



॥ तमसो मा ज्योतिर्गमय ॥

VISION

To provide equal opportunities for value based global education for creating an Enlightened Society

MISSION

To establish and facilitate educational institutions in the region for providing affordable value based global education to all who aspire to study and to create opportunities to educators, social workers and philanthropists to serve society



SARVAJANIK
UNIVERSITY

INCLUSIVE | INTEGRATED | INNOVATIVE

creating an enlightened society...

UNIVERSITY OFFICE

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CURRICULUM FOR

“MASTER OF SCIENCE (MEDICAL LABORATORY TECHNOLOGY)”

M.Sc. (Medical Laboratory
Technology)

SEM – 1

SEM – 2

w.e.f. Academic Year 2026-27

Constituent Institute:
Shree Ramkrishna Institute of
Computer Education and Applied
Sciences (SRKI)



Course Curriculum

MASTER OF SCIENCE (MEDICAL LABORATORY TECHNOLOGY) Sem-1 and 2

The Course Curriculum of Master of Science (Medical Laboratory Technology) was proposed and drafted by **Academic and Curriculum Committee of Microbiology** under the Faculty of Science in the meeting held on **02-07-2026** and recommended to 'BOARD OF STUDIES' for approval.

Dr. Sanjay Parekh
Chairman, Academic
& Curriculum Committee
Science

Place of the meeting
Sarvajani University Office


Sign

The proposed Course Curriculum was approved by **Board of Studies; Science** under the Faculty of Science in the meeting held on **21-08-2026** and was recommended to the 'FACULTY' for approval.

Dr. Jay Bergi
Chairman,
Board of Studies- Science

Place of the meeting
Sarvajani University Office


Sign

The Course Curriculum approved by the **Faculty of Science** in the meeting held on **21-08-2026** and was recommended to 'ACADEMIC COUNCIL' for approval.

Dr. Jay Bergi
Chairman &
Dean, Faculty of
Science

Place of the meeting
Sarvajani University Office


Sign

The Course Curriculum approved by the '**Academic Council of Sarvajani University**' in the meeting held on **16-09-2026**.

Mr. Ashish Desai
Member Secretary,
Academic Council
& I/c. Registrar,
Sarvajani University

Place of the meeting
Sarvajani University Office


Sign

- The approved curriculum of Master of Science (Medical Laboratory Technology) is with effect from the Academic year 2026-27



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II



**SARVAJANIK
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Faculty of Science

M. Sc. (Medical Laboratory Technology)

**DETAILED CURRICULUM
(W.E.F. 2026-27)**



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Credit Framework for 2 Years Postgraduate Program (As per KCG SOP) wef 2026-27
Faculty of Science, Sarvajani University

Semester	DSC						DSE		Skill Enhancement		Total Credits
	DSC No. of Papers	Theory		Lab		Total DSC Credits					
		Theory Hours	Theory Credits	Lab Hrs	Lab Credits		No. of Papers	Credits	No. of Papers	Credits	
1	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2	22
2	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2	22
3	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2	22
4	Dissrt.			48	16	16	1	4	1	2	22
Total after 2yrs	12 + 1					64	4	16	4	8	88



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Teaching Scheme for M.Sc. (Organic Chemistry) Semester – I to II						
Semester	Course Category	Credits	Theory (Hrs/Week)	Theory (Total)	Laboratory (Hrs/Week)	Laboratory (Total)
I	Discipline Specific Core-1	4	3	45	2	30
	Discipline Specific Core-2	4	3	45	2	30
	Discipline Specific Core-3	4	3	45	2	30
	Discipline Specific Core-4	4	3	45	2	30
	Discipline Specific Elective-1	4	3	45	2	30
	Skill Enhancement Courses-1	2	2	30	-	-
	Total	22	17	255	10	150
II	Discipline Specific Core-5	4	3	45	2	30
	Discipline Specific Core-6	4	3	45	2	30
	Discipline Specific Core-7	4	3	45	2	30
	Discipline Specific Core-8	4	3	45	2	30
	Discipline Specific Elective-2	4	3	45	2	30
	Skill Enhancement Courses-2	2	2	30	-	-
	Total	22	17	255	10	150



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Evaluation Scheme for M.Sc. (Organic Chemistry) Semester – I to II							
Semester	Course Category	Continuous and Comprehensive Evaluation (CCE)			Total CCE	Semester End Examination (SEE)	Grand Total
		CCE	Assignment	Attendance			
I	Discipline Specific Core-1	30	10	10	50	50	100
	Discipline Specific Core-2	30	10	10	50	50	100
	Discipline Specific Core-3	30	10	10	50	50	100
	Discipline Specific Core-4	30	10	10	50	50	100
	Discipline Specific Elective-1	30	10	10	50	50	100
	Skill Enhancement Courses-1	15	5	5	25	25	50
II	Discipline Specific Core-5	30	10	10	50	50	100
	Discipline Specific Core-6	30	10	10	50	50	100
	Discipline Specific Core-7	30	10	10	50	50	100
	Discipline Specific Core-8	30	10	10	50	50	100
	Discipline Specific Elective-2	30	10	10	50	50	100
	Skill Enhancement Courses-2	15	5	5	25	25	50





**SARVAJANIK
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Faculty of Science
**M. Sc. (Medical Laboratory
Technology)**

SEM – 1

**DETAILED CURRICULUM
(W.E.F. 2026-27)**



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Systematic Bacteriology

Name of faculty: Science	Department: Microbiology
Program: M. Sc. Medical Laboratory Technology Sem-I	Type: DSC-1
Subject: Systematic Bacteriology	
Credit: 4	Total learning hours: 45
Course Rationale: This subject provides information about various types of bacterial culture procedures, staining techniques, and biochemical tests used for the identification of bacteria. Students will learn about the morphological and cultural characteristics, biochemical properties, and laboratory diagnosis of different bacterial species.	
Learning Outcome: By the end of this course, students will be able to • Perform bacterial culture techniques. • Apply appropriate staining methods. • Conduct biochemical tests for bacterial identification. • Recognise and interpret the morphological, cultural, and biochemical characteristics of various bacteria. • Apply laboratory diagnostic methods for bacterial classification and analysis.	

Reference Book:

- Mackie & McCartney – Practical Medical Microbiology, Elsevier
- R. Ananthanarayan & C.K. Jayaram Paniker – Textbook of Microbiology, Universities Press
- Satish Gupte – The Short Textbook of Medical Microbiology, Jaypee Brothers Medical Publishers
- Kanai L. Mukherjee – Medical Laboratory Technology, McGraw-Hill Education
- Bailey & Scott – Diagnostic Microbiology, Elsevier
- Surinder Kumar – Essentials of Microbiology, Jaypee Brothers Medical Publishers
- Subhash Chandra Parija – Textbook of Microbiology and Immunology, Elsevier
- Lansing M. Prescott – Microbiology, McGraw-Hill
- Apurba Sankar Sastry & Sandhya Bhat K – Essentials in Medical Microbiology, Jaypee Brothers Medical Publishers
- Praful B. Godkar & Darshan P. Godkar – Textbook of Medical Laboratory Technology, Bhalani Publishing



