

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
(‘A++’ Grade, NAAC Accredited)

॥ योगस्थः कुरुकर्माणि ॥
समबुद्धिवियोगयुक्तहोकरकर्मकरो

(Perform Actions while Stead fasting in the State of Yoga)



Scheme of Examination for Under-Graduate Programmes
Bachelor of Vocation Medical Lab Technology (BVoc.MLT)
according to

Curriculum Framework for Under-Graduate Apprenticeship Embedded Degree Programme (AEDP)
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System) and National Skills
Qualifications Framework (NSQF)

DEPARTMENT OF MICROBIOLOGY
(For the Batches Admitted From 2025-2026)

Program Learning Outcomes (PLOs)

1. Domain Knowledge & Technical Proficiency

- i. Demonstrate core knowledge of Biology and Medical Lab Techniques.
- ii. Demonstrate proficiency in Lab technologies and tools.
- iii. Apply the knowledge and proficiency in medical lab techniques to solve real time problems.

2. Work-Based Learning & Industry Exposure

- i. Gain hands-on experience through on-the-job training in live industrial environments.
- ii. Demonstrate understanding of workplace expectations, professional behavior, and organizational structure.
- iii. Translate classroom concepts into practical deliverables in a professional setting.

3. Critical Thinking & Problem Solving

- i. Analyze complex medical problems and apply logical reasoning and thinking for solutions.
- ii. Employ storage, testing and optimization strategies to improve reliability and efficiency of medical laboratory.

4. Communication and Teamwork

- i. Communicate effectively in both written and oral forms in academic and workplace settings.
- ii. Collaborate in teams and interdisciplinary environments, demonstrating interpersonal skills and conflict resolution.

5. Apprenticeship-Based Learning Outcomes

- i. Reflect measurable growth in workplace competencies, productivity, and workplace readiness through formal apprenticeship assessments.
- ii. Demonstrate the ability to assimilate feedback, maintain logs, and submit detailed training reports for performance evaluation.

Kurukshetra University Kurukshetra
Scheme of Examination for Undergraduate AEDP programmes
Subject: B Voc.Medical Lab Technology
According to
Curriculum Framework for Undergraduate Programmes
as per NEP 2020 (Multiple Entry-Exit, Internships and Choice Based Credit System) and NSQF

S e m	Category	Cour se Type	Course Code	Nomenclature of paper	Credits		Contac t hours	Inter nal mark s	End term Marks	Total Mar ks	Duratio n of exam (Hrs)
					T	P					
1	Skill Education Compone nt	CC-1	B25-MLT-101	Basics of Biochemistry	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-2	B25-MLT-102	Human Anatomy and Physiology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-3	B25-MLT-103	Fundamentals of Microbiology I	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-4	B25-MLT-104	Hematology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		PC-1	B25-MLT-105	Project Work/ Experiential Learning-I		4	8	30	70	100	2
		PC-II	B25-MLT-106	Project Work/Experiential Learning-II		4	8	30	70	100	2
				Total Skill Education Component	8	16					
	General Education Compone nt	SEC 1	B23-SEC-101	Office and Spreadsheet Tools Learning	2		2	15	35	50	1
				Practical		1	2	5	20	25	2
		MDC 1	B23-GEN-103	Cytogenetics	2		2	15	35	50	1
				Practical		1	2	5	20	25	2
		VAC	B25-MLT-	Basic Clinical	2		2	15	35	50	1

		1	107	Laboratory Techniques and Ethics							
		AEC1		To be opted from Pool of AEC	2		2	15	35	50	1
		BC	B25-MLT-108	Basics of Biology*	0	0	4	20	55	75	2
				Total General Education Component	8	2					
				Total	16	18					
Students can opt to exit with Certificate in MLT after completion of 1 semester and 6 credit internship (40credits)											

S e m	Category	Course Type	Course Code	Nomenclature of paper	Credits		Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs)
					T	P					
2	Skill Education Component	CC-5	B25-MLT-201	Enzymes and Metabolism	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-6	B25-MLT-202	Cell Biology and Histology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-7	B25-MLT-203	Fundamentals of Microbiology II	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-8	B25-MLT-204	Medical Laboratory Techniques	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		PC-1II	B25-MLT-205	Project Work/ Experiential Learning-III		4	8	30	70	100	2
		PW-	B25-MLT-	Project		4	8	30	70	100	2

	1V	206	Work/Experientia l Learning-IV							
			Total Skill Education Component	8	16					
General Educatio n Compone nt	SEC- 2	B23-SEC- 222	Bioanalytical Techniques	2		2	15	35	50	1
			Practical		1	2	5	20	25	2
	MDC -2	B23-BCH- 204	Biochemistry & Health	2		2	15	35	50	1
			Practical		1	2	5	20	25	2
	VAC- 2	B23-VAC- 101	Human Values and Ethics	2		2	15	35	50	1
	AEC- 2		To be opted from Pool of AEC	2		2	15	35	50	1
			Total General Education Component	8	2					
			Total	16	18					

Note: Mandatory Internship of 6 credits (180hrs) in Hospitals, Diagnostic Laboratories, Pathological labs etc during summer vacation break between 2nd and 3rd Semester. These credits will be counted in 4th semester after evaluation.

Students can opt to exit with Diploma in MLT after completion of 2 semesters and 6 credit internship (74credits)

Sem	Category	Course Type	Course Code	Nomenclature of paper	Credits		Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs)
					T	P					
3	Skill Education Component	CC-9	B25-MLT-301	Clinical Pathology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-10	B25-MLT-302	Hematology and Blood Transfusion	2		2	15	35	50	1
				Practical		2	4	15	35	50	2

		CC-11	B25-MLT-303	Pathogenic Microbiology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-12	B25-MLT-304	Clinical toxicology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		PC-V	B25-MLT-305	Project Work/ Experiential Learning-V		4	8	30	70	100	2
		PC-VI	B25-MLT-306	Project Work/ Experiential Learning-VI		4	8	30	70	100	2
				Total Skill Education Component	8	16					
		SEC-3	B23-SEC-321	Microtomy	2		2	15	35	50	1
				Practical		1	2	5	20	25	2
		MDC 3	B23-BCH-303	Biochemistry of Lifestyle Diseases	2		2	15	35	50	1
				Practical		1	2	5	20	25	2
		VAC3	B23-VAC-102	Environmental Studies	2		2	15	35	50	1
		AEC3		To be opted from Pool of AEC	2		2	15	35	50	1
				Total General Education Component	8	2					
				Total	16	18					

S e m	Category	Course Type	Course Code	Nomenclature of paper	Credits		Contact hours	Internal marks	End term Marks	Total Mark s	Dura tion of exam (Hrs)
					T	P					
4	Skill Education Compone nt	CC-13	B25-MLT-401	Clinical Biochemistry	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-14	B25-MLT-402	Parasitology and Diagnostic Microbiology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-15	B25-MLT-403	Immunology and Serology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-16	B25-MLT-404	Clinical Laboratory Operation and Management	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		PC-VII	B25-MLT-405	Project Work/ Experiential Learning-VII		4	8	30	70	100	2
		PW-VIII	B25-MLT-406	Project Work/ Experiential Learning-VIII		4	8	30	70	100	2
				Total Skill Education Component	8	16					
		VAC4	B23-VAC-402	Art of Happiness	2		2	15	35	50	1
		AEC4		To be opted from Pool of AEC	2		2	15	35	50	1
		INT	B25-MLT-407	Internship*		6	-	75	75	150	2
				Total General Education	4	6					

				Component							
				Total	12	22					
S e m		Course Type	Course Code	Nomenclature of paper	Credits		Contact hours	Internal marks	End term Marks	Total Mark s	Dura tion of exam (Hrs)
	Category				T	P					
5	Skill Education Compone nt	CC-17	B25-MLT- 501	Apprenticeship	-	22	550	275	275	550	3
6	Skill Education Compone nt	CC-18	B25-MLT- 601	Apprenticeship	-	22	500	275	275	550	3
		Total			-	44					

CC-1

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	I		
Name of the Course	Basics of Biochemistry		
Course Code	B25-MLT-101		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	CC		
Level of the course (As per Annex- ure-I	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Demonstrate understanding of MLT scope and apply core chemical concepts (atomic structure, acids-bases, functional groups) in laboratory settings. 2. Interpret the biological roles and diagnostic relevance of carbohydrates and lipids. 3. Explain amino acids, proteins and the molecular functions of DNA/RNA in heredity and diagnostics. 4. Correlate biomolecular structures with physiological functions and diagnostic outcomes in clinical practice. ----- 5.* Understand and apply basic biochemical laboratory techniques for analysis of biomolecules.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	

Part B- Contents of the Course		
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.		
Unit	Topics	Contact hours
I	Introduction, aim and scope of MLT, Elementary knowledge of chemistry :- atomic weight, molecular weight, equivalent weight, acid, bases. Elementary knowledge of organic chemistry : (a) Organic compounds (b) Aliphatic and aromatic compounds (c) Alcohols, Aldehydes, Ketones, Amines, Esters, Phenol etc.	7
II	Carbohydrates : Structure, classification and their functions in biological system. Lipids : General structure of fatty acids and classification of lipids.	8
III	Amino acids : Common structural features, Functions and classification of amino acids; essential amino acids. Proteins : Classification, structural organization and functions of proteins.	8
IV	Nucleic acids : Structure, function and types of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA), Nucleotides, Nucleosides, Nitrogen bases and role of Nucleic acids. Porphyrins : A brief account of Porphyrins.	7
V*	Practical: • Preparation of solutions; Normal, Molar, Percent solutions • Qualitative analysis of carbohydrates-identification of carbohydrate, reducing sugar, monosaccharide, disaccharide (sucrose), polysaccharide • Qualitative analysis of amino acids- Identification of proteins, amino acids, aromatic amino acids, Arginine, Histidine, methionine • Qualitative analysis of fats- Identification, triglycerides, cholesterol • Isolation of nucleic acids	60
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.:4 • Mid-Term Exam:7		End Term Examination:70 ➤ Theory-35 ➤ Practical-35

➤ **Practicum -15**

- Class Participation:5
- Seminar/Demonstration/Viva-voce/Lab records etc.:10

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Lehninger, A. L., Nelson, D. L., & Cox, M. M. (2017). *Lehninger Principles of Biochemistry* (7th ed.). W.H. Freeman.
- Satyanarayana, U., & Chakrapani, U. (2020). *Biochemistry* (5th ed.). Elsevier.
- Voet, D., & Voet, J. G. (2011). *Biochemistry* (4th ed.). Wiley.
- Murray, R. K., Bender, D. A., Botham, K. M., Kennelly, P. J., Rodwell, V. W., & Weil, P. A. (2018). *Harper's Illustrated Biochemistry* (31st ed.). McGraw Hill.
- Berg, J. M., Tymoczko, J. L., & Gatto, G. J. (2015). *Biochemistry* (8th ed.). W.H. Freeman.
- Miesfeld, R. L., & McEvoy, M. M. (2021). *Biochemistry* (2nd ed.). W.W. Norton.
- Devlin, T. M. (Ed.). (2010). *Textbook of Biochemistry with Clinical Correlations* (7th ed.). Wiley.
- Rawn, J. D. (1989). *Biochemistry*. Harper & Row.
- Metzler, D. E. (2001). *Biochemistry: The Chemical Reactions of Living Cells* (2nd ed.). Academic Press.
- Plummer, D. T. (2001). *An Introduction to Practical Biochemistry* (3rd ed.). Tata McGraw-Hill

CC-2

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	I		
Name of the Course	Human Anatomy and Physiology		
Course Code	B25-MLT-102		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	CC		
Level of the course (As per Annex- ure-I	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain the structural organization of the human body at cellular, tissue, organ, and system levels 2. Describe the anatomy and physiology of major human organ systems and their interrelationships in maintaining homeostasis. 3. Perform basic hematological and physiological experiments with accuracy and reliability. 4. Identify bones, tissues, and organs using models, charts, and microscopic slides. 5. Interpret physiological parameters (e.g., blood pressure, blood groups, lung function, urine analysis) in the context of clinical laboratory practice.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			

Instructions for Paper- Setter

The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of **multiple-choice type** (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..

