Bachelor of Vocation (Medical Laboratory Technology)

B.Voc. (MLT) Syllabus

Year 1 (Diploma)

Semester I

Course Code	Component	Unit	Topic	Credits	L / Week
BMLT101 (General & Human Anatomy , Physiology –I)	Skill	I	Basics of Human Anatomy-I	04	01
	Skill	II	Basics of Physiology-I		01
	Skill	III	Basic English		01
	Skill	IV	Human Values and Professional Ethics		01
BMLT102 (Routine Laboratory Techniques-I)	Skill	I	Human Healthcare and Safety Regulations	04	01
	Skill	II	Introduction to Haematology and Routine tests		01
	Skill	III	Specimen Collection		01
	Skill	IV	Laboratory Preparation in Hematology		01
BMLT103 (Special Laboratory Techniques-I)	Skill	I	Biochemical Test Profile -I	04	01
	Skill	II	Biochemical Test Profile – II		01
	Skill	III	Elementary Knowledge of Chemistry- I		01
	Skill	IV	Elementary Knowledge of Chemistry- II		01
BMLT104 (Cell Biology and Biodiversity–I)	General	I	Microscopy and Organization of Cell -I	03	01
	General	II	Microscopy and Organization of Cell -II		01
	General	III	Systematic study of Animals - I		01
	General	IV	Systematic study of Animals - II		01
BMLT105 (Biomolecules)	General	I	Structure, Functions and Classification of Amino Acids and Proteins	03	01
	General	II	Structure, Functions and Classification of Carbohydrates		01
	General	III	Structure, Functions and Classification of Lipids		01
	General	IV	Physical and Chemical Properties of Nucleic Acids		01
BMLT106 (Fundamentals of Microbiology)	General	I	Introductory Microbiology-1	03	01
	General	II	Morphology and Structure of Microorganisms		01
	General	III	Recombinant DNA Technology		01
	General	IV	Microbial Ecology and Biotic Interactions		01
BMLTP101			Practicals of Course BMLT101	02	06
BMLTP102			Practicals of Course BMLT102	02	06
BMLTP103			Practicals of Course BMLT103	02	06
BMLTP104			Practicals of Course BMLT104	01	06
BMLTP105			Practicals of Course BMLT105	01	06
BMLTP106			Practicals of Course BMLT106	01	06
Total Credits				30	

Year 1 (Diploma)

Semester II

Course Code	Component	Unit	Topic	Credits	L / Week
BMLT107 (General & Human Anatomy , Physiology – II)	Skill	I	Basics of Human Anatomy-II	04	01
	Skill	II	Basics of Physiology-II		01
	Skill	III	Basics of Computer Skills		01
	Skill	IV	Communication Skills		01
BMLT108 (Routine Laboratory Techniques-II)	Skill	I	Routinue Haematological Tests	04	01
	Skill	II	Urine Examination		01
	Skill	III	Stool Examination		01
	Skill	IV	Sputum and Semen Examination		01
BMLT109 (Special Laboratory Techniques-II)	Skill	I	Basic Microbiology	04	01
	Skill	II	Introduction to serology		01
	Skill	III	Serological Tests		01
	Skill	IV	Staining Techniques		01
BMLT110 (Ecology and Biodiversity-II)	General	I	Systematic study of Animals - III	03	01
	General	II	Systematic study of Animals - IV		01
	General	III	Ecosystem-I		01
	General	IV	Ecosystem-II		01
BMLT111 (Enzymology and Bioenergetics)	General	I	Enzymes	03	01
	General	II	Enzyme Purification and Chromatography Techniques		01
	General	III	Enzyme Kinetics		01
	General	IV	Bioenergetics		01
BMLT112 Microbial Physiology - Metabolism	General	I	Microbial Nutrition, Cultivation, Isolation and Preservation	03	01
	General	II	Enzyme Regulation		01
	General	III	Microbial Metabolism -I		01
	General	IV	Microbial Metabolism -II		01
BMLTP107			Practicals of Course BMLT107	02	06
BMLTP108			Practicals of Course BMLT108	02	06
BMLTP109			Practicals of Course BMLT109	02	06
BMLTP110			Practicals of Course BMLT110	01	06
BMLTP111			Practicals of Course BMLT111	01	06
BMLTP112			Practicals of Course BMLT112	01	06
Total Credits				30	
On Job Training					

Course Code	Component	Unit	Topic	Credits	L / Week
BMLT201 (Hematology and Blood Banking-I)	Skill	I	Special Heamatological Tests	04	01
	Skill	II	Haemostasis & Bleeding Disorders		01
	Skill	III	Immunohaematology & Blood Transfusion		01
	Skill	IV	Routine Lab Procedures in Blood Bank		01
BMLT202 (Microbiology and Serology)	Skill	I	Laboratory Diagnosis of Mycotic and Emerging Infections	04	01
	Skill	II	Diagnostic Microbiology		01
	Skill	III	Serology		01
	Skill	IV	Bacteriology		01
BMLT203 (Clinical Pathology and Biochemistry)	Skill	I	Miscellaneous Body Fluids	04	01
	Skill	II	Biochemical Test Profile		01
	Skill	III	Analytical Techniques		01
	Skill	IV	Biochemical Processes		01
BMLT204 (Metabolism)	General	I	Carbohydrate Metabolism	04	01
	General	II	Lipid Metabolism		01
	General	III	Protein Metabolism		01
	General	IV	Nucleic Acids		01
BMLT205 (Pathogenic Microbiology)	General	I	Infectious Diseases	04	01
	General	II	Microbes of Medical Importance		01
	General	III	Mode of Microbial Infections		01
	General	IV	Antimicrobial Drugs		01
BMLTP201			Practicals of Course BMLT201	02	06
BMLTP202			Practicals of Course BMLT202	02	06
BMLTP203			Practicals of Course BMLT203	02	06
BMLTP204			Practicals of Course BMLT204	02	06
BMLTP205			Practicals of Course BMLT205	02	06
Total Credits				30	

Course Code	**Component**	**Unit**	**Topic**	**Credits**	**L / Week**
BMLT206 (Clinical Biochemistry and Microbiology-I)	**Skill**	**I**	**Metabolic Disorders & Deficiency**	**04**	**01**
	Skill	**II**	**Clinical Endocrinology**		**01**
	Skill	**III**	**Body Fluid Specimen Processing**		**01**
	Skill	**IV**	**Blood Banking**		**01**
BMLT207 (Histolohy-Cytology –I)	**Skill**	**I**	**Introduction to Histology**	**04**	**01**
	Skill	**II**	**Tissue Processing**		**01**
	Skill	**III**	**Staining Procedures**		**01**
	Skill	**IV**	**Instrumentation in Histocytotechnology**		**01**
BMLT208 (Parasitology and Blood Cell Disirders-I)	**Skill**	**I**	**Medical Parasitology**	**04**	**01**
	Skill	**II**	**Common Intestinal worms**		**01**
	Skill	**III**	**Malarial parasites, Filarial parasites**		**01**
	Skill	**IV**	**Lab. diagnosis of Parasitic infections**		**01**
BMLT209 (Biochemical Techniques)	**General**	**I**	**Spectroscopic Techniques**	**04**	**01**
	General	**II**	**Electrophoretic Techniques**		**01**
	General	**III**	**Chromatographic Techniques**		**01**
	General	**IV**	**Radio Isotopic Techniques**		**01**
BMLT210 (Immunology)	**General**	**I**	**Introduction to Immunology**	**04**	**01**
	General	**II**	**Humoral Immunity**		**01**
	General	**III**	**Cell Mediated Immunity**		**01**
	General	**IV**	**Antigen-Antibody Interactions**		**01**
BMLTP206			**Practicals of Course BMLT206**	**02**	**06**
BMLTP207			**Practicals of Course BMLT207**	**02**	**06**
BMLTP208			**Practicals of Course BMLT208**	**02**	**06**
BMLTP209			**Practicals of Course BMLT209**	**02**	**06**
BMLTP210			**Practicals of Course BMLT210**	**02**	**06**
Total Credits				**30**	
On Job Training					

Bachelor of Vocation (Medical Laboratory Technology)

B.Voc. (MLT) Syllabus

Year 3 (B.Voc. Degree)

Semester V

Course Code	Component	Unit	Topic	Credits	L / Week
BMLT301 (Medical Genetics and Microbiology-II)	Skill	I	Genetics	04	01
	Skill	II	CLIA techniques		01
	Skill	III	Immunology and Virology		01
	Skill	IV	Toxicology		01
BMLT302 (Histology-Cytology –II)	Skill	I	Exfoliative Cytology-Specimen Preparation	04	01
	Skill	II	Exfoliative Cytology- Staining Techniques		01
	Skill	III	Exfoliative Cytology- Benign and Malignant Cells		01
	Skill	IV	Advanced Instrumentation		01
BMLT303 (Parasitology and Blood Cell Disorders-II)	Skill	I	Descriptive study of RBC abnormalities	04	01
	Skill	II	Disorders related to RBC		01
	Skill	III	Normal White Cell Count & Physiological variation		01
	Skill	IV	Disorders related to WBC		01
BMLT304 (Pathogenic Microbiology)	General	I	Pathogenic Microbes, Diagnosis, Prevention and Control	10	01
	General	II	Prevention and Control of Viral Diseases		01
	General	III	Human Mycotic Infections		01
	General	IV	Mechanisms and Control of Parasitic Infections		01
BMLTP301			Practicals of Course BMLT301	02	06
BMLTP302			Practicals of Course BMLT302	02	06
BMLTP303			Practicals of Course BMLT303	02	06
BMLTP304			Practicals of Course BMLT304	02	06
Total Credits				30	

Bachelor of Vocation (Medical Laboratory Technology)

B.Voc. (MLT) Syllabus

Year 3 (B.Voc. Degree)

Semester VI

Course Code	Component	Unit	Topic	Credits	L / Week
BMLT305 (Clinical Laboratory Operations and Management)	Skill	I	Clinical Laboratory Operations and Management	04	04
BMLT306 (Professional Training)	Skill	I	Professional Training for three (3) months at reputed hospital, diagnostic centre, pathology laboratory, research institute, pharmaceutical industry, etc.	04	---
BMLT307 (Project Work)	Skill	I	Student shall carry out the project work in consultation with faculty and industrial partner organizations.	04	---
BMLT308 (Food and Industrial Microbiology)	General	I	Food Microbiology	10	01
	General	II	Contamination, Preservation and Spoilage of Food		01
	General	III	Production Strains Isolation and Screening Techniques		01
	General	IV	Fermentation Products		01
BMLTP305			Practicals of Course BMLT305	02	06
BMLTP306			Practicals of Course BMLT306	02	06
BMLTP307			Practicals of Course BMLT307	02	06
BMLTP308			Practicals of Course BMLT308	02	06
Total Credits				30	

Bachelor of Vocation (Medical Laboratory Technology)

B.Voc. (MLT) Syllabus

Year 1 (Diploma)