Unit	Topic	Hours
I	Fundamentals of Bacterial Staining & Diagnostic Overview: Significance and principles of staining in bacterial taxonomy and diagnostics; Procedures and interpretation of: Simple stain, Negative stain, Gram stain, Albert's stain, Neisser's stain, Ziehl-Neelsen stain, Capsule, Flagella, Spore stains, Fontana stain for spirochetes; Diagnostic relevance tied to bacterial structures and classification; Overview of bacterial groups relevant to human health.	8
II	Biochemical Identification of Bacteria: Diagnostic interpretation and significance of the following tests in systematic classification: Catalase, Coagulase, Indole, Methyl Red, Voges-Proskauer, Urease, Citrate, Oxidase, TSIA, Nitrate reduction, Carbohydrate fermentation, Bile solubility, H ₂ S production, Motility, Decarboxylases; Integration of biochemical patterns into genus/species-level diagnosis	6
III	Gram-Positive & Gram-Negative Cocci: Study of morphological, cultural, biochemical characteristics, pathogenesis and laboratory diagnosis of – <i>Staphylococcus</i> , <i>Streptococcus</i> , <i>Pneumococcus</i> , <i>Haemophilus</i> , <i>Neisseria gonorrhoea</i> and <i>Neisseria meningitidis</i>	8
IV	Enterobacteriaceae: Study of various characteristics (morphological, cultural and biochemical), pathogenesis and laboratory diagnosis of bacteria- Enterobacteriaceae: <i>Escherichia</i> , <i>Citrobacter</i> , <i>Enterobacter</i> , <i>coli</i> , <i>Proteus</i> , <i>Klebsiella</i> , <i>Shigella</i> , <i>Yersinia enterocolitica</i> and <i>Yersinia pestis</i>	7
V	Systemic & Atypical Bacterial Pathogens: Classification, morphology, pathogenicity, and diagnostics of: <i>Corynebacterium</i> , <i>Salmonella</i> , <i>Vibrio</i> , <i>Clostridium species</i> , <i>Mycobacterium tuberculosis complex</i> , <i>Spirochetes</i> : <i>Treponema</i> , <i>Borrelia</i> , <i>Leptospira</i> , <i>Pseudomonas</i>	8
VI	Non-sporing anaerobic cocci and bacilli: Classification & Morphology, pathogenicity, and diagnostics of - Anaerobic cocci: <i>Peptostreptococcus</i> , <i>Veillonella</i> ; Anaerobic Gram-positive bacilli: <i>Propionibacterium</i> , <i>Actinomyces spp.</i> (non-sporing); Anaerobic Gram-negative bacilli: <i>Bacteroides</i> , <i>Fusobacterium</i> .	8
Total		45



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

List of Practical

- 1) Examination of living Bacteria: Hanging – drop technique.
- 2) Differential Staining:
 - a) The Gram Stain
 - b) The Acid fast Staining.
- 3) Special Staining:
 - a) The Spirocheate Stain
 - b) The Metachromatic Granules Stain.
 - c) The Spore Stain
 - d) The Capsule Stain
- 4) Pure culture study of the following cultures and their antibiotic susceptibility:
 - a) *Bacillus cereus*
 - b) *Staphylococcus aureus*
 - c) *Klebsiella mobillis/Klebsiella pneumoniae*
 - d) *Escherichia coli*
 - e) *Proteus vulgaris*
 - f) *Salmonella typhi / paratyphi A / paratyphi B*
 - g) *Pseudomonas aeruginosa*



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Medical Entomology and Parasitology

Name of faculty: Science	Department: Microbiology
Program: M. Sc. Medical Laboratory Technology Sem-I	Type: DSC-2
Subject: Medical Entomology and Parasitology	
Credit: 4	Total learning hours: 45
Course Rationale: This course enables students in medical laboratory science to equip students with an in-depth understanding of morphology, pathogenesis, diagnostics, and control strategies of medically important parasites and arthropod vectors. It supports clinical decision-making and laboratory proficiency in detecting and characterising parasitic infections and vector-borne diseases with health significance.	
Learning Objectives: ● Recognise global priority parasitic diseases and research advances ● Understand the classification and structure of parasites and arthropods of medical importance ● Explain life cycles, disease mechanisms, and host-pathogen interactions of protozoa and helminths ● Identify parasites and vectors using microscopy, serology, and molecular methods ● Analyse vector ecology and apply integrated control measures ● Interpret immunological and molecular diagnostics relevant to parasitology ● Recognise global priority parasitic diseases and research advances in their management	

Reference Book:

- C.K. Jayaram Paniker, Paniker's Textbook of Medical Parasitology, Jaypee Brothers Medical Publishers
- D.R. Arora & B. Arora – Medical Parasitology, CBS Publishers & Distributors
- P. Chakraborty – Textbook of Medical Parasitology, New Central Book Agency
- Lynne Shore Garcia – Diagnostic Medical Parasitology, ASM Press
- K.D. Chatterjee – Parasitology in Relation to Clinical Medicine, CBS Publishers & Distributors
- Praful B. Godkar – Textbook of Medical Microbiology and Parasitology, Bhalani Publishing House
- K. Park – Park's Textbook of Preventive and Social Medicine, Banarsidas Bhanot Publishers
- WHO Technical Reports – Vector Control and Parasitic Disease Surveillance



SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Master of Science (Medical Laboratory Technology) Sem-I and II

Unit	Topic	Hours
I	Introduction to Medical Parasitology & Entomology: scope and relevance; classification of medically important parasites and arthropods; transmission types, host categories, global burden and disease impact, emerging threats. Types of animal association, parasitism, commensalism, symbiosis, host adaptation mechanisms	5
II	Protozoa: morphology, life cycle, pathogenesis, laboratory diagnosis, treatment and prevention of nonpathogenic: Entamoeba coli, Endolimax nana, Free living Amoebae: Naegleria, Acanthamoeba, Flagellates: Trichomonas, Giardia lamblia, Leishmania, Trypanosoma, Sporozoa: Malarial parasites, Bebesia, Toxoplasma gondii.	8
III	Helminths: Classify helminths; compare morphological features, transmission routes, and adaptation mechanisms. Trematodes: morphology, life cycle, pathogenesis, laboratory diagnosis, treatment and prevention of Schistosoma species, Fasciola species, Fasciolopsis species, Paragonimus species Cestodes: morphology, life cycle, pathogenesis, laboratory diagnosis, treatment and prevention of Taenia species, Echinococcus species, Hymenolepis nana, Diphyllbothrium latum	10
IV	Nematodes: morphology, life cycle, pathogenesis, laboratory diagnosis, treatment and prevention of Intestinal Nematodes: Ascaris lumbricoides, Ancylostoma duodenale, Necator americanus, Enterobius vermicularis, Trichuris trichiura, Lymphatic Nematodes: Wuchereria bancrofti, Brugia malayi, Subcutaneous tissue Nematodes: Loa loa, Onchocerca volvulus, Dracunculus medinensis	10
V	Introduction of Arthropods: classify the arthropods of public health importance; distinguish between vector and vehicle; vector control strategies (environmental control, chemical control, biological control, genetic control) approaches; role of vehicles and vectors in disease spread.	6
VI	Arthropods of Medical Importance: morphology, life cycle, public health importance and control of Mosquitoes, Sandflies, Tse-tse fly, Blackflies, Fleas, Ticks and Mites, Housefly, Reduviid Bug, bed bug, lice.	6
Total		45



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

List of Practical

- 1) Routine stool examination for detection of intestinal parasites with concentration methods:
 - a) Saline preparation
 - b) Iodine preparation
 - c) Floatation method
 - d) Centrifugation method
- 2) Identification of adult worms, Tapeworm segments, ova, cysts and larvae of parasite from charts/photographs/models/slides
- 3) Malarial Parasite Microscopy:
 - a) Preparation of thin and thick blood smears
 - b) Staining of smears
 - c) Examination of smears for malarial parasites (*P. vivax* and *P. falciparum*)
 - d) Demonstration of various stages of life cycle of malarial parasites from stained slides
- 4) Malaria Rapid diagnostic test (RDT/ICT)
- 5) Test for Filarial parasite: (slide/demonstration)
- 6) Arthropod Identification - using charts, preserved samples, shared slides



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Clinical Pathology and Immunology

Name of faculty: Science	Department: Microbiology
Program: M. Sc. Medical Laboratory Technology Sem-I	Type: DSC-3
Subject: Clinical Pathology and Immunology	
Credit: 4	Total learning hours: 45
Course description: The Clinical Pathology course has been prepared to inform anatomy, physiology, formation and collection of various clinical samples (urine, stool, semen, serous fluid etc.). Also routine analysis of various clinical samples is included to expand the view of the subject. The Principles of Immunology course has been designed to convey basic information about immune system development. Also included humoral and cell mediated immunity, antigen & antibody in detail. Topics included like Ag-Ab reactions will help the students to know latest diagnostic methods. Also included immunization and autoimmunity topic to broaden the perspective of the subject.	
Student learning outcome: • The training in this subject enables the students to carry out routine clinical laboratory investigation (urine, stool, semen etc.). • The candidates are made to learn collection of clinical samples and their processing with basic technique and recording of data. • Analyze various serum samples, for estimation of different components which are the cause of the immune disease or are the diagnostic/prognostic markers. • Gain information about pathogenicity and infection. • Know about various immunodeficiency disorders like- Hypersensitivity and autoimmunity.	

