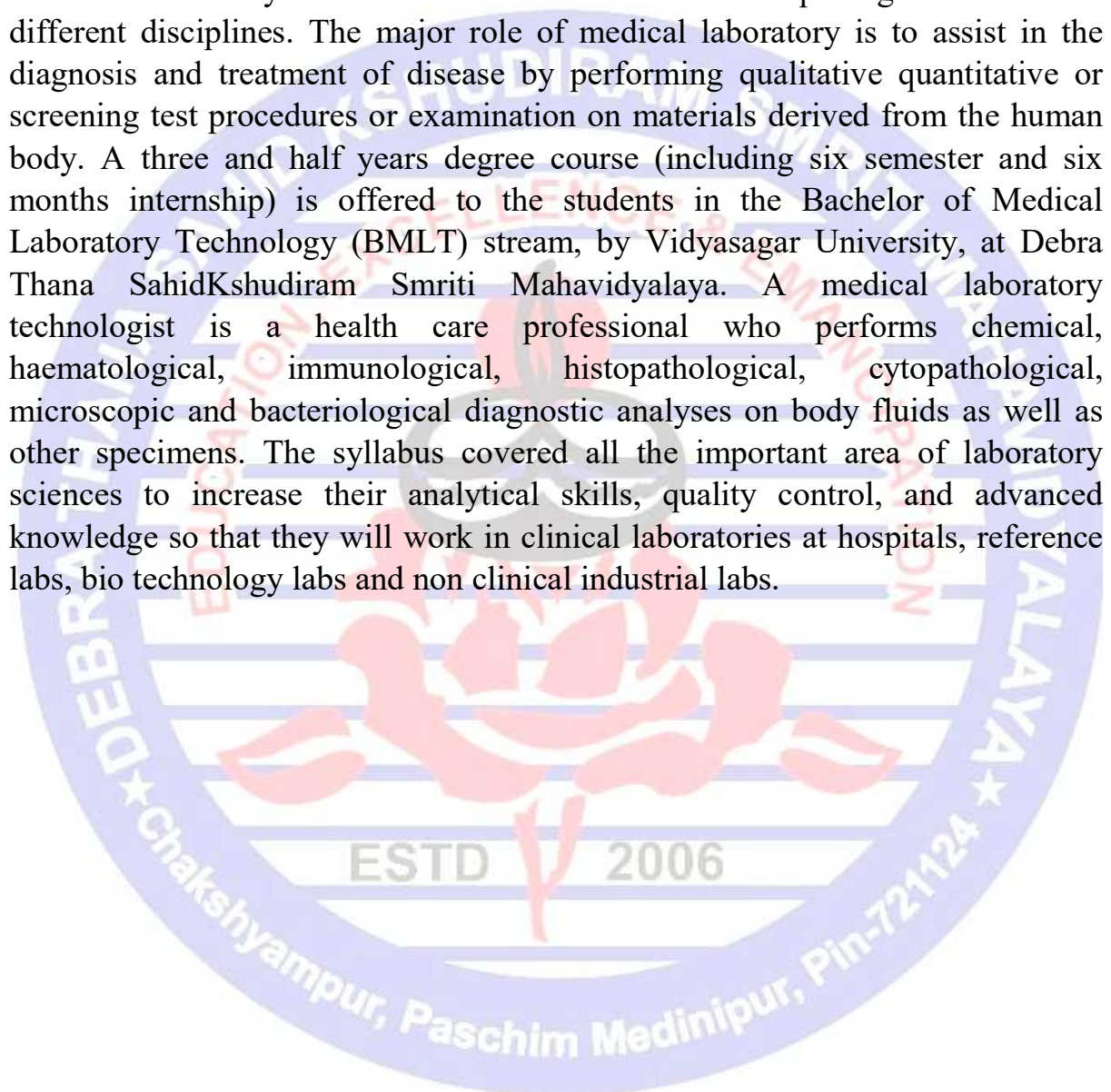


# BMLT

## Programme Specific Outcome (PSO)

Medical laboratory technology is also called as clinical laboratory science. Medical laboratory science is an umbrella field comprising a number of different disciplines. The major role of medical laboratory is to assist in the diagnosis and treatment of disease by performing qualitative quantitative or screening test procedures or examination on materials derived from the human body. A three and half years degree course (including six semester and six months internship) is offered to the students in the Bachelor of Medical Laboratory Technology (BMLT) stream, by Vidyasagar University, at Debra Thana SahidKshudiram Smriti Mahavidyalaya. A medical laboratory technologist is a health care professional who performs chemical, haematological, immunological, histopathological, cytopathological, microscopic and bacteriological diagnostic analyses on body fluids as well as other specimens. The syllabus covered all the important area of laboratory sciences to increase their analytical skills, quality control, and advanced knowledge so that they will work in clinical laboratories at hospitals, reference labs, bio technology labs and non clinical industrial labs.