Semester I

Part A: Skill Component

Course Code	Title	Credits
BMLT 101	**General & Human Anatomy , Physiology -I**	**04**
	Basics of Human Anatomy-I	
Unit I	Introduction to: Anatomy, epithelial tissue, muscular tissue, nervous tissue. Skeletal System, Structure of bones, types of bones, Bones of cranium, face vertebral column upper and lower limbs.	
	Circulation System: Structure of heart, names and position of main blood vessels.	
	Lymphatic System: Lymph vessels, lymph nodes and lymphoid organs, their structure & functions.	
	Digestive systems.: Parts of gastrointestinal tract and associated glands.(names)	
	Respiratory System:. Parts of Respiratory System.(diagram ,Name, function)	
Unit II	**Basics of Physiology- I**	
	Blood. Composition and function of blood, haemopoesis, blood coagulation. Blood groups, body fluid. Cardiovascular Systems. Circulation of blood. function of heart and blood vessels. Control of heart rate, blood volume.(Diagram of heart and Functions in details)	
	Respiratory system.: Function of lungs, (theory) Respiration disorders like anoxia.dyspnea . (Theory) lung function tests.(theory)	
	Digestive Systems:. Digestion of food in mouth, stomach & small intestines. Absorption of food, function of liver. (formation of bilirubin & other functions in detail)	
	Basic English	
	Grammar	
	Use of Articles and Prepositions, Tense, Transformation of	

Unit III	Sentences, Parts of Speech, Idioms and Pharses, Vocabulary a) Synonyms b) Antonyms c) One Word Substitution d) Homophones & Homonyms, Punctuations, Common Errors, Spelling in English	
	Composition	
	Formal & Informal Writing, Precise, Essay Writing, Report Writing,	
	Reading Comprehension	
Unit IV	**Human Values and Professional Ethics**	
	Introduction	
	Need, basic guidelines, content and process for Value Education, Self Exploration- its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration. Continuous Happiness and Prosperity- basic Human Aspirations, Right , Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Happiness and Prosperity .A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels	
	Implications of Harmony on Professional Ethics	
	Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order , Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and ecofriendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: at the level of individual: as socially and ecologically responsible engineers, technologists and managers, at the level of society: as mutually enriching institutions and organizations	

Course Code	Title	Credits
BMLT 102	**Routine Laboratory Techniques-I**	**04**
Unit I	**Human Healthcare and Safety Regulations**	
	Basic causes of accidents, common types of laboratory accidents. First aid in laboratory	
	Human health and Homeostasis, medical care in India, Medical Laboratories of developing countries, Importance of Biomedical Waste. NABL and SOP	
	Organization of Laboratory	
	Functional components of clinical laboratories,(cleanliness, precautions to be taken WRT patients ,reports, analysis. Communication between physician ,patients, and the medical laboratory professional, basic needs of clinical laboratory technician, awareness of soft skills,.	
	Basic Laboratory Equipments	
	Identification, use, maintenance and care of common laboratory glassware and equipments, handling of all glassware ,,use, principle and care of centrifuge, colorimter, oven, incubator, microscope, Newber's chamber, Autoclave.etc .	
	Automation	
	Semiautoanalysers	
Unit II	**Introduction to Haematology and Routine tests**	
	Components of blood and their functions, Haematopoietic systems of the body	
	Haematological Diseases	
	Anaemia and various types of anemias, Thalssemias, Polycythemia, Leukemia, hemolytic disease of new born,multiple myoloma, parasitic infections of blood	
Unit III	**Specimen Collection**	
	Specimen collection for hematological studies	
Unit IV	**Laboratory Preparation in Hematology**	
	Cleaning of Laboratory glassware in hematology	

Course Code	Title	Credits
BMLT103	**Special Laboratory Techniques-I**	**04**
	Biochemical Test Profile - I (Quantitative determination of blood, plasma and serum)	

Unit I	Acid Phosphatase (ACP), Alkaline Phosphatase (ALP), Amino acids, Bilirubin, Cholesterol, Creatinine, Creatine Phosphokinase (CPK), SGOT,SGPT,Uric Acid, Urea, TSH	
	Biochemical Test Profile (Quantitative determination of Urine)	
	Amylase, Calcium, Chlorides, Creatinine, Sodium, Potassium, Glucose, Proteins, Urea nitrogen, uric acid	
Unit II	**Biochemical Test Profile – II (Quantitative determination of CSF)**	
	Chlorides, Glucose, Proteins	
	Sterilization Techniques	
	Definition & Methods, principles, bacteriological filtration, irradiation, tyndalization	
	Elementary Knowledge of Chemistry- I	
Unit III	**Elementary Knowledge of Inorganic Chemistry**	
	Structure of atom, atomic weight, molecular and equivalent weight. Acids, bases and salts. pH indicators (pH meter, pH paper, universal indicator). Molar solutions, normal solutions, buffer solutions, percent solutions, saturated solutions, standard solutions	
	Elementary Knowledge of Organic Chemistry	
	Organic compounds, aliphatic, aromatic, alcohol, ethers, phenols, acids, etc.	
	Elementary Knowledge of Chemistry- II	
Unit IV	**Elementary Knowledge of Physical Chemistry**	
	Osmosis, osmotic pressure, diffusion, hypotonic, hypertonic and isotonic solutions. Definition and classification of some colloids and crystalloids.	
	Elementary Knowledge of Analytical Chemistry	
	Principles, instrumentation, working, uses, care, maintenance : balances,- monopan, twopan, toppan, centrifuges, pH meter, colorimeter, spectrophotometer, florimeter, flame photometer, ion selective electrodes, urinometer, chromatograph, electrophoresis, densitometer.	

Part B: General Education Component

SUBJECT: ZOOLOGY

Course Code	Title	Credits
BMLT 104	**Cell Biology and Biodiversity –I**	**03**
UNIT I	**Microscopy and Organization of Cell -I**	
	Methods in Cell Biology : Principles of light and electron microscopes, fixation & fixatives, staining techniques. Organisation of Cell : Extra nuclear and nuclear. Plasma : Structure, Osmosis, active and passive transport, endocytosis and exocytosis Endoplasmic reticulum: Structure, types and associated enzymes. Mitochondria Structure, mitochondrial enzymes and the role of mitochondria in respiration and mitochondrial DNA. Golgi complex : Structure and functions. .	
UNIT II	**Microscopy and Organization of Cell -II**	
	Ribosomes : Types of ribosomes, their structure and functions. Lysosomes : Polymorphism and their function Centrosome : Structure and functions. Nucleus : Structure and functions of nuclear membrane, nucleolus and chromosomes. An elementary idea of cell transformation in Cancer. An elementary idea of cellular basis of immunity.	
UNIT III	**Systematic study of Animals - I**	
	Detailed study of the following animal types : Protozoa : Amoeba, Paramecium and Plasmodium. Prtozoa (Porifera) : Sycon , Cnidaria (Coelenterata): Obelia Classification upto orders with brief ecological note and economic importance (if any) of the following: Protozoa : Entamoeba, Trypanosoma, Giardia, Noctiluca, Eimeria, Opalina Vorticella, Balantidium and Nyctotherus. Parazoa (Porifera) : Grantia, Euplectella, Hyalonema and Spongilla. Cnidaria (Coelenterata) : Hydra, Sertularia, Plumularia, Obelia, Tubularia, Bougainvillea, Porpita, Velella, Physalia, Rhizostoma Millipora, Aurelia, Alcyonium, Tubipora, Zoanthus, Metridium, Madrepora, Favia, Fungia and Astrangia.	

UNIT IV	**Systematic study of Animals - II**	
	Detailed study of the following animal types : Platyhelminthes: Fasciola, Taenia Aschelminthes : Ascaris, Parasitic adaptations in Helminths. Annelida : Pheretima Classification upto orders with brief ecological note and economic importance (if any) of the following: Platyhelminthes : Dugesia, Schistosoma and Echinococcus. Aschelminthes: : Ascaris, Oxyuris, Wuchereria. Annelida: Nereis, Polynoe, Eunice, Arenicola, Aphrodite, Amphitrite, Chaetopterus, Tubifex and Pontobdella.	

SUBJECT: BIOCHEMISTRY

Course Code	Title	Credits
BMLT 105	**Biomolecules**	**03**
	Structure, Functions and Classification of Amino Acids and Proteins	
UNIT I	Amino Acids & Proteins : Introduction to Bio-chemistry. Water as a biological solvent. Dissociation of water. Buffer solution. Henderson Hasselbalch equation. Amino Acids : Common structural features. Stereoisomerism and RS system of designating optical isomers. Classification based on the nature of "R" groups. Amino acids present in proteins and non-protein amino acids. Specialized role of amino acids. Physical and Chemical properties of amino acids. Titration of amino acids. Peptide Bonds : Rigid and planar nature of a peptide bond. Folding of peptide chains into regular repeating structures (helix, pleated sheets). turn in polypeptides. Chemical synthesis of polypeptides. Biologically active peptides. Proteins : Levels of protein structure. Determination of primary structure of proteins. Forces stabilising structure and shape of proteins. Native proteins and their conformations. Behaviour of proteins in solutions. Salting in & salting out of proteins. Denaturation of proteins.	

	Structural and functional diversity of proteins, fibrous proteins (keratins, collagen & elastin), globular proteins (hemoglobin, myoglobin) and conjugated proteins.	
UNIT II	**Structure, Functions and Classification of Carbohydrates**	
	Carbohydrates : Definition and classification of carbohydrates. Fischer and Haworth structures of carbohydrates. Stereoisomerism, and mutarotation. Anomeric forms of monosaccharides. Derivatives of monosaccharides (glycosides, deoxysugars, amino sugars and other derivatives of biological importance). Oligosaccharides (structure of maltose, lactose, sucrose, cellobiose, trehalose, raffinose). Characteristic reactions of monosaccharides : Reactions with hydrazine, hydrogen cyanide, hydroxylamine; reduction and oxidation of sugars; periodic acid oxidation; action of alkali upon sugars; acylation and methylation of sugars. Homo-and hetero-polysaccharides (structures of amylose, amylopectin, starch, inulin, pectins, dextrins, glycogen, cellulose, chitin). (GAGs) as components of connective tissue. Polysaccharides of bacterial cell well.	
UNIT III	**Structure, Functions and Classification of Lipids**	
	Lipids : Definition and classification of fatty acids (saturated and unsaturated). Essential fatty acids. Important reactions of functional groups present in fatty acids. Characteristics of fatty acids and fats (saponification, iodine, acid, acetyl and peroxide values). Refractive index, m. p., b. p. and their relation to molecular size. Properties of glycerol. Fats as source of energy. Waxes. Structures, characteristics and functions of lipids : Triacylglycerols, phospholipids : lecithins (Phosphotidyl Cholines), lysolecithins, cephalins (Phosphotidyl ethanolamines), Phosphatidyl serines, phosphatidyl inositol, sphingomyelins, plasmalogens), cerebrosides, gangliosides, sulfatides. Lipoproteins—Composition, classification and biological	

	functions. Liposomes. Terpenes and Steroids—Terpenes of biological significance e.g. carotenes, phytol. Cholesterol and other animal sterols. Colour reactions of sterols. Sterols of yeast and fungi (Mycosterols). Phytosterols. Steroidal hormones. Bile acids. Structure and properties of Eicosanoids - Prostaglandins, Leukotrienes, Thromboxanes, Prostacyclins. Structure, sources and biochemical functions of fat soluble vitamins.	
UNIT IV	**Physical and Chemical Properties of Nucleic Acids**	
	Nucleic Acid and Porphyrins : Nucleic Acids : Structure and properties of purine and pyrimidine bases. Nucleosides and nucleotides. Biologically important nucleotides. Double helical model of DNA and forces responsible for it. Shorthand representation of polynucleotides. Denaturation of DNA. Physical and chemical properties of nucleic acids. Methods for isolation, purification and characterization of nucleic acids. Chemical and enzymatic hydrolysis of nucleic acids. Sequencing of polynucleotides. Porphyrins : Porphyrin nucleus and classification of porphyrins. Heme and other metalloporphyrins occurring in nature. Detection of Porphyrins spectrophotometrically and by fluorescence. Chemical nature and physiological significance of bile pigments.	

