

VIDYASAGAR UNIVERSITY



Bachelor of Medical Laboratory Technology (BMLT)

**Revised Syllabus Under CBCS
(w. e. f. 2022-2023)**

**Vidyasagar University
Midnapore 721102
West Bengal**

VIDYASAGAR UNIVERSITY

Curriculum for Bachelor of Medical Laboratory Technology [Choice Based Credit System (CBCS)]

Year	Semester	Course Type	Course Code	Course Title	Credit	L-T-P	Marks			
							CA	ESE	TOTAL	
Semester-I										
1	I	Core-1	BMLTCC1	CC1T: Human Physiology	6	4-0-0	10	40	50	
				CC1P: Human Physiology Lab		0-0-4			50	
		Core-2	BMLTCC2	CC2T: Biochemistry and Biophysics	6	4-0-0	10	40	50	
				CCP: Biochemistry and Biophysics Lab		0-0-4			50	
		GE-1	BMLTGE1	GE1.1T : Community Medicine Or GE1.2T : Health Programmes in India	6	5-1-0	20	80	100	
	AECC-1	BMLTAECC1	Communicative English	2	1-1-0	10	40	50		
	Semester –I: total					20			350	
	Semester-II									
	II	Core-3	BMLTCC3	CC3T: Human Anatomy	6	4-0-0	10	40	50	
				CC3P: Human Anatomy Lab		0-0-4			50	
Core-4		BMLTCC4	CC4T: Diagnostic Laboratory instrumentation	6	4-0-0	10	40	50		
			CC4P: Diagnostic Laboratory instrumentation Lab		0-0-4			50		
GE-2		BMLTGE2	GE2.1T : Laboratory and Patient safety, Medical Law and Ethics Or GE2.2T : Medical Laboratory Total Quality Management	6	5-1-0	20	80	100		
AECC-2		BMLTAECC2	Environment Science and Health	4	2-0-0	20	80	100		
Semester-II : total					22			400		

Year	Semester	Course Type	Course Code	Course Title	Credit	L-T-P	Marks				
							CA	ESE	TOTAL		
Semester-III											
2	III	Core-5	BMLTCC5	CC5T: Basic and Clinical Haematology	6	4-0-0	10	40	50		
				CC5P: Basic and Clinical Haematology Lab		0-0-4					
		Core-6	BMLTCC6	CC6T: Medical Microbiology 1: Bacteriology	6	4-0-0	10	40	50		
				CC6P: Medical Microbiology 1: Bacteriology Lab		0-0-4					
		Core-7	BMLTCC7	CC7P: Clinical Immunology and Serology	6	4-0-0	10	40	50		
				CC7P: Clinical Immunology and Serology Lab		0-0-4					
		GE-3	BMLTGE3	GE3.1T :Pathological Basis of Diseases Or GE3.1T : Medical Lab Diagnostic	6	5-1-0	10	40	50		
		SEC-1	BMLTSEC1	SEC1.1T: Professionalism & human values Or SEC1.2T: Hospital Waste Management	2	2-0	10	40	50		
		Semester – III : total					26				400
		Semester-IV									
IV	IV	Core-8	BMLT CC8	CC8T: Basic Pathology	6	4-0-0	10	40	50		
				CC8P: Basic Pathology Lab		0-0-4					
		Core-9	BMLTCC9	CC9T: Diagnostic Microbiology 2: Mycology and Virology	6	4-0-0	10	40	50		
				CC9P: Diagnostic Microbiology2: Mycology and Virology Lab		0-0-4					
		Core-10	BMLTCC10	CC10T: Applied Histopathology and Cytopathology	6	4-0-0	10	40	50		
				CC10P: Applied Histopathology and Cytopathology Lab		0-0-4					
		GE-4	BMLTGE4	GE4.1T : Medical Biotechnology Or GE4.2T : Genetics and Health	6	5-1-0	10	40	50		
		SEC-2	BMLTSEC2	SEC2.1T: Blood Bank and Blood transfusion SEC2.2T: Immunohematology	2	2-0-0	10	40	50		
		Semester – IV : total					26				400

Year	Semester	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
							CA	ESE	TOTAL
3	V	Semester-V							
		Core-11	BMLTCC11	CC11T: Clinical Pathology	6	4-0-0	10	40	50
				CC11P: Clinical Pathology (Practical)		0-0-4			
		Core-12	BMLTCC12	CC12T: Clinical Biochemistry	6	4-0-0	10	40	50
				CC12P: Clinical Biochemistry (Practical)		0-0-4			
		DSE-1	BMLTDSE1	DSE1.1T: Research Methodology OR DSE1.2T: Health Statistics	6	5-1-0	20	80	100
		DSE-2	BMLTDSE2	DSE2.1T: Forensic Diagnosis OR DSE2.2T: Pharmacology & Toxicology	6	5-1-0	20	80	100
	Semester –V : total					24			400
	VI	Core-13	BMLTCC13	CC13T: Andrology and Endocrinology	6	4-0-0	10	40	50
				CC13P: Andrology and Endocrinology Lab		0-0-4			
		Core-14	BMLTCC14	CC14T: Clinical Parasitology and Entomology	6	4-0-0	10	40	50
				CC14P: Clinical Parasitology and Entomology Lab		0-0-4			
		DSE-3	BMLTDSE3	DSE3.1T: Computer Application OR DSE3.2T : Health Informatics	6	5-1-0	20	80	100
		DSE-4	BMLTDSE4	DSE4.1T : Epidemiology DSE4.2T : Community orientation and clinical visit	6	5-1-0	20	80	100
		Semester – VI : total					24		

Year	Semester	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
							CA	ESE	TOTAL
	VII	Core-15	BMLTCC15	CC15T: Immunopathology and Molecular Biology	6	4-0-0	10	40	50
				CC15P: Immunopathology and Molecular Biology Lab		0-0-4		50	50
		Core-16	BMLTCC16	CC16T: Assisted Reproductive Technology and Human Embryology	6	4-0-0	10	40	50
				CC16:P Assisted Reproductive Technology and Human Embryology Lab		0-0-4		50	50
		DSE-5	BMLTDSE5	DSE5.1T : Onco-pathology OR DSE5.2T : Cellular and System Pathology	6	5-1-0	20	80	100
		DSE-6	BMLTDSE6	DSE6P : Project Work	6	0-0-12			100
		Semester – VII : total				24			
VIII	BMLTSIP (P) : Internship			12				200	
Total in all semester:					178				2950

CC = Core Course, **AECC** = Ability Enhancement Compulsory Course, **GE** = Generic Elective, **SEC** = Skill Enhancement Course, **DSE** = Discipline Specific Elective, **CA**= Continuous Assessment, **ESE**= End Semester Examination, **CT** = Core Theory, **L** = Lecture, **T** = Tutorial, **P** = Practical.