Unit	Topics	Contact hours
I	General Anatomy & Cell Biology: Introduction to Anatomy and Physiology: Definitions, Terminology, Anatomical positions and planes. Cell: Basic Structure and function of cell organelles, cell cycle, mitosis, meiosis. Tissues: Epithelial, connective, muscular, and nervous tissues – types, characteristics, functions. Membranes and glands – types and physiological roles.	7
II	Skeletal, Muscular & Nervous Systems: Skeletal system: Classification of bones, structure of long bone, types of joints, axial & appendicular skeleton overview. Muscular system: Types of muscles, physiology of muscle contraction, neuromuscular junction. Nervous system: Organization (CNS, PNS, ANS), structure of neuron, reflex arc, brain & spinal cord (basic anatomy & functions).	8
III	Circulatory, Respiratory & Digestive Systems: Cardiovascular system: Structure of heart, blood vessels, cardiac cycle, blood pressure, Blood & Lymph: Composition, plasma proteins, hemopoiesis, blood groups, coagulation, Respiratory system: Anatomy of respiratory tract, mechanism of breathing, exchange & transport of gases. Digestive system: Anatomy of GIT, digestion & absorption of carbohydrates, proteins, and fats.	8
IV	Excretory, Endocrine & Reproductive Systems: Excretory system: Structure of nephron, urine formation, Endocrine system: Major endocrine glands (pituitary, thyroid, parathyroid, adrenal, pancreas, gonads), hormones & functions. Reproductive system: Male and female reproductive organs, menstrual cycle, gametogenesis, fertilization & pregnancy.	7
V*	Practical: ● Study of compound microscope and its parts. ● Preparation and observation of human epithelial tissue slides. ● Preparation and observation of connective tissue slides. ● Identification of skeletal muscle, cardiac muscle, and smooth muscle under microscope. ● Identification of neuron and nervous tissue under microscope. ● Study of human skeleton: Identification of bones (long bones, skull, vertebrae, ribs, pelvis). ● Demonstration of different types of joints.	60

	● Demonstration of lung capacity and spirometry experiment. ● Urine analysis: Physical and chemical examination (pH, protein, sugar).	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ● Tortora, G. J., & Derrickson, B. H. (2017). <i>Principles of anatomy and physiology</i> (15th ed.). Wiley. ● Guyton, A. C., & Hall, J. E. (2020). <i>Guyton and Hall textbook of medical physiology</i> (14th ed.). Elsevier. ● Marieb, E. N., & Hoehn, K. (2018). <i>Human anatomy & physiology</i> (11th ed.). Pearson. ● Chaurasia, B. D. (2016). <i>Human anatomy</i> (Vols. 1–3, 7th ed.). CBS Publishers & Distributors. ● Hall, J. E. (2016). <i>Guyton and Hall review of medical physiology</i> (13th ed.). Elsevier. ● Ross, M. H., & Pawlina, W. (2015). <i>Histology: A text and atlas with correlated cell and molecular biology</i> (7th ed.). Wolters Kluwer. ● Singh, I. (2018). <i>Textbook of anatomy for medical students</i> (2nd ed.). Jaypee Brothers Medical Publishers. ● Jain, A. K. (2019). <i>Textbook of physiology</i> (Vols. 1–2, 8th ed.). Avichal Publishing Company.		

CC-3

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Medical Laboratory Technology		
Semester	I		
Name of the Course	Fundamentals of Microbiology – 1		
Course Code	B25-MLT-103		
Course Type:	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To know the basics of microbiology and knowledge about the contributions of microbiologists. 2. To learn about basics of microscopy 3. To study growth parameters and designing of cultural media for microbial growth. 4. Provide knowledge about the isolation of pure culture and various sterilization techniques. 5*. Handling of the different instruments used and to know about the isolation of pure microbial cultures and sterilization techniques.		
CLO5 is based on practical component			
Credits	Theory	Practical	Total
	02	02	04
Contact Hours	02	04	06
Max. Marks: 100 Internal Assessment Marks: 30 (Theory 15 + Practical 15) End Term Exam Marks:70(Theory 35 + Practical 35)		Exam duration: Theory: 1 Hour Practical: 2 hours	
Part B- Contents of the Course			
Instructions for Paper- Setter: The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..			

Unit	Topics	Contact Hours
I	Introduction: Introduction to Laboratory, Basic laboratory principles, Organization of clinical laboratory and role of medical laboratory technician Safety measures and biomedical waste management rules in Medical Laboratory, Introduction to Medical Microbiology, Discovery of microorganisms. Countribution of Robert Koch, Antonie Van Leeuwenhoek, Louis Pasteur, Bordet, Paul Ehrlich, Alexander Flemming, Elie Metchnikoff, Needham, Tyndall Janssen, Joseph Lister, Karl Landsteiner etc. Scope & relevance and safety measures of Medical Microbiology.	1 hour/ week
II	Microscopy and Micrometry: Microscopy: Study of compound microscope-magnification, numerical aperture, resolution and components of microscope. Dark ground illumination, care of microscope and common difficulties. Study of phase contrast, interference, fluorescent, polarising and electron microscope. Calibration of ocular micrometer and measurement of microorganisms.	
III	Cultural Media: Liquid and solid media, container for media distribution of media in tubes, bottles and Petri dishes. Common ingredients of cultural media, synthetic media, peptone water, nutrient agar and broth, chocolate and blood agar, malt extract and broth, milk agar etc. Nutrition of Bacteria: various phases of growth, typical growth curve, Nutrition of microbes and physical condition required for growth. Effect of Carbon, Nitrogen, Growth factors, Vitamins, Temperature, pH, Osmotic Pressure, Oxygen and Carbon Di Oxide on microbial growth.	
IV	Sterilization and Disinfection: Physical agents- Sunlight, Temperature less than 100 ⁰ C, Temperature at 100 ⁰ C, steam at atmospheric pressure and steam under pressure, irradiation, filtration. Chemical Agents- Alcohol, aldehyde, Dyes, Halogens, Phenols, Ethylene oxide. Pure culture isolation and preservation: Streaking, serial dilution and plating methods, cultivation, maintenance and preservation/stocking of pure cultures, cultivation of aerobic and anaerobic bacteria	
V*	PRACTICALS - Basic rules for specimen collection and handling, transportation of specimen, sorting of biological waste and safety regulations. - Study of Principle and Working of : (a) Microscopes (all types) (b) Distillation apparatus (c) Centrifuge (d) Balance (e) De-ionizer (f) pH meter (g) Autoclave (h) Incubator (i) Oven (j) Colony Counter (k) Muffle Furnace (l) Refrigerator - Preparation of different cultural media for cultivation of microbes - Effect of different cultural parameters on microbial growth - Study of sterilization through different physical and chemical agents	1 hours/ week

	6	Isolation of pure culture of microorganisms through different Techniques	
	7	Preservation of Microbial cultures	
Suggested Evaluation Methods			
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 05 ➤ Practicum • Class Participation: 05 • Seminar/Demonstration/Viva-voce/Lab records etc.: 5 • Mid-Term Exam: 05			End Term Examination: Theory: 35 (Written exam) Practical: 35 (Semi-nar/Demonstration/Viva-voce/Lab records etc)
PartC- Learning Resources			
Recommended Books/e-resources/LMS: 1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)• 2. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication• 3. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. • 4. Elsevier Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. • 9th edition. McGraw Hill Higher Education 5. Text Book of Microbiology, Baveja.			

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	I		
Name of the Course	Haematology		
Course Code	B25-MLT-104		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the composition, functions, and formation of blood, including coagulation and morphology. 2. Explain the use, action, and handling of anticoagulants and clinical blood samples. 3. Perform haemoglobin estimation and interpret haemoglobin variations and red cell indices. 4. Apply quality assurance measures in haematology and ensure accurate lab practices. ----- 5.* Perform blood collection, component separation, cell identification, and haemoglobin estimation using standard methods.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks: 30 (Theory 15 + Practical 15) End Term Exam Marks:70(Theory 35 + Practical 35)		Exam duration: Theory: 1 Hours Practical: 2 hours	

Part B- Contents of the Course

Instructions for Paper- Setter

The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of **multiple-choice type** (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..

Unit	Topics	Contact hours 2hrs /week
I	Introduction to Haematology; Scope and importance of haematology; Laboratory organization and safety measures; Transportation and preservation of clinical materials; Composition and functions of blood; Formation of blood and blood morphology; Physiology of coagulation of blood.	
II	Various anticoagulants and their uses; Composition, amount and mode of action of anticoagulants; Merits and demerits of different anticoagulants; Collection and preservation of blood for haematological investigations; Storage-related changes in blood samples.	
III	Normal and absolute values in haematology; Quality assurance and quality control in haematology; Haemoglobinometry; Various methods of haemoglobin estimation; Errors and standardization of instruments for Hb estimation; Physiological variations in haemoglobin.	
IV	Haemoglobin synthesis, functions and degradation; Haemoglobin pigments (e.g., methemoglobin, carboxyhemoglobin) and their clinical significance; Identification of abnormal haemoglobins; Calculation and interpretation of red cell indices (MCV, MCH, MCHC).	
V*	Practicals: ● Collection of blood sample-from artery, vein, capillary ● Separation of RBC ● Studying morphology of normal and abnormal	

	blood cells and their identifications; ● Separation of serum from blood ● Separation of plasma from blood ● Preparation of different types of vials. ● Estimation of Hb by Sahli's method ● Estimation of Hb by cyanmethaemoglobin method	
Suggested Evaluation Methods		
Internal Assessment:15 ➤ Theory-15 ● Class Participation: 5 ● Seminar/presentation/assignment/quiz/class test etc.:5 ● Mid-Term Exam:5 ➤ Practicum -15 ● Seminar/Demonstration/Viva-voce/Lab records etc.: 15	End Term Examination:70 ➤ Theory-35 ➤ Practical-35	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ● Hoffbrand, A. V., Moss, P. A. H., & Pettit, J. E. (2016). <i>Essential Haematology</i> (7th ed.). Wiley-Blackwell. ● Rodak, B. F., Fritsma, G. A., & Doig, K. (2020). <i>Hematology: Clinical Principles and Applications</i> (6th ed.). Elsevier. ● Bain, B. J. (2020). <i>Blood Cells: A Practical Guide</i> (5th ed.). Wiley-Blackwell. ● Turgeon, M. L. (2012). <i>Clinical Hematology: Theory and Procedures</i> (5th ed.). Lippincott Williams & Wilkins. ● Lewis, S. M., Bain, B. J., & Bates, I. (2016). <i>Dacie and Lewis Practical Haematology</i> (12th ed.). Elsevier. ● Kaushansky, K., Lichtman, M. A., Prechal, J. T., Levi, M. M., & Burns, L. J. (2018). <i>Williams Hematology</i> (9th ed.). McGraw-Hill. ● McKenzie, S. B., & Williams, J. L. (2015). <i>Clinical Laboratory Hematology</i> (3rd ed.). Pearson. ● Clinical and Laboratory Standards Institute. (2021). <i>Reference and Selected Procedures for the Erythrocyte Sedimentation Rate</i>. CLSI Document H2-A6. ● Harmening, D. M. (2018). <i>Clinical Hematology and Fundamentals of Hemostasis</i> (6th ed.). F.A. Davis Company. ● Greer, J. P., Arber, D. A., Glader, B., List, A. F., Means, R. T., Paraskevas, F., & Rodgers, G. M. (2013). <i>Wintrobe's Clinical Hematology</i> (13th ed.). Lippincott Williams & Wilkins		

SEC

Session: 2025-26			
Part A - Introduction			
Subject	Medical Lab Technology		
Semester	1		
Name of the Course	Office and Spreadsheet Tools Learning		
Course Code	B23-SEC-101		
Course Type:	SEC-1		
Level of the course (As per Annexure-I)	0-99		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. understand the basic concepts of operating systems 2. do the basic editing and formatting in a document 3. create basic spread-sheets for different purposes 4. create basic presentations for different applications 5*. to understand the working of operating system and various office tools practically.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks:75(50(T)+25(P)) Internal Assessment Marks:20(15(T)+5(P)) End Term Exam Marks: 55(35(T)+20(P))		Time: 1 Hrs.(T), 3Hrs.(P)	
Part B-Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..			

Unit	Topics	Contact Hours
I	Operating System - Definition, Functions, Types of Operating System, Basics of Popular Operating Systems, The User Interface, Exploring Computer, Icons, taskbar, desktop, Using Menu and Menu- selection, managing files and folders, Control panel – display properties, add/remove software and hardware, Common utilities.	4
II	Word Processing - Introduction to Word Processing, Menus, Creating, Editing & Formatting Document, Spell Checking, Printing, Views, Tables, Word Art, Mail Merge, Macros, Inserting hyperlinks, Searching for text, Modifying page setup, Applying document themes, Applying document style sets, Inserting headers and footers.	7
III	Spread Sheet: Elements of Electronics Spread Sheet, Applications, Creating and Opening of Spread Sheet, Menus, Manipulation of cells: Enter texts numbers and dates, Cell Height and Widths, Copying of cells, Mathematical, Statistical and Financial function, Drawing different types of charts, Sort and Filter Data.	7
IV	Presentation Software: Creating, Modifying and enhancing a presentation, Type of presentation views, Using sound, Animation, Working with Objects, Printing.	7
V*	Practical: Operating System: - Starting with basics of Operating Systems and its functionalities Word Processing: - Create and format word documents. - Use tables, word Art and other features in your documents. - Use macros to simplify the tasks in a document. - Use mail merge to write once for many. Spread Sheet: - Use spreadsheet for basic data handling - Apply formulas to sheet for automation. - Use Charts & Shapes for better visualization of the data. - Use sorting and filtering of the data Presentation Software: - Prepare and format presentations. - Apply slide transitions, animations and sequencing for slides. - Apply different formatting and insert options to make presentation better. - Applying sound and animation.	25
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 4 - Seminar/presentation/assignment/quiz/class test etc.: 4 - Mid-Term Exam: 7 ➤ Practicum - Class Participation: 2		End Term Examination: A three hour exam for both theory and practicum.