SUBJECT: MICROBIOLOGY

Course Code	Title	Credits
BMLT 106	**Fundamentals of Microbiology**	**03**
UNIT I	**Introductory Microbiology**	
	History, development, scope and applications of Microbiology. Methods of Microbiology isolation of pure cultures, theory and practice of sterilization. Microscopic examination of micro-organism, bright	

	field microscopy, dark field microscopy, phase contrast microscopy, electron microscopy. Staining of microbes, theory of Gram staining. Nature of Microbial World : Prokaryotes and eucaryotes, growth pattern in microbes	
UNIT II	**Morphology and Structure of Microorganisms**	
	Morphology & fine structure of bacteria, fungi, actinomycete and algae. Organization of cell wall, cell membrane, flagella and capsules in bacteria. Morphogenesis in bacteria, formation of spores and cysts. Animal Viruses : Morphology, cultivation and viral disease cycle. Bacteriophages : Morphology, multiplication, detection and enumeration. Biotransformation of (a) D-Sorbitol to L-Sorbose. (b) Antibiotics. (c) Steroids.	
UNIT III	**Recombinant DNA Technology**	
	Recombinant DNA technology, genetic engineering and gene cloning in micro-organisms. Strategies of genetic engineering. Restriction enzymes, vectors, plasmids. Genetic engineering for human welfare : (a) Production of pharmaceuticals. (b) Insect pest control. (c) Use of Genetically Engineered Micro-organisms (GEMs) for control of pollution	
UNIT IV	**Microbial Ecology and Biotic Interactions**	
	Rhizosphere & Rhizoplane micro-organisms, reasons for increased microbial activity in rhizosphere. Biogeochemical Cycling—Carbon cycle, Nitrogen cycle, Phosphorus & Sulphur cycle. Symbiotic & non-symbiotic Nitrogen fixation biofertilisers & biopesticides. Sewage (waste-water) treatment, chemical characteristics, microbiological characteristics, waste water treatment processes.	

Bachelor of Vocation (Medical Laboratory Technology)

B.Voc. (MLT) Syllabus

Year 1 (Diploma)

Practicals for Semester I

Part A: Skill Component

Sr. No	Experiment	Credits
	BMLTP101 (General –I & Anatomy, Physiology -I)	**02**
1	Study of Epithelial, Muscle, Nerve and mammalian blood cells through permanent or temporary cells	
2	Study of the skeletal system of human beings	
3	To study human respiratory system	
4	To study human circulatory system	
5	To study human digestive system	
6	To study the compound microscope and parts.	
7	To separate the plasma and serum from given blood Sample	
8	To visit the following places, meet people visiting/living/working in that environment, understand their life style, understand value of human life in each environment and share with them the aspects of their joys and sorrows: 1. Charitable and Government Hospitals 2. Orphanages 3. Old age homes 4. Training Institute for handicapped 5. Drug De-Addiction centers 6. Schools in rural areas 7. Industries 8. Slums 9. Jails (The students shall prepare their project note books during each visit mentioning their experience about life of the people to whom they visited)	

	BMLTP102 (Routine Laboratory Technology-I)	**02**
9	To indentify and to study applications of the different laboratory instruments. (A)Hot air oven. (B) centrifuge. (C)autoclave (D)burettes & pipettes (E)colorimeter (F)neubauer's Chamber	
10	Determination of haemoglobin concentration by sahil's method	
11	Determination of haemoglobin concentration by cyanmeth Method	
12	Determination of total erythrocyte(RBC) count	
13	Determination of leukocyte (WBC) count	
14	Determination of pack cell volume (PCV)	
15	Determination of erythrocyte sedimentation rate (ESR)	
16	Determination and calculation of red blood indices MCH,MCH,MCHC	
17	Study of differential leukocyte count	
18	Determination of absolute Eosinoehil count	
19	Determination of platelet count	
	BMLTP 103 (Special Laboratory Technology-I)	**02**
20	Principals and working of laboratory instruments	
21	Importance and methods of cleaning of glass apparatus	
22	Calibration of apparatus and glasswares	
23	Preparation and standardization of volumetric solutions	
24	Basic titration such as acid vs alkali, silver nitrate vs sodium chloride	
25	Preparation of buffer solution and measurement of their pH	
26	Verification of Beer Lamber's Law	
27	Determination of blood sugar level of plasma (or serum) (a) Orthotoluidine method, (b) Glucose oxidase method	
28	Determination od the serum urea nitrogen (a) Diacetyl monoxime method	
29	Determination of serum creatinine : Alkaline picrate method	
27	Determination of serum total cholesterol	

28	Determination of serum bilirubin (a) Malloy and Evelyn (b) DMSO method	
29	Determination of serum glutamate pyruvate transaminase (SGPT) and serum glutamate Oxaloacetate transaminase (SGOT) End point reaction	
30	Sterilization Techniques	

Part B: General Education Component

Course Code	Title	Credits
BMLTP 104	**Cell Biology and Biodiversity –I**	**01**
1	Classification upto orders with ecological notes and economic importance, if any, of the following animals : Protozoa : (a)Examination of cultures of Euglena and Paramecium. (b)Slides : Amoeba, Euglena, Trypanosoma, Monocystis, Paramoecium (Binary fission and cjtin , Parazoa (Porifera) : Specimens : Sycon, Grantia, Euplectella, Hyalonema, Spongilla, Euspongia. Cnidaria (Coelenterata) : (a) Specimens : Porpita, Velella, Physalia, Aurelia, Rhizostoma Metridium, Millipora, Alcyonium, (b) Slides : Hydra (W.M.) Hydra with buds. Obelia (colony and medusa). Sertularia, Plumularia. Platyhelminthes : (a) Specimens : Dugesia, Fasciola, Taenia, (b) Slides : Miracidium, Sporocyst, Redia, Cercaria of Fasio , Scolex nottio ,Tamate Alm n s:Ac is ma e nd fe le ric ll , An ylo t . Ali : :Ph etima e is, Hete one i , olyno , Eun ce, Arthropoda : Peripatus, Prawn, Lobster, Cancer (Crab), Sacculina, Eupagurus (Hermit crab), Lepas, Balanus, Apis, Lepisma (Silver Fish), Schistocerca (Locust), Poecilocerus, (Ak Grasshopper), Gryllus	

	(Cricket), Mantis (Preying Mantis) Cicada, Forficula (Earwig) Cimex, Scarabaeus (Dung beetle), Agrian (Dragon fly), Odontotermes Mollusca: Anodonta, Mytilus, Ostrea, Cardium, Pholas, Solen (Razorfish) Pecten, Haliotis, Patella, Aplysia, Doris, Ehindermta : seschiu , Ohrxa Aneon , Hehordata alanossus	
2.	CELL BIOLOGY Paper chromatography. Gel electrophoresis through photographs or through research laboratories. Familarity with TEM & SEM. Study of different ultrastructures of cell organelles through photographs.	

Course Code	**Title**	**Credits**
BMLTP 105	**Biomolecules**	**01**
1.	Qualitative tests for : (a) Carbohydrates. (b) Amino acids and proteins , (c) Cholesterol and lipids	
2.	Determination of saponification value of fats	
3.	Determination of Iodine value of fats	
4.	Estimation of ascorbic acid by dye method	
5.	Titration curve for amino acids and determination of pKa value	
6.	Verification of Beer-Lambert Law for nitrophenol or cobalt chloride	
7.	Estimation of Amino acids by ninhydrin method	
8.	Estimation of Protein by biuret method	
9.	Estimation of Carbohydrate by anthrone method.	

Course Code	Title	Credits
BMLTP 106	**Fundamentals of Microbiology**	**01**
1.	Use of microscope in examination of unstained bacteria, fungi, algae, parasites and stained cell preparations including simple staining, Gram's staining, acid fast staining, capsule staining, spore staining using prokaryotic and eukaryotic cells, hanging drop preparation.	
2.	Preparation of culture media, spread plates, pour plates, selective media, differential media.	
3.	Separation of pure cultures and study the effect of selective nutrients on prokaryotes.	
4.	Isolation of Soil Bacteria, Soil Fungi, Soil Actinomycets	
5.	Selective media for Soil microflora and use of growth factors, Study of Rhizosphere interactions, Quantitative measurements of Soil nutrients and Rhizosphere microflora and preparation of starter cultures of Rhizobia, Azotobacter.	

Bachelor of Vocation (Medical Laboratory Technology)

B.Voc. (MLT) Syllabus

Year 1 (Diploma)

Semester II

Part A: Skill Component

Course Code	Title	Credits
BMLT107	**General & Human Anatomy, Physiology -II**	**04**
	Basics of Human Anatomy-II	
	Urinary System.: Parts of Urinary System.(name, Function)	
Unit I	Endocrine System: Various endocrine glands. Thyroid. Parathyroid. Adrenal glands pituitary pancreas. Thymus and sex glands.(detail function of each gland & clinical significance)	
	Reproductive System. Male & female Reproductive organs.(name & function)	
	Nervous System.: Parts of brain, spinal cord, peripheral nerves.(function)	
	Basics of Human Physiology-II	
Unit II	Excretory Systems:. Structure & function of kidney and urinary bladder. Mechanism of urine formation. disorders of kidney.	
	Reproductive Systems: Physiology of reproductive organs.	
	Nervous System: Neurone & its function,.	
Unit III	**Basics of Computer Skills**	
	Data, information,properties , Types of information. computing files,internet,server. Introduction to computer: Introduction to associated terms like CPU,storage devices, peripherals output & input devices etc.	