LIST OF CORE COURSES AND ELECTIVES

Core Course (CC)

- BMLTCC1T** : Human Physiology.
BMLTCC1P : Human Physiology Lab
BMLTCC2T : Biochemistry and Biophysics
BMLTCC2P : Biochemistry and Biophysics Lab
BMLTCC3T : Human Anatomy
BMLTCC3P : Human Anatomy Lab
BMLTCC4T : Diagnostic Laboratory instrumentation
BMLTCC4P : Diagnostic Laboratory instrumentation Lab
BMLTCC5T : Basic and Clinical Haematology
BMLTCC5P : Basic and Clinical Haematology Lab
BMLTCC6T : Diagnostic Microbiology 1: Bacteriology
BMLTCC6P : Diagnostic Microbiology 1: Bacteriology Lab
BMLTCC7T : Clinical Immunology and Serology
BMLTCC7P : Clinical Immunology and Serology Lab
BMLTCC8T : Basic Pathology
BMLTCC8P : Basic Pathology Lab
BMLTCC9T : Diagnostic Microbiology 2: Mycology and Virology
BMLTCC9P : Diagnostic Microbiology2: Mycology and Virology Lab
BMLTCC10T : Applied Histopathology and Cytopathology
BMLTCC10P : Applied Histopathology and Cytopathology Lab
BMLTCC11T : Clinical Pathology
BMLTCC11P : Clinical Pathology Lab
BMLTCC12T : Clinical Biochemistry
BMLTCC12P : Clinical Biochemistry Lab
BMLTCC13T : Andrology and Endocrinology
BMLTCC13P : Andrology and Endocrinology Lab
BMLTCC14T : Clinical Parasitology and Entomology
BMLTCC14P : Clinical Parasitology and Entomology Lab
BMLTCC15T : Immunopathology & Molecular Biology
BMLTCC15P : Immunopathology & Molecular Biology Lab
BMLTCC16T : Assisted Reproductive Technology & Human Embryology
BMLTCC16P : Assisted Reproductive Technology & Human Embryology Lab

Discipline Specific Electives (DSE)

- BMLTDSE1.1T**: Research methodology
Or
BMLTDSE1.2T: Health Statistics
BMLTDSE2.1T: Forensic diagnosis
Or
BMLTDSE2.2T: Pharmacology & Toxicology
- BMLTDSE3.1T**: Computer Application
Or
BMLTDSE3.2T: Health Informatics

BMLTDSE4T: Epidemiology

Or

BMLTDSE4T: Community orientation and clinical visit

BMLTDSE5T: Onco-pathology

Or

BMLTDSE5T: Cellular and System Pathology

BMLTDSE6P: Project Work

Skill Enhancement Course (SEC)

BMLTSEC1.1 (T): Professionalism & human values

Or

BMLTSEC1.2 (T): Hospital Waste Management

BMLTSEC2.1 (T): Blood Bank and Blood transfusion

Or

BMLTSEC2.2 (T): Immunohematology

Generic Electives (GE)

BMLTGE1.1 (T): Community Health

Or

BMLTGE1.2 (T): Health Programmes in India

BMLTGE2.1 (T): Laboratory and Patient safety, Medical Law and Ethics

Or

BMLTGE2.2 (T): Medical Laboratory Total Quality Management

BMLTGE3.1 (T): Pathological Basis of Diseases

Or

BMLTGE3.2 (T): Medical Lab Diagnostic

BMLTGE4.1 (T): Medical Biotechnology

Or

BMLTGE4.2 (T): Genetics and Health

Ability Enhancement Compulsory Course (AECC)

BMLTAECC (T): Communication and soft skills- English

BMLTENVS (T): Environment and Health / Occupation and Health

Internship

BMLTSIP (P): Students Industrial Attachment - Internship

Core Course (CC)

Core Course (CC)-01

Credits: 06

BMLTCC1T: Human Physiology

Credits: 04

Course content:

1. General Physiology: Homeostasis: Basic concept, Feedback mechanisms in general, transport across cell membrane.
2. Blood and Body Fluid: Plasma protein, Erythropoiesis & factors affecting erythropoiesis, Anaemia, Jaundice - types. Leucocytes: functions & variation. Thrombocytes - variations, function. Intrinsic & extrinsic pathways of coagulation. Fibrinolytic system. Tests of haemostatic function, like blood glucose, blood pressure, bleeding time, clotting time, Anticoagulants. Bleeding disorders. Blood groups: ABO & Rh system, dangers of blood transfusion.
3. Muscle and Nerve: Structure of skeletal muscle - Molecular mechanism of muscle contraction, neuromuscular junction; Resting potential & Action Potential, synapse structure and signal propagation.
4. Digestive System: Introduction to digestion: Composition, regulation of secretion & functions of saliva, gastric juice & pancreatic juice. Peptic ulcer, Gastritis, movements of small and large intestine, defecation.
5. Excretory System: Formation of Urine: Glomerular filtration rate - definition, normal values, factors influencing G.F.R. Micturition; Role of kidney in the regulation of pH of the blood.
6. Endocrinology: Endocrine function of hypothalamus, anterior pituitary, posterior pituitary, thyroid, adrenal cortex & medulla, pancreatic hormones, PTH,
7. Reproduction: Female reproductive system: Menstrual cycle, functions and hormones of ovary. Ovarian and uterine changes during menstrual cycle. Male reproductive system, spermatogenesis. Hormonal control.
8. Cardio Vascular System: Origin & propagation of cardiac impulse. Cardiac cycle. Heart sounds. Jugular venous pulse, Arterial pulse. ECG. Heart rate, Stroke volume, Cardiac output: factors affecting. Arterial blood pressure: variations, determinants, Regulation of Coronary circulation.
9. Respiratory System: Mechanics of breathing - surfactant, Spirometry: Lung volumes & capacities definition, normal values, significance, Transport of Oxygen & carbon dioxide in the blood. Hypoxia, cyanosis, dyspnoea, periodic breathing. Artificial respiration. Pulmonary function tests.
10. Central Nervous System: Neuronal organization at spinal cord level, Receptors, reflexes, sensations and nerve tracts (Gals and Burdach tract, Pain tract, pyramidal nerve tract), Functions of thalamus, hypothalamus, cerebellum. Cerebral cortex, Pons and medulla, CSF: clinical significance. Autonomic nervous system.
11. Special Senses: Fundamental knowledge of vision, hearing, taste and smell.

