B. Voc. (Medical Laboratory Technology)

SEMESTER- IV

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	General, Clinical & Systemic Pathology(Theory)	BVML411CCT	04	70	30	---	---	100
		General, Clinical & Systemic Pathology(Lab.)	BVML411CCP	02	---	---	35	15	50
2.	Skill Paper - 2	Clinical Biochemistry and Quality Assurance (Theory)	BVML412CCT	04	70	30	---	---	100
		Clinical Biochemistry and Quality Assurance(Lab.)	BVML412CCP	02	---	---	35	15	50
3.	Skill Paper - 3	Parasitology and Mycology(Theory)	BVML413CCT	04	70	30	---	---	100
		Parasitology and Mycology(Lab.)	BVML413CCP	02	---	---	35	15	50
4.	Non-Skill Paper - 4	Immunology & Serology(Theory)	BVML414CCT	04	70	30	---	---	100
		Immunology & Serology(Lab.)	BVML414CCP	02	---	---	35	15	50
5.	Non-Skill Paper - 5	Biochemical Techniques(Theory)	BVML415CCT	04	70	30	---	---	100
		Biochemical Techniques(Lab.)	BVML415CCP	02	---	---	35	15	50
		Total		**30**					**750**

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SEMESTER-IV

(Skill Paper - 1) General, Clinical & Systemic Pathology (Theory)

Credits – 04

Objective – To develop the basic understanding of why and how diseases develop and the changes that occur at the macroscopic, tissue and cellular level.

Outcome intended — At the end of the semester , the student will become familiar with the terminology used in pathology , identify changes that occur at the macroscopic and microscopic level , perform various basic clinical pathology tests like routine examination of urine and body fluids.

Unit I : **General Pathology and Systemic Pathoogy** -

Introduction to pathology – study of pathology , an overview – health and disease - Determinants of health-- Etiology – cause of disease multi — factorial causation of disease– significance of etiology , natural history of disease , pathogenesis , clinical manifestations- signs and symptoms , morphological changes – macroscopic and microscopic - in disease - common terms in pathology Systemic Pathology –an overview of the systems and pathology conditions Cardiovascular system-atherosclerosis, ischaemic heart disease, Respiratory diseases- chronic obstructive lung disease, chronic restrictive lung disease, respiratory infections Musculoskeletal system - neurogenic disease , myopathies- muscular dystrophy, The nervous system— infective diseases, ischaemic brain damage, cerebral infarction, intracerebral haemorrhage, degenerative diseases Digestive System- Disease of Oesophagus, Stomach, Hepatitis, Cirrhosis of Liver, Neoplasm of GIT, Excretory System- Glomerulonephritis, Nephritic & Nephrotic Syndrome, Pyelonephritis, Renal Arteriosclerosis, Hydronephrosis, Renal neoplasms

Unit II :

Cell injury - etiology of injury - Reversible and Irreversible Injury, morphology of reversible injury --hydropic ,hyaline , mucoid and fatty change. Intracellular Accumulation, endogenous and exogenous pigments, morphology of irreversible injury – cell death – autolysis – apoptosis – necrosis – coagulative , liquifactive , caseous , fibrinoid - Cellular adaptations –Causes, types and morphology - Atrophy, Hypertrophy, Hyperplasia, Metaplasia.

Unit III :

Inflammation and Healing — Types of inflammation -Acute and Chronic, chemical mediators of inflammation , Inflammatory Cells, Morphology and Fate of inflammation -Chronic inflammation — chemical mediators and morphology — types - non specific and Granulomatous . Healing – Regeneration, Repair, Healing in Skin -- Healing by primary and secondary intention, healing in other tissues

Unit IV :

Pathophysiology of Haemodynamics and Clinical Pathology fluid compartments of the body types of pressure gradients Disturbance of Body Water pathogenesis of oedema– types of oedema, haemorrhage, hyperaemia and congestion, Thrombosis,embolism, ischaemia & infarction Neoplasia overview ,benign and malignant tumours, classification and nomenclature of neoplastic disease , Chemical, Physical and Biological Cacinogenesis Clinical and Gross Features dysplasia invasion and metastasis cytological features of malignancy. Routine urine examination specimen collection physical examination chemical examination microscopic examination, body fluids an overview description of various body fluids CSF, pleural, peritoneal, synovial indications for collection of body fluids – normal and abnormal features routinesample processing and examination .

Essential reading :

1. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications
2. Robbins,(2012), Text book of Pathology, 3rd edition, Elsevier Publications

Suggested reading :

1. Boyd's Textbook of Pathology (Systemic Pathology), 10th ed, Dr. J.R.Bhardwaj
2. Essentials of Clinical Pathology, Kawthalkar, Shirish M

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SEMESTER-IV

(Skill Paper - 1) General, Clinical & Systemic Pathology (Lab/Practical)

Credits – 02

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1. Manual method of urine glucose estimation.
2. Manual method of urine proteins estimation.
3. Leishman's Staining
4. Fluid Processing.

