

Bachelor of Vocation

B. Voc in Medical Laboratory Technology

PROGRAM OUTCOMES

On successful completion of Bachelor of Vocation programme, students will be able to:

- PO1. Perform routine clinical laboratory procedures within acceptable quality control parameters in Hematology, Clinical Chemistry, Immunohematology, Phlebotomy, and Microbiology.
- PO2. Perform basic laboratory techniques on biological specimens.
- PO3. Recognize factors that affect laboratory procedures and results.
- PO4. The course bridges the gap between the pure life sciences and medical sciences.
- PO5. The focus of skill development components is to equip students with appropriate knowledge, practice and attitude, so as to become work ready.
- PO6. To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.
- PO7. Soft skills training empowered the students to collaborate and work together in order to collectively meet the objectives, improved the efficiency and productivity.
- PO8. Six months of Internship at relevant health care organizations provides necessary experience and skills to be a professional in the field of medical lab technology.
- PO9. Assessment and Certification by LSSSDC creates a robust, dynamic and quality driven ecosystem for laboratory demand led vocational education and skill development in Life Sciences Sector in India

PROGRAM SPECIFIC OUTCOME

PSO 1- A candidate with B. Voc in MLT can easily fit in private hospitals/Govt. hospitals/ clinics/ nursing homes/ diagnostic labs as technologist/technician, Laboratory manager/Consultant/supervisor, Healthcare Administrator, Hospital Outreach coordinator, Laboratory information system Analyst/Consultant, educational consultant / coordinator etc.

PSO 2- B. Voc MLT candidates can pursue PG courses in various fields like Biotechnology, Microbiology, Life Sciences, Biochemistry, Medical Lab Technology etc.

COURSE OUTCOMES

Semester I

GC 103

- CO1.1 Students will gain an understanding of the importance of laboratory quality and gain the knowledge of the quality management system model.
- CO1.2 Acquire fundamental knowledge of laboratory design, spatial organization, physical aspects of premises and rooms. Gain knowledge on safety management programme.
- CO1.3 Deep knowledge on equipment, purchasing and inventory management programme.
- CO1.4 Inculcates the better understanding of the concept of sample management, quality control for qualitative and semiquantitative procedures.
- CO1.5 Gain the knowledge on external audit, internal audit and external quality assessment. Understands the international standards, standardization bodies, national standards technical guidelines, certification and accreditation.
- CO1.6 Acquire fundamental knowledge of the recruitment and orientation, competency and competency assessment, training and continuing education and employee performance appraisal.
- CO1.7 Understand the laboratory clients, Assessing and monitoring customer satisfaction and Customer satisfaction surveys
- CO1.8 Acquaint the knowledge of Continual improvement, Tools for process improvement, Quality indicators and Implementing process improvement.
- CO1.9 Will understand the importance of documents, quality manual, Standard operating procedures (SOPs), records and Storing documents and records
- CO1.10 Obtain the knowledge of elements of information management, manual paper-based systems, computerized laboratory information systems and data security.
- CO1.11 Gain awareness about Organizational requirements, Management role, Organizational structure, and Organizational functions.

SC 101

- CO1.1: This will help the students to gain basic knowledge about anatomical and medical terminology which is used in medical lab.
- CO1.2: This will give the basic knowledge about tissues and cells. The study of this unit help the students easy to understand anatomy of other systems.
- CO1.3: This will help the students when they work with doctors in medical lab.
- CO1.4, 5 and 6: This will give knowledge about anatomical structure and physiology of the systems. Students who go for higher studies or work in medical lab, this basic knowledge help them to easy understanding.

CO1.7: In medical evaluation body fluid is the main sample where we can detect the abnormal cells. There for one should have the proper knowledge about secretion and function of the body fluid.

SC 102

CO1.1 Gain awareness about the different types of laboratory apparatus, its uses, cleaning procedure and maintenance.

CO1.2 Will understand the importance and steps of specimen collection and processing as specimens are an important part of a holistic assessment. The accurate diagnostic and therapeutic decisions lies in proper patient preparation, specimen collection and processing.

CO1.3 Gain knowledge of the use of anticoagulants.

CO1.4 Gain knowledge of the use of preservative.

CO1.5 Laboratory record keeping is a part of their job as laboratory technicians. This chapter introduces the students to basic lab record keeping techniques and its role.

CO1.6 Introduces the reporting formats and its types.

SC 103

CO1.1: Students will have knowledge about branches & scope of Microbiology.

CO1.2: Students will study the types of microorganisms and their characteristics.

CO1.3: This provides basic principles and types of microscopes.