BMLTCC1P: Human Physiology Lab

Credits 02

Practical:

1. Study of Microscope and its uses
2. Staining of squamous epithelium
3. Collection of blood and study of haemocytometer
4. Determination of RBC count
5. Determination of WBC count

6. Determination of blood groups
7. Leishman's staining and differential leucocyte count
8. Blood pressure recording
9. Auscultation of Heart sounds
10. Acculturation of breath sounds
11. Determination of Erythrocyte Sedimentation rate(ESR)
12. Determination of packed cell volume(PCV)
13. Pulmonary function tests

Core Course (CC)-02

Credits: 06

BMLTCC2T: Biochemistry and Biophysics

Credits: 04

Course content:

1. Elementary knowledge of general chemistry: atomic weight, Molecular Weight, equivalent weight, molarity and normality.
2. Acid, base and Buffer concept in physiology.
3. Carbohydrates Definition, Source, Classification, Functions and Importance, Physiological importance of major type of carbohydrates.
4. Protein and amino acids – Definition, Source, Classification, essential and non-essential amino acids, Function and Importance of major type of proteins.
5. Lipids - Definition, Source, Classification, Function of major type of lipids. Saturated and Unsaturated type of fatty acids, Essential fatty acids and their importance. Phospholipids and their importance
6. Vitamins and Minerals – Fat-soluble and water-soluble vitamins, Daily requirements, Physiological functions and diseases of vitamin deficiency, minerals – Iron, calcium and Phosphorus. Deficiency and excess of these minerals. Vitamin as co-enzyme, Vitamin D as hormone
7. Bioenergetics, Respiratory chain and biological oxidation
8. Enzymes – Definition, Classification, Mode of action, Factors affecting enzyme action, co-enzyme, co-factor, isoenzyme, Chemical importance of enzyme.
9. Carbohydrate metabolism – Glycolysis, HMP shunt, TCA cycle, Glycogenesis, Glycogenolysis, Neoglucogenesis, Blood sugar level.
10. Lipid metabolism – Fatty acid oxidation, Ketone bodies, Metabolism of cholesterol, Arteriosclerosis and Obesity.
11. Protein metabolism – Transamination, Transmethylation, Deamination, Urea synthesis.
12. Sodium potassium metabolism and their clinical significance.
13. Inborn error of metabolism- PKU, Galactosemia, MSUP, Glycogen storage disease

BCACC2P: Biochemistry and Biophysics Lab

Credits: 02

Practical:

1. Preparation of solution. Calculation of normal, molar and percent solutions.
2. Qualitative identification of Carbohydrate, protein, acetone, Bile salt and cholesterol.
3. Principle and operation of Colorimeter
4. Preparation of different buffers used in pathological laboratory and their pH determination

5. Sodium and Potassium estimation in Serum.
6. Quantification of glucose, lactose and sucrose in a specific sample.

Core Course (CC)-03

Credits 06

BMLTCC3T: Human Anatomy

Credits 04

Course Content:

1. Cell and Tissue: Structure of cell & cell organelles; Types, structure & location of tissues
2. Cardiovascular System: Basic anatomy of heart and important blood vessels
3. Respiratory System: Respiratory system: Basic anatomy of nose, larynx, trachea, bronchi and lungs
4. Digestive System: Basic anatomy of oesophagus, stomach, small intestine, large intestine, liver, gall bladder, pancreas
5. Excretory System: Basic anatomy of kidney, General arrangement of urinary system.
6. Nervous System: Basic anatomy of brain and spinal cord.
7. Reproductive System: Basic anatomy of ovary, testis, uterus, prostate, epididymis.
8. Anatomy of superficial vein.

BCACC3P: Human Anatomy Lab

Credits 02

Practical:

1. Identification of surface land marks of a human body.
2. Study on muscles of trunk, lower and upper extremities and face on a dissected human body.
3. Study on bone on human body with special reference to the origin and insertion of muscles and ligaments.
4. Study on gross anatomy of respiratory, digestive, endocrine, urinary and genital system on a dissected human body.

Core Course (CC) - 04

Credits 06

BMLTCC4T: Diagnostic Laboratory instrumentation

Credits 04

Course content:

1. Microscope: Light microscope, Compound microscope, Phase Contrast microscope, Fluorescent, Polarized, Electron Microscope.
2. Colorimeter: Working Principle, components and its application.
3. Spectrophotometer: Working Principle, components and its application.
4. Centrifuges: Working Principle, types and its application g and rpm.
5. Laminar flow: Working Principle, components and its application.
6. Autoclave: Types, Working Principle, and its application.
7. Incubator: Working Principle, types and its application.
8. Blood cell counter: Working Principle, and its application.
9. ELISA, RIA & CLIA: Types, Working Principle, and its application.
10. Semi and full auto-analyser: Working Principle, and its application.
11. Electrophoresis: Types, Working Principle, and its application.
12. HPLC: Types, Working Principle, and its application.

13. Chromatography
14. Bio-safety cabinet

BMLTCC4P: Diagnostic Laboratory instrumentation Lab

Credits 02

Practical:

1. Demonstration and operation of different microscope (Light microscope, Compound microscope).
2. Demonstration and operation of Colorimeter and spectrophotometer.
3. Demonstration and operation of Centrifuges
4. Demonstration and operation of incubator, hot air oven, laminar flow and autoclave.
5. Demonstration and operation of semiauto analyser and ELISA.
6. Demonstration and operation of blood cell counter.

Core Course (CC)-05

Credits 06

BMLTCC5T: Basic and Clinical Haematology

Credits 04

Course content:

1. Collection and handling of blood- Standardize procedure, phlebotomy tray, Blood film preparation, differences between capillary and venous blood, Anticoagulant used, Phlebotomy and after care.
2. Introduction to Automation in haematology- Principle, advantages, cautions.
3. Overview of haematopoiesis.
4. Principle of Blood grouping, false positive and false negative reaction. Coomb's test/ Du test
5. Blood component separation- principles, preparation & uses
6. Mandatory blood tests in blood banking with donor's blood.
7. Anaemia-Definition, morphological classification and diagnostic tests
8. Normal & abnormal Hb with special reference to Thalassemia. Hb electrophoresis
9. RBC indices & PCV estimation.
10. Overview of WBC production, morphology, common causes of leucocytosis& leukopenia.
11. Classification & lab diagnosis of Leukaemia, Leukaemia vs leukemoid reaction.
12. Flow cytometry- working principle and application
13. Basic concepts of Haemorrhagic disorders, coagulation disorders.