- Seminar/Demonstration/Viva-voce/Lab records etc.: 3
- Mid-Term Exam: NA

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Help files from Apache Open Office, <https://wiki.openoffice.org/wiki/Documentation>
- Channelle Andy, “Beginning OpenOffice 3: From Novice to Professional”, aPress Publications
- Beginning OpenOffice 3: From Novice to Professional, Andichannele, Apress.
- Microsoft Office 2016 Step by Step: MS Office 2016 Step by Step, By Joan Lambert, Curtis Frye
- Computer Fundamentals - By Pradeep K. Sinha, Priti Sinha, BPB Publications, 6th Edition
- Getting Started with LibreOffice 5.0, Friends of OpenDocuments Inc.,
[Http://friendsofopendocument.com](http://friendsofopendocument.com)
- Documentation from LibreOffice, <https://documentation.libreoffice.org/en/english-documentation/>

MDC-1

Session: 2025-26

Part A - Introduction

Subject	Medical Lab Technology		
Semester	1		
Name of the Course	CYTOGENETICS		
Course Code	B23-GEN-103		
Course Type:	MDC-1		
Level of the course (As per Annexure-I)	0-99		
Pre-requisite for the course (ifany)			
CourseLearningOutcomes (CLO):	After completing this course, the learner will be able to: 1.Understand the basic characteristics and types of living beings 2. exhibit knowledge of organization of cell, organs and body 3. demonstrate the basics of mole concept and applications in lab 4. understand the role of biomolecules in life ----- 5. Applicable for courses having practical component.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks: 75 Internal Assessment Marks:20 (15T+5P) End Term Exam Marks: 55 (35T+20P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
Instructions for Paper- Setter			
The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..			
Unit	Topics		Con- tact hours
I	Cell: Cell as a unit of structure and function. Organization of plant and animal cells. Nucleus: Structure, nuclear pore complex, nucleolus, sex chromatin (Barr body).		8
II	Chromosomes: Structure and morphology of chromosomes, chemical organization, karyotype study. Cell Cycle: Different Phases of Cell cycle, Brief account of Mitosis and Meiosis		8
III	Linkage: History, coupling and repulsion hypothesis, chromosomal theory of linkage, linkage groups and significance of linkage. Crossing Over: Introduction, mechanism and its significance.		7
IV	Structural changes in chromosomes: Deficiencies, duplications, inversions and trans- locations; their consequences. Numerical changes in chromosomes: Aneuploidy, euploidy, their types and applica- tions		7

V	PRACTICAL 1.To study the structure and functioning of a compound microscope. 2. Karyotype studies of Normal male and female Human from micro photographs 3. Preparation of Idiograms 4. Identification of chromosomal disorders with the help of karyotype. 5. Study of different stages of mitosis and meiosis from permanent slides. 6. To study different mitotic stages in root tips of Allium cepa. 7. To work out the genetics of a cross from the given F-2 harvest.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 4 - Seminar/presentation/assignment/quiz/class test etc.:4 - Mid-Term Exam: 7 ➤ Practicum NA - Class Participation: 5 - Demonstration/Viva-voce/Lab records etc.:10 - Mid-Term Exam:		End Term Examination: Theory: 35 Written Exam Practicum: 20 demonstration/viva-voce/Lab records
PartC-Learning Resources		
Recommended Books/e-resources/LMS: - Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th Ed. Sinauer Associates, Inc. • Publishers Sunderland, Massachusetts U.S.A. - De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia - Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons In. - Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. X Edition. Benjamin Cumming - Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. Introduction to Genetic Analysis. IX Edition. W. H. Freeman and Co. - Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. VIII Edition. Wiley India		

Session: 2025-26			
PartA - Introduction			
Subject	Medical Lab Technology		
Semester	1		
Name of the Course	Basic Clinical Laboratory Techniques and Ethics		
Course Code	B25-MLT-107		
Course Type:	VAC-1		
Level of the course (As per Annexure-I)	0-99		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand the role, organization, and safety measures of clinical laboratories. 2. Perform basic laboratory techniques and handle instruments correctly. 3. Collect, process, and analyze clinical specimens for routine tests. 4. Apply professional ethics, confidentiality, and communication skills in lab practice. ----- 5. Prepare accurate reports and follow quality control in laboratory work.-.		
Credits	Theory	Practical	Total
	2	0	0
Contact Hours	2	0	2
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35			Time: T-1 hrs
Part B- Contents of the Course			
Instructions for Paper- Setter			
The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..			
Unit	Topics		Contact hours
I	Introduction to Clinical Laboratory Science. Overview of Medical Laboratory Technology (role in healthcare, scope). Organization of a clinical laboratory (sections: Hematology, Biochemistry, Microbiology, Pathology). Laboratory infrastructure and basic equipment (centrifuge, microscope, pipettes, autoclave, balances). Laboratory hazards and safety (biological, chemical, fire, radiation). First aid and emergency procedures in labs		8
II	Basic Clinical Laboratory Techniques: Specimen collection, labeling, transport, and storage. Preparation of solutions, buffers, and reagents. Calibration and maintenance of laboratory instruments. Microscopy: principle, types, and applications. Common laboratory techniques: centrifugation, filtration, sterilization, dilution, and staining. Quality control basics in laboratory testing.		8

III	Clinical Laboratory Practices. Blood collection methods: venipuncture, capillary puncture. Urine, stool, and sputum sample collection – guidelines and precautions. Hematology basics: preparation of blood smears, Hb estimation, hematocrit, ESR. Clinical Biochemistry basics: blood glucose, urea, creatinine, and lipid profile (introductory level). Clinical Microbiology basics: aseptic techniques, culture media preparation, inoculation methods. Documentation and record keeping in labs.	7
IV	Professional Ethics and Communication in Laboratory. Code of ethics for medical laboratory professionals. Patient confidentiality and informed consent.. Professional conduct and teamwork in healthcare. Handling medico-legal samples responsibly. Communication skills: interacting with patients, doctors, and healthcare staff. Importance of accuracy, honesty, and accountability in lab reporting	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.:4 • Mid-Term Exam: 7		End Term Examination: Theory: 35 Written Exam
Part C- Learning Resources		
Recommended Books/e-resources/LMS: • Cheesbrough, M. (2010). <i>District Laboratory Practice in Tropical Countries (Part 1 & 2)</i> (2nd ed.). Cambridge University Press. • McKenzie, S. B., & Williams, J. L. (2019). <i>Clinical Laboratory Hematology</i> (4th ed.). Pearson Education. • Henry, J. B. (2017). <i>Henry's Clinical Diagnosis and Management by Laboratory Methods</i> (23rd ed.). Elsevier. • Mundt, L. A., & Shanahan, K. (2015). <i>Graff's Textbook of Urinalysis and Body Fluids</i> (2nd ed.). Lippincott Williams & Wilkins. • Mahajan, B. K., & Gupta, M. C. (2018). <i>Textbook of Preventive and Social Medicine</i> (5th ed.). Jaypee Brothers Medical Publishers. • Turgeon, M. L. (2018). <i>Clinical Hematology: Theory and Procedures</i> (6th ed.). Wolters Kluwer. • Collee, J. G., Fraser, A. G., Marmion, B. P., & Simmons, A. (2014). <i>Mackie & McCartney Practical Medical Microbiology</i> (14th ed.). Churchill Livingstone/Elsevier. • Bishop, M. L., Fody, E. P., & Schoeff, L. E. (2018). <i>Clinical Chemistry: Principles, Techniques, and Correlations</i> (8th ed.). Wolters Kluwer. • Kanagasabapathi, B., & Arumugam, S. (2019). <i>Fundamentals of Medical Laboratory Technology</i>. CBS Publishers. • WHO. (2011). <i>Laboratory Quality Management System: Handbook</i>. World Health Organization.		

BC

Session: 2025-26			
Part A - Introduction			
Subject	Medical Lab Technology		
Semester	1		
Name of the Course	Basics of Biology		
Course Code	B25-MLT-108		
Course Type:	BC		
Level of the course (As per Annexure-I)	0-99		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1.Understand the basic characteristics and types of living beings 2. exhibit knowledge of organization of cell, organs and body 3. demonstrate the basics of mole concept and applications in lab 4. understand the basics of organic compounds ----- 5. Applicable for courses having practical component.		
Credits	Theory	Practical	Total
	0	0	0
Contact Hours	2	2	4
Max. Marks: 75 Internal Assessment Marks:20 End Term Exam Marks: 55			Time: T-2 hrs
Part B- Contents of the Course			
Instructions for Paper- Setter			
The question paper will consist of FIFTY-FIVE questions of one mark each, and the candidate will be re-quired to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 2 hour.			
Unit	Topics		Con- tact hours
I	Living and Non-living Organisms, Microbial World, and Human Biology Characteristics of living and non-living organisms; differences with examples. Cell as the basic unit of life; Prokaryotic and Eukaryotic cells – key differences and examples. Intro-duction to microbes: bacteria, viruses, fungi, protozoa, and helminths – morphology, structure, basic classification, and their relevance in human health and disease. Concept of pathogens vs. normal flora; importance in laboratory diagnosis		8
II	Overview of organization: cell, tissue, organ, organ system, and organism: Structure and function of cell organelles – nucleus,mitochondria, endoplasmic retic-ulum(smooth and rough), lysosomes, Golgi bodies, ribosomes, plasma membrane. Introduction to human blood components – RBCs, WBCs, platelets, and plasma.		8

	Overview of human organ systems relevant to lab testing – circulatory, immune, excretory, and digestive systems. Introduction to basic laboratory practices: sample types (blood, urine, stool), personal protective equipment (PPE), biosafety basics, and microscope handling	
III	Concept of Matter- Structure of Atom, Mole, Buffer: Atomic structure: protons, neutrons, electrons; atomic number and mass number. Introduction to chemical bonding: ionic and covalent bonds (concept only). Mole concept and basic idea of chemical equations (no numerical problems). Acids, bases, salts – definitions and examples relevant to human body fluids. pH scale: concept, pH of biological fluids (blood, urine), introduction to buffers.	7
IV	Solutions and basics of organic compound: Solutions and concentrations: concepts of solute, solvent, solution, molarity, and normality (basic understanding only). Introduction to organic compounds: characteristics, functional groups (alcohols, carboxylic acids, amines, aldehydes, ketones); relevance in biological systems. Basics of isomerism – structural and geometric (overview only)	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory: 20 • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10		End Term Examination: Theory: 55 Written Exam
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Tortora, G. J., Funke, B. R., & Case, C. L. (2020). <i>Microbiology: An introduction</i> (13th ed.). Pearson. • Marieb, E. N., & Hoehn, K. (2018). <i>Human anatomy & physiology</i> (11th ed.). Pearson. • Nelson, D. L., Cox, M. M., Lehninger, A. L., & Cox, M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman. • Brown, T. L., LeMay, H. E., Bursten, B. E., Murphy, C. J., & Woodward, P. (2017). <i>Chemistry: The central science</i> (14th ed.). Pearson. • McMurry, J., & Castellion, M. E. (2016). <i>Fundamentals of general, organic, and biological chemistry</i> (7th ed.). Pearson. • Cheesbrough, M. (2006). <i>District laboratory practice in tropical countries</i> (Part 1). Cambridge University Press. • Boyer, R. (2012). <i>Concepts in biochemistry</i> (3rd ed.). Wiley. • Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2015). <i>Molecular biology of the cell</i> (6th ed.). Garland Science. • Banerjee, P. K. (2005). <i>Introduction to human physiology</i>. S. Chand Publishing. • Killeen, A. A. (2008). <i>Laboratory techniques in biochemistry and molecular biology</i>. Springer.		