CO1.4: This provides the types and nutritional requirements including micronutrients for bacteria. And also about the general purpose media and other different media which support the growth of bacteria.

CO1.5: This provides the basic knowledge about how to isolate microorganisms and preservation of pure cultures.

CO1.6: Students will understand multiplication of bacteria and different stages of growth. Also they will be having the knowledge about different techniques used for the enumeration of bacteria.

PRACTICAL

SCP104

- Microscopic study of tissues will help students understand the basic system of body. Histological study of different organs will help students understand the function of the organs.

SCP 105

- Acquire fundamental knowledge of laboratory equipments and specimen collection methods.
- Gain awareness about safety measures and laboratory organization and management.
- Understand the preparation of standard normal, molar and percent solution.
- Obtain the knowledge of determination of viscosity, surface tension and density of body fluids, mean and standard deviation of serum samples and osmosis using hypotonic and hypertonic solution.

SCP 106

- Students will understand the safety measures followed in microbiology laboratory.
- They will learn how to clean and sterilize glass wares and various advanced instruments used for sterilization, Inoculation, Incubation and for the separation of microorganisms.
- They also learn about the preparation of wet mounts.

Semester II

GC 203

- CO2.1: Define and distinguish the various types of errors encountered in qualitative experimental measurements and apply their skills in minimizing the error.
- CO2.2: Determine the molecular weight of substances using colligative properties.
- CO2.3: Recognize and draw constitutional isomers, stereoisomers, including enantiomers and diastereomers, racemic mixture and meso compounds.
- CO2.4: Provides the fundamental properties of atoms, molecules, and the various states of matter with an emphasis on the particulate nature of matter.
- CO2.5: Understand how the concept of electronegativity and its variation over the periodic table can be used to rationalise the nature of the bonding in substances.
- CO2.6: Acquainted with the basic knowledge of radiation and nuclear chemistry; requirements, methods of preparation, uses of radio elements.
- CO2.7: Apply the first and second laws of Thermodynamics to various gas processes and cycles
- CO2.8: Describe the properties of chemical equilibrium and be able to write the equilibrium constant expression (K_c or K_p for gaseous reactions) for a balanced chemical equation.
- CO2.9: Students will be able to determine the rate and extent of chemical reactions.

CO2.10: To identify organic compounds, explain their properties and reactions.

SC 201

CO2.1: This unit helps in the understanding of role of kidney in excretion, composition of urine and complications in kidney due to certain disorder. Students can identify the practices which can keep their kidney healthy.

CO2.2: Study of bones and its position helps in the better understanding of each bone and its function, aiding in the proper posture of an organism.

CO2.3: This unit helps us in knowing the importance of joints in movement. Knowledge about joints helps students to pay attention to their posture during sports activities.

CO2.4: This helps students to understand the role of brain in the function of any organ system. Study of neuro muscular junction creates analytical ideas in students about the spontaneous work done by brain and the co-ordination

CO2.5: Studying of nervous system paves path in analysing the different techniques for cognitive neuroscientists

CO2.6: This chapter helps students to interpret the environment and also gives awareness about the disorders and its prevention.

CO2.7: From this chapter, students learn about the anatomies of reproductive systems, which helps them to know the advantages of sexual reproduction, role of hormones during gestation period.

CO2.8: Chemistry of hormones and its action is understood. Gain knowledge about different endocrine glands and their hormones.

SC 202

CO2.1 Understand the properties of acids and bases, their strength. Gain knowledge of buffer preparation and importance of pH and buffers in biological system.

CO2.2 Acquire fundamental knowledge of structure, properties and biological function of carbohydrates, lipids, amino acids & proteins and nucleotides.

Assimilate the clinical significance of steroids and lipoproteins and gain knowledge about the membrane composition, behaviour and function.

Gain insight about functions of proteins by learning their structures.

CO2.3 Understand the characteristics of enzymes, their mechanisms, assay methods and its importance in biological reactions.

SC 203

- CO2.1: This provides the knowledge about differences between prokaryotes and eukaryotes.
CO2.2: This gives the knowledge of morphology & ultra-structure of bacteria.
CO2.3: It deals with Transposons and bacterial recombination
CO2.4: Detailed description on different types of bacterial reproduction.
CO2.5: This unit provides knowledge of aerobic & anaerobic respiration of microorganisms.
CO2.6: Students will have complete knowledge about different methods of sterilization-
Physical & chemical methods
CO2.7: Different staining techniques used for the identification of bacteria.

