B. Voc. (Medical Laboratory Technology)

SEMESTER- III

S. No.	Component	Title of The Paper	Paper Code	Credits	Marks (Theory)		Marks (Practical)		Total
					External Assessment	Internal Assessment	External Assessment	Internal Assessment	
1.	Skill Paper - 1	Haemotology & Disorders (Theory)	BVML311CCT	04	70	30	---	---	100
		Haemotology & Disorders (Lab.)	BVML311CCP	02	---	---	35	15	50
2.	Skill Paper - 2	Systemic Bacteriology (Theory)	BVML312CCT	04	70	30	---	---	100
		Systemic Bacteriology (Lab.)	BVML312CCP	02	---	---	35	15	50
3.	Skill Paper - 3	Blood Banking & Transfusion Medicine (Theory)	BVML313CCT	04	70	30	---	---	100
		Blood Banking & Transfusion Medicine (Lab.)	BVML313CCP	02	---	---	35	15	50
4.	Non-Skill Paper - 4	General Microbiology (Theory)	BVML314CCT	04	70	30	---	---	100
		General Microbiology (Lab.)	BVML314CCP	02	---	---	35	15	50
5.	Non-Skill Paper - 5	Metabolism (Theory)	BVML315CCT	04	70	30	---	---	100
		Metabolism (Lab.)	BVML315CCP	02	---	---	35	15	50
		Total		**30**					**750**

B. Voc. (Medical Laboratory Technology)

SEMESTER-III

(Skill Paper - 1) Hematology & Disorders (Theory)

Credits – 04

Objective – To familiarise the student with the structure and function of blood and the techniques used to diagnose disease by studying the different components of blood in the laboratory .

Outcome intended– At the end of the semester , the students will be able to perform various basic haematological tests , correlate and compare the normal and abnormal values and be aware of the advantages and disadvantages of each technique.

Unit I :

Blood –an overview , general aspects of Haemopoiesis , sites of haemopoiesis , regulation of haemopoiesis , haematopoetic stem cell , structure of bone marrow , examination of bone marrow , sites of bone marrow aspiration and biopsy , development of blood cells , erythropoiesis , granulopoiesis , lymphopoiesis , development of monocyte macrophage series ,the megakaryocyte , development, structure and functions of platelets.

Unit II :

Laboratory investigations of haematologic disorders ,Disorders of Red Blood Cells , Anaemia due to Impaired Red Cell Production: Iron Deficiency Anaemia, Megaloblastic Anaemia, Aplastic Anaemia, haemolysis & Anaemia due to Excessive Red Cell destruction , anaemias due to enzyme deficiencies — pyruvate kinase deficiency , G6PD deficiency , Haemoglobin Variants, Haemoglobinopathies—α- Thalassemia, β -Thalassemia , Sickle-cell disease/trait

Unit III :

An overview of WBCs , types , Structure and functions of WBCs , normal ranges , Disorders of White Blood Cells , etiology , pathogenesis & laboratory diagnosis of disorders of granulocytes , causes of neutrophilia, lymphocytosis, eosinophilia , neutropenia, lymphopenia, eosinopenia , monocyte macrophage system, causes of monocytosis and monocytopenia , leukaemoid reaction , leukamias ,lymphomas

Unit IV :

Disorders of platelets, Thrombocytopenia, Thrombocytosis , mechanism of coagulation , tests for coagulation , disorders of coagulation , fibrinolysis , bleeding disorders caused by abnormalities of the Blood Vessels — vascular Purpuras , anticoagulant therapy , Heparin Therapy, Oral Anticoagulants and monitoring.

Essential reading :

1. Shirish M Kauthalkar, Essentials of haematology, 2nd ed.
2. Dacie & Lewis, Practical Haematolgy
3. Atlas of Haematology by Renu Saxena

Suggested reading :

1. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications
2. Sood Ramnik,(2015), Text book of Medical Laboratory Technology,2nd edition,Jaypee Publications

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SEMESTER-III

(Skill Paper - 1) Hematology & Disorders (Lab/Practical)

Credits – 02

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1. Preparation of leishman stain
2. Preparation of giemsa stain
3. Staining of blood smear by leishman stain
4. Determination of ESR by westergren and mintrobes methods
5. Reticlocyte count
6. Stickle cell preparation
7. Thalasemia test

B. Voc. (Medical Laboratory Technology)

SEMESTER-III

(Skill Paper - 2) Systemic Bacteriology (Theory)

Credits – 04

Objectives: The students will learn the techniques of sample collection , culture , identification and study of different types of bacteria .

Intended outcome : At the end of the semester the student will be able to collect microbiological samples , set up culture and antimicrobial sensitivity and identify the causative organisms using various culture media .