	MS WORD: Basic. Making new document, editing.formating the text(text: border,color, spacing,copying the text, undo,Redo,repeate) Formatting: Paragraph alignment,(line spacing, paragraph spacing, paragrph indents) Borders paragraph border, shading. Spelling and grammar,	
	COLUMNS: typing text by defining columns, converting text to column & columns to text	
	TABLES: selecting the table, insertion of raw .columns text ,merging the cell converting table to text and text to table insert date ,time, foot notes header footer, end notes. MS WINDOW: making new file, folders. saving data	
Unit IV	**Communication Skills**	
	The Types of Business Communication	
	Introduction, Business Communication,The Classification, Functions & Scope of Business Communication, Internal Communication, External Communication,	
	The Communication Process	
	Elements of Communication, The Communication Cycle, The Barriers To Communication	
	The Principles of Communication	
	Introduction, The Medium of Communication, Accuracy, Brevity, Clarity, Courtesy, Conclusion	
	The Modes of Communication	
	Oral, written, messenger service, postal service, FAX, Electronic mail	
	The Essentials of Written Communication	
	Office stationery and forms, telephone and FAX equipments, Computers with internet connection	

Course Code	Title	Credits
BMLT 108	**Routine Laboratory Technology-II**	**04**
Unit I	**Routinue Haematological Tests**	
	Determination of hemoglobin concentration ,determination of haematocrit , enumeration of formed elements ,calculations of red blood cell indices - MCV, MCH,and MCHC, Automated systems in haematology ,study of blood smear , Reticulocyte count, Erytrocyte sendimantation rate (ESR) Eosinophil count , platelet count	
Unit II	**Urine Examination**	
	Urine analysis, routine examination of urine, rapid chemical tests of Urine	
	Clinical significance, specimen collection, laboratory investigation, Clinical significance, specimen collection, laboratory investigation	
Unit III	**Stool Examination**	
	Gross examination, physical examination of stool, determination of pH, chemical examination of feces, microscopic examination of stool specimen	
	Clinical significance, specimen collection, laboratory investigation, Clinical significance, specimen collection, laboratory investigation	
Unit IV	**Semen Examination**	
	Semen analysis, routine examination of semen, quantitative determination of semen fructose, interpretative semen analysis, examination for the presence of sperms	
	Sputum Examination	
	Indication, collection, container, transport, preservation for different types of sputum analysis. Physical examination and its significance, chemical examination and its significance. Microscopic examination and its significance.	

Course Code	Title	Credits
BMLT 109	**Special Laboratory Technology-II**	**04**
Unit I	**Basic Microbiology** Classification , morphology and physiology of bacteria, anatomy of bacterial cell, growth requirement of bacteria-growth curve, nutrients required. Gram positive & Gram negative Bacteria. Normal flora of human body.	
Unit II	**Introduction to serology** Antigens, antibodies, structure and classes of antibodies, monoclonal antibodies and its uses. Collection and preparation of specimen,	
Unit III	**Serological Tests** Serological test for syphilis (STS),Agglutination- 4 tests ,C-reactiveprotein test (CRP) ,Rheumatoid arthritis test (RA) ,Serodignosis of streptococcal infection .HBsAg, HIV-1(Rapid TriDot test) Widal test, Tuberculine test	
Unit IV	**Staining Techniques** Gram positive & Gram negative Bacteria. Difference between cocci & bacteria, virus(definition ,properties & example) Sputum test for AFB	

Part B: General Education Component

SUBJECT: ZOOLOGY

Course Code	Title	Credits
BMLT 110	**Ecology and Biodiversity-II**	**03**
	Systematic study of Animals - III	
UNIT I	Detailed study of the following animal types Arthropoda : Periplanata, Prawn, Social organizations in insects (honey bee and termite), life cycle of Anopheles and Culex. Classification up to orders with ecological notes and economic importance (if any) Arthropoda : Peripatus, Prawn, Lobster, Cancer,(Crab) Sacculina, Eupagurus (Hermit crab), Lepas, Balanus, Apis, Lepisma (Silver Fish), Schistocerca (Locust), Poecilocerus, (AkGrasshopper), Gryllus (Cricket), Mantis (Preying Mantis) Cicada, Forficula (Earwig) Scarabaeus (Dung beetle), Agrian (Dragon fly),Odontotermes, (Termite queen), Cimex (Bed bug), Cicindela (Tiger beetle), Polistes (Wasp), Bombyx (Silk moth), Julus (Millipede), Scolopendra (Centipede) Palamnaeus (Scorpion) Aranea (Spider) and Limulus (King crab).	
	Systematic study of Animals – IV	
UNIT II	Mollusca : Pila Echinodermata : Asterias, Echinoderm larvae. Hemichordata : Balanoglossus, External characters and affinities. Classification up to orders with ecological notes and economic importance (if any) Mollusca : Chiton, Anodonta, Mytilus, Ostrea, Cardium, Pholas, Solen (Razor Fish), Pecten, Haliotis, Patella, Aplysia, Doris, Limax, Loligo, Sepia, Octopus, Nautilus shell and Dentalium. Echinodermata : Echinus, Cucumaria, Ophiothrix and Antedon. Hemichordata : Balanoglossus.	
	Ecosystem –I	
UNIT III	Ecology - Scope of ecology and subdivisions. Ecosystem - Components, ecological energetics, food web, introduction to major ecosystems of the world. Ecological factors - Temperature, light and soil as ecological factors.	

	Nutrients : Biogeochemical cycles & concept of limiting factors. Ecological : Morphological, physiological and behavioural adaptations in animals in different habitats. Population : Characteristics and regulation of population.	
UNIT IV	**Ecosystem-II**	
	Inter and intra - Competition, predation, parasitism, commensalisms & specific relationships & mutualism. Biotic community - Characteristics, ecological succession, ecological niche. Natural resources - Renewable and nonrenewable natural resources and their conservations. Environmental Degradation. - Causes, impact and control of environmental pollution.	

SUBJECT: BIOCHEMISTRY

Course Code	Title	Credits
BMLT 111	**Enzymology and Bioenergetics**	**03**
UNIT I	**Enzymes**	
	General Characteristics : Introduction to enzymes. General characteristics of enzymes. Prosthetic group. Holoenzymes, apoenzyme and cofactors. Coenzymes and their biochemical functions, assay of enzyme activity, units of enzyme activity. Active sites(s) of enzymes. IUB system of nomenclature and classification of enzymes. Enzymes as catalysts. Theories of enzymes catalysis : Proximity and orientation effects, acid base catalysis, covalent catalysis. Role of metals in enzyme catalysis.	
UNIT II	**Enzyme Purification and Chromatography Techniques**	
	Enzyme Purification : Need for purification. Preliminary fractionation procedures and precipitation techniques, Chromatography methods : Gel filtration—, adsorption–, ion exchange–and affinity chromatography. Types of support materials. Selection of appropriate conditions and elution procedures. Criteria of enzyme purity.	
	Enzyme Kinetics	
	Enzyme Kinetics : Factors affecting velocity of enzyme catalysed reactions : Enzyme concentration, pH and	

UNIT III	temperature. Michaelis –Menten equation. Determination of Km and its significance. Enzyme inhibition. Various types of enzyme inhibitions. Determination of Ki value. Enzyme inhibitors and their importance. Introduction to multisubstrate enzymes. Allosteric enzymes and enzyme regulation. Isoenzymes and their clinical significance. Bioenergetics :	
UNIT IV	**Bioenergetics**	
	Biological systems and concept of free energy, Endergonic processes and role of ATP & other high energy compounds. Biological oxidations. Redox potential. Enzymes and co-enzymes involved in oxidations and reductions. Mitochondrial electron transport chain and oxidative phosphorylation. Mechanism of oxidative phosphorylation.	

SUBJECT: MICROBIOLOGY

Course Code	Title	Credits
BMLT 112	**Microbial Physiology —Metabolism**	**03**
UNIT I	**Microbial Nutrition, Cultivation, Isolation and Preservation**	
	Microbial Nutrition: Requirements for Growth. Physical requirement (Temperature, pH, osmotic pressure), chemical requirements (C, N, S, P, O). Culture Media : Chemically defined media, complex media, anaerobic growth media, selective & differential media, and enrichment culture. Cultivation of Aerobes and Anaerobes. Microbial Growth : Growth in population, bacterial growth curve, mathematical nature and expression, measurement of growth in bacteria, Factors affecting growth in microorganisms, continuous cultures and synchronous cultures.	
UNIT	**Enzyme Regulation**	
	Enzymes and their Regulation: Chemical and physical properties of enzymes. Nomenclature of Enzymes.	

II	Mechanism of enzymes action. Inhibition of enzyme action. Regulation of enzymes.	
UNIT III	**Microbial Metabolism –I**	
	Microbial Metabolism : Respiration and fermentation. Glycolysis, Pentose Phosphate pathway, The Entner Doudoroff pathway, Fermentation. Tricarboxylic acid cycle. Catabolism of lipid, proteins. Glyoxylate cycle. Beta oxidation.	
UNIT IV	**Microbial Metabolism –II**	
	Microbial Utilization of Energy & Biosynthesis : Transport of nutrient by bacteria. Biochemical mechanisms of generation of ATP. Synthesis of Amino Acids : Glutamate, lysine, glutamine, serine, arginine family. Structures and biosynthesis of cell wall peptidoglycan. Biosynthesis of Carbohydrates (gluconeogenesis) & Phospholipids. Replication of DNA molecules, Transcription & Translation (process of protein synthesis). Bacterial Genetics : Conjugation, Transformation, Transduction (generalized transduction, specialized transduction), The Regulation of Gene Expression : Lac operon, tryptophan operon.	

Bachelor of Vocation (Medical Laboratory Technology)

B.Voc. (MLT) Syllabus

Year 1 (Diploma)

Practicals for Semester II

Part A: Skill Component

Sr. No	Experiment	Credits
	BMLPT107 (General –I & Anatomy, Physiology -I)	**02**
1	To study human urinary system	
2	To study human reproductive system	
3	To study human nervous system	
4	To measure the blood pressure of human being	
5	To measure the body weight and height and calculate BMI of a human (body mass index)	
6	Introduction to the word	
7	Introduction to the excel	
8	Introduction to the internet	
	BMLTP108 (Routine Laboratory Technology-II)	**02**
10	To prepare of the 1/10 N HCL	
11	To prepare the different concentration of solutions.	
12	To prepare different bulbs required in the laboratory	
13	To determine the nature of the given solution	
14	To find out the normality of given solution	
15	Routine examination of urine (physical examination of urine)	
16	Determination of specific gravity of urine by urinometer and refractormeter	

17	Chemical examination of urine.	
18	Microscopic examination of urine	
19	Physical and chemical examination of semen	
20	Microscopic examination of semen	
21	Physical examination of stool	
22	Chemical examination of stool	
23	Microscopic examination of stool	
24	Determination of reducing substances in stool	
25	Routine examination of sputum	
	BMLTP109 (Special Laboratory Technology-II)	**02**
26	Preparation of smear	
27	Monochrome staining (simple staining)	
28	Gram's staining	
29	Study of motility of capsule	
30	Study of bacterial capsule	
31	Study of acid fast bacilli	
32	Study of malerial parasite	
33	Isolation of bacteria by streak plate techniques	
34	To perform qualitative widal test	
	BMLTP107 (On Job Training)	

Part B: General Education Component

SUBJECT: ZOOLOGY

Course Code	Title	Credits
BMLTP 110	**Ecology and Biodiversity-II**	**01**
1.	Study of the following permanent stained preparations : L.S. and T.S. Sycon, gemmules, spicules and spongin fibres of a sponge. T.S. Hydra (Testis and ovary region). T.S. Fasciola (Different regions). T.S. Ascaris (Male & female). T.S. Pheretima (Pharyngeal and typhlosolar regions); setae, septal nephridia, spermathecae and ovary of Pheretima ,Trachea, mouth parts of Periplanata Radula and osphradium of Pila. T.S. Star fish (Arm).	
2.	Preparation of the following slides : Temporary preparation of Paramecium, mouth parts of Periplaneta (cockroach), radula of Pila & appendages of Prawn. Preparation of permanent whole mount stained in borax carmine of Hydra, Obelia. Sertularia, Plumularia and`Bougainvillea.	
3.	Dissections of the following animals : Pheretima : Digestive, reproductive and nervous systems. Periplanata : Digestive and nervous systems; mouth parts and trachea. Pila : Pallial complex, digestive and nervous systems	
4.	ECOLOGY :Study of animal adaptations with the help of specimens, charts and models. Study of Zoogeographical regions and their fauna. Study of biotic components of an ecosystem. Study of different types of nests in birds. Study & preparation of zoogeographical charts.	

