FACULTY OF SCIENCES

SYLLABUS FOR THE BATCH 2024-25

Programme Code: ZMLT

Programme Name: Certificate/Diploma in Medical Laboratory Technology
(Semester I-II)

Examinations: 2024-2025

Department of Zoology
Khalsa College, Amritsar

S. No.	PROGRAMME OBJECTIVES
1.	To demonstrate various safety rules in laboratory; cleaning and sterilization of glassware.
2.	Understand laboratory apparatus and glassware; the preparation of chemical reagents and standards.
3.	Study various filtration methods, types of microscopes, blood test and preservation of different clinical samples.
4.	Study various blood and urine tests.
5.	Understand various pathogenic microbes and diseases caused by them, their occurrence and eradication programs.
6.	Understand the life history, mode of infection and pathogenicity and control measures of pathogenic protozoans and helminthes.

S. No.	PROGRAMME SPECIFIC OUTCOMES (PSOS)
PSO-1	Have knowledge of various safety rules in laboratory; cleaning and sterilization of glassware.
PSO-2	Will be able to handle laboratory apparatus and glassware, chemical reagents, standards and equipment used in the pathology lab.
PSO-3	Analyse various blood, urine & other materials for any disease/abnormality.
PSO-4	Diagnose presence of various pathogens in a given sample.
PSO-5	The knowledge of Lifecycle of pathogens & vectors will enable them to participate in various eradication programs.

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Course Code	Course Name	Hours/ Week	Credits			Total Credits	Max Marks				Page No.
			L	T	P		Th	P	IA	Total	
ZMLT111	Cell Biology	4	4	-	-	4	75	--	25	100	4
ZMLT112	Hematology-I	4	4	-	-	4	75	--	25	100	5
ZMLT113	Principles of Biochemistry	4	4	-	-	4	75	--	25	100	6
ZMLT114	Basic Microbiology	4	4	-	-	4	75	--	25	100	7
ZMLT115	Practicals in Cell Biology	2	-	-	2	2	--	37	13	50	8
ZMLT116	Practicals in Hematology-I	2	-	-	2	2	--	37	13	50	9
ZMLT117	Practicals in Biochemistry	2	-	-	2	2	--	37	13	50	10
ZMLT118	Practicals in Microbiology	2	-	-	2	2	--	37	13	50	11
										600	

Course Code	Course Name	Hours/ Week	Credits			Total Credits	Max Marks				Page No.
			L	T	P		Th	P	IA	Total	
ZMLT121	Anatomy and Physiology	4	4	-	-	4	75	--	25	100	12
ZMLT122	Hematology-II	4	4	-	-	4	75	--	25	100	13
ZMLT123	Advanced Pathology	4	4	-	-	4	75	--	25	100	14
ZMLT124	Clinical Biochemistry and Community Medicine	4	4	-	-	4	75	--	25	100	15
ZMLT125	Practicals in Anatomy and Physiology	2	-	-	2	2	--	37	13	50	16
ZMLT126	Practicals in Hematology-II	2	-	-	2	2	--	37	13	50	17
ZMLT127	Practicals in Advanced Pathology	2	-	-	2	2	--	37	13	50	18
ZMLT128	Practicals in Clinical Biochemistry and Community Medicine	2	-	-	2	2	--	37	13	50	19
ZMLT129	Training and Report	4	-	-	4	4	--	--	--	--	20
										600	

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–I

Theory

COURSE CODE: ZMLT111

COURSE TITLE: CELL BIOLOGY

Credit Hours: 4 hrs.
Total Hours: 60 hrs.
Theory Paper: 75
Periods/week: 6 **Internal Assessment: 25**
Time: 3 Hrs. **Total Marks: 100**

Instructions for the Paper Setters:

1. **Section A**: Question 1 will be compulsory (15 marks). There will be of 10 short answer type questions (1.5 marks each).
2. **Section B**: Candidates shall be required to attempt 4 questions, one from each unit. Each question carries 15 marks. Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

COURSE OBJECTIVES: The paper aims to

1.	Understand the structures and purposes of basic components of prokaryotic and eukaryotic cells through light and phase contrast microscopy, Electron microscopy.
2.	Understand how these cellular components are used to generate and utilize energy in cells
3.	Understand the cellular components underlying mitotic cell division.