BMLTCC5P: Basic and Clinical Haematology Lab

Credits 02

Practical:

1. Estimation of Hb by Colorimetric method
2. Total count of RBC, WBC & platelet
3. PCV determination& RBC Indices calculation.
4. ESR estimation
5. Drawing of PBS, Romanowsky's stain, Stain preparation, staining of PBS & recognition of cells & DC.
6. Absolute eosinophil count
7. Training at blood bank and submission of report and discussion

8. ABO blood grouping and Rh typing
9. Coombs test
10. Cross matching
11. Reverse grouping
12. Identification of abnormal cells in PBS
13. MPO, PAS stain, SBB staining of Bone marrow smears for differential diagnosis of leukemia.
14. BT, CT, PT, APTT & INR

Core Course (CC) -06

Credits 06

BMLTCC6T: Diagnostic Microbiology 1: Bacteriology

Credits 04

Course content:

1. Bacterial taxonomy; characteristics of bacterial pathogens; Morphology-structure of a typical bacterial cell- size, shape, arrangement; ultra-structures- flagella, pili, cell-wall, cytoplasmic membrane, endospore, capsule, prokaryotic cellular reserve materials
2. Bacterial nutrition, factors influence bacterial growth, microscopic and macroscopic features of bacteria, biochemical identification of medically important bacteria, host microbe interaction, biofilms
3. Control of microbial growth by physical and chemical methods; sterilization, disinfection, sanitization, fumigation, preservation; major groups of antibiotics and their mode of action, antibiotic resistance, antimicrobial susceptibility testing
4. Specimen collection and handing in microbiological laboratory; safety regulation of the laboratory, basic laboratory procedures of diagnostic laboratory.
5. The study of representative medically important bacteria:
 - a. Gram-positive cocci: *Staphylococcus*, *Streptococcus*, *Enterococcus*
 - b. Gram-positive bacilli: *Clostridium*, *Bacillus*, *Corynebacterium*
 - c. Gram-negative bacilli and coccobacilli: *Enterobacteriaceae*, *Acinetobacter*, *Pseudomonas*, *Vibrio*, *Haemophilus*
 - d. Gram-negative cocci: *Neisseria*
 - e. *Mycobacterium*

BMLTCC6P: Diagnostic Microbiology 1: Bacteriology Lab

Credits 02

Practical:

1. Sterilization techniques and cleaning of glassware.
2. Preparation of culture media
3. Culture techniques of different clinical specimens
4. Semi-quantitative urine analysis
5. Bacterial culture preservation and transport
6. Biochemical identification of medically important bacteria.
7. Staining techniques: Gram staining, AFB stain, Albert stain, endospore stain
8. Antimicrobial susceptibility testing by disc diffusion.

Core Course (CC) -07**Credits 06****BMLTCC7T: Clinical Immunology and Serology****Credits 04****Course content:**

1. Basic concept of Immune system.
2. Types of immunity, cellular, humoral, active, passive, natural, and acquired immunity. Primary and secondary immune organs.
3. Immunoglobins—type, structure and their specific importance.
4. Antibody development and antigen-antibody reaction, type of reaction.
5. Basic concept of immunization. Primary and secondary response of immunization. Vaccination and Booster dose.
6. Basic concept of immunodeficiency diseases.
7. Basic concept of immunosuppression - role in organ transplantation.
8. Auto immune disease: Hashimoto's disease, myasthenia gravis, RA and Lupus erythematosus.
9. Basic types of hypersensitivity.
10. Collection and preparation of specimen used in serological laboratory.
11. Principle of sero-diagnostic tests: precipitation, flocculation, agglutination, neutralization and coagulation, immunochemotherapy
12. Serological test for syphilis (STS) and VDRL, CRP, RPR test.
13. WIDAL test for Salmonella typhi.
14. Serodiagnosis test for dengue, AIDS, SARS-CoV, TORCH panel test.
15. Immunological test for pregnancy (direct and indirect).
16. Intradermal hypersensitivity test – Mantoux test.
17. ASO test.

BMLTCC7P: Clinical Immunology and Serology Lab**Credits 02****Practical:**

1. Determination of 'ABO' blood grouping and 'Rh' typing.
2. Antibody measurement by Radial immuno-diffusion (RID) technique.
3. Antigen-Antibody reaction testing by precipitating ring. Ouchterlony test.
4. Quantitative assay of Immunoglobins in plasma(IgG,IgM).
5. Study of precipitation, agglutination and coagulation test.
6. VDRL test, WIDAL test, RPR, ASO test, SARS-CoV2.
7. CRP test, RA test, AIDS test, STS test.
8. Immunological test for pregnancy (direct and indirect).
9. Mantoux test.

Core Course (CC) -08**Credit 06****BMLTCC8T: Basic Pathology****Credit 04****Course content:**

1. Neoplasia- Definition, Benign vs malignant tumour, commonly used different laboratory tests in diagnosis of malignant lesions.
2. Hemodynamics- Overview, Basic concept of septic shock.

3. History taking and correlation with laboratory diagnosis of AMI, TB, Diabetes, Hypothyroidism and Hyperthyroidism.
4. Composition of urine, collection & preservation of urine
 - a. Physical examination- Colour, pH & specific gravity
 - b. Chemical examination – Protein, Sugar, ketone body, bile salt, bile pigment, blood, chyle detection
 - c. Microscopic examination. - Cells, casts, crystals
5. Detection of micro albumin & 24 hrs urinary total protein estimation
6. Bone Marrow Aspiration & Bone Marrow Biopsy- Procedure, indications, contraindications, preparation of tray, smear, staining, Iron stain in Bone Marrow.
7. Basic concepts of jaundice, types, lab investigations.
8. Apoptosis and necrosis – Definition, basic concepts & types
9. Hyperplasia, Hypertrophy, Atrophy & Metaplasia- Definition & examples.
 - a. Inflammation- Definition basic feature of acute inflammation cardinal signs.
 - b. Chronic Inflammation- Basic concept, granuloma with examples.
10. Cell Injury

BMLTCC8P: Basic Pathology Lab

Credit 02

Practical:

1. Supravital staining & Reticulocyte count
2. Urine RE & ME
3. Use of different types of dip sticks
4. Urine- Total protein estimation, Physical and chemical examination of urine.
5. Qualitative test glucose, ketone body, blood, protein in urine.
6. Stool RE, ME
7. Abnormal cell morphology

Core Course (CC) -09

Credit 06

BMLTCC9T: Diagnostic Microbiology 2: Mycology and Virology

Credit 04

Course content:

1. Fungal taxonomy; morphology, cell structure & reproduction of medically important fungi, sexual and asexual fungal spores, thermal dimorphism.
2. Fungal sample collection techniques from mycoses-suspected patient, laboratory culture for isolation and identification of pathogenic fungi, fungal stains, antifungal agents.
3. Types of mycoses: superficial, cutaneous, subcutaneous, systemic and opportunistic.
4. Laboratory diagnosis of *Candida*, *Aspergillus*, *Cryptococcus*, *Mucor*, *Blastomyces*, *Coccidioides*, *Histoplasma*, Dermatophytes
5. Taxonomy of virus, general properties of viruses, Classification of viruses, Morphology: Virus structure, basic idea of virus culture, important antiviral drugs
6. Medical importance and laboratory diagnosis of hepatitis viruses, herpes simplex, pox, measles, chikungunya, viral hemorrhagic fevers, influenza, coronavirus, HIV.
7. Viroids, virusoids, prions.