Unit I : Collection, Transport and Examination of specimens

Specimen collection, preservation transportation and examination of specimens- urine, urogenital, throat and mouth, feces, blood and bone marrow, CSF, eye specimens, ear discharge, pus from wounds, abscesses, burns & sinuses.

Unit II : Identification of Bacteria

Culture media, Culture Methods-Aerobic & Anaerobic culture methods, Identification methods-Morphology & Culture characteristics, Staining Reactions, Resistance, Metabolism, Biochemical properties-IMViC Tests, Biochemical reactions on TSI slants, Antibiotic resistance, Antimicrobial sensitivity tests

Unit III : Study of gram positive bacteria

Gram positive cocci – staphylococci,streptococci. Gram positive bacilli — Corynebacterium, Mycobacterium, Listeria, LactoBacillus, Anaerobic bacteria - Clostridia.

Unit IV : Study of Gram negative bacteria and Automation in Bacteriology

Gram negative cocci - Neisseria Gram negative bacilli — Enterobacteriaceae, Pseudomonas, Vibrio, Aeromonas, plesiomonas, Campylobacter, Bacteroides, Bordetella, Brucella, Haemophilus, Pasteurella, Francisella, Spirochaetes, Chlamydia, Rickettsia, Mycoplasma, etc Introduction, BACTEK system, The ATB system, The VITEK system, The API systems, BacT/ALERT 3D automated microbial detection system

Essential reading :

1. Clinical Microbiology & and Parasitology , Nanda Maheshwari
2. Diagnostic Microbiology , Ranjan Kumar De
3. Ananthanarayan and Paniker's Textbook of Microbiology , 10th ed.

Suggested reading :

1. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition, Bhalani Publications

B. Voc. (Medical Laboratory Technology)

SEMESTER-III

(Skill Paper - 2) Systemic Bacteriology (Lab/Practical)

Credits – 02

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1. Sterilization procedures
2. Laminar air flow equipment its functions
3. Auto clave
4. Hot air oven
5. Preparation of solid media
6. Inoculation of cultures through loops

B. Voc. (Medical Laboratory Technology)

SEMESTER-III

(Skill Paper - 3) Blood Banking & Transfusion Medicine (Theory)

Credits – 04

Objective — to understand the basics of immunohaematology , blood grouping , compatibility testing , blood donation , component preparation and problem solving in transfusion practice.

Outcome intended : At the end of the session, the student will be able to perform the basic techniques in blood donation , component preparation, blood banking as well as pre transfusion testing and resolution of post transfusion problems.

Unit I:-Introduction to blood banking

basic immunohematologic concepts —— red cell Antigens--- Immunogenicity--Blood Group Antibodies---Natural antibodies –immune antibodies—autoantibodies ---alloantibodies --- The Complement System and role of Complement in Erythrocyte Destruction -- human blood group systems ---ABO and Rh blood group Systems -- other blood groups - inheritance of blood group systems

Unit II:-Pretransfusion testing

Blood groupig & Rh typing --- Basic Principles— Hemagglutination--- Factors Affecting Hemagglutination---Grading of Hemagglutination Reactions---Tube Reactions---ABO blood group typing problems - Antihuman globulin test --- direct Coomb's test--- indirect Coomb's test---antibody screening — cross matching ---Specimen Requirements ---Rh incompatibility , HDN ---blood screening for Transfusion transmitted diseases --TTD—quality control in blood bank procedures

Unit III:- Blood collection

donor selection criteria—phlebotomy—anticoagulants-- blood preservation ---techniques for separation of blood components—preparation , storage and dispensing of blood components like WB , PRBC , FFP , platelets ——blood and blood component transfusion therapy – indications & selection of blood components – leucoreduction -- irradiation - apheresis- indications , techniques and advantages

Unit IV:- Blood transfusion

presurgical blood donation — autologous transfusion -- Massive blood transfusion--- exchange transfusion —neonatal and paediatric transfusion --- transfusion reactions— transfusion reaction investigations—non infectious complications of blood transfusion -- blood transfusion alternatives

Essential reading :

1. Essentials of blood banking , SR Mehdi , 2nd ed
2. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition, Bhalani Publications
3. Technical Manual - American Association of Blood Banks - AABB- 16th ed
4. Handbook of Blood Banking and Transfusion Medicine , Rao Gundu HR

Suggested reading :

1. Wintrobe's Clinical Hematology,(2014),13th edition, Lippincott Williams &Wilkins
2. Handbook of Blood banking and Transfusion medicine, H.R. Gundurao

B. Voc. (Medical Laboratory Technology)

SEMESTER-III

(Skill Paper - 3) Blood Banking & Transfusion Medicine (Lab/Practical)