UNIT-I

Microscopic techniques: light and phase contrast microscopy, Electron microscopy (TEM and SEM), Fixation and Staining techniques.

UNIT-II

Types of cells, Cell Division, Mitosis and meiosis Plasma Membrane: Structure and molecular models.

UNIT-III

Structure of mitochondria, Endoplasmic reticulum and Golgi complex, Lysosomes, Vacuoles, Nucleus

UNIT-IV

Ribosomes: Types, their structure and functions. Protein synthesis and types of RNA

Books recommended:

1. Alberts, B. Bracy, P. Lewis, J. Raff, M. Roberts K and Watson, J. (eds) (2008). MolecularBiology of the Cell (5th Ed.), Garland Publishing, New York.
2. Copper, G.M. (2015). The Cell, Molecular Approach (7th Ed) ASM press Washington,D.C.
3. Chandra Roy, S and DE Kumar, K. (2001) Cell Biology. New Central Book Agency (P)Ltd. Kolkata
4. Darnell, J. Lodish, Baltimore, D. (2007). Molecular Cell Biology, 6th edition, Freeman,New York.

COURSE OUTCOMES

CO-1.	Study the structure and functions of the cell organelles like Golgi complex, Endoplasmic reticulum, Mitochondrion, Ribosomes, Peroxysomes and glyoxysomes.
CO-2.	Understand the phases of cell cycle including Mitosis and Meiosis.

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–I

Theory

COURSE CODE: ZMLT112

COURSE TITLE: HEMATOLOGY-I

Credit Hours: 4 hrs.
Total Hours: 60 hrs.
Theory Paper: 75
Periods/week: 6 **Internal Assessment: 25**
Time: 3 Hrs. **Total Marks: 100**

Instructions for the Paper Setters:

1. **Section A**: Question 1 will be compulsory (15 marks). There will be of 10 short answer type questions (1.5 marks each).
2. **Section B**: Candidates shall be required to attempt 4 questions, one from each unit. Each question carries 15 marks. Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

COURSE OBJECTIVES: The paper aims to-

1.	Understand the structure of blood and various components
2.	Understand Phlebotomy Techniques.
3.	Understand the cellular components of Hemoglobin.

UNIT-I

Introduction to Hematology: Definition and significance of hematology, Characteristics of good technician, Blood and its various components. RBC's indices & Anomalies.

UNIT-II

Phlebotomy Techniques: Preparation of specimen collection material, lab request form, vein puncture and its complications, Patient after care, Specimen rejection criteria for blood specimen, changes in blood on keeping, maintenance of specimen, identification & transport of the specimen, Haemolysis of blood, separation of serum & plasma, effects of storage on blood cell morphology. Anticoagulants

UNIT-III

Hemoglobin: Its structure and derivatives, estimation of hemoglobin, CBC, Blood filmpreparation & staining methods, Differential count.

UNIT-IV

Hemocytometry: Types of Hemocytometers, ruled area, RBC's Count, Total leucocyte count, platelet count, absolute eosinophil count.

Books Recommended:

1. Godkar, PB and Godkar, DP (2008) Text Book of Medical Laboratory Technology, 2ndedition Bhalani Publishing House, Mumbai, India.
2. Martin R. Howard & Peter J Hamilton (2013)Text Book of Hematology, 4 th edition,Churchill Livingstone.

COURSE OUTCOMES

CO-1.	Study the structure and functions of blood and various components.
CO-2.	Understand the Phlebotomy Techniques.