PRACTICAL

SCP 204

- Study of histology of tissues helps them to understand the functions of organs.
- Physiological experiments like qualitative analysis of urine makes it easier for them to understand the physiology of the system.

SCP 205

- Understand the Preparation of different buffers and titrations. Gain knowledge about Qualitative analysis of carbohydrates, lipids, proteins, amino acids and estimation methods of carbohydrates, proteins, DNA and RNA by using different estimation methods.

SCP 206

- Practically perform different staining techniques to observe the morphology of bacteria. Learn the cultivation of aerobic and anaerobic bacteria and Effect of Antiseptics and Disinfectant on the growth of Microorganisms.

Semester III

GC 303

- CO3.1: Students will gain the Basic working knowledge of all the Hardware components of the computer and the Software requirements to boot the system with its functions.
CO3.2: Students will be exposed to the usage of different most widely used Software packages which will help them in their future placements.
CO3.3: The advantages and disadvantages of internet usage will provide a good awareness to students.

CO3.4: Discussion of different biological databases will provide in depth knowledge and it is an advantage for higher studies also placements.

SC 301

CO3.1: Describes different types of blood cells and their origin.

CO3.2: Routine hematology tests will be studied & are used in the identification of many diseases.

CO3.3: Students will have knowledge of coagulation of blood & its mechanism.

CO3.4: Students will study special hematological tests which are used in the diagnosis of many carcinomas and hereditary diseases.

CO3.5: Students will study causes of different carcinomas & hereditary diseases.

CO3.6: Describes different types of blood groups.

CO3.7: Students will study method of collection of blood, separation of different blood cells and their storage.

CO3.8: Tests used during blood transfusion like minor & major cross matching will be studied here.

SC 302

CO 3.1 Obtain the basic knowledge on the concept of anabolism, catabolism of biomolecules and compartmentalization of metabolic pathways.

CO 3.2 Know the importance of high energy compounds, energy coupling, electron transport chain and synthesis of ATP under aerobic and anaerobic conditions in the cell.

CO 3.3 Understands the fundamental biochemical process that ensures a constant supply of energy to living cells. Gain insight about group of metabolic disorders associated with carbohydrate metabolism.

CO 3.4 Acquire knowledge about the synthesis and breakdown of fatty acids and ketone bodies. Understands the effect of abnormal amounts of lipids in blood and overproduction of ketone bodies in causing diseases.

CO 3.5 Gain basic knowledge general reactions of amino acid degradation and understand the purpose of the urea cycle to eliminate toxic ammonia from the body.

CO 3.6 Acquire knowledge of synthesis of building blocks of nucleic acids and outcome of excessive degradation of nucleic acids.

CO 3.7 Gain familiarity about the rare diseases that affect small percentage of population

SC 303

CO3.1: This describes normal flora of human body, human body's natural defense mechanism against microorganism, different types of infections.

CO3. 2: Type study of important pathogenic microorganisms will be studied in this unit.

CO3.3: This deals with guidelines for selection, collection & transportation of different body specimens for the diagnosis of bacterial infections.

Practical

SCP 304

- Students will understand and perform various hematological tests and the interpretation of results.
- Tests like complete blood count will help them understand the corelate the concepts studied in theory paper.

SCP 305

- Understand the estimation of the blood components like glucose, hemoglobin, albumin and globulin proteins present in the blood.
- Estimation of total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides, calcium, bilirubin from the serum samples by using different estimation methods.

SCP 306

- Helps students to understand the concepts related to common flora of our body and different tests to isolate and characterize them.

Semester IV

GC 403

- CO4.1: Students will be taught - how to operate routine laboratory instruments - water bath, oven, incubators, water distillation plant, water deionizers, refrigerators, cold box, deep freezer, reflux condenser, balances- single pan, double pan, triple balance, direct read out electrical balances, pH meter.
- CO4.2: students will gain knowledge in various instruments used in hospitals- ventilators, nebulizers, humidifier, spirometer, ECG recorder, treadmill, Pacemaker, Angiography, Fingertip pulse oximeter, Colour Doppler and Heart Lung machine.
- CO4.3: This describes principle, applications and types of centrifuges.
- CO4.4: This describes principle, applications and types of Chromatography.
- CO4. 5: This describes principle, applications and types of Electrophoresis.
- CO4.6: This describes principle, applications and types of Spectrophotometry.
- CO4.7: Students will study principle and applications of various semi-automatic & automatic analyzers which will be used in diagnostic laboratories.
- CO4.8: Students will study principle and applications of various advanced instruments- ELISA reader, flow cytometer, PCR and point of care Testing (POCT) devices.

