolism -

Introduction, definition, classification, biomedical importance

Metabolism :

Transformation, Decarboxylation, Ammonia formation & transport, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids especially Phenylalanine, Tyrosine & Tryptophan, Creatine, Creatinine, Proteinuria.

4. Chemistry of Lipids & their related metabolism -

Introduction, definition, classification, biomedical importance, essential fatty acids.
Brief outline of metabolism :

Beta oxidation of fatty acids, fatty liver, Ketosis, Cholesterol & its clinical significance, Lipoproteins in the blood composition & their functions in brief, Atherosclerosis.

5. Enzymes -

Introduction, definition, classification, coenzymes, isoenzymes, properties, factors affecting enzyme action, enzyme inhibition, diagnostic value of serum enzymes - Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase etc.

6. Acid base balance concepts & disorders - pH, Buffers, Acidosis, Alkalosis

7. Hyperglycemia & hypoglycemia -

Diabetes mellitus - definition, types, features, gestation diabetes mellitus, glucose tolerance test, glycosurias,

Hypoglycemia & its causes

PRACTICAL

1- Introduction

Aim, basis, interpretation, safety in clinical biochemistry Laboratory.

2- Laboratory organisation

Instruments, glassware, sample collection & specimen labeling, routine tests, anticoagulants, reagents, cleaning of glassware, isotonic solution, standardization of methods, preparation of solution & interpretation of result, normal values.

3- Identification of Carbohydrates (qualitative tests).

3- Identification of Proteins (qualitative tests).

4- To study general properties of the enzyme (Urease) & Achromatic time of Salivary amylase.

5- Urine analysis – normal & abnormal constituents of urine.

6- CSF & Semen Analysis - Gross & Microscopic.

7- Glucose tolerance test & Glycosylated haemoglobin.

8- Centrifugation : Principle, types & applications.

9- Chromatography : Definition, types, RF value, description of paper chromatography & applications.

10- Uses, Care and Maintenance of various instruments of the laboratory.

QUALITY CONTROL AND BIOSTATISTICS

Subject Code : BMM-104

Min. Hrs - Theory : 80 Hrs & Practical : 60 Hrs.

THEORY

QUALITY CONTROL

- Introduction to Quality control.
- Total quality management framework.
- Quality laboratory processes, Quality assurance, Quality assessment, Quality control, Quality planning and Quality improvement.
- Costs of conformance and non conformance, appraisal costs, prevention costs.
- Internal quality control, basic steps, sources of error and their correction methods, CAPA - corrective action & preventive action.
- Sources of variation in laboratory results.
- Quality control charts, Levy- Jennings and Cusum charts.
- External quality control.
- Quality control programme, intrinsic and extrinsic and random errors.
- Current trends in laboratory accreditation, *ISO certificate, West guard Rules.*

BIOSTATISTICS

1. **Introduction:** Meaning, definition, characteristics of statistics. Importance of the study of statistics, Branches of statistics, Statistics and health science, Parameters and Estimates, Variables and their types, Measurement scales.
2. **Tabulation of Data:** Basic principles of graphical representation, Types of diagrams – histograms, frequency polygons, smooth frequency polygon, cumulative frequency curve, Normal probability curve.
3. **Measures of Central Tendency:** Need for measures of central Tendency, Definition and calculation of **Mean** – ungrouped and grouped, interpretation and calculation of Median-ungrouped and grouped, Meaning and calculation of Mode, Geometric mean & Harmonic mean, Guidelines for the use of various measures of central tendency.
4. **Measures of Dispersion :** Range, mean deviation, standard deviation & variance.
5. **Probability and Standard Distributions:** Meaning of probability of standard distribution, the binominal distribution, the normal distribution, Divergence from normality – skewness, kurtosis.
6. **Correlation & regression :** Significance, correlation coefficient, linear regression & regression equation.
7. **Testing of Hypotheses , Level of significance, Degrees of freedom.**
8. **Chi-square test, test of Goodness of fit & student t-test.**
9. **Analysis of variance & covariance:** Analysis of variance (ANOVA), what is ANOVA? Basic principle of ANOVA, ANOVA technique, Analysis of Co variance (ANACOVA)
10. **Sampling:** Definition, Types- simple, random, stratified, cluster and double sampling. Need for sampling - Criteria for good samples, Application of sampling in community, Procedures of sampling and sampling designs errors.

PRACTICAL

QUALITY CONTROL

1. Demonstration of various methods of quality control.

BIOSTATISTICS

1. Calculation of Mean, Median & Mode.
2. Calculation of Variance and Standard Deviations.
3. Graphical representation of Laboratory data.

B.Sc. in Medical Microbiology (BMM) Second Year

HEMATOLOGY, IMMUNOLOGY & BLOOD TRANSFUSION

Subject Code : BMM-201

Min. Hrs - Theory : 100 Hrs & Practical : 100 Hrs.

THEORY

HEMATOLOGY

1. Hematological Disorders

- Classification of Anemia : Morphological & Etiological
- Iron Deficiency Anemia : Distribution of body iron. Iron absorption causes of iron deficiency, lab findings.
- Megaloblastic Anemia : Causes, Lab findings.
- Hemolytic Anemia : Definition, Causes, Classification & Lab findings.