Reference Book:

CLINICAL PATHOLOGY

- Mundt, L., & Shanahan, K. (2020). Graff's textbook of urinalysis and body fluids. Jones & Bartlett Learning.
- Godkar, P. B., & Godkar, D. P. (2006). Textbook of medical laboratory technology. Bhalani publishing house.
- Strasinger, S. K., & Di Lorenzo, M. S. (2014). Urinalysis and body fluids. FA Davis.
- Sood, R. (2006). Textbook of medical laboratory technology. Jaypee Brothers Publishers.
- Chou, D. (2007). Henry's clinical diagnosis and management by laboratory methods. JAMA, 297(16), 1827-1833.
- Polansky, V. D. (2014). Quick Review Cards for Medical Laboratory Science. FA Davis.
- World Health Organization. (2021). WHO laboratory manual for the examination and processing of human semen. In Who laboratory manual for the examination and processing of human semen.



IMMUNOLOGY

- Punt, J., Stranford, S., Jones, P., Owen, J.A. – Kuby Immunology, W.H. Freeman
- Parslow, T.G., Stites, D.P., Terr, A.I. – Medical Immunology, McGraw Hill
- Delves, P.J., Martin, S.J., Burton, D.R., Roitt, I.M. – Roitt's Essential Immunology, Wiley-Blackwell
- Kumar, V., Abbas, A.K., Aster, J.C. – Robbins Basic Pathology, Elsevier
- Gangal, S., Sontakke, S. – Textbook of Basic and Clinical Immunology, Universities Press (India) Pvt. Ltd.
- Subhash Chandra Parija – *Textbook of Microbiology and Immunology*, Elsevier
- S.K. Gupta – *Essentials of Immunology*, Jaypee Brothers Medical Publishers

Unit	Topic	Hours
I	Urine analysis: Collection and preservation; physical, chemical, microscopic exams; urine strip technique; renal pathology; pregnancy tests, urine osmolality. Bence Jones protein, and automation in urinalysis.	7
II	Cerebrospinal Fluid (CSF): CSF formation and handling; differentiation of pathological findings; cell count interpretation; meningitis profiles. Semen analysis: Sample collection; physical, chemical, microscopic exams; sperm morphology; fertility tests and interpretation. WHO sperm morphology criteria.	7
III	Serous & Synovial Fluids: Formation, collection, exam of pleural, pericardial, peritoneal, synovial fluids; transudates vs exudates; crystals; joint disorder profiles. Fecal Analysis: Composition; collection; physical, chemical, microscopic exams; fecal screening tests (occult blood, fat, Hb); clinical correlations.	7
IV	Types of Immunity: 1. Innate immunity a) Anatomical barriers-skin, mucous lining, cilia, saliva, tears etc. b) Role of T cells c) Cellular immunity-neutrophils, macrophages, dendritic cells, natural killer cells d) Inflammation-vasodilation, extravasation, oedema, chemokines, integrin, ICAMs, cytokines (defensins, cathelicidins, interferons, etc.) 2. Adaptive Immune system a) Antigen- types, Antigen properties contributing immunogenicity- molecular size, chemical composition,	8



	genotype, dosage, route of entry etc. b) Role of B cells c) Immunoglobulins- types, structure, antibody- mediated effector functions-opsonization, complement activation, ADCC (antibody dependent cell mediated cytotoxicity).	
V	Immunological techniques a) Precipitation reactions: Immuno diffusion, immune electrophoresis, Immunoprecipitation b) Agglutination reactions: Blood group typing, Bacterial agglutination, Agglutination inhibition c) Complement fixation d) Neutralisation e) Immunofluorescence f) ELISA g) FIA and RIA h) Western Blotting	8
VI	Hypersensitivity Type I, Type II, Type III and type IV: Allergy, skin tests, transfusion reactions, hemolytic disease of the newborn, Immune Complex diseases, tuberculin test Autoimmunity and disorders: SLE, Multiple sclerosis, Rheumatoid arthritis, Myasthenia gravis, Autoimmune Thyroiditis Vaccination: Principle, types, vaccine development, adjuvants	8
Total		45

SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

List of Practical

CLINICAL PATHOLOGY

- 1) Routine Urine Analysis: Physical, Chemical, Microscopic examination. & Reagent Strip Method.
- 2) Routine Cerebrospinal Fluid Analysis: Physical, Chemical, Microscopic examination.
- 3) Routine Stool Analysis: Physical, Chemical, Microscopic examination.
- 4) Routine Semen Analysis: Physical, Chemical, Microscopic examination.
- 5) Routine Peritoneal fluid/Pleural fluid Analysis: Physical, Chemical, Microscopic examination.
- 6) Routine Pericardial fluid/Synovial fluid Analysis: Physical, Chemical, Microscopic examination.

IMMUNOLOGY

- 1) ICT/Dot immunoassay/ Flow through assay for HIV Ab
- 2) ICT/Dot immunoassay/ Flow through assay for HBs Ag
- 3) ICT/Dot immunoassay/ Flow through assay for HCV Ab
- 4) Slide / Tube/ Strip test for typhoid
- 5) Slide test for syphilis (RPR/TRUST)
- 6) Strip test for Pregnancy
- 7) Latex test for C-Reactive protein
- 8) Latex test for Rheumatoid arthritis
- 9) Latex test for Anti Streptolysin O (ASO).



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Essentials of Histology and Cytopathology

Name of faculty: Science	Department: Microbiology
Program: M. Sc. Medical Laboratory Technology Sem-I	Type: DSC-4
Subject: Essentials of Histology and Cytopathology	
Credit: 4	Total learning hours: 45
Course Rationale: This course equips students with foundational and applied competencies in Histology and Histopathology. By exploring the microscopic architecture of cells and tissues, learners will develop diagnostic insight into disease mechanisms and tissue responses. Emphasis will be placed on laboratory organization, specimen processing, cytological techniques, routine and specialized staining, and the interpretation of morphological changes. Through this, students gain readiness to contribute meaningfully to diagnostic histopathology, cytopathology, and integrated laboratory medicine.	
Learning Outcome: At the end of the course the students will be able to: • Apply principles and techniques for tissue fixation, processing, and staining in histological practice. • Demonstrate proper specimen collection and handling to uphold diagnostic standards. • Interpret cellular and tissue morphology across organ systems, correlating with physiological and pathological changes. • Demonstrate knowledge of cellular morphology and identify cytological features of normal and diseased states. • Perform and troubleshoot cytological specimen preparation, staining, and slide screening techniques.	