Practical:

1. Induction on fungal culture laboratory and media
2. Nail scraping for fungal identification
3. Techniques of fungal culture and preservation
4. Microscopic observation of fungal structures by KOH preparation and lactophenol cotton blue stain
5. Demonstration on macroscopic morphology of pathogenic fungi
6. Detection of dengue virus and HIV by ELISA.
7. Rapid detection of virus infections by point-of-care test
8. Demonstration on virus culture techniques
9. Demonstration on ultramicroscopic observations of medically important virus

Core Course (CC)-10**Credit 06****BMLTCC10T: Applied Histopathology and Cytopathology****Credit 04****Course content:****Applied Histopathology**

1. Introduction to histopathological techniques
2. Receiving of specimens
3. Different histological fixatives and their uses, Advantages and disadvantages
4. Step of tissue processing and embedding, Section cutting, Mounting
5. Principle, procedure and clinical significance of Haematoxylin & Eosin staining, PAS stain, Trichrome stain.
6. Microtome & its care
7. Decalcification
8. Reticulin stain & its uses
9. Museum specimen preservation & mounting
10. Frozen section
11. IHC basic principles & utility

Cytopathology

1. Preparation of smear in fine needle aspiration cytology
2. Principle of exfoliative cytology, PAP staining
3. Preparation of smear from fluid, Fluid cytology, Imprint cytology, scrape & brush cytology
4. Examination of body fluids including CSF- transudate & exudates
5. Fixation of smears
6. MGG stain/ Leishman-Giemsa staining
7. Papanicolaou staining, principles & uses in cervical smear. Identification of cells in that stain.
8. Cytospin- Basic principles & utility
9. Cell block preparation- basic principles & utility
10. Liquid Based Cytology

BCACC10P: Applied Histopathology and Cytopathology Lab**Credit 02****Practical**

1. Tissue collection and fixation.
2. Dehydration of collected tissue sample in the graded alcohol.
3. Embedding & preparation of blocks, Section cutting , use & care of microtome
4. Stain preparation – Haematoxylin, eosin, PAS, Trichrome, ironhaematoxylin.
5. Staining techniques using above stains.
6. Preparation of specimen for cytological evaluation by papaniculasstaining, crystal violet staining.
7. Characterization of benign and malignant cells.

Core Course (CC)-11**Credit 06****BMLTCC11T: Clinical Pathology****Credit 04****Course content:**

1. Overview of platelet production common causes of thrombocytopenia.
2. Apoptosis and Necrosis- Definition, basic concepts & types.
3. Collection of urine and stool specimen, types of urine and stool specimen and preservation of urine and stool.
4. Routine examination of urine – physical and Microscopic examination.
5. Chemical test of urine for glucose, protein, Ketone bodies, bilirubin, urobilinogen & blood.
6. Laboratory investigation, Serous fluid, Ascitic fluid,Transudate, Exudate and Gastric juice.
7. Collection and processing of CSF and its laboratory investigation.
8. Routine test for stool and occult blood test.

BMLTCC11P: Clinical Pathology Lab**Credit 02****Practical:**

1. Physical and Microscopic examination of Urine.
2. Bio-chemical estimation of glucose in urine.
3. Bio-chemical estimation of protein and ketone bodies in urine, bile salt, bile pigment, urobilinogen and blood in urine.
4. Laboratory testing of CSF, Serous fluid, Ascitic fluid,Transudate/Exudate,Gastric juice, and Synovial fluid.
5. Collection and processing of CSF and its laboratory investigation.
6. Routine test and microscopical test for stool and occult blood test.

Core Course (CC)-12**Credit 06****BMLTCC12T: Clinical Biochemistry****Credit 04****Course content:**

1. Specimens processing for biochemical analysis – preparation of serum specimen, protein free filtrate and urine.

- Principles of Immuno chemistry – RIA & ELISA.
- Determination of glucose, urea, creatinine, uric acid, bilirubin, Triglyceride, cholesterol and Phospholipids, LDL, VLDL, HDL, Troponine T test in blood.
- Liver function tests. (Total protein, Albumin, Globulin ratio, ALP, ALT, AST, conjugated and unconjugated bilirubin)
- Gastric function tests: Free acidity, Total acidity, total acidity, gastric pH, gastric enzyme analysis.

BMLTCC12P: Clinical Biochemistry Lab

Credit 02

Practical:

- Preparations of plasma, serum, and protein free filtrate from blood for biochemical analysis.
- LFT: total bilirubin, direct-indirect, SGPT/SGOT, gamma-GT, ALP, total protein in serum, albumin-globulin ratio
- Lipid profile: serum TG, blood cholesterol and blood Phospholipids
- RFT: blood urea, blood creatinine,
- Determination of Blood glucose, HbA1c, serum uric acid, and Ketone bodies.
- Estimation of Hepatitis – A, B, C, E.
- Experiment on Glucose tolerance test.
- Amylase, lipase

Core Course (CC) -13

Credit 06

BMLTCC13T: Andrology and Endocrinology

Credit 04

Course content:

- Information on pituitary-gonadal axis, pituitary –thyroid axis, pituitary – Adrenocortical axis, feedback system. Information on pancreatic hormones.
- Hormonal disorders in Diabetes mellitus and insipidus, hypertension, goiter, obesity and infertility.
- Techniques followed in hormone assay – ELISA / RIA cross reaction, inter assay, intra assay variation.
- Spermatogenesis and its hormonal control, semen physiology, sperm count, sperm motility, sperm morphology, fructose estimation of semen. Sperm viability test.
- Primary idea on Assisted Reproductive Technology (ART).
- Acid phosphatase in semen.

BMLTCC13P: Andrology and Endocrinology Lab

Credit 02

Practical:

- ELISA program for hormone assay
- Hormone assay by ELISA reader – Estrogen, Testosterone, thyroid profile, LH, FSH, PRL, Insulin, Glucagon, Glucocorticoids, GH.
- Quality control of hormone assay- Intra assay, Inter assay, Cross reaction
- Sperm count, sperm motility, sperm morphology.
- Fructose assay in semen, Acid Phosphatase in semen. Sperm viability test.