Course Code	Title	Credits
BMLTP 111	**Enzymology and Bioenergetics**	**01**
1.	Assay of serum alkaline phosphatase activity	
2.	Effect of pH on enzyme activity	
3.	Effect of Temperature on enzyme activity	
4.	Effect of substrate concentration on enzyme activity	
5.	Inhibition of alkaline phosphatase by EDTA	

Course Code	Title	Credits
BMLT 112	**Microbial Physiology —Metabolism**	**01**
1.	Measurement of Soil Enzymes.	
2.	Use of ultraviolet light for its germicidal effect.	
3.	The replica plating technique.	
4.	Presumptive, confirmed and completed tests for safety of water supplies.	
5.	Effect of temperature, Osmotic pressure, energy source etc. on growth of prokaryotes	
6.	Relation of free oxygen to microbial growth, monitoring of dissolved oxygen in various effluents	
7.	Determination of COD in Industrial effluents.	
8.	Effects of antimetabolites on Microbial culture (Inhibition by Sulfanilamide).	
9.	Determination of Water Activity of various substrates and assay of surface active agents.	
10.	Turbidimetric/spectrophotometric monitoring of growth using liquid cultures. Efficiency of photosynthesis in photoautotrophs.	

Bachelor of Vocation (Medical Laboratory Technology)

B.Voc. (MLT) Syllabus

Year 2 (Advanced Diploma)

Semester III

Part A: Skill Component

Course Code	Title	Credits
BMLT 201	**Hematology and Blood Banking-I**	**04**
Unit I	**Special Heamatological Tests**	
	Special Heamatological tests & factors in Haemoglobin synthesis & automation	
	Screening of sickle cell anaemia, Estimation of foetal haemoglobin, Haemoglobin electrophoresis, Osmotic fragility test, Heinz body preparation, Laboratory diagnosis of protozone blood parasites, Lupus erythematosus (LE) cell preparation, Preparation of bone marrow smear for microscopic examination , Cytochemical tests.	
	Autoanalysis- Electrolyte acid base balance	
	Acid base balance	
	Interpretation of lab findings in Haematology	
	Anaemias, Leukaemias, Miscellaneous disorders.	
Unit II	**Haemostasis & Bleeding Disorders**	
	Introduction to Haemostasis & coagulation	
	Heamostasis,Mechanism of blood coagulation, Fibrinolysis.	
	Laboratory Investigation & Bleeding Disorders	
	Laboratory preparation for coagulation tests , Routine coagulation tests, (prothrombin time , plasma recalcification time ,partial thromboplastin time , activated partial thromboplastin time, thrombin time,Laboratory diagnosis of bleeding disorders .	

Unit III	**Immunohaematology & Blood Transfusion**	
	Principles of Immunohaematology & Clinical of Blood Transfusion	
	Principles of immunohaematology,Human blood group systems,(basic ABO blood group systems, Clinical significance of blood transfusion.	
	Collection & Processing of blood for transfusion	
	Preparation for blood collection, Blood collection, Transportation of blood after collection , storage of blood, Preparation and use of blood components.	
Unit IV	**Routine Lab Procedures in Blood Bank**	
	Routine Lab procedures in Blood Bank	
	Specimen collection for blood bank, General laboratory reagents in blood bank . Preparation of laboratory regents in blood bank ,Reporting of haemagglutination reaction, ABO blood grouping Rh blood typing Antihuman globulin (AHG) or crossmatching	
	Transfusion reactions & Haemolytic Disease of a new born	
	Blood transfusion process, Transfusion reaction , Haemolytic disease of the newborn .	

Course Code	Title	Credits
BMLT 202	**Microbiology and Serology**	**04**
Unit I	**Laboratory Diagnosis of Mycotic and Emerging Infections**	
	Introduction to Microbiology	
	Disease oriented microbiology,culture & sensitivity test,aerobic, anaerobic techniques	
	Laboratory Diagnosis of Mycotic infections	
	Introduction to Fungi and parasitic fungi, specimen collection, Laboratory diagnosis of mycotic infections, Diagnostic mycology	
	Emerging / New infections in human being	
Unit II	**Diagnostic Microbiology**	
	Diagnostic Microbiology & Micro Techniques	
	Role of microbiology laboratory,specimen handling , laboratory records, safety Regulations,Basic procedures of Diagnostic Rapid and automation methods in Diagnostic Microbiology,Culture environments of microbes , Quality control in microbiology, Quick reference of media and biochemical tests	
	Lab Diagnosis of parasitic infections	

	Collection and handling of faecal specimen, Laboratory techniques in parasitological investigation of stool, Processing of specimens other than stool, Lab identification of human parasites	
	Serology	
Unit III	**Serology : Introduction & Serological Lab Procedures**	
	Principles of immunologic reactions, serodiagnosis. Collection and prepration of specimen,Serological test for syphilis (STS),Agglutination tests ,C-reactive protein test (CRP) ,Rheumatoid arthritis test (RA) ,Serodiagnosis of streptococcal infection ,Serodiagnostic tests for miscellaneous disorders, Immunologic test for pregnancy RIA, ELISA	
	Parasitology	
	Introduction, Protozoa, Helminths, Medical Entomology	
Unit IV	**Bacteriology**	
	Bacteriology	
	Gram positive - streptococcus, staphylococcus, bacillus, mycobacterium, corynebacterium, Gram negative - E-coli, Klebsiella, Salmonella, shingela, Vibrio, Pseudomonas	
	Diagnostic & Systemic Bacteriology	
	Staphylococcus, Streptococcus, spirochaetes, mycoplasma, rickettsiae etc, Systematic grouping of pathogenic bacteria , Laboratory identification of infectious agents, Diagnosis of anaerobic infections , idenifying characteristics of common pathogenic bacteria,Antimicrobial susceptibility test. IMViC, Urease, catalase, geletine liquification, coagulase, oxidase, sugar fermentation, antibiotic sensitivity test.	

Course Code	Title	Credits
BMLT 203	**Clinical Pathology and Biochemistry**	**04**
Unit I	**Miscellaneous Body Fluids**	
	Lab Examination of Miscellaneous Body Fluids	
	Cerebrospinal fluid ,Laboratory investigation ,Serous fluids, Synovial fluid.	
	Routine Biochemical Tests	
	Phosphatases, transaminases, lactic dehydrogenase , Creatine kinase , Electrolytes ,Blood gases and bicarbonate, Determination of serum / plasma bicarbonate	

Unit II	**Biochemical Test Profile**	
	Normal & Abnormal Biochemical processes of the body (Basic physiology and biochemistry of the body)	
	Basic physiology and biochemistry of the body , interrelated metabolic processes of the body.	
	Biochemical Test Profile	
	Liver tests ,Renal tests, Endocrine function tests, Lipid profile, Transaminase, LDH, CPK, CPK-MB, SGPT/SGOT/ Amylase.GTT	
Unit III	**Analytical Techniques**	
	Basic Steps of Analytic Techniques	
	Basic steps in analytical chemistry, titrimetry photometry, Electrochemistry, Immuno - chemistry, Seperation and analysis of organic compounds	
	Principles of Analytic Techniques	
	Principles of analytical chemistry, titrimetry, photometry, Electrochemistry, Immunochemistry.	
Unit IV	**Biochemical Processes**	
	Normal & Abnormal Biochemical processes of the body (Biochemical changes in the body under pathological conditions)	
	Biochemical changes in the body under pathological conditions.	
	Normal & Abnormal Biochemical processes of the body (Functions of various organs and their clinical assessment)	
	Functions of various organs and their clinical assessment	

Part B: General Education Component

SUBJECT: BIOCHEMISTRY

Course Code	Title	Credits
BMLT 204	**Metabolism**	**03**
UNIT I	**Carbohydrate Metabolism**	
	Digestion & Absorption of Carbohydrates : Metabolic Pathways of Carbohydrates, Glycolysis and alcoholic fermentation, The Pentose Phosphate Pathway, Glucuronate and glyoxylate pathway, TCA cycle, Glycogenolysis & Glycogenesis, Gluconeogenesis, Biosynthesis of starch, Biosynthesis of Ascorbic acid.	
UNIT II	**Lipid Metabolism**	
	Digestion & Transport of Lipids : -Oxidation of fatty acids including odd chain fatty acids. α -and ω- oxidation of fatty acids Degradation of triglycerides and phospholipids. Formation and utilization of ketone bodies. Biosynthesis of saturated and unsaturated fatty acids. Biosynthesis of triglycerides and phospholipids, biosynthesis of cerebrosides; sulfatides and gangliosides. Biosynthesis of Cholesterol. Biosynthesis of Prostaglandins, Thromboxanes, Leukotrienes, Lipoxins and Prostacyclins.	
UNIT III	**Protein Metabolism**	
	Digestion of Proteins : General Reactions of Amino Acids : Deamination, transamination and decarboxylation. Urea cycle. Catabolism of Carbon Skeletons of Amino Acids : Glycine and Alanine, Serine and threonine, Phenylalanine and Tyrosine, Tryptophan, Histidine, Leucine, Valine and Isoleucine, Cysteine and Methionine, Lysine, Glutamic acid and Glutamine, Aspartic acid and Asparagine. Biosynthesis of Nutritionally Non-Essential Amino Acids : Glutamate and Glutamine, Aspartate and Asparagine, Proline, Alanine, Cysteine & Selenocysteine, Tyrosine, Serine, Glycine.	
UNIT IV	**Nucleic Acids**	
	Nucleic Acids : Degradation of purines and pyrimidines. Biosynthesis of purines, pyrimidines and nucleotides. Catabolism of Heme & Formation of Bile pigments. Biosynthesis of porphyrins and heme. Conjugation of bilirubin and its clinical significance.	