Reference Book:

- Bancroft, J. D., & Gamble, M. (Eds.). (2008). Theory and practice of histological techniques. Elsevier health sciences.
- Ramakrishnan, S., & Sulochana, K. N. (Eds.). (2012). Manual of Medical laboratory techniques. Jaypee Brothers Medical Publishers Pvt. Ltd.
- Culling, C. F. A., & Taylor, H. E. (1963). Handbook of histopathological techniques (including museum technique).
- Nayak, R., & Nayak, R. (2018). Exam Preparatory Manual for Undergraduates: Pathology. Jaypee Brothers Medical Publishers
- Carson, F. L., & HLADIK, C. (2015). Histotechnology. A self-instructional text, American-Society.
- Curran, R. C., & Crocker, J. (2000). Curran's atlas of histopathology.
- ComBibbo, M., & Wilbur, D. (2014). Comprehensive cytopathology. Elsevier Health Sciences.
- Cibas, Edmund S, and Barbara S Ducatman. Cytology: Diagnostic Principles and Clinical Correlates. Fifth edition. Philadelphia, PA: Elsevier, 2021.
- Koss, L.G. and Melamed, M.R. (2005) Koss' diagnostic cytology and its histopathologic bases. 5th Edition, JB Lippincott, Philadelphia.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Unit	Topic	Hours
I	Introduction to Histology and Cell Architecture: Scope and relevance of histology in laboratory medicine, Microscopic anatomy overview, Histological terminology and classification of tissues, Cellular organelles and nuclear-cytoplasmic relationships	6
II	Cell Biology and Cytological Architecture: Cell membrane, cytoskeletal elements, and intracellular junctions, Nucleus, nucleolus, and chromatin organization, Cell cycle phases and mitotic activity in tissues, Apoptosis and cellular degeneration markers.	6
III	Tissue Preparation and Processing: Fixation techniques: chemical principles and types, Processing steps: dehydration, clearing, embedding, Microtomy principles and troubleshooting, Frozen sections and cryostat applications. Staining Techniques and Interpretation: Principles of staining: dye-tissue interactions, Routine stains: H&E, Romanowsky stains, Special stains: PAS, Masson's trichrome, Reticulin, Alcian blue. Histochemical techniques in tissue differentiation, Stain validation, control tissues, and interpretative accuracy.	9
IV	Exfoliative Cytology: Introduction to Exfoliative Cytology Definition and scope, Types of exfoliation: spontaneous vs. mechanically induced, Advantages and limitations in clinical diagnostics Sample Collection Techniques: General principles of collection and fixation, Specific site-based collection: • Respiratory tract: sputum, bronchial washings • Urinary tract: voided urine, bladder washings • Female genital tract: Pap smear (conventional and liquid-based cytology) • Serous cavities: pleural, peritoneal, and pericardial fluids • Nipple discharge, oral cavity, gastrointestinal tract	8
V	Interventional Cytology: Introduction to Interventional Cytology Definition, scope, and evolution, Indications and contraindications, Role in minimally invasive diagnosis Fine Needle Aspiration Cytology (FNAC) • Techniques: Palpation-guided, USG-guided, CT-guided • Needle types, aspiration vs. non-aspiration (capillary) technique • FNAC of common sites: breast, thyroid, lymph node, salivary gland, soft tissue Sample Collection, Smear Preparation Smear techniques (pull, squash, drop, spray), Cell block preparation and liquid-based cytology	8



VI	Slide Preparation and Staining: Smearing techniques, Fixatives used for exfoliative samples, Staining methods: Papanicolaou stain (Pap stain), Hematoxylin and Eosin, May-Grünwald Giemsa (MGG), Special stains for infection (Ziehl-Neelsen, PAS) Microscopic Interpretation: Criteria for adequacy and cellular preservation, Identification of normal epithelial cells and reactive changes, Recognition of inflammatory and infectious processes, Cellular atypia and malignancy: cytomorphological features)	8
Total		45

List of Practical

- 1) Demonstrate receiving, handling, and labelling and specimen rejection criteria of cytological specimen.
- 2) Tissue Processing & Embedding – fixation, dehydration, clearing, impregnation (Demonstration).
- 3) Staining – (a) Haematoxylin and Eosin for paraffin sections.
(b) PAP Stain for cytology.
- 4) Perform mounting of the stained section



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M.Sc. Microbiology / Medical Laboratory Technology / PGDMLT		
Course Type	DSE		Version	2.0		
Semester	01		Effective From	June, 2026		
Course Code	MSMB22101	Course Name	Bioanalytical Techniques (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
3	3 hrs	0	0 hrs	50	50	100

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M.Sc. Microbiology / Medical Laboratory Technology / PGDMLT		
Course Type	DSE		Version	2.0		
Semester	01		Effective From	June, 2026		
Course Code	MSMB22102	Course Name	Bioanalytical Techniques (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0 hrs	0	2 hrs	50	50	100



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Name of Faculty: Sciences	Department: Microbiology
Program: M.Sc. Microbiology / Medical Laboratory Technology / PGDMLT Sem-I	Type: DSE-1
Subject: Bioanalytical Techniques	
Credit: 4	Duration: 45 hours
Course description: The objective of this course is to study of the various separation and the spectroscopic techniques for the detection of bio-analytes	
Learning Outcomes: • Make use of the centrifuge and Flow cytometry • Apply chromatography and electrophoresis techniques in the separation of biomolecules. • Estimation and identification of molecules in biological samples by spectroscopic techniques.	

Reference:

- Wilson K and Walker J: *Principles and Techniques of Biochemistry and Molecular Biology*. Cambridge University Press (Low price edition), New York, 6th ed.
- Khandpur R S (2008): *Handbook of analytical instruments*. Tata McGraw-Hill Publishing Company Limited (New Delhi), 2nd ed.
- Webster J G (2009): *Bioinstrumentation*. Wiley India (P) Ltd. New Delhi. (Student ed.)
- Upadhyay A., Upadhyay K and Nath N. (2003): *Biophysical Chemistry (Principles and Techniques)*. Himalaya Publishing House, 8th ed.
- Khopkar S M (2008): *Basic concepts of Analytical Chemistry*. New age international publishers (New Delhi), 3rd ed.
- Sharma B K (2005): *Instrumental methods of chemical analysis*. GOEL publishing house, Meerut, 24th ed.

Unit 1: Important Biological Instrument

(7 Hours)

- a. Centrifugation
 - 1.1.1. Basic Principles of sedimentation
 - 1.1.2. Types, Care and Safety Aspects of Centrifuge
 - 1.1.3. Preparative centrifugation
 - 1.1.4. Analytical Ultracentrifugation
- 1.2 Flow cytometry
 - 1.2.1 Introduction
 - 1.2.2 Instrumentation
 - 1.2.3 FACS
 - 1.2.4 Applications



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Unit 2: Spectroscopic Techniques - I

(8 Hours)

- 2.1 General properties of electromagnetic radiation
- 2.2 The electromagnetic spectrum
- 2.3 Interactions of radiation and matter
- 2.4 Transmittance, Absorbance & Beer & Lambert's law
- 2.5 UV/Vis Spectrometry
 - 2.5.1 Instrument component
 - 2.5.2 Types of instruments – Single and double beam
 - 2.5.3 Applications of UV/Vis Spectroscopy
- 2.6 IR Spectrometry
 - 2.6.1 Theory of IR absorption spectrometry
 - 2.6.2 Sample preparation
 - 2.6.3 Instrument component
 - 2.6.4 Application of IR spectrometry

Unit 3: Spectroscopic Techniques – II

(6 Hours)

- 3.1 Mass Spectrometry
 - 3.1.1 Introduction
 - 3.1.2 Methods of ionization
 - 3.1.3 Components of Mass Spectrometers
 - 3.1.4 Types of mass analyzers
 - 3.1.5 Types of Mass spectrometers
 - 3.1.6 Tandem Mass Spectrometry
 - 3.1.7 Application of Mass spectrometry

Unit 4: Separation Techniques – I

(10 Hours)

- 4.1 Chromatography: General principles and Chromatographic performance parameters
- 4.2 Types of chromatography: Liquid & Gas
- 4.3 Liquid chromatography: Principles and applications of Column, Thin-layer, Partition, Adsorption, Ion-exchange, Size-exclusion, Affinity. HPLC
- 4.4 Gas chromatography: Principles, Classification: GSC & GLC, Components of instrument- Carrier gas, Sample injection systems, Columns and Detectors. Principle and applications of GC-MS.