Core Course (CC) -14**Credit 06****BMLTCC14T: Clinical Parasitology and Entomology****Credit 04****Course content:**

1. Basic concept of Medical Entomology and Parasitology in relation of this course.
2. Arthropods of medical importance. Arthropods borne disease and their transmission. Principle of arthropod control.
3. Mosquito – Role in this arthropod in disease transmission, Diseases types, Controlling measures.
4. Houseflies – Role in disease transmission and controlling measures. And Sandflies.
5. Flea – Role in disease transmission and controlling measure & itch mite.
6. Filaria – Causes, Symptoms and controlling measures.
7. Taeniasis – Causes, Symptoms and controlling measures.

BCACC14P: Clinical Parasitology and Entomology Lab**Credit 02****Practical:**

1. Collection, Presentation & Identification of different disease-causing Arthropods (Housefly, Mosquito etc.)
2. Whole mount preparation of slide of different disease-causing arthropods for their detailed anatomical studies.
3. Identification of different disease-causing Helminth and Protozoan parasites.
4. Identification of different phases of life cycle of arthropods protozoa, helminth, having medical importance for causing disease.
5. Slide identification of microfilaria, Taeniasolium, ascaris, and deferent stages of malaria. 6. Examination of stool for OPV (Ova parasite Cyst)

Core Course (CC) -15**Credit 06****BMLTCC15T: Immunopathology & Molecular Biology****Credit 04****Course content:**

1. General principles of replication, enzyme involved in DNA replication – DNA polymerases, DNA ligase, primase, telomerase and other accessory proteins.
2. Basic transcription apparatus, Initiation, elongation and termination of transcription,
3. Introduction of translation
4. PCR, Principle, Types, applications, Thermal cycler, qRT PCR
5. Blotting techniques, southern blotting and Western blotting
6. Unit-V: Radioisotopes and its application in measurement of blood volume, determination of red cell volume and plasma volume, red cell life span, platelet life span.
7. Stem cell banking
8. Prenatal Diagnosis.

BMLTCC15P: Immunopathology & Molecular Biology Lab**Credit 02****Practical:**

1. Isolation of nucleic acid
2. Separation of DNA by Agarose gel electrophoresis

3. Demonstration of PCR and qRT PCR.
4. Demonstration of PCR HLAB-27
5. Demonstration of PCR HIV
6. Demonstration of PCR MTB

Core Course (CC) -16

Credit 06

BMLTCC16T: Assisted Reproductive Technology & Human Embryology

Credit 04

Course content:

1. Concept of infertility & sterility.
2. Factors of male & female infertility.
3. General concept of fertilization.
4. ART & different types – AI (IVI, ICI, IUI), IVF, ICSI, GIFT, SUZI, general concept.
5. Testing for status assessment of female reproductive system.
6. Basic concept of human embryology
7. First week of development of zygote- Cleavage, Morulla, Blastula, Implantation, Gastrulation in brief.
8. Organogenesis in brief
9. Placentation
10. Amniocentesis
11. Foetal circulation
12. Foetal respiration.

BMLTCC16P Assisted Reproductive Technology & Human Embryology Lab

Credit 02

Practical:

1. Hormone assay by ELISA reader – Estrogen, Testosterone, T3 and T4, LH, FSH, PRL, Insulin, Glucagon, Glucocorticoids, GH.
2. Sperm count, sperm motility, sperm morphology, fructose assay in semen, Acid Phosphatase in semen. Sperm viability test.
3. Assessment of acrosome reaction.
4. Antisperm antibody test.
5. Pregnancy test.

Discipline Specific Electives (DSE)

Discipline Specific Electives (DSE) - 01

Credit 06

BMLTDSE1.1 T: Research methodology

Credit 06

Course content:

1. Concepts of Research and it's types.
2. Concepts of hypothesis.
3. Basic idea about Project formulation.
4. Sampling-Types.

5. Data collection.
6. Experimental design.

OR

BMLTDSE1.2T: Health Statistics

Credit 06

Course content:

1. Introduction to medical statistics: Definition, role of statistics in health science
2. Sampling: Population, sample, sampling, reasons for sampling, probability and non-probability sampling.
3. Measures of location: Arithmetic mean, median, mode.
4. Measures of variation: Range, variance, standard deviation, coefficient of variation-definition.
5. One way analysis of variance (ANOVA).
6. Correlation and Regression: Concept and properties of correlation coefficient

Discipline Specific Electives (DSE) - 02

Credit 06

BMLTDSE 2.1T: Forensic diagnosis

Credit 06

Course content:

1. Medico-legal aspects of a disease, Essential forensic pathology and clinical forensic medicine to include recognition and interpretation of wounds and other injuries. Medical and scientific investigation of fires.
2. Explosions and similar causes of non-natural deaths, Child deaths and child abuse; Investigation of sexual offenses.
3. Principles of forensic toxicology, Drugs and poisons including drugs of abuse and the related law; Alcohol – scientific and legal aspects, Forensic DNA, Basics of Forensic Odontology.
4. Basics of forensic entomology. Insects of forensic importance. Collection of entomological evidence during death investigations.

OR

BMLTDSE 2.2 T: Pharmacology & Toxicology

Credit 04

Course content:

1. Pharmacodynamics & pharmacokinetics
2. Bio-transformation of drug
3. Drug receptor
4. Concept of toxins & toxicology
5. Basic idea about LD₅₀, ED₅₀, safety factor, NOEL
6. Factor affecting toxicity of toxins
7. Pharmacotoxicity

Discipline Specific Electives (DSE) - 03

Credit 06

BMLTDSE3.1T: Computer application

Credit 06

Course content:

1. Study on various components of a personal computer, hardware and software.
2. Computer Applications in pathological laboratory to recording and data presentation.
3. Basic knowledge and utility in multimedia in laboratories.
4. Application of the digital computer in patient maintaining, Basic knowledge on MS-office, Floppy recording, Storage of data in pathological laboratory.

OR

BMLTDSE3.2 T: Health Informatics

Credit 06

Course content:

1. General idea about health information system.
2. Idea about data, information and intelligence.
3. Components of health information system and uses.
4. Sources of health information.

Discipline Specific Electives (DSE) - 04

Credit 06

BMLTDSE4.1T: Epidemiology

Credit 06

Course content:

1. Principles of Epidemiology; Natural History of disease; Methods of Epidemiological studies; Epidemiology of communicable & non-communicable diseases, disease, transmission, host defence immunizing agents, cold chain, immunization, disease, monitoring and surveillance.
2. Fundamentals of Public Health Surveillance.
3. Principles and Methods of Applied Infectious Disease Epidemiology.
4. Methods in Field Epidemiology.