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	II		
Name of the Course	Enzyme and Metabolism		
Course Code	B25-MLT-201		
Course Type:	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Demonstrate understanding of enzymes, their types, cofactors, and active sites. 2. Explain the catalytic role of enzymes and the basic theories of enzyme action. 3. Identify and analyze factors affecting enzyme activity, regulation, and inhibition. 4. Interpret the clinical significance of enzymes and isoenzymes in diagnosis. 5. Understand and apply basic experimental techniques to study enzyme activity and metabolism.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..			
Unit	Topics		Contact hours
I	Introduction to Enzymes : Definition and importance of enzymes., General characteristics of enzymes. Apoenzyme, holo-enzyme, cofactors, prosthetic group, coenzymes, Nomenclature and classification of enzymes.		7

II	Enzyme Catalysis: Enzymes as catalysts. Simple theories of enzyme action (lock & key, induced fit). Factors affecting enzyme activity: enzyme concentration, substrate concentration, pH, temperature. Simple concept of enzyme kinetics.	8
III	Enzyme Regulation and Inhibition: Enzyme inhibition – reversible (competitive, non-competitive) and irreversible. Enzyme regulation – allosteric enzymes. Isoenzymes – examples and clinical importance (LDH, CK, etc.)..	8
IV	Basics of Bioenergetics and Metabolism: Concept of energy in metabolism (ATP as energy currency). Bioenergetics – basic idea of free energy and biological oxidation. Introduction to metabolism: catabolism and anabolism. Overview of carbohydrate, protein, and fat metabolism.	7
V*	Practical: ● Demonstration of enzyme activity using starch and amylase. ● Effect of pH on enzyme activity. ● Effect of temperature on enzyme activity. ● Effect of enzyme concentration on enzyme activity (demonstration). ● Effect of substrate concentration on enzyme activity (demonstration). ● Demonstration of enzyme inhibition using simple models (e.g., fluoride on amylase). ● Estimation of blood glucose (as application of enzyme – glucose oxidase method). ● Estimation of achromatic point ● Estimation of serum/salivary amylase (demonstration).	60

Suggested Evaluation Methods

Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35
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Part C-Learning Resources

Recommended Books/e-resources/LMS: ● Nelson, D. L., Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W. H. Freeman and Company. ● Berg, J. M., Tymoczko, J. L., Gatto, G. J., & Stryer, L. (2019). <i>Biochemistry</i> (9th ed.). W. H. Freeman and Company. ● Voet, D., Voet, J. G., & Pratt, C. W. (2016). <i>Fundamentals of biochemistry: Life at the molecular level</i> (5th ed.). Wiley.

- Satyanarayana, U., & Chakrapani, U. (2021). *Biochemistry* (5th ed.). Elsevier India.
- Jain, J. L., Jain, S., & Jain, N. (2016). *Fundamentals of biochemistry* (7th ed.). S. Chand Publishing.
- Champe, P. C., Harvey, R. A., & Ferrier, D. R. (2019). *Lippincott's illustrated reviews: Biochemistry* (8th ed.). Wolters Kluwer.
- Garrett, R. H., & Grisham, C. M. (2016). *Biochemistry* (6th ed.). Cengage Learning.
- Conn, E. E., & Stumpf, P. K. (2009). *Outlines of biochemistry* (5th ed.). Wiley.
- Campbell, M. K., & Farrell, S. O. (2018). *Biochemistry* (9th ed.). Cengage Learning.
- Murray, R. K., Bender, D. A., Botham, K. M., Kennelly, P. J., Rodwell, V. W., & Weil, P. A. (2018). *Harper's illustrated biochemistry* (31st ed.). McGraw Hill.

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	II		
Name of the Course	Cell Biology and Histology		
Course Code	B25-MLT-202		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Demonstrate understanding of the structure and functions of prokaryotic and eukaryotic cells. 2. Explain the organization and role of major cell organelles in cellular activities. 3. Describe the process of cell division (mitosis and meiosis) and its biological significance. 4. Identify and classify basic tissue types (epithelial, connective, muscular, and nervous) through microscopic study. 5. Apply basic histological techniques, including preparation and staining of slides, for diagnostic purposes.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..			

Unit	Topics	Contact hours
I	Introduction to Cell Biology: Definition of cell, cell theory, prokaryotic vs. eukaryotic cells. Overview of cell structure and function. Plasma membrane structure and function (elementary). Basic concept of cytoplasm and organelles.	7
II	Cell Organelles and Functions : Nucleus, mitochondria, endoplasmic reticulum, Golgi apparatus, lysosomes, ribosomes – structure and basic functions. Simple concept of cell communication. Introduction to cytoskeleton and its role.	8
III	Importance of cell division in growth, repair, and reproduction: Mitosis Stages: Prophase, Metaphase, Anaphase, Telophase, Cytokinesis, Significance in tissue renewal and asexual reproduction Meiosis: Meiosis I: Prophase I, Metaphase I, Anaphase I, Telophase I, Meiosis II: Prophase II, Metaphase II, Anaphase II, Telophase II. Importance in gamete formation and genetic diversity	8
IV	Histology Basics : Definition and importance of histology. Types of tissues – epithelial, connective, muscular, nervous (structure and basic function). Simple introduction to staining techniques (H&E stain). Clinical relevance of tissue studies in diagnosis.	7
V*	Practical: • Demonstrate mitochondria in living cells using Janus Green B stain. • Identify and study stages of mitosis in onion root tip cells. • Perform Hematoxylin & Eosin (H&E) staining and observe stained tissue section. • Prepare a temporary mount of human cheek cells and study under microscope. • Prepare a temporary mount of onion peel cells and observe under microscope. • Prepare and stain simple epithelial tissue (cheek cell / onion epidermis). • Stain cells using methylene blue/iodine and identify nucleus and cytoplasm. • Study different types of tissues (epithelial, connective, muscle, nervous) under microscope. • Study plasmolysis and deplasmolysis in plant cells using salt solution. • Study stages of meiosis from prepared slides.	60
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ● Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2019). <i>Essential cell biology</i> (5th ed.). Garland Science. ● Bhatia, B. S. (2012). <i>Elementary cytology and genetics</i>. S. Chand Publishing. ● Darnell, J., Lodish, H., & Baltimore, D. (1990). <i>Molecular cell biology</i>. W. H. Freeman. ● Gupta, P. K. (2010). <i>Cytology, genetics and molecular biology</i>. Rastogi Publications. ● Junqueira, L. C., & Carneiro, J. (2015). <i>Basic histology: Text & atlas</i> (14th ed.). McGraw Hill Education. ● Karp, G. (2018). <i>Cell and molecular biology: Concepts and experiments</i> (8th ed.). Wiley. ● Khurana, I. (2014). <i>Textbook of medical physiology</i>. Elsevier India. ● Ross, M. H., & Pawlina, W. (2015). <i>Histology: A text and atlas</i> (7th ed.). Wolters Kluwer. ● Silverthorn, D. U. (2018). <i>Human physiology: An integrated approach</i> (8th ed.). Pearson.	

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	II		
Name of the Course	Fundamentals of Microbiology II		
Course Code	B25-MLT-203		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: • Demonstrate understanding of microbial structure, growth, and factors influencing growth. • Explain methods of sterilization, disinfection, and aseptic handling in the microbiology laboratory. • Identify types of culture media and describe their diagnostic applications. • Apply basic microbiological techniques such as streaking, staining, and culture handling. • Recognize the role of bacteria, fungi, and viruses of medical importance in health and disease.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..			

Unit	Topics	Contact hours
I	Morphology and Classification of Bacteria: Size, shape, and arrangement of bacteria. Bacterial cell structure: cell wall, capsule, flagella, pili, cytoplasm, spores. Elementary classification of bacteria (cocci, bacilli, spirilla, vibrios; Gram-positive vs Gram-negative). Endospores – properties and significance.	7
II	Staining Techniques: Principles of staining. Simple and negative staining. Differential staining: Gram staining, Acid-fast staining. Special stains: spore stain, capsule stain, flagella stain. Difference between dye and stains	8
III	Cultivation and Control of Microorganisms: Cultivation of aerobic and anaerobic organisms. Enrichment, selective and differential media (MacConkey agar, Mannitol salt agar, Sabouraud's agar). Control of microbes: antibiotics (basic mode of action), antiseptics, disinfectants. Antibiotic sensitivity testing (disc diffusion method).	8
IV	Microorganisms in Health and Disease : Normal flora of human body (skin, gut, respiratory, urogenital tract). Opportunistic vs pathogenic microbes. Brief introduction to medically important bacteria: <i>Staphylococcus</i> , <i>Streptococcus</i> , <i>E. coli</i> , <i>Salmonella</i> .	7
V*	Practical: • Perform negative staining of bacteria. • Perform spore staining. • Perform capsule staining. • Perform acid-fast staining. • Demonstrate motility of bacteria (hanging drop / wet mount). • Perform catalase test. • Perform oxidase test. • Perform IMViC tests (elementary demonstration). • Demonstrate antibiotic sensitivity by disc diffusion method (Kirby–Bauer). • Demonstrate microbial contamination in water/milk by simple plate count.	60

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ● Ananthanarayan, R., & Paniker, C. K. J. (2017). <i>Textbook of microbiology</i> (10th ed.). Universities Press. ● Black, J. G., & Black, L. J. (2018). <i>Microbiology: Principles and explorations</i> (10th ed.). Wiley. ● Cappuccino, J. G., & Welsh, C. T. (2017). <i>Microbiology: A laboratory manual</i> (11th ed.). Pearson. ● Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M., & Stahl, D. A. (2018). <i>Brock biology of microorganisms</i> (15th ed.). Pearson. ● Pelczar, M. J., Chan, E. C. S., & Krieg, N. R. (2016). <i>Microbiology: An application based approach</i>. Tata McGraw-Hill. ● Prescott, L. M., Harley, J. P., & Klein, D. A. (2014). <i>Microbiology</i> (9th ed.). McGraw Hill Education. ● Rajan, S. (2016). <i>Textbook of medical laboratory technology</i>. Jaypee Brothers Medical Publishers. ● Sharma, P. D. (2016). <i>Microbiology</i>. Rastogi Publications. ● Tortora, G. J., Funke, B. R., & Case, C. L. (2018). <i>Microbiology: An introduction</i> (13th ed.). Pearson. ● Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2017). <i>Prescott's microbiology</i> (10th ed.). McGraw Hill.	

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	II		
Name of the Course	Medical Laboratory Techniques		
Course Code	B25-MLT-204		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: • Identify and safely operate basic medical laboratory instruments and glassware. • Perform simple hematological tests such as hemoglobin estimation, hematocrit, and blood cell counts. • Apply fundamental clinical biochemistry methods for estimation of glucose, urea, and proteins. • Conduct routine urine analysis including physical, chemical, and microscopic examination. • Demonstrate safe collection, handling, and disposal of clinical specimens in compliance with laboratory safety standards.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
Instructions for Paper- Setter The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			

Unit	Topics	Contact hours
I	Introduction to Medical Laboratory: Role of medical laboratory in healthcare. Different sections of a clinical laboratory (hematology, clinical biochemistry, microbiology, histopathology, serology). Commonly used laboratory glassware and equipment (micropipettes, centrifuge, hot air oven, autoclave, microscope). Laboratory safety rules and biomedical waste disposal.	7
II	Basic Hematology Techniques : Composition and functions of blood. Collection and preservation of blood samples (EDTA, heparin, sodium citrate). Hemoglobin estimation (principle and methods). Total RBC count, WBC count, Platelet count	8
III	Basic Clinical Biochemistry Techniques : Collection and handling of serum/plasma samples. Estimation of blood glucose (glucose oxidase/peroxidase method); Estimation of urea and creatinine. Estimation of serum proteins (Biuret method). Concept of quality control in clinical biochemistry.	8
IV	Basic Clinical Microbiology and Urine Analysis: Collection, transport, and storage of clinical specimens (urine, sputum, blood, swabs). Routine urine examination (physical, chemical, and microscopic). Detection of proteins, glucose, ketone bodies in urine. Stool examination (macroscopic and microscopic). Introduction to serological tests (Widal, VDRL, Rapid card tests).	7
V*	Practical: • Identification and proper use of laboratory glassware and equipment (micropipette, centrifuge, hot air oven, autoclave, microscope). • Demonstration of safe handling of biological samples and biomedical waste disposal. • Collection of blood sample by finger prick and preparation of peripheral smear. • Estimation of hemoglobin using Sahli's/acid hematin method. • Determination of packed cell volume (hematocrit). • Total RBC count using hemocytometer. • Total WBC count using hemocytometer. • Estimation of blood glucose by glucose oxidase/peroxidase method. • Routine urine analysis – physical and chemical examination (pH, glucose, protein, ketone bodies). • Microscopic examination of urine sediment for cells and crystals.	60
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ● Cheesbrough, M. (2017). <i>District laboratory practice in tropical countries</i> (2nd ed., Part 1 & 2). Cambridge University Press. ● Bishop, M. L., Fody, E. P., & Schoeff, L. E. (2018). <i>Clinical chemistry: Principles, techniques, and correlations</i> (8th ed.). Wolters Kluwer. ● Mahon, C. R., Lehman, D. C., & Manuselis, G. (2019). <i>Textbook of diagnostic microbiology</i> (6th ed.). Elsevier. ● Bain, B. J., Bates, I., Laffan, M. A., & Lewis, S. M. (2017). <i>Dacie and Lewis practical haematology</i> (12th ed.). Elsevier. ● McPherson, R. A., & Pincus, M. R. (2022). <i>Henry's clinical diagnosis and management by laboratory methods</i> (24th ed.). Elsevier. ● Arora, D. R., & Arora, B. B. (2021). <i>Medical microbiology</i> (6th ed.). CBS Publishers & Distributors. ● Godkar, P. B., & Godkar, D. P. (2014). <i>Textbook of medical laboratory technology</i> (2nd ed.). Bhalani Publishing House. ● Praveen, A., & Ramakrishnan, S. (2016). <i>Clinical biochemistry for medical students</i>. Wolters Kluwer India. ● Ochei, J., & Kolhatkar, A. (2000). <i>Medical laboratory science: Theory and practice</i>. Tata McGraw-Hill. ● Pambuccian, S. E., & Barkan, G. A. (2020). <i>Clinical laboratory management</i>. Springer.	