SUBJECT: MICROBIOLOGY

Course Code	Title	Credits
BMLT 205	**Pathogenic Microbiology**	**03**
UNIT I	**Infectious Diseases**	
	Brief introduction to terminology of Infections diseases, Frequency of disease, Recognition of Infectious disease, Infections, Disease cycle, Virulence and mode of transmission, Emerging and reemerging Infectious diseases, Global travel & Health considerations, Nosocomial Infections.	
UNIT II	**Microbes of Medical Importance**	
	Nomenclature and classification of microbes of medical importance. Origin of the Normal Flora, Germfree and Gnotobiotic Life, Distribution and occurrence of Normal Flora of Skin, Eye, Respiratory Tract, Mouth, Intestinal Tract & Genitourinary Tract.	
UNIT III	**Mode of Microbial Infections**	
	Microbial adherence, Passive Penetration into body, Active Penetration into body, Events in Infection following penetration, Microbial virulence factors.	
UNIT IV	**Antimicrobial Drugs**	
	Development of chemotherapy, General characteristics of antimicrobial drugs, Determining level of antimicrobial activity, Mechanism of action of antimicrobial agents, factors influencing the effectiveness of antimicrobial drugs, Antibacterial drugs viz. sulfonamides, Quinolones, Penicillins, Cephalosporins, Tetracyclines, Erythromycin, Chloramphenicol, Drug Resistance, Antifungal and Antiviral drugs.	

Bachelor of Vocation (Medical Laboratory Technology)

B.Voc. (MLT) Syllabus
Year 2 (Advanced Diploma)

Practicals for Semester III

Part A: Skill Component

Sr. No	Experiment	Credits
	BMLTP201(Hematology and Blood Banking-I)	**02**
1	To study sickling test using 2% sodium metabisulphite	
2	Determination of reticulocyte count.	
3	Determination of prothrombin time	
4	Determination of glucose-6-phosphate dehydrogenase(G-6-PD)	
5	Determination of serum sodium and potassium using flame photometer/commercial kit	
6	Determination of serum chloride	
7	Determination of bleeding time	
8	Determination of blood clotting time 1.capillary method 2.tube method	
9	Qualitative test for ABO grouping with antisera by slide method	
10	Qualitative test for ABO grouping with antisera by tube method	
11	Qualitative test for Determination of D(Rho) antigen on human red blood cells. 1.tube method 2.slide method	
12	Determination of D by tube method.	
13	To perform cross matching test by saline-tube method	
14	To perform direct coomb's test	
15	To perform indirect coomb's test	

16	Determination of the anti-D antibody titer	
17	Determination of the foetal haemoglobin	
	BMLTP202 (Microbiology and Serology)	**02**
18	Study of gram's staining	
19	Study of acid fast bacilli by ZNCF(hot stain)staining	
20	Demonstration of bacterial capsule by negative staining. (india ink method)	
21	Demonstration of bacterial motility by hanging drop preparation	
22	Isolation of microorganism by streak method	
23	To perform biochemical test 1.IMVic test 2.Catalase test 3.Coagulase test 4.Oxidase test 5.Gelatin liquefaction test 6.Urease test	
24	Identification of organism from urine sample.	
25	Identification of organism from pus sample.	
26	Antibiotic sensitivity test from stalk culture or biological specimen using commercial plates and discs	
27	Identification of ova/cyst from given stool sample. 1.iodine preparation 2.saline preparation	
28	Identification of malarial parasite by using blood smear.	
29	To perform widal test-by tube method or slide method	
30	To perform VDRL test/RPR	
31	To perform RA test by latex agglutination	
	BMLTP203 (Clinical Pathology and Biochemistry)	**02**
13	Estimation of blood sugar level of plasma (or serum) (a) orthotoluidine method (b)glucose- oxidase method	
14	To perform pregnancy test by dipstick method	
15	Estimation of the serum urea nitrogen.	

	(a)diacetyl monoxime method.	
16	Estimation of serum creatinine. (a)alkaline-picrate method.	
17	Determination of protein in blood Albumin, globulin	
18	Determination of serum bilirubin. (a)malloy and evelyn. (b)DMSO method.	
19	Estimation of serum total cholesterol.	
20	Determination of serum glutamate pyruvate transaminase(SGPT) and serum glutamate oxaloacette tranasaminase(SGOT) (a)end point reaction	
21	Determination of serum alkaline phosphatase	
22	To perform glucose tolerance test	

Part B: General Education Component

Course Code	Title	Credits
BMLTP 204	**Metabolism**	**01**
1.	Estimation of blood glucose by the methods of (i) Folin Wu (ii) Nelson Somogyi.	
2.	Isolation and assay of glycogen from rat liver.	
3.	Estimation of Ca+ in serum	
4.	Estimation of total and free cholesterol in serum.	
5.	Estimation of total lipids in serum by Vanillin method.	
6.	Estimation of proteins by Lowry's method.	
7.	Estimation of Lipoproteins in plasma	
8.	Colorimetric estimation of inorganic phosphate.	

Course Code	Title	Credits
BMLTP 205	**Pathogenic Microbiology**	**01**
1.	Stainings – Gram's, Alberts, ZNCF.	
2.	Isolation and Maintenance of Pure Cultures.	
3.	Physiological characteristics of bacteria and its use for their identification.	
4.	Assay of antimicrobials.	
5.	Preparation of serum/plasma.	
6.	Sterilization – Introduction to autoclave, hot air oven, filter sterilization.	

Bachelor of Vocation (Medical Laboratory Technology)

B.Voc. (MLT) Syllabus

Year 2 (Advanced Diploma)

Semester IV

Part A: Skill Component

Course Code	Title	Credits
BMLT 206	**Clinical Biochemistry and Microbiology-I**	**04**
Unit I	**Metabolic Disorders & Deficiency**	
	Diagnostic Test profile	
	Other than biochemical tests profiles i.e. ANC, Arthritis, Cardiac, Hypertension, Anaemia.	
Unit II	**Clinical Endocrinology**	
	Hormonal studies & Clinical Endocrinology	
	Thyroid, Pancreas, Adrenal & Sexual glands, hormones & it's diagnostic significance.	
Unit III	**Body Fluid Specimen Processing**	
	Specimen processing for biochemical analysis	
	Blood, Urine, Cerebrospinal fluid, Body fluids	
	Automation in Clinical Biochemistry Laboratory	
	Classification of automated systems , steps of automation in biochemical analysis, some commonly used automated analysers of biochemical laboratories	
Unit IV	**Blood Banking**	
	Blood Banking	
	Organization, operation, administration of bank and maintenance of records, government regulation (FDA)	

Course Code	Title	Credits
BMLT 207	**Histology-Cytology -I**	**04**
Unit I	**Introduction to Histology**	
	Introduction to Histology & Cytotechnology	
	Basic terminology , Laboratory equipment for histology and cytology , Use and care of frequently used equipment , Preparation of reagent solutions	
Unit II	**Tissue Processing**	
	Lab techniques in histology: Tissue Processing	
	Logging of specimen, preparation of tissues , processing of tissues , Frozen section technique , Handling and embedding of small tissue fragments.	
Unit III	**Staining Procedures**	
	Lab techniques in histology: Staining Procedures	
	Routine staining procedure in histotechnology , special stains and staining techniques , stains for particular substances	
Unit IV	**Instrumentation in Histocytotechnology**	
	Instrumentation in Histocytotechnology	
	Autoanalyser, Tissue Processor, Microtome	

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Course Code	Title	Credits
BMLT 208	**Parasitology and Blood Cell Disirders-I**	**04**
Unit I	Medical Parasitology	
Unit II	Common Intestinal worms	
Unit III	Malarial parasites, Filarial parasites	
Unit IV	Lab. diagnosis of Parasitic infections	

Part B: General Education Component

SUBJECT: BIOCHEMISTRY

Course Code	Title	Credits
BMLT 209	**Biochemical Techniques**	**03**
UNIT I	**Spectroscopic Techniques**	
	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 II	**Electrophoretic Techniques**	
	Electrophoretic Techniques : Principles and applications of the following electrophoresis techniques. Paper and gel electrophoresis, high voltage electrophoresis, SDS-PAGE : Discontinuous electrophoresis, isotachophoresis, isoelectric focussing and immunoelectrophoresis. Centrifugation Techniques : Various centrifugation techniques and their applications in Biochemistry. Preparative and analytical ultra- centrifugation procedures. Application of partial specific volume, diffusion coefficient and viscosity measurements in the study of macromolecules of biochemical importance.	
UNIT III	**Chromatographic Techniques**	
	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	
	Radio Isotopic Techniques	

UNIT IV	Radio Isotopic Techniques : Nature of isotopes and radioisotopes. Radioactive decay. Properties of radioactive emissions. Units of radioactivity. Techniques used to measure radioactivity; GM counter and liquid scintillation counting and gamma counter. Labelling of Biochemical compounds and autoradiography. Use of radioactive tracers in the study of	
	enzyme reaction mechanisms and metabolic pathways. Radioimmuno assay. Biological hazards of radiation and safety measures in handling radioisotopes	

SUBJECT: MICROBIOLOGY

Course Code	Title	Credits
BMLT 210	**Immunology**	**03**
UNIT I	**Introduction to Immunology**	
	Introduction and history of Immunology, Non-specific Defense; Physical Barriers, Chemical Barriers, Phagocytosis, Inflammation, Fever, Types of Immunity, Active & Passive Immunity, Immunological memory, Primary & Secondary Lymphoid organs, Mucosa Associated Lymphoid tissue (MALT), Cutaneous Associated Lymphoid Tissue (CALT), Lymphocyte Traffic, Cells of immune system, Antigens; factors affecting Immunogenicity, epitopes, haptens.	
UNIT II	**Humoral Immunity**	
	Humoral Immune Response, Antibodies / Immunoglobulins, Structure, function and type of antibodies, Antigentic-combining regions of antibodies, factors influencing antibody production, Genetic model, Multigene Organisation, generation of antibody diversity.	
UNIT III	**Cell Mediated Immunity**	
	Cell Mediated Immune System, Mechanism of CMI, Types of effector T Cells, Helper T-cells, Suppressor, T-cells, cytotoxic T cells, Killer T cells, Cytokines, Lymphokines, Colony Stimulating factors, Tumour Necrosis factor, Interferons, Accessory cells (Macrophages), the Complement System, Classical and Alternate pathway, HLA, Monoclonal antibody technology and its applications, Interactions between B and T lymphocytes.	
	Antigen-Antibody Interactions	

UNIT IV	Antigen-Antibody Interactions : Precipitation reaction, Immuno-diffusion test, counter current Immuno electrophoresis, complement fixation tests, Widal test, Wasserman's test, Weil Felix reaction, Western Blotting, Types of vaccines.	