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–I

Theory

COURSE CODE: ZMLT113

COURSE TITLE: PRINCIPLES OF BIOCHEMISTRY

Credit Hours: 4 hrs.
Total Hours: 60 hrs.
Theory Paper: 75
Periods/week: 6 **Internal Assessment: 25**
Time: 3 Hrs. **Total Marks: 100**

Instructions for the Paper Setters:

1. **Section A**: Question 1 will be compulsory (15 marks). There will be of 10 short answer type questions (1.5 marks each).
2. **Section B**: Candidates shallbe required to attempt 4 questions, one from each unit. Each question carries 15 marks. Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

COURSE OBJECTIVES: The paper aims to

1.	Understand the fundamental chemical principles that govern complex biological systems
2.	To appreciate the chemical foundation of life processes
3.	To understand the structure and metabolism of biologically significant molecules

UNIT-I

Introduction of Biochemistry, Definition, Classification and biomedical importance of Carbohydrates. Brief description of Monosaccharides (Glucose, Galactose, Fructose), Oligosaccharides (Maltose, Lactose, Sucrose), Polysaccharides (Starch, Glycogen, Cellulose), Reducing vs. Non reducing sugars.

UNIT-II

Fat: Biomedical importance, Fatty acids, Essential fatty acids, General structure and function of acylglycerols, phosphoglycerides, and steroids, Protein & Amino acid: Biomedical importance; Classification of standard amino acids, essential amino acids, Different classes of proteins,

UNIT-III

Enzymes (Classification, factors regulating, inhibitors, clinical application) Buffers, Molarity, Radiation hazard.

UNIT-IV

Overview of Iron, Calcium. Water- & Fat-soluble Vitamins;Overview of Nucleic Acids.

Books Recommended

1. Nelson D Land Cox MM. (2013) Lehninger Principles of Biochemistry, 6th Edition. Macmillan Worth Publishers, New Delhi.
2. Berg JM, Tymoczko JL, Gatto GJ and Stryer L (2015) Biochemistry, 8th Edition, WH Freeman & Co., New York.
3. Bender DA, Botham KM, Kennelly PJ, Rodwell VW and Weil PA (2015) Harper's Illustrated Biochemistry, 30th Edition, McGraw Hill Medical Canada

COURSE OUTCOMES

CO-1	The scope of biochemistry is applied in medicine, nutrition and agriculture
CO-2	Students have scope of career in research laboratories

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–I

Theory

COURSE CODE: ZMLT114

COURSE TITLE: BASIC MICROBIOLOGY

Credit Hours: 4 hrs.
Total Hours: 60 hrs.
Theory Paper: 75
Internal Assessment: 25
Total Marks: 100

Periods/week: 6
Time: 3 Hrs.

Instructions for the Paper Setters:

1. **Section A**: Question 1 will be compulsory (15 marks). There will be of 10 short answer type questions (1.5 marks each).
2. **Section B**: Candidates shallbe required to attempt 4 questions, one from each unit. Each question carries 15 marks. Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

COURSE OBJECTIVES: The paper aims to

1.	Understand the Bacteriology, virology and mycology, immunology
2.	Understand Microscopy and staining techniques.
3.	Understand the classification of medically important parasites

UNIT-I

Introduction to Bacteriology, virology and mycology, immunology, medical microbiology. General account of Bacteria, fungi, protozoa, viruses, their morphology.

UNIT-II

Microscopy and staining, microbiological techniques, pour plating, spreading, streaking serial dilution, methods of sterilization, media preparation, types of media (synthetic, natural, enrichment, selective

UNIT-III

Pure cultures & cultural characteristics: Mixed culture, selective methods, natural selection of microorganisms, maintenance & preservation of cultures, colony characteristics & characteristics of broth cultures.

UNIT-IV

Parasitology - Introduction & classification of medically important parasites, Brief review of Intestinal & Tissue protozoa (*E. histolylica*, *Giardia*) - Malarial parasite, Tapeworms.