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SEMESTER-IV

(Skill Paper - 2) Clinical Biochemistry and Quality Assurance (Theory)

Credits – 04

Unit - 1 : Evaluation of LFT and PFT

Introduction of liver, functions of liver, liver enzymes, liver function test, formation and analysis of gall stones, pancreatic function test, function of pancreas, composition of pancreatic juice, clinical utility of enzymes determination of pancreatitis. Formation of Bilirubin, Jaundice, Panel of Liver function tests in clinical laboratory.

Unit - 2 : Thyroid function tests and renal function test

Overview of Functions of Thyroid gland & Hormones Clinical utility and methods for the measurement of Circulating thyroid hormones. **Renal function tests & Renal Calculi** Glomerular function test ; Clearance tests (Urea, creatinine, Inulin clearance tests) Tests for tubular function ; Concentration and dilution tests, Measurementof specific gravity and osmolality Urinary acidification tests; ammonium chloride loading test. Microalbuminuria and it's importance Formation & analysis of Renal calculi.

Unit - 3 : Cardiac markers & Tumor markers

Chemistry & overview of cardiac markers Diagnostic & prognostic use of cardiac markers Laboratory evaluation. Definition, Classification, and clinical applications. Overview of specific tumor markers; AFP, CEA, CA-125, PSA, ALP, hCG, CA 19.9.

Unit - 4 : Automation in Clinical Biochemistry Laboratory and Quality Assurance

Classification of automated systems , steps of automation in biochemical analysis, some commonly used automated analysers of biochemical laboratories Measurements in clinical laboratory Quantitative estimations; Selecting a method, linearity of a method, end point and rate reaction methods. Checking accuracy & precision. Calibration; Preparation of calibration curve, importance of calibration curve Techniques of preparation of calibration curve using stock standard solutions. Graphic representation of calibration. Quality , an overview - Introduction to laboratory quality management --- Essential elements of Quality Assurance Programme – QMS – QLPs – quality assurance QAS – quality assessment QA – Indicators of laboratory quality - TAT –sample rejection - patient feedback -- quality control QC --- Internal Quality control—external quality control - EQUAS.

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SEMESTER-IV

(Skill Paper - 2) Clinical Biochemistry and Quality Assurance (Lab/Practical)

Credits – 02

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1. Quantitative LFT
2. Quantitative RFT
3. Quantitative TFT
4. Estimation of Cardiac Markers
5. Quantitative estimation of CEA, AFP, CA 125 & beta HCG
6. Quality Control, Internal & External

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SEMESTER-IV

(Skill Paper - 3) Parasitology and Mycology (Theory)

Credits – 04

Objective — The students will be introduced to the characteristic features of parasites and hosts, life cycles , diseases and laboratory methods of detection of various medically important parasites , fungi and viruses.

Outcome intended : At the end of the semester the student will be able to perform the basic techniques in detection and identification of various parasite , fungi and viruses of medical significance.

Unit I

General Parasitology—introduction -- Basic concepts in medical parasitology -- Association between parasite and host—surface , intestinal , blood and tissue parasites ,Effect of parasites on the host-- Mechanism of disease production by parasites, --Classification of medical parasitology --General characteristics of medically important parasites -- Protozoa -- Heliminths-- Arthropods

Unit II

Medically important parasites -- Introduction & classification of medically important parasites --E.histolylica, Giardia - Malaria parasite-- Leishmanial parasites— Tapeworms-- Intestinal nematodes -- Filarial worms -- tissue nematodes --Arthropods--Importance of Arthropods in Parasitology -Classification of Arthropods -Medical conditions related to arthropods

Unit III

Mycology — introduction to fungi - structure , general properties and characteristic features - useful fungi - Classification of pathogenic Fungi-- Morphology of Fungi— Brief idea of Dermatophytes, - Cutaneous mycoses, Systemic mycoses, Opportunistic mycoses - Mycotoxins sample collection - Laboratory diagnosis of Fungi Culture and laboratory test for fungus -- KOH preparation , LCB mount –India Ink preparation

Unit IV:

List of medically important fungi and diseases
1. Candidiasis
2. Cryptococcosis
3. Aspergillosis
4. Mucormysosis
5. Lab diagnisis of fungal infection, anti fungal agents

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SEMESTER-IV

(Skill Paper - 3) Parasitology and Mycology (Lab/Practical)

Credits – 02

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1. Stool examination: Saline mount, Iodine mount
2. Stool concentration techniques
3. Preparation and staining technique of Leishman's stain and Giemsa stain
4. Preparation of thick and thin smears
5. Demonstration of malarial parasite in peripheral smear
6. Demonstration of fungi using KOH and India ink
7. Colony characteristics and Microscopic examination and identification tests for:
8. Candida and Cryptococcus,
9. Dermatophytes
10. Aspergillus sp
11. Slide culture technique

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SEMESTER-IV

(Skill Paper - 4) Immunology & Serology (Theory)

Credits – 02

Objective – The student will learn the basics of immunology, the types and outcome of immune response, principles of antigen-antibody reactions, principles of serological procedures and their application in laboratory medicine.