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	II		
Name of the Course	Bioanalytical Techniques		
Course Code	B23-SEC-222		
Course Type:	SEC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: • Understand the basic chemistry and properties of water; physiological buffers. • Demonstrate the knowledge of the general principles, components and applications of centrifuges. • Learn the principles and applications of chromatographic techniques in isolation, quantification and characterization of biomolecules. • Know the general principles, components and applications of spectrophotometer. • Develop the skills to verify and apply the basic principles of spectroscopy; separation of amino acids by thin layer/ paper chromatograph.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks: 75 Internal Assessment Marks:20 (15T+5P) End Term Exam Marks: 55 (35T+20P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			

Unit	Topics	Contact hours
I	Water and Buffers: Structure, hydrogen bonding, solvent properties, and ionization, Weak acids and bases, ionization of weak acids, titration of weak acid by a strong base, pH, buffers, Henderson-Hasselbalch equation and physiological buffers. Measurement of pH: Principles and composition of reference electrodes, glass electrode and combined electrode	7
II	Centrifugation: Basic principle of centrifugation techniques, sedimentation rate, Svedberg unit / sedimentation coefficient. Preparative ultracentrifuge, Differential centrifugation, density gradient centrifugation, rate zonal, isopycnic, equilibrium centrifugation. Analytical ultracentrifuge method.	8
III	Chromatographic techniques- General principles and applications of adsorption, ion-exchange, molecular-sieve, thin layer & paper chromatography.	8
IV	UV-Visible Spectroscopic techniques: Beer-Lambert law, light absorption and its transmittance, extinction coefficient, a brief account of instrumentation and applications of visible and UV spectroscopic techniques (structure elucidation excluded).	7
V*	Practical: • Determination of pKa of acetic acid and glycine. • Verification of Beer- Lambert's Law. • Estimation of Amino acid by Ninhydrin method. • Estimation of Protein by Biuret method. • separation of amino acids/ sugars by thin layer chromatography/paper chromatography	15
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory- • Class Participation: • Seminar/presentation/assignment/quiz/class test etc.: • Mid-Term Exam: ➤ Practicum - • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.:		End Term Examination: ➤ Theory ➤ Practical
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- Principles & Techniques of Biochemistry & Molecular Biology, 7th edition, by Keith Wilson and John Walker (2018).
- Biophysical Chemistry: Principles and Techniques, by A. Upadhyay, K. Upadhyay and N. Nath. (2016). Himalaya Publishing House, Delhi.
- Introductory Practical Biochemistry by S.K. Sawhney and Randhir Singh (2014). Narosa Publishing House, New Delhi.
- An introduction to Practical Biochemistry, 3rd Edition, by David Plummer (2017). Tata McGraw Hill
- Modern Experimental Biochemistry, 3rd edition, by R. Boyer (2002) Addison-Wesley Longman.
- Biochemical Methods, 3rd edition, by Sadasivam & Manickam (2018) New Age International (P) Ltd.

Part A - Introduction			
Subject	Biochemistry		
Semester	2		
Name of the Course	Biochemistry and Health		
Course Code	B23-BCH-204		
Course Type: (CC/MCC/MDC/CC-M/DSECNOC/DSE/PC/AECNA C)	MDC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	Students appeared in B.Sc. P ^t semester		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Exhibit the knowledge of the importance of biochemistry with reference to health. 2. Learn the biochemical functions and role of major and minor nutrients. 3. Know the relationship between biochemistry, exercise and energy metabolism. 4. Understand the Biochemistry of Aging and effect of environmental toxins and pollutants on human health.		
	5*. An understanding of quantitatively analyze the sample for vitamin, minerals and lactose.		
Credits	Theory	Practical	Total
	2	1	3

Contact Hours	30	15	45
Max. Marks: 75 Internal Assessment Marks: 20 (15T+5P) End Term Exam Marks: 55 (35T+20P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics	Contact Hours	
I	Overview of Health: Components of health (physical, mental and emotional), importance of air, water and food in health and relevance of studying Biochemistry in maintaining good health.	7	
II	Nutritional Biochemistry and Health: Macronutrients and micronutrients: roles and biochemical functions of macronutrients and micronutrients in human health.	8	
III	Biochemistry and Exercise Physiology: Energy metabolism during exercise; Biochemical adaptations to physical activity; and complications related to sedentary life style, Sports nutrition and performance-enhancing substances.	7	
IV	Biochemistry of Aging: Biochemical changes associated with aging; impact on hormones, muscle and nervous system. Impact of environmental toxins and pollutants on human health.	8	
V*	1. Estimation of carbohydrate in milk. 2. Estimation of protein in milk. 3. Estimation of fats in milk. 4. Estimation of sugar in blood — before and after exercise	15	

Suggested Evaluation Methods

Internal Assessment: ➤

Theory

- Class Participation:
- Seminar/presentation/assignment/quiz/class test etc.:
- Mid-Term Exam:

➤ Practicum

- Class Participation:
- Seminar/Demonstration/Viva-voce/Lab records etc.:
- Mid-Term Exam:

End Term Examination:

Written theory examination will be conducted as per scheme.

Evaluation of the practical skill will be done by an external examiner.

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Textbook of Biochemistry with Clinical Correlations (2011) Devlin, T.M. John Wiley & Sons, Inc. (New York).
2. Nutrition for health, fitness and sport (2013); Williams. M.H, Anderson, D.E, Rawson, E.S. McGraw Hill international edition.
3. Krause's Food and Nutrition Care process. (2012); Mahan, L.K Strings, S.E, Raymond, J. Elsevier's Publications.
4. Principles of Nutritional Assessment (2005) Rosalind Gibson. Oxford University Press.
5. Essentials of Biochemistry, 5th edition by Satyanarayana and Chakrapani. (2019) Elsevier, India.
6. Introductory Practical Biochemistry by S.K. Sawhney & R. Singh (2014). Narosa Publishers
7. Practical Biochemistry by David Plummer (2001). Tata Mc-Graw Hill
8. Biochemical Methods, 3rd edition, by Sadasivam & Manickam (2018) New Age International (P) Ltd.

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	II		
Name of the Course	Human Values and Ethics		
Course Code	B-VAC-101		
Course Type:	VAC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: • The Need, Content and Process for Value Education. • The Human Values and Ethics • The theories of Integrated Personality and Well-being • The Professional Ethics and Global Citizenship		
Credits	Theory	Practical	Total
	2	0	2
Contact Hours	2	0	2
Max. Marks: 50 Internal Assessment Marks:15 End Term Exam Marks: 35		Time: T-1 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics		Contact hours
I	Course Introduction - Need, Content and Process for Value Education. Understanding the need, content and process for Value Education. (Students should be aware of the difference among skills, values and ethics and their respective needs in life.). Classification of Value Education: understanding Personal Values, Social Values, Moral Values & Spiritual Values; Understanding the difference between ideology and values. Understanding Harmony with self, Society and Nature. Practical: Debate and discussion on the need and nature of value		7

	education; Students should be encouraged to find and analyze suitable case studies to Understand various types of values	
II	Human Values and Ethics • Meaning and nature of human values; Significance of human values in life; • Relation between values and ethics. • Relevance of Human values: Integrity Empathy, Loksangrah, Brahmvihara. • Theory of Naya (Jainism), Deontology, Virtue Ethics, Utilitarianism • Practical: Students should be divided in small groups and should be motivated to reflect upon their values. Teacher should make an environment to make them realize that everyone has a set of values arisen from their family, social, cultural, religious, and political contexts, some of which correspond to more “human” and “universal” frameworks. This exercise is to encourage students to articulate their values and put them into conversation with values from other contexts	8
III	Integrated Personality and Well-being • Understanding the relationship among: Self, Identity and Personality. • Understanding Integrated Personality – with the three gunas theory of Sankhya, the four • Antah-karanas (inner instruments) in Yoga, and Panchkosha (five sheaths) in Upanishad. • Approaching comprehensive understanding of well-being and its relation to Happiness. • Practical: Bhramadhyana Dhyana, Chakra Dhyana, Preksha Dhyana, Sakshi Bhava Dhyana, Vipassana, Yog Nidra, Partipakshabhava (yogic way of cognitive restructuring).	8
IV	Professional Ethics and Global Citizenship • Nature, characteristics and scope of professional ethics; Types of Professional Ethics • Professional Values: Trusteeship, Inclusiveness, Commitment, Sustainability, Accountability, Transparency, Impartiality. • Values for Global Citizenship: Equality, Justice, and Human Dignity. • Nature and need of competency based education; Types of Competencies, Core • Competencies: communication, teamwork, planning and achieving goals, Functional • Competencies: analytical thinking, knowledge sharing and learning, decision making, partnership building	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory- • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.:4 • Mid-Term Exam:7 ➤ Practicum - • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.:		End Term Examination: ➤ 35 Marks
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- Gaur, R. R., Sangal, R., & Bagaria, G. P. (2009). *A foundation course in human values and professional ethics*. Excel Books.
- Kiran, D. R. (2014). *Professional ethics and human values*. McGraw Hill Education (India).
- National Institute of Open Schooling. (n.d.). *Happiness and well-being* (Module V: Health and well-being). NIOS.
- Salagame, K. K. K. (2016). Meaning and well-being: Indian perspectives. *Journal of Constructivist Psychology*, 29(3), 267–274.
- McAdams, D. P., Trzesniewski, K., Lilgendahl, J., Benet-Martínez, V., & Robins, R. W. (2021). Self and identity in personality psychology. *Personality Science*, 2, Article e6035.
- Kumar, S. K. K. (2003). An Indian conception of well-being. In J. Henry (Ed.), *European positive psychology proceedings 2002* (pp. 27–34). Leicester, UK: British Psychological Society.
- Vignoles, V. L. (2017). Identity: Personal and social. In K. Deaux & M. Snyder (Eds.), *Oxford handbook of personality and social psychology* (2nd ed., pp. 289–316). Oxford University Press.
- 王 (Wong, S.-C. (2020). Competency definitions, development and assessment: A brief review. *International Journal of Academic Research in Progressive Education and Development*, 9(3), 95–114.

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	III		
Name of the Course	Clinical Pathology		
Course Code	B25-MLT-301		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain the principles and scope of clinical pathology in medical diagnostics. 2. Analyze urine, stool, and body fluids for normal and abnormal constituents. 3. Correlate biochemical and microscopic findings with clinical conditions. 4. Perform basic clinical pathology laboratory tests with accuracy. 5. Interpret pathological changes in relation to disease diagnosis.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour			
Unit	Topics		Contact hours
I	Introduction to Clinical Pathology : Definition, scope, and importance of clinical pathology in laboratory medicine. Basic principles of specimen		7

	collection, preservation, transport, and processing. Anticoagulants: types, uses, and effects on samples. Laboratory safety guidelines, biomedical waste disposal, and ethical considerations. Role of laboratory technicians in clinical decision-making.	
II	Urine Examination: Collection, preservation, and handling of urine samples., Physical examination: volume, color, clarity, odor, and specific gravity. Chemical examination: protein, glucose, ketone bodies, bile salts, bile pigments, blood, and urobilinogen. Microscopic examination: RBCs, WBCs, epithelial cells, casts, crystals, bacteria, and parasites	8
III	Stool Examination : Techniques of stool collection and preservation (formalin, polyvinyl alcohol fixative). Macroscopic analysis: color, consistency, presence of blood, mucus, pus, and adult helminths. Microscopic examination: saline and iodine wet mount for cysts and ova, concentration techniques (formol-ether sedimentation, zinc sulfate floatation). Staining techniques: Modified Ziehl–Neelsen stain for <i>Cryptosporidium</i> and <i>Cyclospora</i> . Occult blood testing and fecal fat estimation.	8
IV	Body Fluids : Collection and preservation of CSF, pleural, peritoneal, synovial, and pericardial fluids. CSF analysis: physical examination cell count biochemical analysis. Synovial fluid: viscosity test, mucin clot test, and crystal analysis Pleural/ascitic fluid: differentiation of transudate vs. exudate using Rivalta’s test and biochemical markers.	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10		End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Henry, J. B. (2017). <i>Henry’s clinical diagnosis and management by laboratory methods</i> (23rd ed.). Elsevier. 2. McPherson, R. A., & Pincus, M. R. (2021). <i>Henry’s clinical diagnosis and management by laboratory methods</i> (24th ed.). Elsevier. 3. Bishop, M. L., Fody, E. P., & Schoeff, L. E. (2018). <i>Clinical chemistry: Principles, techniques, and correlations</i> (8th ed.). Wolters Kluwer. 4. Burtis, C. A., Brunis, D. E., & Tietz, N. W. (2018). <i>Tietz fundamentals of clinical chemistry and molecular diagnostics</i> (8th ed.). Elsevier. 5. Strasinger, S. K., & Di Lorenzo, M. S. (2019). <i>Urinalysis and body fluids</i> (6th ed.). F.A. Davis. 6. Rodak, B. F., Keohane, E. M., & Fritsma, G. A. (2020). <i>Hematology: Clinical principles and appli-</i>		

cations (6th ed.). Elsevier.