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B.Voc. (MLT) Syllabus

Year 2 (Advanced Diploma)

Practicals for Semester IV

Part A: Skill Component

Sr. No	Experiment	Credits
	BMLT P206 (Clinical Biochemistry and Microbiology-I)	**02**
1	Puncture fluid	
2	Routine examination of peritoneal (ascitic) fluid	
3	Routine examination of pleural fluid	
4	Routine examination of synovial fluid	
5	Routine examination of CSF	
6	Chemical examination of CSF	
7	To determine uric acid in serum.	
8	To determine uric acid concentration of urine.	
9	To estimate serum calcium and phosphorus	
10	To estimate the concentration of serum amylase	
11	To estimate the concentration of CPK total and LDH	
12	To determine serum acid phosphatase	
13	Determination of antistrptolysin O(ASO)	
14	To perform C-reactive protein test (CRP)	
	BMLTP207 (Histology and Cytology-I)	**02**

15	To study autoanalysers	
16	Introduction to chromatography	
	BMLT P208 (Parasitology and Blood Cell Disorders-I)	**02**
17	Routine examination of feces.	
18	Gross examination and physical examination of stool.	
19	Concentration method of microscopic stool examination	
20	Microscopic examination of stool specimen.	
21	Detection of malarial parasite	
22	Detection of trypanosomes(the casual agent of sleeping sickness)	
23	Laboratory diagnosis of kala azar	
24	Laboratory diagnosis of microfilaria(wuchereeia bancrofti)	
25	Quantitative determination of serum (or plasma) igG class antibodies to toxoplasma gondii by ELISA	
26	Determination of IgM class antibodies to toxoplasma gondii by ELISA	

Part B: General Education Component

Course Code	Title	Credits
BMLTP 209	**Biochemical Techniques**	**01**
1.	Separation and identification of amino acids by (i) Paper chromatography (ii) Thin layer chromatography.	
2.	Separation of phospholipids by thin layer chromatography	
3.	Estimation of lactic acid in blood before and after exercise.	
4.	Preparation of starch from potato and its hydrolysis by salivary amylase.	

Course Code	Title	Credits
BMLTP 210	**Immunology**	**01**
1.	Demonstration of Immune organs in dissected animal.	
2.	Demonstration of Immune cells in the smears prepared from Immune organs.	
3.	Complement fixation.	
4.	Antigen-antibody interactions – Agglutination – Precipitation – Blood grouping – Immunodiffusion	

Bachelor of Vocation (Medical Laboratory Technology)

B.Voc. (MLT) Syllabus

Year 3 (B,Voc. Degree)

Part A: Skill Component

Semester V

Course Code	Title	Credits
BMLT 301	**Medical Genetics and Microbiology-II**	**04**
Unit I	**Genetics**	
	Genetics: Genetics disorders, Karyotyping, Electrophoresis and Hybridization techniques	
	Introduction to Medical Genetics (Structures of DNA RNA). Genetic of common diseases.	
Unit II	**CLIA techniques**	
	CLIA techniques	
	Care and handling of laboratory animals	
	Introduction, general care and handling, ethics and legality in use of laboratory animals	
Unit III	**Immunology and Virology**	
	Immunology	
	Immunity/Immune system, innate immunity, adaptive immunity, cells and oragans involved in immune system	
	Virology	
	General characteristics of Viruses, Chemotherapy of Viral diseases, classification of viruses, Oncogenic Viruses, RNA/DNA Viruses,AIDS, Miscellaneous viruses, Structure of viruses, lysogenic cycle, lytic cycle, smallpox, polio, HIV,Hepatitis B	
Unit IV	**Toxicology**	
	Toxicological investigation & Therapeutic drug monitoring	
	Analystical Techniques, drug screening, heavy metals	

Course Code	Title	Credits
BMLT 302	**Histology-Cytology -II**	**04**
Unit I	**Exfoliative Cytology-Specimen Preparation**	
	Diagnostics Exfoliative cytology: Preparation of specimen	
	Prepration of specimens for cytological evaluation ,	
Unit II	**Exfoliative Cytology- Staining Techniques**	
	Diagnostics Exfoliative cytology: Cytological Stains and Staining Techniques	
	Cytological stains and staining techniques ,	
Unit III	**Exfoliative Cytology- Benign and Malignant Cells**	
	Diagnostics Exfoliative cytology: Characteristics of Benign and malignant cells	
	Charecteristics of benign and malignan cells	
Unit IV	**Advanced Instrumentation in Laboratory Technology**	

Course Code	Title	Credits
BMLT 303	**Parasitology and Blood Cell Disorders-II**	**04**
Unit I	**Descriptive study of RBC abnormalities**	
	Descriptive study of RBC abnormalities	
Unit II	**Disorders related to RBC**	
	Disorders related to RBC	
Unit III	**Normal white cell count & physiological variation**	
	Normal white cell count & physiological variation	
Unit IV	**Disorders related to WBC**	
	Disorders related to WBC	

Part B: General Education Component

SUBJECT: MICROBIOLOGY

Course Code	Title	Credits
BMLT 304	**Pathogenic Microbiology**	**03**
UNIT I	**Pathogenic Microbes, Diagnosis, Prevention and Control**	
	Introduction to important diseases caused by Streptococcus, Pneumococcus, Neisseria, Corynebacterium, Bacillus, Ciostridium, enterobacteriaceae (Proteus, Shigella, Salmonella), Vibrio, Yersinia, Hemophilus, Mycobacterium, The operative pathogenic mechanisms, laboratory diagnosis, prevention and control of these diseases.	
UNIT II	**Prevention and Control of Viral Diseases**	
	Morphology, pathogenesis, life cycle, laboratory diagnosis, prevention and control of viral diseases viz. Rabies, Polio, Small pox, Herpes, Measles, Influenza and AIDS.	
UNIT IIII	**Human Mycotic Infections**	
	Introduction to Human mycotic infections viz Cryptococcosis, Dermatophytosis, Blastomycosis, Opportunisitc Mycosis; Candidiasis and Aspergillosis.	
UNIT IV	**Mechanisms and Control of Parasitic Infections**	
	Life cycle, pathogenic, mechanisms and control of parasitic infections viz. amoebiasis, Kala-azar, toxoplasmosis, ascariasis, filarasis, hook worm infections.	

Year 3 (B.Voc.Degree)

Practicals for Semester V

Part A: Skill Component

Sr. No	Experiment	Credits
	BMLT P301 (Clinical Biochemistry and Microbiology-II)	**02**
1	To detect hepatitis-B surface antigen(HBsAg)	
2	To detect HIV antibodies	
3	To perform haemoglobin electrophoresis	
4	To perform electrophoresis	
5	To determine T4 by RIA/ELISA method	
6	Visit to animal house and demonstration about care of laboratory animals	
	BMLTP302 (Histology and Cytology-II)	**02**
7	**T**issue processing by using tissue processor	
8	Sharpening of the microtome knife	
9	Gross examination and fixation of the specimen	
10	Decalcification of calcified tissue	
11	Processing of the tissue by manual method	
12	Section cutting of paraffin wax embedded tissue	
13	To fix the section on the slide	
14	Staining of the tissue section by using hematoxylin and eosin staining method	

	BMLTP 303 (Parasitology and Blood Cell Disorders-II)	**02**
15	Preparation of staining of blood smear	
16	Study of morphology of blood cells	
17	Blood cells disorder in leukemia	
18	Screening for sickle cell anemia	
19	Determination of osmotic fragility of red blood cells	
20	Determination of fetal hemoglobin.	
21	Preparation of lupus erythromatosus(LE) cell	
22	Preparation of Heinz bodies	
23	Microscopic examination of bone marrow smear	
24	Detection of presence of iron in bone marrow smear	
25	Laboratory tests for diagnosis of aplastic anemia	
26	Investigations of megaloblastic anemia	
27	Laboratory tests in iron deficiency anemia	
28	Laboratory test for diagnosis of hemolytic disorders.	

Part B: General Education Component

Course Code	**Title**	**Credits**
BMLTP 304	**Pathogenic Microbiology**	**01**
1.	Identification of both gram positive and gram negative microorganisms on the basis of : (i) Morphology. (ii) Bio-chemical characteristics. (iii) Serological reactions.	
2.	Demonstration of pathogens (Viruses, fungi, parasites) in permanent mounted slides.	
3.	Demonstration of cysts/ovas of protozoa/Helminths.	
4.	Demonstration of Laboratory grown fungi on sabauraud's agar.	
5.	Germ tube test for candida albicans.	
6.	Demonstration of fungi through normal saline/KOH preparation.	

Year 3 (B.Voc. Degree)

Semester VI

Part A: Skill Component

Course Code	Title	Credits
BMLT 305	**Clinical Laboratory Operations and Management**	**04**
Unit I	Reagent preparation**:** The metric system, preparation of molar, normal, percent solutions Buffers, Acid, Base, pH (Definition and examples) Lab calculations and graphs.	**200 Marks** (Theory = 100 Marks Practical= 100 Marks)
	Clinical sample collection e.g. Blood, Urine, Stool examination, Saliva sample, Sputum sample, Semen analysis etc.	
	Preparing and maintaining Lab records: Labeling of sample, ;.(making, entries storage, annexes), management of histopathology records.	
	Reporting results : a. Basic format of a test report, b. Release of examination results c. Alteration in reports	
	Quality Management system : Internal and External quality control	
	Biomedical waste management in a clinical laboratory : Disposal of used samples, reagents and other biomedical waste	
	Calibration and Validation of Clinical Laboratory instruments	
	Ethics in Medical laboratory Practice : Pre-Examination procedures, Examination procedures, Reporting of results, Preserving medical records, Access to Medical laboratory Records	
	Audit in a Medical Laboratory	
	Documentation	

	Professional Training	**04**
BMLT 306	Professional Training for three (3) months at reputed hospital, diagnostic centre, pathology laboratory, research institute, pharmaceutical industry, etc. (Student shall submit the valid certificate of completion of training issued by the concern organization to the college for the award of B.Voc. degree) **(Professional Training completed / obtained by the student for 3 months will be included in this semester for 200 marks)**	**200 Marks**
	Project Work	**04**
BMLT 307	Student shall carry out the project work in consultation with faculty and industrial partner organizations. **(Project work done by the student will be included in this semester for 200 marks)**	**200 Marks**

Part B: General Education Component

SUBJECT: MICROBIOLOGY

Course Code	Title	Credits
BMLT 308	**Food and Industrial Microbiology**	**03**
	Food Microbiology	
UNIT I	Food as a substrate for microorganisms, Nutritive value of food stuffs, effect of Hydrogen ion concentration (pH), moisture requirement on food, Important food borne diseases viz. Staphyococcal intoxication, Botulism. Salmonellosis, Shigillosis, Qualitative and Quantitative analysis of food components (proteins, fats, lipids, carbohydrates), Microbiological examination of food products including dairy products, food poisoning caused by bacteria and fungi.	
UNIT II	**Contamination, Preservation and Spoilage of Food**	
	Contamination, preservation and spoilage in various foods viz. cereals & cereal products (cereal grains, flour, bread, pasta, macroni), sugars & sugars products (Maple, Syrup, Honey, Candy), Vegetables & Fruits, Meat (Fresh meat, fresh beef, hamburger, fish), Milk and Milk products (cheese, butter).	
UNIT III	**Production Strains Isolation and Screening Techniques**	
	Production strains Isolation & screening techniques, preservation and genetic modification of Industrial Microorganisms, Fermentation Media, characteristics of ideal production media, common substrates used in ideal fermentations, Batch and continuous fermentations.	
UNIT IV	**Fermentation Products**	
	Yeasts (Baker's) and its uses, fermentation of Beer, Wine and Alcohol, Production of organic acids viz. acetic acid, lactic acid, propionic and butyric acid and mixed acids. Mass transfer in aerobic fermentation.	