2. Basic Hematological Techniques

- Preparation of specimen collection material.
- Collection of blood specimen : various methods of collection.
- Haemolysis of blood.
- Separation of serum.
- Separation of plasma.
- Changes in blood on Keeping.
- Maintenance of specimen identification.
- Transport of the specimen.
- Effect of storage on Blood Cell morphology.
- Universal precautions.

3. Coagulation and Bleeding Disorders (in brief)

IMMUNOLOGY

1. Immunity
 - Definition and classification
 - General Principles of Innate & Acquired Immunity.
2. Immune Response
 - Humoral immunity & cell mediated immunity.
3. Antigen
 - Definition, classes, properties.
4. Antibodies/Immunoglobulins
 - Definition, Properties, Sub types of Immunoglobulins
5. Antigen/Antibody Reaction/Serological Refractions -
6. Features of antigen/antibody Reaction
 - Precipitation
 - Agglutination
 - Complement fixation test
 - Neutralization
 - Opsonization
 - Immune adherence
 - Immuno fluorescence
 - Immuno electron Microscopic test
7. Structure and functions of Immune System
 - Parts of Immune system
 - T/B cells, other cells & their functions
8. Hyper sensitivity Reactions
 - General Principles of different types of hypersensitive reactions i.e., type 1, 2, 3, 4.
 - Auto immune disorders
9. ELISA

BLOOD TRANSFUSION

1. Blood group system, Blood grouping & cross matching
2. Transfusion reactions
3. Preparation and use of blood components.

PRACTICAL

HEMATOLOGY

1. **Haematological tests** : Complete blood counts (Haemoglobin, TLC, DLC), ESR.
2. Morphology of red blood cells.

IMMUNOLOGY

1. WIDAL Test
2. VDRL Test,
3. RA Test
4. CRP Test
5. Pregnancy Test & HIV Test

BLOOD TRANSFUSION

1. Blood grouping & Cross Matching.

SYSTEMIC BACTERIOLOGY

Subject Code : BMM-202

Min. Hrs - Theory : 80 Hrs & Practical : 80 Hrs.

THEORY

Study of -

Staphylococcus, Streptococcus, Pneumococcus, Neisseira gonorrhoea, Neisseira meningitis, Cornybacterium diptheriae, Mycobaterium, Clostridium, E.coli, H. pylori, Klebsiella, Salmonella, Proteus, Pseudomonas, Vibrio & Spirochaetes with reference to their :

- Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis.

PRACTICAL

1. Culture techniques
2. Culture media
3. Preparation of media
4. Identification of media & their uses
5. Culture methods & identification of common bacteria on media.
6. Antibiotic sensitivity testing.

PARASITOLOGY

Subject Code : BMM-203

Min. Hrs - Theory : 60 Hrs & Practical : 60 Hrs.

THEORY

1. Definition - parastism, HOST, Vectors etc.
2. Classification of Parasites
3. Phylum Protozoa- general Pathogenic and non pathogenic protozoa.
4. Phylum Nematelminths/Round words (Nematoda)
5. Phylum Platyhelminths - class-Cestoda, class-Trematoda
6. Lab diagnosis of parasitic infections.

Protozoa :

1. Intestinal Amoebae
 - a. E. Histolytica : Life cycle, Morphology, Disease & Lab Diagnosis

- b. E. coli : Life cycle, Morphology, Disease & Lab Diagnosis
- 2. Flagellates of intestine/genitalia
 - a. Giardia lamblia : Life cycle, Morphology, Disease & Lab Diagnosis
 - b. Trichomonas vaginalis : Life cycle, Morphology, Disease & Lab Diagnosis
- 3. Malarial Parasite
 - a. Plasmodium vivax : Life cycle, Morphology, disease & lab diagnosis
 - b. Differences between P. vivax, P. malaria, P. falciparum & P. ovale.

Nematodes :

Intestinal Nematodes :

- a. Ascaris : Life cycle, Morphology, disease & lab diagnosis
- b. Brief discussion about Enterobius vermicularis (Thread worm) and Ancylostoma duodenale (Hook worm)

Tissue Nematodes :

W. Bancrofti - Life cycle, Morphology, Disease & Lab Diagnosis

Phylum Platyhelminths

- a. Cestodes - T. solium, T. saginata & E. granulosus.
- b. Trematodes - S. haematobium & F. hepatica.

PRACTICAL

- Stool examination.
- Identification of different ova & cysts in stool samples.

CLINICAL BIOCHEMISTRY

Subject Code : BMM-204

Min. Hrs - Theory : 100 Hrs & Practical : 100 Hrs.