7. McKenzie, S. B., & Williams, J. L. (2022). *Clinical laboratory hematology* (4th ed.). Pearson.
8. Mundt, L. A., & Shanahan, K. (2020). *Graff's textbook of urinalysis and body fluids* (3rd ed.). Wolters Kluwer.
9. Cheesbrough, M. (2017). *District laboratory practice in tropical countries* (2nd ed.). Cambridge University Press.
10. Brunzel, N. A. (2018). *Fundamentals of urine and body fluid analysis* (4th ed.). Elsevier..

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	III		
Name of the Course	Hematology and Blood Transfusion		
Course Code	B25-MLT-302		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Describe the composition and functions of blood and its formed elements. 2. Perform hematological tests including hemoglobin estimation, ESR, and differential counts. 3. Interpret peripheral blood smears and hematological findings in disease. 4. Apply principles of blood grouping, cross-matching, and safe transfusion practices. 5. Recognize hematological disorders and correlate them with diagnostic results.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics		Contact hours

I	Introduction to Hematology : Composition and functions of blood, Collection of blood: methods, anticoagulants, and storage, Normal values and variations in blood parameters	7
II	Hematological Techniques : Hemoglobin estimation (cyanmethemoglobin, Sahli's method, automated methods). Hematocrit (micro & macro methods). Total leukocyte count (TLC) and differential leukocyte count (DLC) Platelet count and reticulocyte count	8
III	Hemostasis and Coagulation Studies : Blood coagulation pathways (intrinsic and extrinsic). Bleeding time (BT), clotting time (CT), prothrombin time (PT),. Coagulopathies: hemophilia, DIC, vitamin K deficiency. Anticoagulants and fibrinolytic system	8
IV	Blood Grouping and Transfusion Medicine : ABO and Rh blood group systems – principles and techniques. Cross-matching and compatibility testing. Blood transfusion reactions – causes and management. Screening of donor blood for infectious diseases (HIV, HBV, HCV, syphilis, malaria). Blood bank organization and regulations	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10		End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Hoffbrand, A. V., & Moss, P. A. H. (2019). <i>Essential haematology</i> (8th ed.). Wiley-Blackwell. 2. Greer, J. P., Arber, D. A., Glader, B. E., List, A. F., Means, R. T., Paraskevas, F., Rodgers, G. M., & Foerster, J. (2018). <i>Wintrobe's clinical hematology</i> (14th ed.). Wolters Kluwer. 3. Bain, B. J. (2017). <i>Blood cells: A practical guide</i> (5th ed.). Wiley-Blackwell. 4. Harmening, D. M. (2018). <i>Modern blood banking and transfusion practices</i> (7th ed.). F.A. Davis. 5. McKenzie, S. B., & Williams, J. L. (2022). <i>Clinical laboratory hematology</i> (4th ed.). Pearson. 6. Lichtman, M. A., Kipps, T. J., Kaushansky, K., Prchal, J. T., & Levi, M. (2016). <i>Williams hematology</i> (9th ed.). McGraw-Hill. 7. Rodak, B. F., Keohane, E. M., & Fritsma, G. A. (2020). <i>Hematology: Clinical principles and applications</i> (6th ed.). Elsevier. 8. Dacie, J. V., & Lewis, S. M. (2017). <i>Practical haematology</i> (12th ed.). Elsevier. 9. Hillyer, C. D., Silberstein, L. E., Ness, P. M., Anderson, K. C., & Roback, J. D. (2019). <i>Blood banking and transfusion medicine: Basic principles and practice</i> (3rd ed.). Elsevier. 10. Hoffbrand, A. V., Higgs, D. R., Keeling, D. M., & Mehta, A. B. (2023). <i>Postgraduate haematology</i> (8th ed.). Wiley-Blackwell.		

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	III		
Name of the Course	Pathogenic Microbiology		
Course Code	B25-MLT-303		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain the pathogenic mechanisms of bacteria, viruses, fungi, and parasites. 2. Perform culture, staining, and identification of medically important pathogens. 3. Interpret results of diagnostic microbiological tests. 4. Apply biosafety and aseptic techniques in handling pathogenic microbes. 5. Correlate microbial infections with their clinical presentations and diagnostic approaches.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour			
Unit	Topics		Contact hours
I	Introduction to Pathogenic Microbiology : Normal microbial flora of the human body. Opportunistic vs true pathogens. Pathogenesis: virulence		7

	factors, toxins, enzymes. Principles of host–pathogen interactions	
II	Bacterial Pathogens : Cocci: <i>Staphylococcus</i> , <i>Streptococcus</i> , <i>Neisseria</i> . Bacilli: <i>Corynebacterium</i> , <i>Mycobacterium</i> , <i>Bacillus</i> , <i>Clostridium</i> . Enterobacteriaceae: <i>Escherichia coli</i> , <i>Salmonella</i> , <i>Shigella</i> , <i>Klebsiella</i> , <i>Proteus</i> . <i>Vibrio</i> , <i>Pseudomonas</i> , <i>Haemophilus</i>	8
III	Viral Pathogens : General properties of viruses and viral replication. DNA viruses: Herpesvirus, Hepatitis B virus, Adenovirus. RNA viruses: Influenza virus, HIV, Hepatitis C, Rabies virus. Laboratory diagnosis of viral infections	8
IV	Fungal and Parasitic Pathogens : Medically important fungi: <i>Candida</i> , <i>Cryptococcus</i> , <i>Aspergillus</i> , <i>Dermatophytes</i> Protozoa: <i>Entamoeba histolytica</i> , <i>Giardia</i> , <i>Plasmodium</i> , <i>Leishmania</i> , <i>Trypanosoma</i> . Helminths: <i>Ascaris</i> , <i>Taenia</i> , <i>Hookworm</i> , <i>Schistosoma</i> . Diagnostic methods in medical parasitology and mycology	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10		End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ● Murray, P. R., Rosenthal, K. S., & Pfaller, M. A. (2020). <i>Medical microbiology</i> (9th ed.). Elsevier. ● Brooks, G. F., Carroll, K. C., Butel, J. S., Morse, S. A., & Mietzner, T. A. (2021). <i>Jawetz, Melnick, & Adelberg's medical microbiology</i> (28th ed.). McGraw-Hill. ● Greenwood, D., Barer, M. R., Slack, R. C. B., & Irving, W. L. (2019). <i>Medical microbiology</i> (19th ed.). Elsevier. ● Ryan, K. J., & Ray, C. G. (2020). <i>Sherris medical microbiology</i> (8th ed.). McGraw-Hill. ● Tortora, G. J., Funke, B. R., & Case, C. L. (2021). <i>Microbiology: An introduction</i> (13th ed.). Pearson. ● Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M., & Stahl, D. A. (2020). <i>Brock biology of microorganisms</i> (16th ed.). Pearson. ● Prescott, L. M., Harley, J. P., & Klein, D. A. (2019). <i>Prescott's microbiology</i> (11th ed.). McGraw-Hill. ● Goering, R. V., Dockrell, H. M., Zuckerman, M., Chiodini, P. L., & Roitt, I. (2018). <i>Mims' medical microbiology and immunology</i> (6th ed.). Elsevier. ● Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2019). <i>Prescott's principles of microbiology</i> (3rd ed.). McGraw-Hill. ● Koneman, E. W., Allen, S. D., Janda, W. M., Schreckenberger, P. C., & Winn, W. C. (2017). <i>Koneman's color atlas and textbook of diagnostic microbiology</i> (7th ed.). Wolters Kluwer.		

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	III		
Name of the Course	Clinical Toxicology		
Course Code	B25-MLT-304		
Course Type:	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Describe principles of toxicology and classifications of poisons. 2. Identify common toxic agents and their effects on human systems. 3. Perform basic laboratory investigations for detection of poisons. 4. Apply toxicological knowledge in medico-legal and clinical cases. 5. Correlate toxicological findings with diagnosis and management of poisoning.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics		Contact hours
I	Introduction to Toxicology: Definition, scope, and significance of		7

	toxicology. Classification of poisons (corrosives, irritants, neurotoxic, cardiotoxic, nephrotoxic, hepatotoxic). Routes of entry, absorption, metabolism, and excretion of poisons. General principles of management of poisoning cases	
II	Common Poisons and Their Clinical Features : Inorganic poisons: arsenic, mercury, lead. Organic poisons: alcohols, cyanide, organophosphates, carbamates. Plant poisons: oleander, datura, aconite. Snake and insect venom	8
III	Laboratory Diagnosis of Poisoning : Specimen collection in poisoning cases (blood, urine, gastric lavage, viscera). Screening tests for common poisons. Chromatographic and spectrophotometric techniques. Role of forensic toxicology laboratory	8
IV	Antidotes and Management of Poisoning : Specific antidotes for common poisons (BAL, EDTA, atropine, naloxone, flumazenil). Supportive therapy: oxygenation, fluid replacement, ventilatory support. Role of gastric lavage, activated charcoal, and diuresis. Medicolegal importance of poisoning cases	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10		End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ● Klaassen, C. D. (Ed.). (2018). <i>Casarett & Doull's toxicology: The basic science of poisons</i> (9th ed.). McGraw-Hill. ● Hayes, A. W., & Kruger, C. L. (2019). <i>Hayes' principles and methods of toxicology</i> (7th ed.). CRC Press. ● Gupta, R. C. (2019). <i>Veterinary toxicology: Basic and clinical principles</i> (3rd ed.). Academic Press. ● Timbrell, J. (2021). <i>Introduction to toxicology</i> (4th ed.). CRC Press. ● Hodgson, E. (2018). <i>A textbook of modern toxicology</i> (5th ed.). Wiley-Blackwell. ● Barceloux, D. G. (2018). <i>Medical toxicology: Diagnosis and treatment of human poisoning</i> (3rd ed.). Wiley-Blackwell. ● Ballantyne, B., Marrs, T. C., & Syversen, T. (2021). <i>General and applied toxicology</i> (3rd ed.). Wiley-Blackwell. ● Hoffman, R. S., Howland, M. A., Lewin, N. A., Nelson, L. S., & Goldfrank, L. R. (2019). <i>Goldfrank's toxicologic emergencies</i> (11th ed.). McGraw-Hill.		

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	III		
Name of the Course	MICROTOMY		
Course Code	B23-SEC-321		
Course Type:	SEC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: • Students will have a thorough understanding of modern developments in microtomy. • Learners will be able to process animal samples for permanent slide preparation. • Students will gain knowledge regarding various biological stains. • Students will be able to localize histochemical components such as proteins, lipids, and nucleic acids. • Students will gain practical exposure to microtomy.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks: 75 Internal Assessment Marks: 15+5 End Term Exam Marks: 35+20		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics		Contact hours
I	Microtomy: Introduction, definition, history and applications in biological sciences		8

	Types of microtomes: Rotary microtome, Sledge microtome, and Cryomicrotome	
II	Collection and transportation of samples/specimens for histological examination. Basic concepts of fixation: Various types of fixatives used in microtomy. Process of fixation. Embedding and block formation	8
III	Section cutting: Paraffin section cutting. Stretching: Spreading the sections and attachment to the glass slides. Staining – Principle and procedure. Preparation of stains and solvents	7
IV	General staining procedures for paraffin-embedded tissue. Nuclear stains and cytoplasmic stains. Haematoxylin and Eosin staining. Mercury Bromophenol Blue staining. Toulidine Blue staining. Commonly used mountants in microtomy	7
V	Practical 1. Collection and labeling of histological samples/specimens 2. Demonstration of various parts and types of microtome 3. Preparation of various fixatives – Bouin's fluid, Corney's fluid, 10% Neutral formalin, Normal saline 4. Processing of tissue by manual method 5. Embedding and casting of block, section cutting, and stretching 6. Performing and practicing staining: Haematoxylin and Eosin staining, Mercury Bromophenol Blue staining Toulidine Blue staining 7. Study of permanent slides of different tissues	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory- ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum - ● Class Participation:NA ● Seminar/Demonstration/Viva-voce/Lab records etc.:5		End Term Examination: 55 ➤ Theory-35 ➤ Practical-20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ● Seligman, M. E. P. (2002). <i>Authentic happiness: Using the new positive psychology to realize your potential for lasting fulfillment</i>. Free Press. ● Selin, H., & Davey, G. (2012). <i>Happiness across cultures</i>. Springer. ● Lama, H. H., & Cutler, H. C. (2009). <i>The art of happiness: A handbook of living</i> (10th anniversary ed.). Riverhead Books. ● Clark, A. E., Flèche, S., Layard, R., Powdthavee, N., & Ward, G. (2019). <i>The origins of happiness</i>. Princeton University Press. ● Yew-Kwang, N. (2022). <i>Happiness: Concept, measurement and promotion</i>. Springer.		