# Course Outcome (CO)

## 1<sup>st</sup> Semester

### Unit-1

#### Functional English (Theory)

##### Outcomes: -

- Students will learn about pronunciation, grammar, concord of number, person, Tenses, Articles, types of sentences, Phrases, Clauses etc.
- Students will improve their writing skills by brush up on the basic principles of writing, grammar and spelling.
- This unit is very important to perform a specific function like academic study or career progression.

### Unit-2

#### Basic Instrumentation and its Application (Theory)

##### Outcomes: -

- Students will learn about microscope and its uses in laboratory.
- Students will acquire knowledge about working principle of Colorimeter, Spectrophotometer, Spectrofluorometer and Centrifuges.
- Students will know about working principle of Laminar flow, Autoclave, Incubator, Semi and Full auto-analyzer and their uses in pathology laboratory.
- They will study about working principle of Blood cell counter, ELISA, Electrophoresis, HPLC and their application in medical laboratory.
- They will gain their knowledge about Laboratory Safety and Quality control.

### Unit-3

#### Environment and Health (Theory)

##### Outcome: -

- Students will get idea about macro and micro environment and components of environment.
- They will study about environmental air, water, noise, radiation, and food pollution and pollutants.
- Students will read about managements of environmental pollution like arsenic, fluoride, lead and mercury pollution.
- Students can know about occupational health hazards and occupational disease like silicosis, asbestosis, farmer's lung etc.

- Students will know standard human excreta disposal system and health disorders due to mismanagement of excreta disposal.
- They will know about importance of good lighting on health.
- They will gain their knowledge about how communicable disease is transmitted and management of it.
- They will study about role of environment for non-communicable disease and management of these disease.

#### **Unit-4**

##### **Community Health Care (Theory)**

###### **Outcomes: -**

- Students will gain their concept about disease, different way to control disease, different dimension of health and community of health.
- They will get idea about present community health care ecosystem.
- They will know primary health care in India, mother-child health care system at village level, sub centre level, primary health centre and community health centre.
- They will learn about sources of health information system.
- Students will get idea about role of Non-Government agencies in community health care system.
- They will know about system of health care awareness in community in rural and urban areas.
- Students also learn about community nutrition programmes for community health care.
- Students will know about National strategies for community health upgradation.

#### **Unit-5**

##### **Human Anatomy (Theory)**

###### **Outcomes: -**

- Students will learn about different system of human body like circulatory system, urogenital system, Endocrine system, integumentary system.
- They also study about anatomy of upper and lower respiratory tract, gastro intestinal tract, CNS and PNS of human body and surface anatomy.
- They will gather knowledge about the Fascia and muscles of head, neck, face, trunk, upper limb and lower limb, muscles of eye.
- Students will read about general structure of all bones of skeleton and their attachment.
- Students will learn about classification of joints, joint of head, neck, trunk, upper limb, shoulder girdle and pelvic girdle.

## Unit-6

### Human Anatomy (Practical)

#### Outcomes: -

- Students will learn about identification of surface land marks of a human body.
- Students can learn to detect muscles of trunk, lower and upper extremities and face on a dissected human body.
- Students will identify different bones in the human body and learn about their origin and insertion of muscles and ligaments

## 2<sup>nd</sup> Semester

## Unit-7

### Human Physiology (Theory)

#### Outcomes: -

- Students will learn about cell structure, cellular contents and transport across membrane along with different type of tissue and it's function.
- Students will know about cardiovascular system of human body.
- They will know about Respiratory system, Endocrine system, Digestive system of human body.
- Students also learn about regulatory process of body temperature in human.
- They will study about Neurophysiology, Muscle Physiology of human.
- Students will know about special senses of our body.
- They also learn about Renal physiology and Reproductive system of human.

## Unit-8

### Human Physiology (Practical)

#### Outcomes: -

- Students will learn how to stain Squamous epithelium.
- Students will know how to measure blood pressure and heart rate.
- They also know procedure for Harvard Step Test in different posture.
- Students can learn blood group determination.
- Students will learn identification of blood cells and TC, DC.
- They can separate a cellular and cellular components of blood.
- Students will study on superficial and deep reflexes.
- They will know how determine ESR.
- Students will study muscle striation by methelene blue.
- They will study on nodes of Ramvier by silver chloride method.