SC 401

- CO4.1: Proper organization gives good results; therefore it is very important to have good knowledge about organization of lab.
- CO4.2: Decalcification and Casting procedure is other two important steps that students will learn in this unit. It gives knowledge about decalcification and casting.
- CO4.3: Students will learn about taking the section, fixing the blade and very important thing student have theoretical knowledge about trouble shooting for poor sections. Also they will study about principle of different microtome and staining principle and techniques
- CO4.4: Students will learn about techniques in smear preparation for different samples. This knowledge will give more assurance to the student to work in medical laboratory.

SC 402

- CO4.1 Gain an understanding of chemical and molecular processes that occur in and between cells. Compare and contrast the structures of DNA and RNA
- CO4.2 Deciphers different steps involved in the process of replication and to understand its mechanism.
- CO4.3 Gives a detailed insight of different repair mechanisms operating in the cell.
- CO4.4 Introduces central dogma concept and elucidates different steps involved in the synthesis of RNA from DNA and its associated enzymes.
- CO4.5Introduces the concept of genetic code and wobble hypothesis. Steps contributing to the synthesis of proteins from RNA are mastered.
- CO4.6 It gives a basic knowledge about the immune system, which is very much essential to understand immunology related advancement in various fields
- CO4.7 To learn the principles behind the method used to develop Polyclonal and monoclonal antibodies and its importance in application in research and diagnosis.
- CO4.8 To learn the principle and components of humoral immune response.
- CO4.9 To understand different types of hypersensitivity reactions

SC 403

- CO4.1: Students will study general properties, classification and many pathogenic viruses in this chapter.
- CO4.2: This describes properties, classification and cultivation of fungi. Also they study different diseases caused by pathogenic fungi.
- CO4.3: In this chapter, students study characteristics, life cycle, pathogenesis and treatment of important pathogenic parasites.
- CO4.4: This provides guidelines for selection, collection and transportation for handling specimens for microbiological evaluation- fungi, viruses and parasites

Practical:

SCP 404

- Students will learn about fixing, labeling, displaying the specimen.
- This also will give knowledge to the students about how to maintain the different samples in medical lab.
- Nuclear staining technique will give the knowledge about how to identify different types of cells based on the shape of nucleus. Nuclear stains help to study the nucleus.
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SCP 405

- Various methods of DNA isolation will be learnt. Students gain a deeper understanding of various hematological tests which can establish the condition of health and disease.
- Immunoprecipitation reactions will help the students understand the antigen-antibody complex formation and precipitation.

SCP 406

- Demonstration of Collection, Transport and Processing of specimens for the evaluation of fungi from skin, nail & hair.
- Demonstration of Collection, Transport and Processing of specimens for the evaluation of parasites from blood and stool samples.
- Demonstration of Collection, Transport and Processing of specimens for the evaluation of viruses
- Demonstration of serological tests for the diagnosis of HIV & Hepatitis B virus.

Semester V

GC 501

CO5.1: This topic plays an important role in creating self-awareness and social awareness about hygiene, nutritional importance and need for public health. The knowledge of above concepts creates an opportunity to work in health sectors too.

CO5.2: The primary objective of the topic is to create awareness about the diseases, its epidemiology, diagnosis, prevention and cure. It enables students to educate people who are unaware and create social awareness among people.

- CO5.3: This topic provides an exposure to available medicine alternative to the allopathic medicines and their importance, which may drive students towards research in the respective fields.
- CO5.4: This topic provides detailed information which enables students to take up career in environmental sciences and to take up careers in the fields of environmental research and learning. It enables students to work in NGO's as volunteer in cleanliness drive and participate in motivating people for the betterment.

GC 502

- CO5.2: Differentiate between different methods of communication. Discuss the importance of effective communication in business, effectively use charts, diagrams, and other graphics in business messages and identify potential sources.
- CO5.2: Effective interpersonal skills can help you during the job interview process and can have a positive impact on your career advancement. By demonstrating that you are dependable, taking the initiative to lead and having a positive impact on your colleagues, you can develop a strong reputation as a collaborative teammate.
- CO5.3: Group discussions offer an opportunity for extended speaking and listening. Helps individuals identify weakness and strengths, Helps brainstorming with conceptual learning. Group discussion practice and skill development is therefore useful for all students.
- CO5.4: Transition from campus to career needs more attention as it involves a lot of planning. The objective of the planning must ensure that the person possesses the necessary skills to enable the person to cope up with the corporate culture and climate.
- CO5.5: Students can understand the function of the entrepreneur in the successful, commercial application of innovations, explore entrepreneurial leadership and management style. Identify personal attributes that enable best use of entrepreneurial opportunities.