Outcome intended : At the end of the semester the student will be able identify the structure, function, and special features of of immunoglobulin , perform serological tests and correlate their results with disease conditions.

Unit I :

Cells and organs of the Immune system, Immunity — innate and acquired immunity, humoral and cell mediated immunity, Primary and secondary immune response.

Unit II :

Antigen – Classes, properties. Antibodies/Immunoglobulins – Structure, Properties, Types of Immunoglublins, Complement, Introduction to serology

Unit III :

Immunological principles of various reactions and techniques: Affinity and avidity, cross reactivity, precipitation, agglutination, neutralisation, opsonisation, immunodiffusion, immunoelectrophoresis, ELISA (indirect, sandwich, competitive, chemiluminescence, and ELISPOT assay), western blotting, immunofluorescence, flow cytometry and immunoelectron microscopy. Allergy, Hypersensitivity, Different hypersensitive reactions -type I, II, III, IV, Major Histocompatibility Complex and Antigen presentation, Tumor immunity, Tolerance, Autoimmunity-Mechanism, Transplantation immunology

Unit IV :

Diagnostic Immunology & serology -qualitative & quantitative tests, Widal test, VDRL Test, ASO Titre, Rheumatoid factor, C Reactive protein, HbsAg, Anti HCV, Anti HIV, Automation in serology

Essential Readings :

1. Essentials of Immunology and Serology, Jaqueline Stanley
2. Kuby's Immunology ,Owen , Judith A

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SEMESTER-IV

(Non - Skill Paper - 4) Immunology & Serology (Lab/Practical)

Credits – 02

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1. Draw the diagrams of organs of immune system.
2. Serology testing methods and procedure:
   (I) RA, CRP, ASO,
   (II) HSV, HBV, HCV,
   (III) Dengue NSI, Dengue IgG & IgM,
   (IV) use of micropippettes,
   (V) WIDAL, VDRL,
   (VI) Pregnancy tests, Agglutination,
   (VII) ECLIA, Immunochromatography,
   (VIII) ANA Profile for autoimmune disorders,
   (IX) IgE test, IgA & IgM Assay,
   (X) Mantoux test, Hypersensitivity tests, Tridot method.

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SEMESTER-IV

(Skill Paper - 5) Biochemical Technique (Theory)

Credits – 04

Unit - 1 :

Spectroscopic Techniques: Beer-Lambert's Law. Light absorption and its transmittance. Determination and application of extinction coefficient. Applications of following spectroscopic techniques in elucidating structure of Biomolecules- Visible, U.V., infra-red and fluorescence spectroscopy. ORD, C.D. and N.M.R.

Unit - 2 :

Centrifugation Techniques : Differential centrifugation, density gradient, isopycnic & rate zonal centrifugation and their applications in Biochemistry. Preparative and analytical ultra-centrifugation procedures.
Electrophoretic Techniques : Principles and applications of the following electrophoresis techniques. Paper and gel electrophoresis, SDS-PAGE : Discontinuous electrophoresis, iso electric focussing and immuno electrophoresis.

Unit - 3 :

Chromatographic Techniques: General principles of chromatography and the application of following chromatographic procedures in isolation and purification of biomolecules : Absorption, partition, paper and thin layer chromatography. Gas liquid chromatography. High performance liquid chromatography (HPLC), Ion exhange and Exclusion chromatography, Affinity Chromatography and applications

Unit - 4 :

Radioactive Isotopes Definition, clinical applications Biological effects of radiations, Radio Isotopic Techniques : Nature of isotopes and radioisotopes. Radioactive decay. Properties of radioactive emissions. Units of radioactivity. Labelling of Biochemical compounds and autoradiography & Radioimmuno assay. Biological hazards of radiation and safety measures in handling radioisotopes.

B. Voc. (Medical Laboratory Technology)

SEMESTER-IV

(Non - Skill Paper - 5) Biochemical Technique (Lab/Practical)

Credits – 02

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1. Preparation of Agar for AGE (Agarose gel electrophoresis)
2. Separation of amino acid in a sample using TLC
3. Separation of Serum from blood using centrifugation technique
4. Demonstration of UV-VIS Spectrophotometer

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