## Unit-9

### Biochemistry and Biophysics (Theory)

#### Outcomes: -

- Students will learn about chemistry, source, classification, function and physiological importance of carbohydrate, protein and lipid.
- They will know about Structure and function of DNA and RNA.
- Students will get knowledge about fat soluble and water soluble vitamins, daily requirements, Physiological function and diseases due to vitamin deficiency.
- Students will study about energy rich compounds, respiratory chain and biological oxidation.
- Students will learn carbohydrate, protein and fat metabolism.
- They can able to know about enzymes classification, mode of action and chemical importance of enzyme.
- They will get a concept about pH and buffers, Acid base equilibrium, osmotic pressure and Physiological importance.
- They can grow their concept about sodium and potassium metabolism.
- They will get idea about isotopes and their role in treatment and diagnosis of disease.

## Unit-10

### Biochemistry and Biophysics (Practical)

#### Outcomes: -

- Students can identified glucose, fructose, Lactose, Maltose, Sucrose, starch, Peptone, Glycerol, Cholesterol, Acetone, Bile salt in sample qualitatively by biochemical tests.
- Students can determine pH of a solution by titration.
- They can also quantitatively determine Glucose, Lactose and Sucrose in a specific sample.
- They can prepared different buffers used in pathological laboratory.
- They can estimate sodium and potassium in serum.

## Unit-11

### Medical Entomology and Parasitology (Theory)

#### Outcomes:

- Students will get a concept about Medical Entomology and Parasitology which is related with pathology.

- Students will know about Arthropods borne disease, their transmission and principle of arthropod control.
- They will learn about causes, symptoms and controlling measure of Filaria.
- Students will get knowledge about causes, symptoms and controlling measures of Taeniasis.

## Unit-12

### Medical Entomology and Parasitology (Practical)

#### Outcomes:-

- Students can identify different disease causing Arthropods (Housefly, Mosquito etc).
- They can learn whole mount preparation technique of slide of different disease causing arthropods, Helminth and Protozoan for their detailed anatomical studies.
- Students can identify the different phases of life cycle of arthropods, protozoa, helminth having medical importance for causing disease.
- Students can identify microfilaria, Taenia solium, ascaris and different stages of malaria.
- They can examine stool for OPV (Ova Parasite Cyst).

### 3<sup>rd</sup> Semester

## Unit-13

### Haematology (Theory)

#### Outcomes:-

- Students will learn about technique of glassware cleaning used in haematology lab.
- Students can learn about procedure of blood collection by pricking method and brachial vein in adult and children.
- Students will get knowledge about use of anticoagulants.
- They also learn about separation technique of plasma and serum from blood.
- Students will gather knowledge about test procedure for routine haematological test like Hb concentration, haematocrit, TC, DC of leukocytes, total count of Erythrocytes, determination of erythrocyte indices – PCV, MCV, MCH, MCHC, Reticulocyte count, platelets count, ESR.
- Students will get a concept about bleeding disorder.
- They will get a idea about Thalassaemia and Sickle cell anaemia. Importance of blood tests before marriage.
- Students will get knowledge about blood clotting factors, Extrinsic and Intrinsic pathway of blood clotting and bleeding disorders.

## **Unit-14**

### **Haematology (Practical)**

#### **Outcomes:-**

Students will practice following practical –

- Collection of blood from vein.
- Blood film preparation and staining by Leishman Giemsa method.
- Experiments on TC, DC, PCV, MCV, MCH, MCHC and ESR (Wintrob method).
- Determination of Hb by haemoglobinometer and colorimetric method.
- Quantification of reticulocyte, thrombocyte and erythrocyte count.
- Determination of Bleeding time and clotting time, PT.
- Screening test for sickle cell anemia and slide identification of thalasemia.

## **Unit-15**

### **Clinical Immunology (Theory)**

#### **Outcomes: -**

- Students will gain their basic concept about immune system and primary immune organs.
- Students will know about antibody formation and antigen antibody reaction, type of reaction.
- They will gather knowledge about immunization and primary and secondary response of immunization.
- Students will know about Immunoglobins type, structure and their specific importance.
- Students can able to know about immunosuppression.
- They will learn about auto immune disease like Hasimotor disease, myasthenia gravis, RA and Lupus erythromatosus.
- Students will know about Erythroblastosis fetalis.

## **Unit-16**

### **Clinical Immunology (Practical)**

#### **Outcomes: -**

- Students can determine 'ABO' blood grouping and 'Rh' typing.
- Students can measure antibody by Radial immune diffusion (RID) technique.
- Students can test Antigen – Antibody reaction by precipiting using ouchterlony technique.