Books Recommended:

1. Stanier, R.Y. Adelberg, E.A. and Ingraham, J.L. (1984), General Microbiology, IV edn.Mac Millan Press.
2. Pelczar, M.J. Chan, E.C.S. and Krieg, N.R. (1986), Microbiology, V Ed. McGraw Hill.
3. Prescott. L.M. Harley J.P. and L. Kreig D.A. (1990). Microbiology, WCB Publishers.
4. Rosenberg, E & Cohen I.R. (1983). Microbial Biology. H.S. International Editions.

COURSE OUTCOMES

CO-1	Understand the structure of Bacteria, virus and Fungi
CO-2	Students have scope of career in research laboratories

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–I

Theory

COURSE CODE: ZMLT115

COURSE TITLE: PRACTICALS IN CELL BIOLOGY

Credit Hours: 2 hrs.
Total Hours: 30 hrs.
Theory Paper: 37
Periods/week: 3+3 **Internal Assessment: 13**
Time: 3 Hrs. **Total Marks: 50**

COURSE OBJECTIVES: The paper aims to

1.	Understand Different types of Microscopes
2.	Understand permanent slides of prokaryotic and eukaryotic cell

1. Different types of Microscopes and their working.
2. Study of permanent slides of prokaryotic and eukaryotic cell
3. Study of permanent slides of tissues.
4. Temporary preparation of *Lacto bacillus* from curd
5. Temporary preparation of fresh water Protozoa
6. Histological preparation of tissues

Note: Some changes can be made in the Practicals depending on the availability ofmaterial.

COURSE OUTCOMES

CO-1	Understand the structure of prokaryotic and eukaryotic cell
CO-2	Understand various tissues through permanent slides

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COURSE CODE: ZMLT SESSION: 2024-2025

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Semester–I

Theory

COURSE CODE: ZMLT116

COURSE TITLE: PRACTICALS IN HEMATOLOGY-I

Credit Hours: 2 hrs.
Total Hours: 30 hrs.
Theory Paper: 37
Periods/week: 3+3 **Internal Assessment: 13**
Time: 3 Hrs. **Total Marks: 50**

COURSE OBJECTIVES: The paper aims to

1.	Understand Equipments for Hematology
2.	Determine Hemoglobin in blood

1. Basic requirements for Hematology laboratory.
2. Glassware for Hematology.
3. Equipments for Hematology.
4. Anticoagulant vial preparation.
5. Determination of Hemoglobin.
6. TRBC count by Hemocytometer.
7. TLC by Hemocytometer.
8. Differential Leukocyte count.

COURSE OUTCOMES

CO-1	Understand the Basic requirements for Hematology laboratory
CO-2	Understand Glassware for Hematology

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–I

Theory

COURSE CODE: ZMLT117

COURSE TITLE: PRACTICALS IN BIOCHEMISTRY

Credit Hours: 2 hrs.
Total Hours: 30 hrs.
Theory Paper: 37
Periods/week: 3+3 **Internal Assessment: 13**
Time: 3 Hrs. **Total Marks: 50**

COURSE OBJECTIVES: The paper aims to

1.	Understand Equipments for Biochemistry
2.	Perform various practicals of biochemistry

1. Introduction to Biochemistry Laboratory: General Glassware, Equipment: use ofanalytical balance, Micropipettes and general safety measures
2. Cleaning of glassware: preparation of chromic acid
3. Preparation of 1N NaOH
4. Preparation of normal saline
5. Use of pH meter and preparation of Buffer.
6. Use of Centrifuge with different types of Rotor
7. To find the absorption maxima of a dye.
8. Volumetric analysis- acid base titration

COURSE OUTCOMES

CO-1	Understand the Biochemistry Laboratory
CO-2	Understand Cleaning of glassware

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–I

Theory

COURSE CODE: ZMLT118

COURSE TITLE: PRACTICAL MICROBIOLOGY

Credit Hours: 2 hrs.
Total Hours: 30 hrs.
Theory Paper: 37
Periods/week: 3+3 **Internal Assessment: 13**
Time: 3 Hrs. **Total Marks: 50**