Credits – 02

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1. Blood graphing by ABO System
2. Cross matching
3. Coobs test direct
4. Combs test indirect
5. Presence of H antigen on RBC

B. Voc. (Medical Laboratory Technology)

SEMESTER-III

(Non - Skill Paper - 4) General Microbiology (Theory)

Credits – 04

Objectives: The students will develop an understanding of the history of microbiology, microorganisms and basic requirements for their growth, methods of cultivation and staining and biomedical waste management

Intended outcome : The student will be able to understand growth of microorganisms , methods of cultivation and detection by different types of staining , management of biomedical waste

Unit I : Introduction to Microbiology:

Introduction of Medical Microbiology, Discovery of microorganism. Contribution of Antony Van Leeuwenhoek, Louis Pasteur and theory of spontaneous generation**,** Robert Koch and his postulates, Metchnikoff, Alexander Fleming.

Unit II : Control of growth of Microorganism & Biomedical Waste management:

Physical and Chemical Method of Control of Microorganism. Classification of Hazardous Waste. Different Locations of Biomedicals waste Generation. Importance of Segregation. Biomedical Waste Management process.

Unit III : Microorganisms and Staining :

The morphology and fine structure of Bacteria, Fungai, Alge, Protozoa and Viruses.Classification of microbiology stains and different types of staining – Simple staining, Negative staining, Impregnation methods, Different staining (Gram staining), Special Staining – Z. N. stain & Albert stain, KOH test.

Unit IV : Cultivation of Microorganism:

Purpose of cultivation of Microorganism. Basic growth requirements and Essential growth factor. Types of media, Preparation of media, storage of media.

Essential reading :

1. Ananthanarayan and Paniker's Textbook of Microbiology , 10th ed.
2. An Introduction To Microbiology , M.G. Sequeira, K.K. Kapoor, K.S. Yadav, P. Tauro, 3rd ed

Suggested reading :

1. Textbook of Medical Laboratory Technology, Praful B.Godkar , Darshan P.Godkar

B. Voc. (Medical Laboratory Technology)

SEMESTER-III

(Non - Skill Paper - 4) General Microbiology (Lab/Practical)

Credits – 04

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1. Procedure of growth of micro organisms in sold media by streaking method
2. Gram staining
3. Identification of bacteria by IMVIC test
4. Cell transport of eye specimen cultural Antibiotic sensitivity test
5. Automation in bacteriology
6. Antibiotic Sensitivity test
7. ZN Staining
8. Albert Staining

B. Voc. (Medical Laboratory Technology)

SEMESTER-III

(Non - Skill Paper - 5) Metabolism (Theory)

Credits – 04

Unit - 1 :

Carbohydrate Metabolism: Metabolic Pathways of Carbohydrates, Glycolysis and Pyruvate to Acetyl CoA, Krebs cycle, TCA Gluconeogenesis (Pyruvate, lactate, propionate, glycogenic aminoacids, glycerols) & Glycogenesis, Glycogenolysis, Glycogen storage disease, DM-I,2, Insulin, glycogen, OGTT, digestion & abosrption of carbohydrate, lactose intolerance.

Unit - 2 :

Lipids Metabolism :- Oxidation of fatty acids including odd chain fatty acids. α -and ω-oxidation of fatty acids, ketone bodies, ketogenesis, Formation and utilization of ketone bodies. Biosynthesis of fatty acids. Cholestrol metabolism, Biosynthesis of Cholesterol and degradation, lipoprotens structure, classification, metabolism, disorders, fatty liver, obesity, atheroselerosis, digestion & abosrption of lipids.

Unit - 3 :

Protiens metabolism, Deamination, transamination and decarboxylation, Metabolism of ammonia. Urea cycle Glycine and phenylalanine and Tyrosine, Tryptophan, Histidine, arginine, melanin formation, thyroid hormones, serotonin, dopamine, phenyl ketonoria, tyrosinemia, alkaptoneria, and other disorders, Digestion and absorption of Proteins.

Unit - 4 :

Nucleotide metabolism:- nucleic acids, synthesis of purine ribonuculotide, degeradation of purine ribonuculotide, disorders of purine metabolism, synthesis of pyrimidine ribonuculotide.

B. Voc. (Medical Laboratory Technology)

SEMESTER-III

(Non - Skill Paper - 5) Metabolism (Lab/Practical)

Credits – 02

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1. Separation of serum and plasma
2. Estimation of glucose by god pod method
3. Estimation of sr creatinine levels by alkaline picrate method
4. Estimation of sr urea levels by DAM method
5. Estimation of sr uric acid levels by uricase method
6. Estimation of sr total protein by biuret method
7. Estimation of sr albumin by BCG method