BMLTDSE4.2T: Community orientation and clinical visit

Credit 06

Course content:

1. Basic principle of community health and its impact on health and disease, structure and functioning of the community health centre.
2. Understanding of the health care system in India with reference to primary, secondary and tertiary level care.
3. National health scenario, demographic, socio-cultural and epidemiological issues.
4. Understanding the national health goals and policies.
5. Obtain patient experiences through patient and family interactions and relate this experience to impact of environment and diseases.

Discipline Specific Electives (DSE) - 05

Credit 06

BMLTDSE5.1T: Onco-pathology

Credit 06

Course content:

1. Basic concept about Cancer and Tumour.
2. Features of cancer cells.
3. Metastasis
4. Cancer marker detection technique-Marker study

BMLTDSE5.2T: Cellular and System Pathology

Credit 06

Course content:

1. Cardiovascular Pathology

- a) Rheumatic fever and Rheumatic Heart Disease: Pathogenesis and diagnosis.
- b) Atherosclerosis, Ischemic Heart Disease and Myocardial Infarction: Pathogenesis and diagnosis.
- c) Cardiomyopathy: Pathogenesis and diagnosis.

2. Respiratory Pathology

- a) Emphysema: Types, pathogenesis and diagnosis.
- b) Occupational lung disorders: anthracosis, silicosis, asbestosis, mesothelioma: pathogenesis and diagnosis.
- c) Pulmonary Tuberculosis : Primary and Secondary: pathogenesis and diagnosis.

3. Gastro-Intestinal Tract Pathology

- a) Hemolytic Anaemias : Classification, pathogenesis and diagnosis.
- b) Thalassemia, sickle cell anaemia: pathogenesis and diagnosis.

4. Urinary Tract Pathology

- a) Glomerulonephritis: Classification, pathogenesis and diagnosis.
- b) Urolithiasis: pathogenesis and diagnosis.

5. Hepatic Pathology

- a) Jaundice: Types, Pathogenesis and Diagnosis.
- b) Hepatitis: types, Pathogenesis and diagnosis.
- c) Cirrhosis: Pathogenesis and diagnosis.

6. Endocrine Pathology

- a) Diabetes Mellitus : Types, Pathogenesis and diagnosis
- b) Adrenal diseases : Pathogenesis and diagnosis

Discipline Specific Electives (DSE) - 06

Credit 06

BMLTDSE6P: Case Study

Credit 06

Skill Enhancement Course (SEC)

Skill Enhancement Course (SEC)- 01

Credit 02

BMLTSEC1.1 (T): Professionalism & human values

Credits 02

Course content:

1. Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality
2. Personal values- ethical or moral values
3. Attitude and behaviour- professional behaviour, treating people equally
4. Code of conduct, professional accountability and responsibility, misconduct
5. Differences between professions and importance of team efforts
6. Cultural issues in the healthcare environment

OR

BMLTSEC1.2 (T): Hospital Waste Management

Credits 02

Course content:

1. Introduction about health care waste and diseases
2. Infectious waste, geno-toxic waste, waste sharps
3. Biomedical waste categories categorization , composition of biomedical waste
4. Colour coding,sources of health care waste
5. Health impact of biomedical waste-direct and indirect
6. Persons at risk of health care waste, legislation policies for management

Skill Enhancement Course (SEC)- 02

Credit 02

BMLTSEC2.1 T: Blood Bank and Blood transfusion

Credit 02

Course content:

1. Principles of blood grouping.
2. Blood transfusion in total or in fractionated part. Condition of blood transfusion, basic principles followed for such case.
3. Disorders of mismatched blood transfusion, Transmission of diseases in relation to blood transfusion (HIV, Hepatitis, Jaundice, Malaria, Syphilis).
4. Introduction of blood collection and basic concept for storage of blood and its transportation.
5. Preparation of reagents for blood Banking.
6. Fractionation of blood storage.
7. Donor's selection.
8. Preparation and preservation of various blood components for transfusion

OR

BMLTSEC2.2 T: Immunohematology**Credit 02****Course content:**

1. Blood group antigen: their importance in blood transfusion.
2. Transfusion reactions - brief introduction
3. Laboratory aspects of Blood Transfusion in total or in fractionated components, Cross matching
4. Disorders of mismatched blood transfusion, General idea about Blood Transfusion related diseases
5. Screening of blood for -AIDS, Hepatitis, Syphilis.
6. Forward matching and reverse matching.

Generic Electives (GE)**Generic Electives (GE)- 01****Credit 06****BMLTGE1.1T: Community Health****Credit- 06****Course content:**

1. Natural History of Disease: Determinants of health, and disease, host, agent, and environment relationship, levels of prevention to diseases of national importance.
2. Mode of Transmission of Disease: Air – borne, vector and vehicle transmission; Methods of control with examples for control of each mode.
3. Health Services: Brief description of organization of health services at the Centre and state levels; Primary Health Care - Definition, components and principles of primary health care; Health for all indicators; Primary Health Centre - The functions, staffing pattern and the role of laboratory technicians in primary Health Centre.
4. National Programmes of Health and Disease Eradication /Control: Health Programmes Family Welfare Programme, National Programme for water supply and sanitation, Nutritional Programmes, Immunization and universal immunization Programme; Disease control Programmes - Tuberculosis, Malaria, Filariasis, S.T.D, Goitre, Cholera and other diarrhoeal diseases.
5. Demography & Population Control: The factors influencing population growth, death rate, birth rate and methods of contraception.
6. Health Education: Definition, principles, objectives, purpose, types and AV aids; Communication - definition, process and types, Behavioural change communication; IEC (Information Education and Communication) - aims, scope, concept and approaches; Role and skill of health professional in Health Education.

OR**BMLTGE1.2T: Health Programmes in India****Credit- 06**

1. Brief idea about National Health Programme-Programme formulation, implementation, monitoring and evaluation.
2. National Vector Borne Disease Control Programme- Malaria, Filariasis, Dengue, Chikungunya.

3. National Leprosy Eradication Programme.
4. Revised National Tuberculosis Programme.
5. National AIDS Control Programme.
6. National Programme for Control of Blindness.
7. Iodine Deficiency Disorders Programme.
8. Universal Immunization Programme.