Part A - Introduction			
Subject		Medical Lab Technology	
Semester		III	
Name of the Course		BIOCHEMISTRY OF LIFESTYLE DISEASES	
Course Code		B23-BCH-303	
Course Type:		MDC	
Level of the course (As per Annex-ure-I)		200-299	
Pre-requisite for the course (if any)		Students appeared in B.Sc. 2 nd semester	
Course Learning Outcomes(CLO):		After completing this course, the learner will be able to: • Demonstrate the knowledge of various types of lifestyle diseases; corelation among lifestyle and metabolic disorders. • Give an insight on Diabetes and cancer (lifestyle factors, exercise and management. • Know about the diet and lifestyle interventions in management of heart diseases • Understand and analyse the relationship of sedentary life-style and metabolism and significance of physical exercise in maintaining good health. • An understanding of qualitative analysis of normal and abnormal constituents of urine, quantitative analysis of constituents of blood.	
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks: 75 Internal Assessment Marks: 15+5 End Term Exam Marks: 35+20		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics		Contact hours

I	Overview of lifestyle diseases: Impact of lifestyle diseases on public health, economy and society. Obesity and metabolic syndrome: Molecular mechanisms linking lifestyle factors (diet, physical activity) to metabolic disorders.	8
II	Diabetes: Role of diet, exercise, and other lifestyle factors in diabetes management. Cancer: Lifestyle factors influencing cancer development; Diet and lifestyle interventions in management of cancer.	8
III	Heart diseases and atherosclerosis development: Diet and lifestyle interventions in management of these diseases.	7
IV	Modern Lifestyle and Exercise: Impact of physical inactivity on metabolism and health; Biochemical changes induced by exercise and physical activity; Exercise prescription and its role in preventing lifestyle diseases.	7
V	Practical 1. Qualitative analysis of sugar in urine. 2. Monitoring blood pressure (systolic and diastolic) using sphygmomanometer. 3. Estimation of hemoglobin. 4. Monitoring oxygen level and heart rate during and after exercise.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory- ● Class Participation: ● Seminar/presentation/assignment/quiz/class test etc.: ● Mid-Term Exam: ➤ Practicum - ● Class Participation: ● Seminar/Demonstration/Viva-voce/Lab records etc.: ● Mid term exam		End Term Examination: Written theory examination will be conducted as per scheme. Evaluation of the practical skill will be done by an external examiner.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ● Teitz Textbook of Clinical Chemistry, 6th edition, Carl A. Burtis and Edward R. Ashwood, W. B. (2017). Saunders Company. ● Harper's Biochemistry, by R.K. Murray, P.A. Hayes, D.K. Granner, P.A. Mayes and V.W. Rodwell (2003). Prentice Hall International. ● Textbook of Biochemistry with Clinical Correlations, 5th edition, by T.M. Devlin (2002). Wiley-Liss. ● Biochemistry, 4th edition, by U. Satyanarayana (2013). Books and Allied (P) Ltd. ● Textbook of Biochemistry and Human Biology, 3rd edition, Talwar G.P., Srivastava L.M. and Moudgil K.D. (2002). Prentice-Hall of India Private Limited, New Delhi, India. ● Introductory Practical Biochemistry, by S.K. Sawhney & R. Singh (2014). Narosa Publishers. ● Biochemical Methods, 3rd edition, by Sadasivam & Manickam (2018). New Age International (P) Ltd.		

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	III		
Name of the Course	Environmental Studies		
Course Code	B23-VAC-201		
Course Type:	VAC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: After completing this course, the learner will be able to: 1. Understand the concept of environmental studies, sustainable development and ecosystem. 2. Learn about the various natural resources and about biodiversity and its conservation. 3. Know about the types of pollution, solid waste management, global environmental issues and environmental laws. 4. Understand the concept of population growth and its impacts on environment and disaster management.		
Credits	Theory	Practical	Total
	2	NA	2
Contact Hours	2	NA	2
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35		Time: T-1 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour			
Unit	Topics		Contact hours
I	Introduction to environmental studies: Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development. Ecosystems: Definition, structure and function of ecosystem; Energy flow in an ecosystem: food		6

	chains, food webs, Major ecosystems types: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystem (lakes, rivers, oceans).	
II	Natural resources: Renewable and Non- renewable Resources Land re- sources: Land degradation and soil erosion. Forest resources: Importance of forests, deforestation: causes and impacts on environment. Water re- sources: Use and over- exploitation of surface and ground water. Energy resources: Renewable and non- renewable energy sources. Biodiversity and Conservation: Definition and its types, Endangered and endemic spe- cies of India. Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation o biodiversity: In- situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and informational values.	9
III	Environmental pollution Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution. Solid waste management: Sources, methods of disposal: Landfill, incineration and composting. Cli- mate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environmental Policies & Practices Environmental laws: Environment (Protection) Act, 1986, Air (Prevention & Control of Pollution) Act, 1981, Water (Prevention and control of Pollution) Act, 1974.	8
IV	Human Communities and the Environment: Human population growth: Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected person. Disaster management: floods, earthquake, cyclones, landslides and drought. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation	7
Suggested Evaluation Methods		
Internal Assessment:15 marks ➤ Theory ☐ ● Class Participation: 4 marks ☐ ● Seminar/presentation/assignment/quiz/class test etc.: 4marks ☐ ● Mid-Term Exam: 7 marks		End Term Examination: Theory: 35 marks (Written exam)
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Kaushik, A & Kaushik, C.P. 2022. Perspectives in Environmental Studies. New Age International Pvt Ltd, New Delhi. 2. Bharucha, E. 2021. A Textbook of Environmental Studies for Undergraduate Courses, Orient Blackswan Pvt Ltd. 3. Goswami, P., Mandal, J. & Singh, S. 2022. A Textbook on Environmental Studies, Ashok book stall, Assam. 4. Joshi, P.C. & Joshi, N. 2009. A Text Book of Environmental Science. APH Publishing Corporation.		

5. Basu, M. & Xavier Savarimuthu, S.J. 2017. Fundamentals of Environmental Studies. Cambridge University Press.
6. Singh, R.P. & Islam, Z. 2012. Environmental Studies. Concept Publishing Company.

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	IV		
Name of the Course	Clinical Biochemistry		
Course Code	B25-MLT-401		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain biochemical principles underlying normal and pathological processes in the human body. 2. Demonstrate competence in qualitative and quantitative biochemical analysis of blood, urine, and other body fluids. 3. Interpret biochemical test results in the context of clinical diagnosis (e.g., liver, kidney, pancreatic, cardiac function tests). 4. Apply knowledge of enzymology, endocrinology, and clinical biochemistry in disease correlation. 5. Maintain accuracy, precision, and quality control in biochemical laboratory testing.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			

Unit	Topics	Contact hours
I	Introduction & Basics: Scope and applications of clinical biochemistry in diagnostics. Collection of blood and body fluid samples – methods, precautions. Anticoagulants: EDTA, heparin, fluoride, citrate – uses and limitations. Serum vs. plasma: preparation and differences. Quality control in biochemical analysis: internal vs. external QC	7
II	Carbohydrate Metabolism & Disorders : Principles of glucose estimation methods (glucose oxidase, O-toluidine). Normal and abnormal blood glucose levels (FBS, PPBS, RBS). Glucose tolerance test (GTT) – procedure, interpretation, clinical relevance. Diabetes mellitus: biochemical basis, diagnostic criteria, complication	8
III	Protein & Lipid Metabolism : Plasma proteins – normal values, electrophoresis, clinical significance. Albumin, globulin, and A/G ratio in disease conditions. Non-protein nitrogenous substances: urea, uric acid, creatinine – renal function tests. Lipid profile: serum cholesterol, triglycerides, HDL, LDL, VLDL. Role of lipid profile in cardiovascular risk assessment	8
IV	Liver & Enzyme Function Tests: Liver function tests: bilirubin (direct & indirect), SGOT, SGPT, ALP. Enzymes in clinical diagnosis: amylase in pancreatitis, CK-MB in cardiac injury, LDH in tissue damage. Clinical interpretation of abnormal enzyme values. Case correlations: diabetes, jaundice, renal failure	7
V	Practical 1. Perform estimation of blood glucose using GOD-POD method and compare with glucose oxidase strips. 2. Estimate serum cholesterol and interpret clinical relevance. 3. Determine serum total protein and albumin by Biuret method. 4. Assess liver function through estimation of serum bilirubin and SGOT/SGPT levels. 5. Estimate kidney function markers: serum creatinine and blood urea. 6. Measure serum electrolytes (Na^+, K^+, Cl^-) using flame photometry. 7. Determine serum calcium and phosphorus levels. 8. Carry out lipid profile (triglycerides, HDL, LDL, VLDL) analysis. 9. Practice preparation and standardization of buffers and reagents. 10. Operate semi-automated biochemistry analyzer and interpret generated reports.	
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. Burtis, C. A., Ashwood, E. R., & Bruns, D. E. (2012). <i>Tietz Textbook of Clinical Chemistry and Molecular Diagnostics</i> (5th ed.). Elsevier. 2. Kaplan, L. A., & Pesce, A. J. (2010). <i>Clinical Chemistry: Theory, Analysis, Correlation</i> (5th ed.). Mosby. 3. Devlin, T. M. (2010). <i>Textbook of Biochemistry with Clinical Correlations</i> (7th ed.). Wiley. 4. Murray, R. K., Bender, D., Botham, K. M., Kennelly, P. J., Rodwell, V. W., & Weil, P. A. (2018). <i>Harper's Illustrated Biochemistry</i> (31st ed.). McGraw-Hill. 5. Gaw, A., Murphy, M. J., Cowan, R. A., O'Reilly, D. S. J., & Stewart, M. J. (2013). <i>Clinical Biochemistry: An Illustrated Colour Text</i> (5th ed.). Churchill Livingstone. 6. Varley, H., Gowenlock, A. H., & Bell, M. (2012). <i>Varley's Practical Clinical Biochemistry</i> (6th ed.). CBS Publishers. 7. Marshall, W. J., & Lapsley, M. (2014). <i>Clinical Biochemistry: Metabolic and Clinical Aspects</i> (3rd ed.). Churchill Livingstone. 8. Price, C. P., Christenson, R. H., & Lamb, E. J. (2017). <i>Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics</i> (8th ed.). Elsevier. 9. Bissell, M. G. (2014). <i>Clinical Chemistry: Principles, Techniques, and Correlations</i> (7th ed.). Wolters Kluwer. 10. Henry, J. B. (2011). <i>Clinical Diagnosis and Management by Laboratory Methods</i> (22nd ed.). Saunders.	