Unit 5: Separation Techniques – II

(7 Hours)

- 5. Electrophoresis
 - 5.1 General principles
 - 5.2 Modes of electrophoresis
 - 5.3 Support media
 - 5.4 Types of electrophoresis - Horizontal, Vertical and two dimensional
 - 5.5 Principle and applications - Paper electrophoresis, Starch gel electrophoresis, Disc gel, Agarose gel, SDS – PAGE, Immunelectrophoresis.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Unit 6: Radioisotopic techniques

(7 Hours)

6.1 Fundamentals of Radiochemical methods

- 6.1.1 Time decay of radioactive isotopes
- 6.1.2 Units of Radio activity
- 6.1.3 Types and Properties of particles emitted in radio active decay
- 6.1.4 Interaction of radiation with matter

6.2 Detection and measurement of radioactivity - Geiger- Muller and Scintillation counters,

6.3 Auto radiography and its applications.

List of Practical

1. Separation of aminoacids / carbohydrate by Thin Layer Chromatography.
2. Operation of HPLC (Demonstration)
3. Separation of nucleic acids and proteins by gel electrophoresis.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M.Sc. Microbiology / Medical Laboratory Technology / PGDMLT		
Course Type	SEC		Version	2.0		
Semester	01		Effective From	June, 2026		
Course Code	MSMB23101	Course Name	Research Methodology - I			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
2	2 hrs	0	0 hrs	25	25	50



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Name of faculty: Science	Department: Microbiology
Program: M.Sc. Microbiology / Medical Laboratory Technology / PGDMLT Sem-1	Type: SEC-1
Subject: Research Methodology-I	
Credit: 02	Total learning hours: 30
Course description: This course introduces the fundamental concepts and principles of research methodology . It covers the research process, types of research, literature review, identification of research problems, formulation of research objectives and hypotheses, variables, measurement scales, data collection methods, and research design. The course equips students with the knowledge and skills required to plan, design, and conduct scientific research systematically, providing a strong foundation for research in life sciences and other scientific disciplines.	
Student learning outcome: Upon successful completion of this course, students will be able to: ➤ Understand the fundamental concepts, types, and process of scientific research. ➤ Formulate research problems, objectives, and testable hypotheses through literature review. ➤ Identify variables, measurement scales, and appropriate data collection methods for research. ➤ Design suitable research methodologies and experimental plans for scientific investigations. ➤ Apply the principles of research design to conduct systematic and ethical research.	

References:

- Kumar, R. (2005). *A Step-by-step Guide for Beginners*. Sage Publications. (ISBN: 9788132106487)
- Bairagi, V., & Munot, M. V. (Eds.). (2019). *Research methodology: A practical and scientific approach*. CRC Press.
- Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International. (ISBN: 978-81-224-2488-1)

Further Reading:

- Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- Patwardhan, B., Desai, A., Chourasai, A., Nag, S., & Bhatnagar, R. (2020). *Guidance Document Good Academic Research Practices*.
- University Grants Commission. (2021). *Academic Integrity and Research Quality*.

UNIT: 1 Introduction to Research:

(Duration: 08 Hrs)

- 1.1 Definition of Research, Meaning and objectives
- 1.2 Types of research
- 1.3 Important Ingredients for Research
- 1.4 The research process
- 1.5 Criteria of Good Research
- 1.6 Problems Encountered by Researchers in India

UNIT: 2 Important steps of research

(Duration: 08 Hrs)

- 2.1 Reviewing the literature
 - 2.1.1 Searching for the existing literature
 - 2.1.2 Reviewing the selected literature



SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Master of Science (Medical Laboratory Technology) Sem-I and II

- 2.2 Formulating a research problem
 - 2.2.1 The importance of formulating a research problem
 - 2.2.2 Sources of research problems
 - 2.2.3 Considerations in selecting a research problem
 - 2.2.4 Steps in formulating a research problem
 - 2.2.5 The formulation of research objectives
- 2.3 Identifying variables: What are variables? Types of variables

UNIT: 3 Constructing Hypothesis

(Duration: 07 Hrs)

- 3.1 Definition of Hypothesis
- 3.2 The function of a hypothesis
- 3.3 Testing of a hypothesis
- 3.4 Characteristics of hypothesis
- 3.5 Types of hypotheses

UNIT: 4 Research Design

(Duration: 07 Hrs)

- 4.1 Meaning of research design
- 4.2 Need for a research design
- 4.3 Important concepts relating to research design
- 4.4 Basic principles of experimental designs
- 4.5 Important experimental designs



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II



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SEM – 2

**DETAILED CURRICULUM
(W.E.F. 2026-27)**



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II
Clinical Biochemistry

Name of faculty: Science	Department: Microbiology
Program: M. Sc. Medical Laboratory Technology Sem-II	Type: DSC-5
Subject: Clinical Biochemistry	
Credit: 4	Total learning hours: 45
Course Rationale: The Course will equip the student with the knowledge of disorders related to the respective metabolisms taking place in the body. The course emphasizes on the understanding of metabolic pathways and biochemical changes associated with various pathological conditions.	
Learning Outcomes: At the end of the course, students will be able to ● Understand the principles of biochemical processes and how they relate to normal and diseased states. ● Identify and explain the significance of common biochemical markers used in diagnostics and monitoring of disease. ● Perform key biochemical laboratory techniques and follow proper sample handling procedures	

Reference Book:

- Harper's Biochemistry, 28th edition, Robert K Murray, Tata McGraw publishers
- Text book of Medical Biochemistry, MN Chatterjee, Rana Shinde, Jaypee Publishers
- Varleys practical clinical biochemistry, Alan Gowenlock, CBS publishers
- Lehinger Principle of Biochemistry, David L Nelson, 7th edition, WH Freeman Publishers
- Biochemistry, Debajyoti Das, Academic publishers
- Godkar, P. B., & Godkar, D. P. (2006). Textbook of medical laboratory technology. Bhalani publishing house.

Unit	Topic	Hours
I	Disorders of carbohydrates metabolism: ● Glucose level in normal blood, renal threshold ● Diabetes Mellitus: classification and Pathogenesis of DM ● Diabetic ketoacidosis and diabetic coma, secondary degenerative changes associated with diabetes mellitus. ● Hyper glycemia, Hypoglycaemia, glycosuria and Renal Glycosuria ● Laboratory diagnosis : specimen collection, Patient Instructions, storage; principle, estimation, reference range, clinical significance of Plasma glucose (fasting, post prandial, random), Oral Glucose Tolerance Tests, Glucose challenge test, urine microalbumin, Glycated haemoglobin, qualitative tests for sugars in urine, Ketone bodies, Plasma lactate.	8