THEORY

- 1- Photometry-
Definition, laws of photometry, absorbance, transmittance, absorption maxima instruments, parts of photometer, types of photometry–colorimetry, spectrophotometry, flame photometry, fluorometry, choice of appropriate filter, measurements of solution, calculation of formula, applications.
- 2- Water & Mineral Metabolism-
Distribution of fluids in the body, ECF & ICF, water metabolism, dehydration, mineral metabolism, macronutrients (principal mineral elements) & trace elements.
- 3- Liver Functions & their Assessment.
Based on: 1- Carbohydrate metabolism 2-Protein metabolism 3- Lipid metabolism 4-Measurements of serum enzyme levels 4-Bile pigment metabolism, Jaundice, its types and their biochemical findings.
- 4- Renal Function Tests-
Various Tests, GFR & Clearance
- 5- Immunodiffusion Techniques, Radioimmunoassay & ELISA-
Principles & Applications.
- 6- Electrophoresis -
Principle, Types & Applications.
- 7- Polymerase Chain Reaction -
Principle & Applications
- 8- Autoanalysers -

Principle & Applications

9- Vitamins-

Fat & water soluble vitamins, sources, requirement, deficiency disorders & biochemical functions.

10- Cardiac Profile -

In brief Hypertension, Angina, Myocardial Infarction, Pattern of Cardiac Enzymes in heart diseases

11- Different methods of Glucose Estimation-

Principle advantage and disadvantage of different methods.

12- Different methods of Cholesterol Estimation-

Principle, advantage and disadvantage of different methods.

PRACTICAL

(By Colorimeter / Spectrophotometer)

1. Blood urea estimation
2. Serum creatinine estimation
3. Serum uric acid estimation
4. Serum total protein estimation
5. Serum albumin estimation
6. Serum globulin estimation
7. Serum glucose estimation
8. Total cholesterol estimation
9. HDL cholesterol (direct) estimation.
10. LDL cholesterol (direct) estimation
11. Triglyceride estimation
12. Serum Bilirubin total estimation
13. Serum Bilirubin direct estimation
14. Serum amylase estimation
15. Serum GOT (AST) estimation
16. Serum GPT (ALT) estimation
17. Alkaline phosphatase estimation
18. Acid phosphatase estimation
19. Serum sodium estimation
20. Serum potassium estimation
21. Serum chloride estimation
22. CK-NAC estimation

B.Sc. in Medical Microbiology (BMM) Third Year

MYCOLOGY & VIROLOGY

Subject Code : BMM-301

Min. Hrs - Theory : 80 Hrs & Practical : 80 Hrs.

THEORY

MYCOLOGY

- Morphology and structure of fungi.
- Classification of fungi.
- Nutrition and cultivation of fungus.
- Cutaneous & Sub cutaneous and Systemic Mycosis.

- Lab diagnosis of fungal Infections.
- Opportunistic fungal infections.

VIROLOGY

- General characters of viruses.
- Classification of viruses.
- Lab diagnosis of viral infections.
- Cultivation of viruses.
- Bacteriophages
- Retro viruses - HIV, Hepatitis virus , Pox virus .
- Picorna virus - Polio.
- Orthomyxo virus - Influenza.
- Arbo virus - Chikungunya, Dengue.
- Herpies and Adeno virus.

PRACTICAL

- Culture Media used for fungus.
- Fungal culture
- Methods of lab diagnosis of viruses.

APPLIED MICROBIOLOGY

Subject Code : BMM-302

Min. Hrs - Theory : 60 Hrs & Practical : 60 Hrs.

THEORY

1. Urinary tract infections
2. Nosocomial infections
3. Pyrexia of unknown origin
4. Immunization

PRACTICAL

1. Assignment of Microbiology
2. Antimicrobial sensitivity testing
3. Slit smear preparation
4. Culture & sensitivity, inoculation techniques of different specimens

AUTOMATION IN MEDICAL MICROBIOLOGY

Subject Code : BMM-303

Min. Hrs - Theory : 60 Hrs & Practical : 100 Hrs.

THEORY

1. Automation - Introduction, meaning, advantages, history
2. Precipitation assays
 - a. Double diffusion method (Ouchterlony techniques)
 - b. Counter immunoelectrophoresis
 - c. Radial immunodiffusion
 - d. Quantitative immunoelectrophoresis
 - e. Immunonephelometry
 - f. Immunoelectrophoresis
 - g. Immunofixation (immunoblotting)
 - h. Western blot

3. Assay based on agglutination
 - a. Bacterial agglutination
 - b. Hemagglutination
 - c. Agglutination of inert particles coated with antigen or antibody.
4. Tests based on complement fixation.
5. Test based on immunofluorescence
 - a. Immunofluorescence tests in microbiology
 - b. Quantitative immunofluorescence assay
 - c. Immunofluorescence tests for the detection of auto-antibodies
 - d. Immunofluorescence tests to detect tissue fixed antigen-antibody complex.
 - e. Flow cytometry-surface staining, cytoplasmic staining, DNA-analysis, sorting
 - f. Radio immunoassay
 - g. Enzyme immunoassay
6. Cell culture- primary, secondary and those using established cell lines.
7. Latest trends in Automation, Biochips, Lab on a chip (LoC), Nanosensors- advantages and disadvantages, PCR and its clinical applications.

PRACTICAL

Various experiments using ELISA, PCR, Semi-Autoanalyzer or fully automated analyzer