COURSE OBJECTIVES: The paper aims to

1.	Understand different lab apparatuses used in microbiology
2.	Study various techniques of sterilization

1. To study different lab apparatuses used in microbiology.
2. To study various techniques of sterilization.
3. To prepare media & its sterilization.
4. To prepare agar slants/deeps.
5. Serial dilution for enumeration of microorganisms.
6. To study various cultural techniques like pour plating, spreading & streaking.
7. To study the morphology cell structure of microorganisms through staining procedures.
    a. Simple staining
    b. Gram staining
    c. Negative staining
8. To count the no. of microorganisms by Haemocytometer
9. Wet Mount / Hanging drop method

COURSE OUTCOMES

CO-1	Understand the morphology cell structure of microorganisms through staining procedures
CO-2	study various techniques of sterilization

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–II

Theory

COURSE CODE: ZMLT121

COURSE TITLE: ANATOMY AND PHYSIOLOGY

Credit Hours: 4 hrs.
Total Hours: 60 hrs.
Theory Paper: 75
Periods/week: 6 **Internal Assessment: 25**
Time: 3 Hrs. **Total Marks: 100**

Instructions for the Paper Setters:

1. **Section A**: Question 1 will be compulsory (15 marks). There will be of 10 short answer type questions (1.5 marks each).
2. **Section B**: Candidates shall be required to attempt 4 questions, one from each unit. Each question carries 15 marks. Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

Course Objectives: The course aims to-

1.	Understand the metabolic activities in the body of animals.
2.	Understand the structure and function of blood.
3.	Understand the process of digestion.
4.	Understand the gaseous transport and the structure involved in gaseous transport.

UNIT-I

Brief study of Alimentary and digestive system: - Diseases of mouth and Oesophagus, Gastritis, Peptic ulceration, food poisoning, Accessory Digestive glands: **Liver-** hepatitis, liver failure, cirrhosis. **Pancreas-** pancreatitis, **Gall Bladder-** Gall stones, Jaundice.

UNIT-II

Brief study of Circulatory System: - Diseases of Blood vessels- Atheroma, Atherosclerosis, Disorders of Blood Pressure - Hyper & Hypotension and cardiovascular diseases.

UNIT-III

Brief study of Urinary system- Brief anatomical description of constituent parts, Functions of urinary system, Role of kidney in Urine formation and maintaining blood volume.

UNIT-IV

Brief study of Respiratory System:- Upper respiratory tract infection, Bronchi, Asthma, Pneumonia, Tuberculosis.

Books Recommended-

1. Drake, R., Vogl, W. and Mitchell, A. (2004). Gray's Anatomy for Students. Churchil,Livingstone, USA.
2. Marieb, E.N. (2014). Human Anatomy and Physiology. Dorling Kindersley (India)Pvt. Ltd.,
3. Ross and Willson (2012). Anatomy and Physiology. ELBS Publication.
4. Tortora, G.J. and Henderson, S.R. (2012). Principles of Anatomy and Physiology.Harper Collins College Publishers.

COURSE OUTCOMES

CO-1.	To develop understanding of the various fundamental concepts related to physiology of digesting & absorption
CO-2.	To develop understanding of circulatory system and blood components
CO-3.	To teach students the various aspects of respiratory system and exchange of respiratory gases

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–II

Theory

COURSE CODE: ZMLT122

COURSE TITLE: HEMATOLOGY-II

Credit Hours: 4 hrs.
Total Hours: 60 hrs.
Theory Paper: 75
Periods/week: 6 **Internal Assessment: 25**
Time: 3 Hrs. **Total Marks: 100**

Instructions for the Paper Setters:

1. **Section A**: Question 1 will be compulsory (15 marks). There will be of 10 short answer type questions (1.5 marks each).
2. **Section B**: Candidates shallbe required to attempt 4 questions, one from each unit. Each question carries 15 marks. Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

Course Objectives: The course aims to

1.	Understand Coagulation and mechanism of coagulation.
2.	Understand the Hematological Disorders.
3.	Understand the process of Blood Banking.
4.	Understand immunology.