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FACULTY OF SCIENCE

Master of Science (Medical Laboratory Technology) Sem-I and II

II	Disorders of lipid metabolism: - Plasma triglycerides, Cholesterol, HDL cholesterol, LDL cholesterol levels - Familial hypercholesterolemia, hypo and hyper cholesterolemia, Fatty liver, Hyper and hypo lipoproteinemia, hypertriglyceridemia, Dyslipidemia, Atherosclerosis and Myocardial Infarction, ketosis, fatty liver, coronary heart disease. Laboratory diagnosis : Specimen collection, Patient Instructions Principle, estimation, reference range and clinical significance - lipid profile (serum cholesterol, triglycerides, HDL, LDL, HDL:LDL)	8
III	Disorders of Amino acid and protein metabolism: - Overview of plasma proteins and their disorders, multiple myeloma, Paraproteinemia Laboratory diagnosis : Specimen collection, Principle, estimation, reference range and clinical significance of : proteins in blood (albumin, α1-antitrypsin, α1-fetoprotein, C-reactive protein, β2-microglobulin), serum Immunoglobulins; Disorders of nitrogen metabolism: Excretion of nitrogenous waste products, abnormalities of nitrogen metabolism including uremia, Uric aciduria, aminoaciduria Laboratory diagnosis: Principle, estimation, reference range and clinical significance of Ammonia, urea, uric acid, creatinine.	8
IV	Minerals and Trace Metal disorders : - Overview of Mineral and trace metal disorders- Anaemia, Hypercalcemia, Phosphatemia, Wilson disease, etc Laboratory diagnosis: Principle, estimation, reference range and clinical significance: disorders related to iron, calcium, phosphorus, magnesium, copper and zinc	8
V	Clinical Enzymology: - Sources of plasma enzymes, diagnostic importance and their interpretation Laboratory evaluation of enzymes- Principle, estimation, reference range, and clinical significance: Amylase, Lipase, aminotransferase, gamma glutamyl transferase, alkaline phosphatase, creatinine kinase, cholinesterase, lactate dehydrogenase, lipoprotein lipase, LDH, Acid phosphatase	7
VI	Fluid and electrolyte balance disorders: - Disorders of fluid and electrolyte balance Laboratory diagnosis Principle, estimation, reference range, and clinical significance Electrolytes (sodium, potassium, chloride, bicarbonate)	6



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

List of Practical

- 1) Blood Glucose/Sugar estimation and GTT.
- 2) Blood Cholesterol – Free & Total HDL Cholesterol, LDL Cholesterol.
- 3) Serum Triglyceride
- 4) Serum Total Protein and Serum Albumin and A/G ratio
- 5) Micro albumin test
- 6) Blood/Urine Urea.
- 7) Blood /Urine Creatinine.
- 8) Blood /urine Uric Acid
- 9) Serum Calcium / Ionized Calcium
- 10) Serum Phosphorus
- 11) Serum potassium
- 12) Serum Sodium
- 13) Serum Chloride
- 14) Serum Iron, and TIBC (Total Iron Binding Capacity)
- 15) Serum Bilirubin.
- 16) Serum Alkaline Phosphatase.
- 17) Serum Acid Phosphatase.
- 18) S.G.O.T
- 19) S.G.P.T.
- 20) Serum Amylase.
- 21) Serum Lipase



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Haematology and Haematological Disorders

Name of faculty: Science	Department: Microbiology
Program: M. Sc. Medical Laboratory Technology Sem-II	Type: DSC-6
Subject: Haematology and Haematological Disorders	
Credit: 4	Total learning hours: 45
Course Rationale: Students will understand the advanced-level course equips learners with clinical-laboratory expertise to investigate hematologic disorders through morphological, molecular, and algorithmic lenses. It emphasizes interpretation of bone marrow, peripheral blood findings, bleeding profiles, and malignant hematologic conditions using automated and biosafe practices.	
Learning Outcomes: • Interpret bone marrow and peripheral blood findings in hematologic disorders • Apply diagnostic measures for anemia, leukemia, MDS, and hemostatic conditions • Perform and analyze molecular, cytogenetic, and immunophenotypic tests. • Correlate lab data with clinical symptoms to distinguish hematologic and hemostatic disorders. • Use automation tools and quality protocols for hematology lab efficiency	

Reference Book:

- McKenzie, S. B., Williams, J. L., & Landis-Piwowar, K. (2004). Clinical laboratory hematology (Vol. 1). Pearson education.
- Wickramasinghe, S. N., & McCullough, J. J. (2003). Blood and bone marrow pathology.
- Chou, D. (2007). Henry's clinical diagnosis and management by laboratory methods. JAMA, 297(16), 1827-1833.
- Wintrobe, M. M. (2009). Wintrobe's clinical hematology (Vol. 1). Lippincott Williams & Wilkins.
- McKenzie, S. B., Williams, J. L., & Landis-Piwowar, K. (2004). Clinical laboratory hematology (Vol. 1). Pearson education.
- Hoffbrand, A. V. et al (2016). Color Atlas of Clinical Hematology (Fourth ed.). New Delhi, India: Elsevier.
- Sood, R. (2006). Textbook of medical laboratory technology. Jaypee Brothers Publishers.
- Dacie, J. V. (2006). Dacie and Lewis practical haematology. Elsevier Health Sciences.
- Godkar, P. B., & Godkar, D. P. (2006). Textbook of medical laboratory technology. Bhalani publishing house.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Unit	Topic	Hours
I	Hematopoiesis and Bone Marrow Dynamics: Regulation of hematopoietic stem cells and stages of differentiation; Identification of maturation blockages and marrow failure syndromes; Role of marrow micro environment and stromal interactions; Cytokine signaling in stem cell survival and lineage commitment; WHO 2022 marrow grading: fibrosis, cellularity, and blast percentages.	7
II	Red cell structure and metabolism: Red cell morphology and structural variants (size, shape, inclusion bodies); Hemoglobin biosynthesis: heme synthesis, globin chain production; Red cell metabolic pathways: Embden-Meyerhof and Pentose phosphate pathways; Functional implications of morphology and metabolism on red cell survival	7
III	Red cell destructions- extracellular and intracellular red cell destructions; compensation mechanisms in hemolysis-reticulocytosis, erythroid hyperplasia, bilirubin metabolism; Classification of hemolytic anemia: hereditary vs acquired; Pathophysiology and laboratory diagnosis of: Hereditary spherocytosis and elliptocytosis, G6PD deficiency and its oxidative stress pathways, Paroxysmal nocturnal hemoglobinuria (PNH); diagnostic approaches for hereditary and acquired hemolytic anemias.	7
IV	Nutritional & Hypoproliferative Anemias: Classification, pathophysiology and laboratory diagnosis of nutritional anemias- Iron deficiency, folate deficiency, and megaloblastic anemia; Diagnostic interpretation using - Iron studies, megaloblastic indices, folate deficiency; anemia of chronic disease- pathophysiological mechanisms and cytokine- mediated iron sequestration; Hypoproliferative anemias - reticulocyte indices, erythropoietin response, and marrow hypocellularity.	8
V	Hemoglobin Variants and Thalassemia Syndromes: Classification, pathophysiology and laboratory diagnosis of hemoglobin variants and thalassemia syndromes; WHO guidelines for sickle cell disease and unstable hemoglobin - Structural abnormalities (e.g., HbS, HbE, HbD) and synthesis defects (α - and β -thalassemia); Role of genetic counseling and prenatal diagnostic protocols.	8
VI	Acute & Chronic Leukemias: WHO/FAB classifications, pathophysiology and laboratory diagnosis of AML, ALL, CML, CLL including immunophenotyping (CD markers), cytogenetics, flow cytometry and PCR.	8
Total		45



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

List of Practical

- 1) Methods of Blood Collection and Anticoagulants
- 2) Haemoglobin estimation: Sahli's method and Cyanmethaemoglobin method.
- 3) Total R.B.C. Count
- 4) Total W.B.C. Count.
- 5) Differential Count.
- 6) Platelet Count.
- 7) Reticulocyte Count
- 8) E.S.R.
- 9) Packed cell volume/ Determination of Haematocrit.
- 10) Bleeding time, Whole Blood Coagulation time and Prothrombin time.
- 11) Sickling test.- Slide Test, DTT



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Blood Banking and Immunohematology

Name of faculty: Science	Department: Microbiology
Program: M. Sc. Medical Laboratory Technology Sem-II	Type: DSC-7
Subject: Blood Banking and Immunohematology	
Credit: 4	Total learning hours: 45
Course Rationale: The course is designed for students to apply advanced immunohaematological principles. They can also independently execute donor screening, blood collection and preparation of blood components.	
Learning outcome: At the end of the course the students can • Apply advanced immunohematological principles in laboratory diagnostics. • Demonstrate competency in antibody detection, identification, and complex serological problem solving. • Execute donor screening, blood collection, and blood component preparation as per national regulatory standards. • Evaluate and manage transfusion reactions and special transfusion scenarios. • Ensure compliance with quality standards, biosafety, and legal regulations in blood banking.	