GC 503

- CO5.1: To understand the basic concepts in pharmacology and the pharmacological basis of therapeutics.
- CO5.2: To introduce students to the core principles of drug action in terms of bioavailability, pharmacokinetics, pharmacodynamics and mechanism of action of drugs in the treatment of diseases.
- CO5.3: To introduce students to the core principles of drug action in terms of bioavailability, drug efficacy, side effects, toxicities, drug interactions, mechanism of action of drugs in the treatment of diseases.
- CO5.4: To introduce students to understanding toxicities, drug interactions of antibiotics.

SC 501

- CO5.1: Students will be taught urinary system.
- CO5.2: This unit describes collection & preservation methods prior to analysis.
- CO5.3: This chapter describes physical, chemical and microscopic examination
- CO5.4: Constituents of semen and specimen collection will be taught to the students.
- CO5.5: This describes physical, chemical & microscopic examination of semen.
- CO5.6: Specimen collection, microscopic examination and chemical examination
- CO5.7: Constituents of stool and specimen collection will be taught to the students.
- CO5. 8: This describes physical, chemical and microscopic Examination of stool.
- CO5. 9: Specimen collection and processing for the examination of cholera.
- CO5.10: This deals with Formation, composition, Function and collection of CSF.
- CO5.11: This describes physical, chemical and microscopic Examination of CSF
- CO5. 12: Students will study methods of collection, transportation and handling of sputum.
- CO5.13: Physical, Microscopic Examination and Laboratory diagnosis of tuberculosis.

SCP 502

- CO5.1 Introduces basic biochemistry of blood and tests done using blood to assess health.
- CO5.2 Different body fluids are studied and its functions are elucidated. The biochemical parameters associated with the fluids for the assessment of health and disease are studied.
- CO5.3 Role of electrolytes in maintenance of homeostasis is introduced and its measurements. This study helps in understanding the health and disease of human body associated with electrolytes.
- CO5.4 Gain an understanding of functions of organs in maintenance of life. Introduces the concepts of organ function tests and biochemical parameters associated with the organs and to measure them to know organs health.

SC 503

- CO5.1: Students understand General properties, resistance mechanism of antibiotics, antimicrobial sensitivity tests. Also they study antibacterial, antifungal, antiviral, antiprotozoan and anti-helminthic agents.
- CO5.2: Students will be knowing nosocomial infection-mode of transmission and control. Also, they study epidemiologic evaluation - laboratory procedures and problems in epidemiologic evaluation.
- CO5.3: This describes Typing methods and techniques in phenotypic and genotypic methods.
- CO5.4: Students understands Mechanism of injury-Direct tissue invasion, Envenomation, Vesication. Transmission of infectious agents, biological characteristics of arthropods and classification, specimen handling and examination.
- CO5.5: Students study transmission and control of laboratory acquired infections
- CO5. 6: This unit describes microbial flora of food, Microbiological examination of foods and important food borne pathogens.
- CO5.7: This unit describes chemical & microbiological characteristics, microbiological examination of water and water borne pathogens.

CO6.8: This unit describes isolation of microorganisms from air. Bioaerosol control. Important air borne pathogens, bioburden.

Practical:

SCP 504

- Students will perform physical, chemical and microscopic examination of urine.
- Physical, chemical and microscopic examination of semen, stool and CSF will be demonstrated.
- Examination of sputum. Also they study Laboratory diagnosis of tuberculosis

SCP 505

- Gastric juice analysis helps the students perform the gastric profile testing to analyse the gastric health.
- Understand the different electrolytes (sodium, potassium, chloride, calcium) estimation methods and their clinical significance.
- Estimation of different enzymes along with their clinical significance. Basic idea about different urine collection methods and their analysis.

SCP 506

- Determine the Antimicrobial susceptibility tests and MIC by different methods.
- Students will isolate microorganisms from different food sources and air
- Students perform different techniques to determine the quality of milk and water.
- Isolation of microbes from different indoor and hospital environments.

Semester VI

INTERNSHIP

- Students will learn how to handle the patients and specimens.
- They learn blood drawing techniques, collection and storage.
- They perform routine clinical laboratory procedures.
- They learn to do quality checks in clinical laboratory.
- They learn to operate advanced instruments like semi-auto & automatic analyzers, hematology analyzers, ELISA reader, PCR machine etc.
- They perform routine tests in hematology, serology, pathology, biochemistry and microbiology.
- They learn to report the results.
- Students will learn to communicate with patients and give instructions to collect different samples.