Generic Electives (GE) - 02

Credit 06

BMLTGE2.1T: Laboratory and Patient safety, Medical Law and Ethics

Credit- 06

Course content:

1. Laboratory ethics of patient-Safety. Code of good and safe laboratory practice for support staff and responsibilities of the workers regarding Biosafety. ISO rules for laboratory medicine. Laboratory Biosafety Level Criteria (BSL-1-4).
2. Chemical, electrical, fire and radiation safety. Safety organization. General Safety checklist. Safety equipment. Safety signs.
3. Handling, transfer and shipment of specimen. Decontamination and disposal. Treatment and disposal technologies for health- care waste. Responsibility from acquisition of the specimen to the production of data.
4. Medical ethics - Definition - Goal – Scope, Basic principles of medical ethics – Confidentiality
5. Malpractice and negligence - Rational and irrational drug therapy
6. . Autonomy and informed consent - Right of patients
7. Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.
8. Obtaining an informed consent.
9. Ethics in the profession of Medical Laboratory Science

OR

BCAGE2.2T: Medical Laboratory Total Quality Management

Credit- 06

Course content:

1. Quality control of product, chemical reagents, good reliable and authentic report, total quality management framework of laboratory.
2. Quality control chart, Cusum chart, Gaussian curve, Westgard rule. Internal and External factors for quality control. Co-operation and working relationship with other health professionals. Confidentiality of patient information and test result. Dignity and privacy of patient
3. Good Laboratory Practice (GLP) Regulations and Accreditation
4. Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation, Advantages of Accreditation, Brief knowledge about National and International Agencies for clinical laboratory accreditation

5. Awareness / Safety in a clinical laboratory, General safety precautions, HIV: pre- and post-exposure guidelines, Hepatitis B & C: pre- and post-exposure guidelines, Drug Resistant Tuberculosis
6. Patient management for clinical samples collection, transportation and preservation
7. Sample accountability, Purpose of accountability, Methods of accountability.

Generic Electives (GE)- 03

Credit 06

BMLTGE3.1T: Pathological Basis of Diseases

Credit- 06

Course content:

1. Introduction & History of pathology, Basic definitions and common terms in pathology, Causes and mechanisms of cell injury, reversible and irreversible injury, hyperplasia, hypoplasia, hypertrophy, atrophy, metaplasia, necrosis and apoptosis.
2. General features of acute and chronic inflammation: Vascular changes, cellular events, Cells and mediators of inflammation, pathogenesis of inflammatory diseases.
3. Tissue Renewal and Repair, healing and fibrosis, cirrhosis, introduction of oedema, hyperaemia, congestion, haemorrhage, haemostasis, thrombosis, embolism, infarction, shock and hypertension.
4. Protein energy malnutrition, deficiency diseases of vitamins and minerals, nutritional excess and imbalances. Role and effect of metals (Zinc, Iron and Calcium) and their deficiency diseases, Etiology and pathophysiology of diabetes, arteriosclerosis, myocardial infarction, respiratory diseases (COPD), Parkinson disease. Infectious Diseases: pathogenesis & overview of modes of infections, prevention and control with suitable examples like Typhoid, Dengue, malaria, tuberculosis.
5. Cancer: Definitions, nomenclature, characteristics of benign and malignant neoplasm, metastasis, Carcinogens and cancer, concept of oncogenes, tumour suppressor genes, DNA repair genes and cancers stem cells.

OR

BMLTGE3.2T: Medical Lab Diagnostic

Credit- 06

Course content:

1. Diagnostic test and screening test
2. Quality control of diagnostic test
3. Diagnosis of Diabetes- Diabetic profiles
4. Diagnosis of Hyperlipidemia- Lipid profile
5. Diagnosis of Kidney- Renal profiles
6. Diagnosis of liver function- Liver function test.

Generic Electives (GE)- 04

Credit 06

BMLTGE4.1T: Medical Biotechnology

Credit- 06

1. Medical biotechnology – definition and application. Molecular tools and applications- restriction enzymes, ligases, polymerases, alkaline phosphatase. Gene Recombination and

Gene transfer: Transformation, Episomes, Plasmids and other cloning vectors (Bacteriophage-derived vectors, artificial chromosomes).

2. Gene transfer methods– microinjection, embryonic stem cell, gene transfer, Retrovirus & Gene transfer.
3. Introduction to transgenesis. Transgenic Animals.
4. Animal propagation – Artificial insemination, Animal Clones. Conservation Biology – Embryo transfer techniques. Introduction to Stem Cell Technology and its applications.
5. Genetic modification in Medicine - gene therapy, types of gene therapy, vectors in gene therapy, molecular engineering, human genetic engineering, problems & ethics. Therapeutic products produced by genetic engineering-blood proteins, human hormones, immune modulators and vaccines.

OR

BMLTGE4.2T: Genetics and Health

Credit- 06

Course content:

1. Brief idea about chromosome, gene, genotype and phenotype.
2. Chromosomal Disorders- Relating to autosome and sex chromosomes.
3. Blood groups and disease, Erythroblastosis foetalis
4. Sickle cell anaemia, Thalassaemia, Haemophilia, PKU, Cystic fibrosis.
5. Preventive and social measures of inheritable diseases- Eugenics, eugenics, genetic counselling, Early diagnosis and treatment, Rehabilitation.

Ability Enhancement Compulsory Course (AECC)

Ability Enhancement Compulsory Course (AECC) - 01

Credits: 02

BMLTAECC(T): Communicative English

Credits: 02

1. **Communication Skills**
 - a) Theory and Types of Communication
 - b) Verbal and Non-verbal Communication
 - c) Barriers and Strategies
 - d) Workplace Communication
 - e) Telephone Communication
2. **Speaking Skills**
 - a) Inter-personal Communication
 - b) Group Discussion
 - c) Interview
3. **Reading Skills**
 - a) Close Reading
 - b) Comprehension
 - c) Summary
 - d) Paraphrasing
 - e) Interpreting Graphs and Charts

4. Writing Skills

- a) Report Writing
- b) Making notes
- c) Letter writing
- d) Business Communication

Ability Enhancement Compulsory Course (AECC) - 02

Credits: 04

BMLTENVS (T): Environment Science and Health

Credits: 04

Course content:

1. Basic idea about environment, Relation between environment and health.
2. Water pollution-Water related diseases (biological and chemical), water pollution law, purification of water (large scale and small scale), water quality criteria and standards, surveillance of drinking water quality, controlling measures of water pollution.
3. Air pollution- Sources of air pollutants, types, Health hazards by air pollutants, ventilation and its standards, controlling measures of air pollution, air stress indices- heat stress, cold stress, global warming, humidity.
4. Solid waste disposal system- Methods of disposal, modern sewage treatment- primary and secondary treatment.
5. Hospital waste management- Generation of hospital waste, health hazards of hospital wastes, disposal and treatment of hospital wastes, bio-medical wastes.