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	IV		
Name of the Course	Parasitology and Diagnostic Microbiology		
Course Code	B25-MLT-402		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Identify and classify medically important parasites, bacteria, fungi, and viruses relevant to clinical diagnosis. 2. Perform diagnostic procedures such as stool, urine, and blood examination for parasites. 3. Apply culture, staining, and biochemical methods for pathogen detection. 4. Correlate laboratory findings with parasitic and microbial diseases. 5. Implement biosafety measures and proper specimen handling in parasitology and microbiology laboratories.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics		Contact hours

I	Introduction : Scope of medical parasitology and diagnostic microbiology. Types of parasites: protozoa, helminths, ectoparasites – definitions and examples. Collection, preservation, and transport of stool, urine, and blood samples. Safety measures in handling parasitological specimens	7
II	Protozoan Infections : – Life cycle, pathogenesis, diagnostic tests of Amoebiasis: <i>Entamoeba histolytica</i> Giardiasis: <i>Giardia lamblia</i> , Trichomoniasis: <i>Trichomonas vaginalis</i> , Malaria: <i>Plasmodium species</i> , Kala-azar: <i>Leishmania donovani</i> .	8
III	Helminths & Others : Roundworms <i>Ascaris lumbricoides</i> . Hookworm, <i>Enterobius vermicularis</i> , Tapeworms: <i>Taenia saginata</i> , <i>Taenia solium</i> , Filaria: <i>Wuchereria bancrofti</i> . Ectoparasites: lice, mites, scabies – morphology and diagnosis	8
IV	Diagnostic Microbiology :Clinical sample collection (urine, sputum, pus, throat swabs, CSF, blood). Culture techniques: streak plate, spread plate, selective/differential media. Common diagnostic media: blood agar, Mac-Conkey agar, Sabouraud’s agar. Staining methods: Gram stain, Ziehl–Neelsen stain (AFB), Lactophenol cotton blue (fungi). Interpretation of culture and microscopy results	7
V	Practical: 1. Prepare and examine stool samples for ova, cysts, and parasites by saline and iodine mount. 2. Perform concentration techniques for stool examination (formalin-ether and zinc sulfate flotation). 3. Identify malaria parasites in stained blood smears. 4. Prepare and stain thin and thick smears for detection of protozoa and helminths. 5. Demonstrate collection, transport, and processing of stool, urine, and blood samples for parasitology. 6. Identify medically important helminths and protozoa using permanent slides. 7. Perform culture techniques for intestinal protozoa and helminths. 8. Use rapid diagnostic tests (RDTs) for detection of malaria and other parasitic infections. 9. Prepare reports of common parasitic infestations from clinical specimens. 10. Maintain parasite culture and preservation of samples for diagnostic use.	
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. Garcia, L. S. (2016). <i>Diagnostic Medical Parasitology</i> (6th ed.). ASM Press. 2. Chiodini, P. L., Moody, A. H., & Manser, D. W. (2014). <i>Atlas of Medical Helminthology and Protozoology</i> (4th ed.). Churchill Livingstone. 3. Murray, P. R., Rosenthal, K. S., & Pfaller, M. A. (2020). <i>Medical Microbiology</i> (9th ed.). Elsevier. 4. Winn, W. C., Allen, S. D., Janda, W. M., Koneman, E. W., Procop, G. W., Schreckenberger, P. C., & Woods, G. L. (2006). <i>Koneman's Color Atlas and Textbook of Diagnostic Microbiology</i> (6th ed.). Lippincott Williams & Wilkins. 5. Ash, L. R., & Orihel, T. C. (2007). <i>Atlas of Human Parasitology</i> (5th ed.). American Society of Clinical Pathologists Press. 6. Cox, F. E. G. (2017). <i>Modern Parasitology</i> (2nd ed.). Wiley-Blackwell. 7. Greenwood, D., Barer, M., Slack, R., & Irving, W. (2017). <i>Medical Microbiology</i> (19th ed.). Churchill Livingstone. 8. Garcia, L. S., & Bruckner, D. A. (2016). <i>Diagnostic Parasitology for Medical Laboratory Technologists</i> (2nd ed.). Elsevier. 9. Parija, S. C. (2014). <i>Textbook of Medical Parasitology: Protozoology and Helminthology</i> (4th ed.). CBS Publishers. 10. Cheesbrough, M. (2006). <i>District Laboratory Practice in Tropical Countries: Part 1 & 2</i>. Cambridge University Press.	

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	IV		
Name of the Course	Immunology and Serology		
Course Code	B25-MLT-403		
Course Type:	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain the structure, function, and regulation of the immune system. 2. Differentiate between innate and adaptive immune responses and their clinical relevance. 3. Perform immunological and serological tests such as agglutination, precipitation, ELISA, and immunofluorescence. 4. Interpret serological test results in the diagnosis of infectious and autoimmune diseases. 5. Apply immunology principles in transfusion medicine, vaccination, and immunodiagnostics.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics		Contact hours

I	Introduction to Immunology: Concept of innate and adaptive immunity, Primary and secondary immune responses, Antigens: types, properties, determinants, Antibodies: structure, classes (IgG, IgM, IgA, IgE, IgD), Cells of the immune system: T cells, B cells, macrophages, NK cells	7
II	Antigen–Antibody Reactions: Precipitation reactions (ring test, gel diffusion). Agglutination reactions (slide and tube methods, latex agglutination). Complement system: components, functions, pathways (classical, alternative). Neutralization tests and opsonization. ELISA principle and applications in diagnostics	8
III	Hypersensitivity & Immunodeficiency: Type I: anaphylaxis and allergy, Type II: cytotoxic reactions (transfusion reactions), Type III: immune complex diseases, Type IV: delayed type (tuberculin test). Immunodeficiency: HIV/AIDS – pathogenesis and diagnosis	8
IV	Clinical Serology & Diagnostics : VDRL test for syphilis. Widal test for typhoid fever. ASO titer, CRP, RA test – clinical relevance. Rapid card tests: HIV, HBsAg, HCV, Dengue, Malaria. Quality control and interpretation of serological results	7
V	Practical: 1. Perform Widal test for diagnosis of enteric fever. 2. Carry out VDRL test for syphilis detection. 3. Perform Latex agglutination tests for CRP and RF detection. 4. Conduct ELISA for detection of infectious diseases (e.g., HIV, Hepatitis B). 5. Perform blood grouping and Rh typing using slide/tube/gel methods. 6. Practice antigen-antibody precipitation techniques in agar gel. 7. Demonstrate immunodiffusion and immunoelectrophoresis. 8. Perform rapid card tests for detection of HBsAg, HIV, and HCV. 9. Demonstrate complement fixation test (simulation/observation-based if facilities limited). 10. Maintain proper documentation and interpretation of serological test reports.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10		End Term Examination:70 ➤ Theory-35 ➤ Practical-35

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Abbas, A. K., Lichtman, A. H., & Pillai, S. (2019). *Cellular and Molecular Immunology* (9th ed.). Elsevier.
2. Male, D., Brostoff, J., Roth, D. B., & Roitt, I. (2017). *Immunology* (9th ed.). Elsevier.
3. Owen, J. A., Punt, J., & Stranford, S. A. (2018). *Kuby Immunology* (8th ed.). W. H. Freeman.
4. Delves, P. J., Martin, S. J., Burton, D. R., & Roitt, I. M. (2017). *Roitt's Essential Immunology* (13th ed.). Wiley-Blackwell.
5. Kindt, T. J., Goldsby, R. A., Osborne, B. A., & Kuby, J. (2013). *Kuby Immunology* (7th ed.). W. H. Freeman.
6. Abbas, A. K., & Lichtman, A. H. (2014). *Basic Immunology: Functions and Disorders of the Immune System* (5th ed.). Elsevier.
7. Brostoff, J., Male, D., & Roth, D. B. (2013). *Clinical Immunology* (5th ed.). Elsevier.
8. Paul, W. E. (2013). *Fundamental Immunology* (7th ed.). Lippincott Williams & Wilkins.
9. Barrett, A. J., & Bollard, C. M. (2017). *Immunology and Immunotherapy of Cancer* (2nd ed.). Elsevier.
10. Murphy, K., & Weaver, C. (2016). *Janeway's Immunobiology* (9th ed.). Garland Science.

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	IV		
Name of the Course	Clinical Laboratory Operation and Management		
Course Code	B25-MLT-404		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain principles of laboratory organization, workflow, and management. 2. Apply quality assurance, quality control, and accreditation guidelines in laboratory operations. 3. Demonstrate knowledge of biosafety, biomedical waste management, and legal/ethical issues in clinical labs. 4. Utilize laboratory information systems and modern record-keeping practices. 5. Develop teamwork, communication, and managerial skills for effective clinical laboratory functioning.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
Instructions for Paper- Setter			
The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour			
Unit	Topics		Contact hours

I	Laboratory Organization : Types of laboratories: primary health center lab, hospital lab, reference lab. Role of medical laboratory technician in diagnostics. Laboratory infrastructure: sections (clinical chemistry, hematology, microbiology, histopathology). Biosafety levels (BSL-1 to BSL-4) and their applications	7
II	Quality Management: Internal quality control (IQC): Levey–Jennings charts, Westgard rules. External quality assessment schemes (EQAS). Calibration of balances, pipettes, centrifuges, spectrophotometers. SOPs: importance and implementation in labs. Documentation: log books, QC charts, lab reports	8
III	Laboratory Administration: Record keeping: patient registers, test reports, storage. Workload management: prioritization of emergency vs. routine tests. Staff scheduling and training. Inventory management: reagents, consumables, glassware, and kits. Purchase and supply chain system in laboratories	8
IV	Ethics, Regulations, and Management : Biomedical waste management rules: segregation, collection, disposal. Legal and ethical aspects: patient confidentiality, informed consent, errors and reporting. Laboratory accreditation systems: NABL, ISO. Professional ethics and good laboratory practices (GLP). Teamwork, communication, and leadership in lab settings	7
V	Practical: 1. Maintain laboratory registers and records for clinical reporting. 2. Prepare laboratory SOPs (Standard Operating Procedures) for biochemical, microbiological, and hematological tests. 3. Demonstrate quality control (internal and external QC) in clinical chemistry. 4. Perform calibration of pipettes, balances, and spectrophotometers. 5. Manage inventory and stock registers for laboratory consumables. 6. Demonstrate sample collection, labeling, barcoding, and report dispatch procedures. 7. Practice biomedical waste segregation according to color coding. 8. Perform laboratory audit exercise (mock audit for quality compliance). 9. Demonstrate safety protocols for handling infectious samples (PPE, biosafety cabinet, spill management). 10. Prepare a mock NABL documentation file for laboratory accreditation.	
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. McKenzie, S. B., & Williams, J. L. (2019). <i>Clinical Laboratory Hematology</i> (4th ed.). Pearson. 2. Lundberg, G. D. (2014). <i>Managing the Clinical Laboratory</i> (2nd ed.). ASCP Press. 3. Harmening, D. M. (2018). <i>Clinical Laboratory Management</i> (2nd ed.). F. A. Davis. 4. Da Rin, G., & Zerah, S. (2018). <i>Management of Medical Laboratories: A Guide</i> (2nd ed.). Springer. 5. Ward-Cook, K., Lehman, C. A., & Wilson, M. L. (2014). <i>Laboratory Administration for Pathologists</i> (2nd ed.). CAP Press. 6. WHO. (2011). <i>Laboratory Quality Management System: Handbook</i>. World Health Organization. 7. Cheesbrough, M. (2010). <i>District Laboratory Practice in Tropical Countries: Part 1 & 2</i>. Cambridge University Press. 8. Strasz, R. H., & Bennett, B. D. (2017). <i>Laboratory Management: Principles and Processes</i> (3rd ed.). Pearson. 9. Quirk, R., & Forthofer, R. (2015). <i>Quality in Laboratory Medicine</i> (2nd ed.). Springer. 10. Rodney, G., & Kaplan, L. (2013). <i>Accreditation and Quality Assurance in Clinical Laboratories</i>. Springer.	

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	IV		
Name of the Course	Art of Happiness		
Course Code	B23-VAC-402		
Course Type:	VAC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: • Get awareness regarding nature, sources and factors affecting happiness. • Understand the role of culture in happiness and relationship happiness and money • Develop insight about happiness as a intrinsic value, age relationship with happiness and ways to increase happiness • Know about key indicators and index of happiness and status of happiness in INDIA.		
Credits	Theory	Practical	Total
	2	0	2
Contact Hours	2	0	2
Max. Marks: 50 Internal Assessment Marks:15 End Term Exam Marks: 35		Time: T-1 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics		Contact hours
I	Happiness: Definition and Nature, Sources of Happiness, Factors Affecting Happiness.		7
II	Culture and Happiness, Eastern and Western Approaches to Happiness,		7

	Relationship Between Happiness and Money	
III	Happiness as Intrinsic value Age and Happiness, Ways to Increase Happiness	7
IV	Measuring Happiness: Key indicators, Happiness index, Happiness in India	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory- ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7		End Term Examination: ➤ 50 Marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ● Seligman, M. E. P. (2002). <i>Authentic happiness: Using the new positive psychology to realize your potential for lasting fulfillment</i>. Free Press. ● Selin, H., & Davey, G. (2012). <i>Happiness across cultures</i>. Springer. ● Lama, H. H., & Cutler, H. C. (2009). <i>The art of happiness: A handbook of living</i> (10th anniversary ed.). Riverhead Books. ● Clark, A. E., Flèche, S., Layard, R., Powdthavee, N., & Ward, G. (2019). <i>The origins of happiness</i>. Princeton University Press. ● Yew-Kwang, N. (2022). <i>Happiness: Concept, measurement and promotion</i>. Springer.		