UNIT-I

Coagulation and mechanism of coagulation: Hemostasis, Coagulation factors, Routine coagulation Tests, Automated coagulation analyzer. ESR, PCV

UNIT-II

Hematological Disorders: Anemia, various types of anemias., Thalassemia, Polycythemia, Leukemia & its classification.

UNIT-III

Blood Banking: (i) Collection of Blood (ii) Storage of Blood (iii) ABO & Rh Blood Group System by Slide Method & Tube Method (iv) Cross- Matching (v) Blood Transfusion and its Reactions, (vi)blood components(vii)Direct & Indirect Coomb's test (HDN)

UNIT-IV

Immunology: (i) Types of immunity (ii) Antigen & Antibodies; structure, classification & characteristics (iii) Primary & secondary lymphoid organs.

Books Recommended:

1. Godkar, PB and Godkar, DP (2008) Text Book of Medical Laboratory Technology, 2ndedition Bhalani Publishing House, Mumbai, India.
2. Martin R. Howard & Peter J Hamilton (2013) Text Book of Haematology, 4th edition, Churchill Livingstone

Course Outcomes

CO-1.	Students will be able to learn coagulation and its mechanism
CO-2.	Students will be able to learn Hematological Disorders
CO-3.	Students will be able to learn about blood banking

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–II

Theory

COURSE CODE: ZMLT123

COURSE TITLE: ADVANCED PATHOLOGY

Credit Hours: 4 hrs.
Total Hours: 60 hrs.
Theory Paper: 75
Internal Assessment: 25
Total Marks: 100

Periods/week: 6
Time: 3 Hrs.

Instructions for the Paper Setters:

1. **Section A**: Question 1 will be compulsory (15 marks). There will be of 10 short answer type questions (1.5 marks each).
2. **Section B**: Candidates shallbe required to attempt 4 questions, one from each unit. Each question carries 15 marks. Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

Course Objectives: The course aims to-

1.	Understand General Pathology.
2.	Understand Histopathology.
3.	Understand the process of Microtomy.

UNIT-I

General Pathology: Cell injury, inflammation & repair adaptation, hemodynamic, infectious diseases, nutritional diseases, genetic diseases, neoplasia.

UNIT-II

Histopathology: Introduction to histology, sample collection, Fixation, Dehydration, Impregnation & Embedding techniques.

UNIT-III

Microtomy: Types of microtomes, Honning, Stropping, Section cutting, Staining procedures

UNIT-IV

Body Fluids: Urine: Method of Collection Normal Constituents Physical Examination Chemical Examination **Stool Examination:** Method of Collection Normal Constituents and appearance Abnormal Constituents (Ova, Cyst) **C.S.F.:** Examination Physical Examination Chemical Examination Microscopy Cell Count Staining, **Semen Analysis:** Collection, Examination, Special Test

Books Recommended

1. Textbook of Pathology by Harsh Mohan (2015). Jaypee Brothers Medical Publishers (P)Ltd. New Delhi, india
2. Muir's Textbook of Pathology (2014) edited by C. Simon Herrington. CRC press USA
3. Textbook of Pathology (2004) by V Krishna. Orirnt Longman Pvt. Ltd, India

Course Outcomes

CO-1.	Students will be able to learn General Pathology
CO-2.	Students will be able to learn Histopathology
CO-3.	Students will be able to learn about Microtomy

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–II

Theory

COURSE CODE: ZMLT124

COURSE TITLE: CLINICAL BIOCHEMISTRY & COMMUNITY MEDICINE

Credit Hours: 4 hrs.
Total Hours: 60 hrs.
Theory Paper: 75
Periods/week: 6 **Internal Assessment: 25**
Time: 3 Hrs. **Total Marks: 100**

Instructions for the Paper Setters:

1. **Section A**: Question 1 will be compulsory (15 marks). There will be of 10 short answer type questions (1.5 marks each).
2. **Section B**: Candidates shallbe required to attempt 4 questions, one from each unit. Each question carries 15 marks. Preferably, the question should not be split into any sub-parts. In case of any splitting, it should not have more than two sub-parts.