Bachelor of Vocation (Medical Laboratory Technology)

B.Voc. (MLT) Syllabus

Year 3 (B.Voc. Degree)

Practicals for Semester VI

Part A: No Practicals for Skill Component

Part B: General Education Component

Course Code	Title	Credits
BMLTP 308	**Food and Industrial Microbiology**	**01**
1.	Quantitative examination of microbial types in raw processed preserved food stuffs.	
2.	Direct microscopic determination of bacteria in raw, pasteurized milk and reductase test.	
3.	Various biochemical tests and their importance in Food Microbiology.	

Examination Pattern (Semester)

A) Internal Assessment (25%) = 25 Marks

- One periodical test on class instructions 20 Marks
- Active participation (attentiveness/ability to answer questions) 05 Marks

B) Theory External Examination (75%)= 75 Marks

i) **Duration**: These examinations shall be of $2^{1/2}$ Hours duration for each paper

ii) **Theory Question Paper Pattern**:

- There shall be five questions each of 15 marks. On each unit there will be one question and the fifth one will be based on entire syllabus.
- All questions shall be compulsory with internal choice within the questions.
  (Each question will be of 20 to 23 marks with options)
- Question may be subdivided into sub questions a, b, c…. and the allocation of marks depend on the weightage of the topic.

C) Practical External Examination = 50 Marks for each paper

Bachelor of Vocation (Medical Laboratory Technology)

B.Voc. (MLT) List Reference Books

Sr. No.	Title of the Book	Author
01	A guidebook to Biochemistry	Michael Yudkin
02	A Manual of Laboratory & Diagnostic Tests (6/ e)	Frances Fischbach
03	Anatomy & Physiology	Ross and Wilson
04	Anatomy and Physiology	N Murgesh
05	Anatomy and Physiology for nurses	Evelyn Pearce
06	Anatomy and Physiology for nurses	Sears
07	Anatomy and Physiology for nurses	Pearson
08	Anatomy and Physiology: Understanding the Human Body	Clark
09	At the Bench : A Laboratory Navigator	Kathe Barker
10	At the Helm : A Laboratory Navigator	Kathe Barker
11	Atlas of haematology (5/e)	G.A. McDonald
12	Bacterial Metabolism	Gerhard
13	Basic Medical Laboratory techniques	Barbara H. Estridge *et al*
14	Biochemistry	Voet and Voet
15	Biochemistry	Stryer
16	Biochemistry	U. Satyanarayan. & U. Chakrapani
17	Biology in the Laboratory	Doris Helms
18	Biometrics Identity	Sameer Nanawati
19	Biopharmaceutical and Pharmacokinetics	Chatwal, G.R.
20	Biostatistics : A Foundation for Analysis in Health Sciences	Wayne W. Daniel
21	Biotechnological Innovations in Health Care	Butterworth – Heinmann
22	Calculations for Molecular Biology	Stephenson
23	Cell Molecular Biology	Gerald Karp
24	Churchill's Medical Dictionary	Churchill Livingstone
25	Churchill's Medical Dictionary	Churchill Livingstone

26	Clinical Biochemistry	Richard Luxton
27	Clinical Diagnosis & Management by Laboratory method0 (20/e)	John Bernard Henary
28	Clinical Haematology	Christopher A. Ludlam
29	Clinical Laboratory Management	Lynne Shore
30	Clinical Pediatric Neurology	Gerals Fenichel
31	Color Atlas and Synopsis of Clinical Dermatology	Thomas Fitzpatrik
32	Color atlas of basic Histopathology	---
33	Companion to Microbiology	Alan Bull and Paulin Meadow
34	Current topics in AIDS (Volume I)	M.S. Gotlib
35	Di Fiore's Atlas of Histology	Di Fiore
36	Drugs for the heart	Lionrl H. Opie
37	Endocrinology	Headley
38	Fundamental Principles of Bacteriology	Salle, S.J.
39	Gel Electrophoresis of Nucleic Acids	D. RickWood and B.D. Hames
40	Gene VII	Benjamin Lewin
41	Gene VIII	Benjamin Lewin
42	General Microbiology	Stanier
43	Haematology (International edition)	Emmanuel C.Besa
44	Haematology (Pathophysiological basis for clinical practice (3/e)	Stephen M. Robinson
45	Haematology for students Practitioners	Ramnik Sood
46	Hand book of Medical Laboratory Technology (2/e)	V.H. Talib
47	Hospital Acquired Infections	Dr. V. Muralidhar
48	Human Physiology	Andrew Davis
49	Immunology	Riott
50	Immunology	Rao, C.V.
51	Immunology	Kuby
52	Immunology	Roitt, Jonathaan Brostoff and David Male
53	Immunology and Serology	Joshi
54	Instrumental Analysis	Chatwal Anand
55	Laboratory Reference	Jane Roskams
56	Manual of Endocrinology and Metabolism	Norman Levin
57	Medical Bacteriology	Peter Hawkey
58	Medical Bacteriology	Peter Hawkey
59	Medical Dictionary	Oxford
60	Medical Informatics	Mohan Bansal
61	Medical Laboratory Management	Sangeeta Sharma *et al*

62	Medical Laboratory Sciences, Theory & Practical	A. Kolhatkar
63	Medical Laboratory Technology – Volume I	Kanai Mukherjee
64	Medical Laboratory Technology – Volume II	Kanai Mukherjee
65	Medical Laboratory Technology – Volume II	Kanai Mukherjee
66	Medical Laboratory Technology Methods & Interpretation (5/e)	Ramnik Sood
67	Medical Microbiology	Paniker & Satish Gupte
68	Medical Microbiology	Paniker & Satish Gupte
69	Medical Mycology	Dr. Jagdish Chander
70	Medical Parasitology	R.L. Ichhpujani and Rajesh Bhatia
71	Medicinal Chemistry	Ashutosh Kar
72	Microbiology	Pelczar
73	Microbiology	Prescott
74	Molecular and antibody Probes in Diagnosis	Mathew R. Walker
75	Molecular and Antibody Probes in Diagnosis	Mathew R. Walker
76	Molecular Biology in Medicine	Timothy M. Cox
77	Molecular Biology in Medicine	M. Cox
78	Molecular Biotechnology	Glick
79	Neurodegenerative Diseases	Donald B. Calne
80	Outline of Biochemistry	Conn Stumpf
81	Pharmaceutical Microbiology	Hugo
82	Pharmacology	H.P. Rang
83	Physicians' Desk Reference	Edward Barnhart
84	Practical Clinical Biochemistry	Harold Varley
85	Practical Haematology	J.B. Dacie
86	Practical Haematology (8/e)	Sir John
87	Practical Medical Microbiology - (Volume I and II)	Mackie & MacCartney
88	Practical Medical Microbiology - (Volume I and II)	Mackie & MacCartney
89	Principal of Biochemistry	M. A. Siddiqi
90	Principles of Biochemistry	David L. Nelson
91	Principles of Biochemistry	Lehninger
92	Principles of Clinical Toxicology	Gosses
93	Principles of Clinical Toxicology	Thomas

94	Principles of Genetics	Gardner
95	Principles of Internal Medicine	Isselbacher
96	Proteins and Proteomics : Laboratory Manual	Richard J. Simpson
97	Purifying Proteins for Proteomics: Laboratory Manual	Richard J. Simpson
98	Research Methodology in Medical Sciences	Chandorkar
99	Text book of Medical Biochemistry	Chaterjee & Shinde
100	Text book of Microbiology	Ananthanereyan
101	Text book of Parasitology	N.C. Dey
102	Text book of Parasitology	Chaterjee
103	Textbook of Biochemistry and Human Biology	G.P. Talwar
104	Textbook of Medical Laboratory Technology	Godkar and Godkar
105	Textbook of Medical Physiology	Guyton and Hall
106	Zinsser Microbiology	Joklik and Willett
107	Oxford Practical Grammar	Eastwood, John
108	Essential English Grammar	Murphy, Raymond
109	Practical Communication Skills	Chrissie Wright
110	Business Communication	Sinha, K. K.
111	Business English	Taylor, Ken.
112	English Vocbulary in Use	Mccarthy, Micheal.
113	Business Letters, Emails	Shirley Taylor
114	The Craft of Business Letter Writing	Monipally, M. Matthew.
115	Presentations Laws	Anne
116	Telephoning and Teleconferencing Skills	Ken Taylor
117	Business and Administrative Communication	Locker, o. Kitty
118	Presentation Skills in English	Bob Dignen
119	Public Speaking	Osbrn, Micheal
120	Communication in Organisation	Dalmer Fisher
121	Keep Talking : Communicative Fluiency Activities for Language Teaching	Friederike Klippel
122	A Handbook for English Language Laboratories	E. Sureshkumar
123	Cambridge Idioms Dictionary	Cambridge
124	Write to the Point : How to Communicate in business with style and purpose	Salvatore J. Iacone
125	Commercial Correspondence and Office Management	R. S.N. Pillai
126	Comdex Computer Course Kit	Gupta, V.
128	Computer Fundamentals	P.K. Sinha

129	Excel 2010 Inside Out	Dodge, Mark
130	Information Technology for Management	Lucas, Henry C.
131	A Foundation Course in Value Education	R R Gaur, R Sangal, G P Bagaria, 2009
132	Fundamentals of Ethics for Scientists & Engineers	E G Seebauer & Robert L. Berry, 2000
133	Human Values, New Age International Publishers	A.N. Tripathy, 2003
134	Environment Biology	Agarwal, K. C. 2001
135	Environment Protection and Laws	Jadhav, H & Bhosale, V.M. 1995
136	Waste Water Treatment	Rao M. N. & Datta A.K. 1987
137	Environment Science (1st Indian Edition)	Daniel D. Chiras 2010
138	Essentials of Environment Science	Joseph
139	Environment Pollution Control Engineering	Rao, C.S.
140	Perspectives in Environmental Studies	Kaushik, A.
141	Clinical Biochemistry	G. Guru
142	Handbook of Biochemistry	M.A. Siddique
143	Textbook of Medical Biochemistry	S. Ramkrishnan
144	Biochemical Techniques	K. Choudhary
145	Blood Banking Operations	G. Gurur
146	Blood Banking Training Manual	Indian Society for Blood Banking
147	Practical Medical Microbiology	Mackie and MacCartney
148	Textbook of Medical Microbiology	R. Ananthnarayan and C.K. J. Paniker
149	Invertebrate Zoology	E.L. Jordan / V.S. Verma
150	Concepts of Ecology	N. Arunumugam
151	Essentials of Cytology	C.B. Powar
152	Cell Biology , Genetics and Evolution	N. Arunumugam
153	Zoology of F.Y.B.Sc. Volume I and II	S.S. Bhattacharya
154	Zoology of S.Y.B.Sc. Volume I , II and III	S.S. Bhattacharya & S.G. Yeragi
155	Molecular Biology	V.S. Verma & V.V. Agrawal
156	Embryology, Ecology and Physiology	N. Arunumugam
157	Manual of Zoology	Ekumarnath Ayyer
158	Fundamentals of Cytogenetics & Genetics	Mahabali Ram
159	Human Anatomy, Physiology & Health Education	Harie R. Berasari , Gandhi & Goel