Reference Book:

- Lee, G. R., Foerster, J., Lukens, J., Paraskevas, F., Greer, J. P., & Rodgers, G. M. (1999). Wintrobe's clinical hematology 10th. Bethesda, Maryland: Lippincott Williams and Wilkins.
- Klatt, E. C. (2014). Robbins and Cotran atlas of pathology. Elsevier Health Sciences.
- Firkin, F., Chesterman, C., Rush, B., & Pennigton, D. (2008). De Gruchy's Clinical haematology in medical Practice. John Wiley & Sons.
- Bain, B. J., Bates, I., & Laffan, M. A. (2016). Dacie and Lewis Practical Haematology E- Book: Dacie and Lewis Practical Haematology E-Book. Elsevier Health Sciences.
- Ajmani, P. S. (2020). Immunohematology and blood banking: principles and practice. Springer Nature.



SARVAJANIK UNIVERSITY**FACULTY OF SCIENCE****Master of Science (Medical Laboratory Technology) Sem-I and II**

Unit	Topic	Hours
I	Advanced Immunohematologic Principles: Principles of Immunohematology, Genetics of ABO blood group system, their subgroups, RBC antigens and consecutive antibodies, Genetics of Rh Blood group and antibodies, Minor blood group systems, Bombay blood group, ABO and Rh incompatibility, Hemolytic Disease of newborn and its management	10
II	Blood collection and donor selection criteria: Donor Management: Donor registration and screening, Phlebotomy in blood banks, blood storage, various anticoagulants used in blood bags, types of blood bags used in blood banks Blood Collection & Processing: Whole blood collection, Adverse reactions and their management, Blood transmitted disease and their testing, Labelling, storage, and transportation of blood	7
III	Serologic Techniques and Problem Solving: Blood compatibility tests, Antibody screening and identification, DAT and IAT optimization, Enzyme treatment, adsorption/elution techniques	6
IV	Component preparation and storage: Apheresis vs whole blood donation, Component separation techniques, Storage, shelf-life, and transportation protocols, Hemovigilance in component therapy	8
V	Molecular Applications in Immunohematology: Molecular genotyping of blood groups, Discrepancy resolution between serology and molecular testing, Role in prenatal and donor typing	6
VI	Regulatory, QC, and Ethics in Blood Banks: NABH, NACO, FDA, CDSCO guidelines, Quality management system (QMS), Inventory management, Incident reporting & blood bank audits, Regulatory framework: Drugs and Cosmetics Act, licensing of blood banks, GMP, GLP, SOPs, and NABH/NABL accreditation, Standard operating procedures (SOPs), External quality assessment (EQA), Regulatory compliance (FDA, NABL, DGHS), Safety and biosafety in blood banks	8
Total		45



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

List of Practical

- 1) ABO (Forward) and RH grouping by slide method.
- 2) ABO (Forward) and RH grouping by Tube method.
- 3) Reverse grouping
- 4) Direct Antiglobulin Test (DAT)
- 5) Indirect antiglobulin test (IAT)
- 6) Tests for Weak D testing by albumin and indirect antiglobulin technique
- 7) Anti A/ Anti B titre
- 8) Anti D titration by albumin and indirect antiglobulin technique
- 9) Cross matching by saline, albumin and IAT
- 10) Demonstration: Test for HBsAg (Hepatitis B surface Antigen) ELISA.
- 11) Demonstration: Test for HIV Antibodies (ELISA Test)
- 12) Visit to a Blood Bank.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Medical Laboratory Management

Name of faculty: Science	Department: Microbiology
Program: M. Sc. Medical Laboratory Technology Sem-II	Type: DSC-8
Subject: Medical Laboratory Management	
Credit: 4	Total learning hours: 45
C Course Rationale: This course will enable the student to manage resources, understand and follow GCLP, minimize errors, implement and maintain quality control measures, maintain equipment and promote a safe working environment, develop good communication skills, foster team work and develop leadership skills.	
Learning outcomes: At the end of the course the student should be able to • Understand the need for efficient and effective laboratory operations, including resource allocation, personnel management, equipment and reagent purchase and maintenance. • Comprehend knowledge of relevant regulations, standards, and best practices for overall improvement of laboratory services for patient care	

Reference Book:

- MacMillan, D., & Lewandrowski, K. B. The Clinical Laboratories.
- Chou, D. (2007). Henry's clinical diagnosis and management by laboratory methods. *JAMA*, 297(16), 1827-1833.
- Rifai, N. (2017). *Tietz Textbook of Clinical Chemistry and Molecular Diagnostics-E-Book: Tietz Textbook of Clinical Chemistry and Molecular Diagnostics-E-Book*. Elsevier Health Sciences.
- Mrinalini Sant (2022) Textbook of Medical Laboratory Technology 2nd Edition 2022
- Godkar, P. B., & Godkar, D. P. (2006). *Textbook of medical laboratory technology*. Bhalani publishing house.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Unit	Topic	Hours
I	Principles of Lab management: Financial management, human resource management and space and facility management. Organisational structure of lab. Laboratory design: functional components of laboratory, Various types of laboratory. A standardized clinical laboratory set up, Factors affecting productivity of a laboratory Training of technical staff in Clinical laboratory: Areas of training. Role of lab supervisors in training. Job description of various levels. Hands on approach to various laboratory practices	7
II	Work- Flow of a Clinical Laboratory – sample reception, registration, barcoding, centrifuging, sample processing, result checking, result release, sample storage Risk Management and safety measures: Safety responsibility- employer and employee - Safety in a clinical laboratory: personal protection, Laboratory hazards, Laboratory safety- fire, chemical, electrical, radiation, Laboratory infection control, Hazardous waste and transport of Hazardous material, biomedical waste management	7
III	Good Clinical laboratory practices (GCLP) • Standard operating procedures (SOP): importance of SOP's in a clinical laboratory • Laboratory personnel: Role of lab personnel in a medical Laboratory • Laboratory sample management: request form, sample labelling, sample register, sample storage, sample disposal Laboratory equipment: Equipment procurement and evaluation. Details of specific instruments / devices for analyte estimations (routine chemistry, hormones, tumour markers, electrolytes, drugs, metals, blood gases, amino acids)	8
IV	Laboratory errors: Root cause analysis and CAPA (corrective action, preventive action) Phases of errors in clinical Laboratory testing process ➤ Preanalytical variables ➤ Analytical variables- Use of stable reference materials- calibrators & controls, LJ charts and Westgard rules. Standardization / Calibration processes: Calibration of basic equipments by laboratory personnel. Calibration of method :- colorimetric and enzymatic. • Postanalytical variables: transfer of results, documentation, competence and various laboratory processes	8