Course Objectives: The course aims to

1.	Understand Role of the clinical biochemistry laboratory.
2.	Understand Biochemical Test Profile.

UNIT-I

Role of the clinical biochemistry laboratory, lay out and organization of clinical diagnostic lab, Reference ranges, Units of Measurement, Specimen collection: Blood and Urine specimens, Quality assurance, Biomedical waste management

UNIT-II

Biochemical Test Profile (Quantitative Determination of Blood Plasma & Serum) Acid Phosphatase (ACP), Alkaline Phosphatase (ALP), Amino Acids, Bilirubin, Creatinine, SGOT, SGPT, Uric Acid,Urea.

UNIT-III

Biochemical Test Profile (Quantitative determination of Urine), Chlorides, Creatinine, Sodium, Potassium, Glucose, Proteins, Uric Acid, Ketone bodies.

UNIT-IV

HbA1C, Lipid Profile, Thyroid Profile, Tumour Markers, Biochemical Test Profile (Quantitative Determination of CSF**)** Chloride Glucose, Proteins.

Books Recommended

1. Nelson DL and Cox MM. (2013) Lehninger Principles of Biochemistry, 6th Edition. Macmillan Worth Publishers, New Delhi.
2. Berg JM, Tymoczko JL, Gatto GJ and Stryer L (2015) Biochemistry, 8th Edition, WH Freeman & Co., New York.
3. Bender DA, Botham KM, Kennelly PJ, Rodwell VW and Weil PA (2015) Harper's Illustrated Biochemistry, 30th Edition, McGraw-Hill Medical Canada.
4. Godkar, PB and Godkar, DP (2008) Text Book of Medical Laboratory Technology, 2nd edition Bhalani Publishing House, Mumbai. J Ochei , A Kolhatkar, Medical Laboratory Science Theory and Practice.

Course Outcomes

CO-1.	Students will be able to learn Role of the clinical biochemistry laboratory
CO-2.	Students will be able to learn Biochemical Test Profile

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–II

Theory

COURSE CODE: ZMLT125

COURSE TITLE: PRACTICALS IN ANATOMY AND PHYSIOLOGY

Credit Hours: 2 hrs.
Total Hours: 30 hrs.
Theory Paper: 37
Periods/week: 3+3 **Internal Assessment: 13**
Time: 3 Hrs. **Total Marks: 50**

Course Objectives: The course aims to

1.	Understand the metabolic activities in the body of animals.
2.	Understand the Hemoglobin concentration in blood.
3.	Understand the process of Blood cell counts.

1. Estimation of Bleeding time, clotting time.
2. Estimation of Hemoglobin concentration,
3. Blood cell counts- RBC Count, Total leukocyte count, Differential leukocyte count
4. Osmotic fragility of RBC,
5. To record Heart rate and pulse rate
6. To record Blood pressure

Course Outcomes

CO-1.	Students will be able to Estimate Bleeding time, clotting time
CO-2.	Students will be able to count blood cells

KHALSA COLLEGE, AMRITSAR
(An Autonomous college)
P.G. DEPARTMENT OF ZOOLOGY

COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–II

Theory

COURSE CODE: ZMLT126

COURSE TITLE: PRACTICALS IN HEMATOLOGY-II

Credit Hours: 2 hrs.
Total Hours: 30 hrs.
Theory Paper: 37
Periods/week: 3+3 **Internal Assessment: 13**
Time: 3 Hrs. **Total Marks: 50**

Course Objectives: The course aims to

1.	Understand the Determination of ESR by Wintrobes and Westergeren's method.
2.	Understand the Determination of PCV by Wintrobes.
3.	Understand the process of Reticulocyte counts.