- They can able to perform quantitative assay of Immunoglobins in plasma (IgG, IgM).

## **Unit-17**

### **Serology (Theory)**

#### **Outcomes: -**

- Student will learn about collection and preparation of specimen used in serological laboratory.
- They can able to know about principle of sero -diagnostic tests like precipitation flocculation, agglutination, neutralization and coagulation.
- They will know about Serological test procedure syphilis (STS), VDRL, CRP and RPR test.
- Students will be informed about WIDAL test for Salmonella typhi.
- Students will learn about following serodiagnosis test for AIDS, Rubella, Toxoplasmosis, Leishmaniasis, Trypanosomiasis and TORCH panel test.
- Students will gather knowledge about Immunological test for pregnancy by direct and indirect method
- They will learn about ASO test.

## **Unit-18**

### **Serology (Practical)**

#### **Outcomes: -**

- Students can acquire a idea about precipitation, agglutination and coagulation reaction.
- Students can do VDRL, WIDAL, RPR and ASO test.
- They also come do CRP, RA, AIDS and STS test.
- Students can able to perform immunological test for pregnancy by direct and indirect method.
- They can do Montoux test.



## 4<sup>th</sup>Semester

### Unit-19

#### Clinical Pathology (Theory)

##### Outcomes: -

- Students will get knowledge about collection procedure of urine, stool, specimen and preservation of these specimen.
- Students will learn about physical and microscopic examination of urine.
- They also learn about procedure of chemical test of urine for glucose, protein, ketone bodies, bilirubin, urobilinogen and blood.
- Students will study about laboratory investigation procedure of serous fluid and gastric juice.
- Students will learn about collection and processing of CSF and its laboratory investigation.
- They also learn about the method of routine test for stool and occult blood test.

### Unit-20

#### Clinical Pathology (Practical)

##### Outcomes: -

- Student can do physical and microscopic examination of urine.
- They can do bio – chemical estimation of glucose in urine.
- Students can estimate protein, ketone bodies, bile pigment, urobilinogen and blood in urine.
- Students can laboratory testing of CSF, serous fluid, gastric juice and synovial fluid.
- They can do collection and processing of CSF and its laboratory investigation.
- Students can learn routine test and microscopic test for stool and occult blood test.

### Unit-21

#### Clinical Biochemistry (Theory)

##### Outcomes: -

- Students will know about preparation of serum and urine specimen for biochemical analysis and preparation of protein free filtrate.
- Students will learn about principles of RIA and ELISA.
- Students also learn about determination of glucose, urea, creatinine, uric acid, bilirubin, triglyceride, cholesterol, phospholipids, LDL, VLDL, HDL, troponine test in blood.
- Students can know about liver function test and gastric function test.

## Unit-22

### Clinical Biochemistry (Practical)

#### Outcomes: -

- Students can prepare plasma, serum, protein free filtrate from blood for biochemical analysis.
- Students can determine blood glucose, total protein serum, blood urea, blood creatinine, serum uric acid, serum TG, blood cholesterol, blood phospholipids and ketone bodies.
- Students can estimate Hepatitis – A, B, C and E. □Students can do glucose tolerance test.

## Unit-23

### Cytotechnology and Histotechnology (Theory)

#### Outcomes: -

- Students will learn about the equipments used in Cytotechnology and Histotechnology.
- Students will acquire their knowledge about specimen preparation in Cytotechnology and Histotechnology such as fixation, dehydration, clearing, embedding, section cutting and mounting of stained slide.
- Students will learn about different types of stain preparation like Haematoxylin, eosin, PAS stain etc.
- They also learn different staining technique.
- They will get a idea about frozen section techniques and automation of biotechnology laboratory.

## Unit-24

### Cytotechnology and Histotechnology (Practical)

#### Outcomes: -

The following practical are done in the Cytotechnology and Histotechnology portio –

- Tissue collection and fixation.
- Dehydration of collected tissue sample in the graded alcohol.
- Stain preparation – Haematoxylin, eosin, PAS, Trichrome, iron haematoxylin.
- Staining of tissue sample using above stain.
- Preparation of specimen for cytological evaluation by papaniculasstain, crystal violet staining.
- Characterization of benign and malignant cells.