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

V	Total Quality management: ➤ Fundamental principles. TQM framework ➤ External Quality Assessment Schemes ➤ Internal QC Procedures, Use of Internal Quality Control material. Care and procedural steps in reconstitution of commercial controls. ➤ Laboratory Accreditation and Audit: ISO guidelines, NABL 15189 standards, Audit in a Medical Laboratory: Introduction and Importance, Responsibility, Planning, internal audit, Horizontal, Vertical and Test audit, Frequency of audit, Documentation. Overview of JCI & CAP.	8
VI	Biological Reference Intervals: Definition. Establishment. Validation of reference intervals. Diagnostic efficacy. Documentation in Laboratory/Maintenance of records: Patient entry registers, Procedure manuals, Registers of Reagents, consumables and accessories, quality control data, patient data and all relevant lab records ➤ Clinical laboratory informatics: Computer basics. Word processing, spreadsheets, data-base, graphics, statistics, Laboratory Information Systems (LIS).	7
	Total	45

List of Practical

- 1) Clinical laboratory training and its report submission includes:
 - Observation of routine analysis and laboratory procedure.
 - Understanding of Good Laboratory Practice.
 - Understanding of accreditation process



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M. Sc. Microbiology / Medical Laboratory Technology / PGDMLT		
Course Type	DSE		Version	2.0		
Semester	02		Effective From	June, 2026		
Course Code	MSMB22201	Course Name	Epidemiology (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
3	3 hrs	0	0 hrs	50	50	100

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M. Sc. Microbiology / Medical Laboratory Technology / PGDMLT		
Course Type	DSE		Version	2.0		
Semester	02		Effective From	June, 2026		
Course Code	MSMB22202	Course Name	Epidemiology (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0 hrs	0	2 hrs	50	50	100



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Faculty: Science	Department: Microbiology
Program: M. Sc. Microbiology / Medical Laboratory Technology / PGDMLT Sem-2	Type: DSE-2
Subject: Epidemiology	
Credit: 04	Total learning hours: 45
Course description: The program focuses on fundamentals of epidemiology, specifically on disease surveillance in Public Health. The course helps to study of health and disease patterns in populations, and how to investigate their causes, distribution, and control. It provides trans-disciplinary research approach so to create and communicate knowledge on the causes and prevention of disease in the population health and health services. It also broadcasts the knowledge on usage of cutting-edge education and various research tools of public health.	
Student learning outcome: • To acquired concepts and principles of epidemiology • To provide intense knowledge of epidemiology-based health and diseases • To understand various epidemiologic methods • To acquire knowledge on Emergency Preparedness • To explain the concept of emergency risk communication practices	

Reference Book:

- Park and Park (2023). Text book preventive and social medicine. 27th Edition, Banarsidas Bhanot. ISBN-978-93-82219-19-4.
- Emergencies Preparedness. Communicating risk in public health emergencies: a WHO guideline for emergency risk communication (ERC) policy and practice. Who.int. World Health Organization; 2018.
Available from: <https://www.who.int/publications/i/item/9789241550208>
- Schneider, Mary- Jane (2013) Introduction to Public Health, 5th Edition. London: Jones and Bartlett. ISBN: 978-12-84046-35-9.
- Dicker R., Coronado F., Koo. D. and Parrish. R. G. (2012). Principles of Epidemiology in Public Health Practice., (3rd Edition). CDC.

Further Reading:

- Detel, Roger et al, Ed (2011). Oxford textbook of Public Health. 5th Edition. London. Oxford University Press. ISBN: 978-01-99218-70-7.
- Turnock, B.J. (2007). Essentials of Public Health. Jones & Bartlett, Publishers. ISBN: 978-07-63745-25-7

Unit-1: Principles of Epidemiology

(06 Hrs)

- 1.1 Aim of Epidemiology
- 1.2 Basic Measurements in Epidemiology
- 1.3 Measurements of Mortality
- 1.4 Measurements of Morbidity



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Unit-2: Epidemiologic Methods (10 Hrs)

- 2.1 Epidemiologic Method: I: Observational Studies
 - 2.1.1 Descriptive Studies
 - 2.1.2 Analytical Studies: Case Control studies & Cohort studies
- 2.2 Epidemiologic Method: II: Experimental Studies
 - 2.2.1 Animal Studies
 - 2.2.2 Human Experiments
 - 2.2.3 Randomized Controlled Trials
- 2.3 Uses of Epidemiology

Unit-3: Concepts of Disease Occurrence (07 Hrs)

- 3.1 Component causes and causal pies
- 3.2 Natural History and Spectrum of Disease
- 3.3 Chain of Infection
- 3.4 Implications for public health
- 3.5 Epidemic Disease Occurrence

Unit-4: Epidemiology of Communicable & Non communicable Diseases (08 Hrs)

- 4.1 Epidemiology of Communicable Diseases
 - 4.1.1 Respiratory Diseases: Covid-19
 - 4.1.2 Intestinal Infections: Food Poisoning
 - 4.1.3 Arthropod- Borne Infections: Zika Virus Disease
- 4.2 Epidemiology of Non communicable Diseases
 - 4.2.1 Cardiovascular Diseases
 - 4.2.2 Diabetes mellitus
 - 4.2.3 Obesity

Unit-5: Emergency Preparedness (06 Hrs)

- 5.1 Emergency Preparedness
- 5.2 Types of Disasters and Public Health Responses
- 5.3 New York's Response to the World Trade Center Attacks
- 5.4 Response to Hurricane Katrina
- 5.5 Principles of Emergency Planning and Preparedness
- 5.6 Bioterrorism Preparedness & Pandemic Flu

Unit-6: Emergency risk communication practice (07 Hrs)

- 6.1 Strategic communication planning
- 6.2 Monitoring and evaluation tools
 - 6.2.1 Social media
 - 6.2.2 Messaging
- 6.3 Research priorities and gaps
- 6.4 Composition of guideline groups & its development

List of Practicals

1. Incidence & Prevalence and Measurement of risk
2. Steps of Investigation of an Epidemic: Case Study



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M. Sc. Microbiology / Medical Laboratory Technology / PGDMLT		
Course Type	SEC		Version	2.0		
Semester	02		Effective From	June, 2026		
Course Code	MSMB23201	Course Name	Research Methodology - II			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
2	2 hrs	0	0 hrs	25	25	50



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Medical Laboratory Technology) Sem-I and II

Name of faculty: Science	Department: Microbiology
Program: M. Sc. Microbiology / Medical Laboratory Technology / PGDMLT Sem-2	Type: SEC-2
Subject: Research Methodology-II	
Credit: 02	Total learning hours: 30
Course description: This course focuses on the practical aspects of conducting and communicating scientific research. It covers data collection and processing, literature citation and reference management, preparation of research reports, scientific writing, research proposal development, publication of research findings, the role of computers in research, and research ethics including plagiarism. The course equips students with the skills required to collect, organize, analyze, and present research findings effectively while adhering to ethical and academic standards.	
Student learning outcome: ➤ Upon successful completion of this course, students will be able to: ➤ Understand the methods of data collection, processing, and preparation for scientific research. ➤ Apply appropriate citation styles and reference management tools in scientific writing. ➤ Prepare research reports, tables, figures, graphs, and research proposals following standard scientific formats. ➤ Demonstrate effective scientific writing and publication practices using computer-based tools. ➤ Apply the principles of research ethics and academic integrity by identifying and avoiding plagiarism.	

References:

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- Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International. (ISBN: 978-81-224-2488-1)
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- McMillan, K., & Weyers, J. (2007). *How to write dissertations & project reports*. Pearson Education.

Further Reading:

- Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- Patwardhan, B., Desai, A., Chourasai, A., Nag, S., & Bhatnagar, R. (2020). *Guidance Document Good Academic Research Practices*.
- University Grants Commission. (2021). *Academic Integrity and Research Quality*.

Online Resource:

- <https://www.mendeley.com>



Master of Science (Medical Laboratory Technology) Sem-I and II