1. Determination of ESR by Wintrobes.
2. Determination of ESR by Westergeren's method.
3. Determination of PCV by Wintrobes
4. Erythrocyte Indices- MCV, MCH, MCHC.
5. Reticulocyte count.
6. Absolute Eosinophil count.
7. Blood Group Typing

Course Outcomes

CO-1.	Students will be able to Estimate ESR by Wintrobes and Westergeren's method
CO-2.	Students will be able to determine PCV by Wintrobes

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–II

Theory

COURSE CODE: ZMLT127

COURSE TITLE: PRACTICALS IN ADVANCED PATHOLOGY

Credit Hours: 2 hrs.
Total Hours: 30 hrs.
Theory Paper: 37
Periods/week: 3+3 **Internal Assessment: 13**
Time: 3 Hrs. **Total Marks: 50**

Course Objectives: The course aims to

1.	Study of various types of microscope, Use & care of Microscope
2.	Understand Mounting and staining Techniques.
3.	Understand the process of Urine Examination.

1. Study of various types of microscope, Use & care of Microscope
2. Mounting and staining Techniques
3. Maintenance of records and slides
4. Urine Examination– Collection and Preservation of urine
5. Urine- Physical, chemical, Microscopic Examination
6. Sputum Examination.

Course Outcomes

CO-1.	Students will be able to Study of various types of microscope, Use & care of Microscope
CO-2.	Students will be able to study Mounting and staining Techniques

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–II

Theory

COURSE CODE: ZMLT128

COURSE TITLE: PRACTICALS IN CLINICAL BIOCHEMISTRY & COMMUNITY MEDICINE

Credit Hours: 2 hrs.
Total Hours: 30 hrs.
Theory Paper: 37
Periods/week: 3+3 **Internal Assessment: 13**
Time: 3 Hrs. **Total Marks: 50**

Course Objectives: The course aims to

1.	Study Principles and working of Semi auto Biochemical / Auto biochemical analyzer
2.	Understand the Preparation and standardization of volumetric solutions.
3.	Understand the process of Determination of blood sugar level of plasma.

I. Principles and working of Semi auto Biochemical / Auto biochemical analyzer.

II. Preparation and standardization of volumetric solutions.

III. Verification of Beer Lambert's Law

IV. Separation of Serum and Plasma from blood

V. Determination of blood sugar level of plasma (or serum): manual Method (Fehling solution /Benedict solution Test)

VI. Determination of Sugar level from capillary blood using glucometer

VII. Determination of Glucose in urine

VIII. Determination of Serum total cholesterol.

Course Outcomes

CO-1.	Students will be able to Study the Principles and working of Semi auto Biochemical/ Auto biochemical analyzer
CO-2.	Students will be able to Prepare and standardize the volumetric solutions

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COURSE CODE: ZMLT SESSION: 2024-2025

CERTIFICATE/DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Semester–II

Theory

COURSE CODE: ZMLT129

COURSE TITLE: TRAINING AND REPORT

Periods/week: 6
Time: 3 Hrs. **Credit Hours: 4 hrs.**
Total Hours: 60 hrs.

COURSE OBJECTIVES-

1	To inculcate knowledge regarding various biochemical techniques
2	To enhance the scientific writing skills including introduction, methodology, techniques, results, discussion, and bibliography.
3	To provide knowhow regarding project work/field study.

The students will be required to submit a Project Report based on Laboratory Training in some Pathological Lab / Hospital / Nursing Home etc. of one Month and Viva will be conducted by the internal examiner.

COURSE OUTCOMES-

CO-1	Institutional cum field work study report emphasizes theoretical aspect development.
CO-2	Students are able to develop good presentation technique through the use of multimedia and other teaching aids.
CO-3	Students develop skills for collection and analysis of data.
CO-4	Evaluation of the project report enhances viva voce capabilities through open defense type interactions.