## 5<sup>th</sup> Semester

### Unit-25

#### Clinical Endocrinology and Andrology (Theory)

##### Outcomes: -

- Students will get information on pituitary-gonadal axis, pituitary - thyroid axis, pituitary Adrenocortical axis and about pancreatic hormones,
- They will know about hormonal disorders in diabetes, hypertension, goiter, obesity and infertility.
- Students can learn different technique used for hormone assay.
- Students will gather knowledge about spermatogenesis, semen physiology.
- They also gain their knowledge for sperm count, motility sperm morphology, sperm viability test and fructose estimation of serum.
- They will get a primary idea on assisted Reproductive Technology (ART). They also learn about acid phosphatase estimation in semen.

### Unit-26

#### Clinical Endocrinology and Andrology (Practical)

##### Outcomes:-

- Students can conduct the different hormone assay such as Estrogen, Testosterone, T<sub>3</sub>, T<sub>4</sub>, TSH, LH, FSH, PRL, Insulin, glucagon, glucocorticoids, GH etc.
- Students can study the andrological and spermiological sensor like sperm count, motility, viability, morphology, fructose assay in semen and acid phosphatase in semen.

### Unit-27

#### Clinical Microbiology (Theory)

##### Outcomes:-

- Students will get a idea about specimen collection and handling in microbiological laboratory and safety regulation of the laboratory.
- They will learn microscopic examination techniques, culture media and quality control in microbiology.
- Students will gain their knowledge about diagnostic bacteriology.
- They can learn about laboratory diagnosis of mycotic infections.
- Students will acquire their knowledge about virology of following disease : Influenza, measles, Rabies, Kalazar, Swain - flu.

## Unit-28

### Clinical Microbiology (Practical) Outcomes: -

- Students can sterilize and clean glass ware used for Microbiology.
- They can prepare different culture media.
- Students can do biochemical test for bacterial differentiation.
- Students can examine fungi from skin scrapping and acid fast bacilli from sputum.
- Students can do biochemical test for bacterial differentiation. □Students can do gram staining.

## Unit-29

### Blood Transfusion and Blood Bank (Theory)

#### Outcomes: -

- Students can learn about principle of blood grouping.
- Students can learn about blood transfusion method in total or in fractionated part.
- They also get a knowledge about transmission of disease in relation to blood transfusion.
- Students will get a knowledge about storage of blood and it's transfusion.
- Students can acquire knowledge about preparation of reagents for blood banking.
- They also learn storage procedure of fractionation of blood. □They will learn the criteria for blood donation.

## Unit-30

### Blood Transfusion and Blood Bank (Practical)

#### Outcomes: -

- Students can prepare different reagent used in blood bank.
- Students can do forward grouping and reverse grouping.
- They also determine cross matching by blood group testing technique and coomb's test (direct and indirect)
- They can collect fraction from blood and it's storage.
- Students can do pre – transfusion blood screening.

## 6<sup>th</sup> Semester

### Unit-31

#### Research Methodology and Medical Statistics (Theory)

##### Outcomes: -

- Students will get a concept about Research and it's type. □Students will gain a concept of hypothesis.
- Students will get a basic idea about project formation.
- Students will learn the method of data collection and to draw an experimental design. □Students will learn statistical analysis method.

### Unit-32

#### Research Methodology and Medical Statistics (Practical)

##### Outcomes: -

- Students can ready assignment for project.
- They can do statistical analysis after single group study or population mean study.

### Unit-33

#### Computer application Includes MS – Office (Theory)

##### Outcomes:-

- Students will study on various components of personal computer, hardware and software.
- They can learn computer application in pathological laboratory to recording and data presentation.
- They acquire knowledge about utility of multimedia in laboratory.
- They will learn application of digital computer in patient maintaining, storage of data in pathological laboratory.

### Unit-34

#### Computer application Includes MS – Office (Practical)

##### Outcomes: -

- Students can operate personal computer.
- They can able to storage data, reporting, data presentation in computer

##### Project Outcomes: -

- Student will prepare a project paper based on their subject.

### **Internship**

**After completion of 6<sup>th</sup> semester, 6 months internship in a hospital or medical college is a part of the BMLT course and it is mandatory for receiving BMLT degree.**

### **Overall outcomes**

- Medical laboratory science provides clues that are key in the diagnosis and treatment of disease or injury and laboratory professionals are the detectives of health care world.
- The students will provide us clues that are keys in the diagnosis and treatment of disease or injury and assist in the maintenance of healthy lifestyles.
- After completion of the course, the students can learn to perform the tests that help in the diagnosis and treatment tests.
- The course also equips candidates with the skill required to handle advanced equipment so as to perform accurate laboratory tests.
- Students will gain their creativity, problem solving skills, innovation and much more.

Students can get placement in pathology laboratory, research laboratory, pharmaceuticals and hospitals.

