

Punjab Technical University, Jalandhar
B.Sc (Medical Lab Technology)
Scheme of Syllabi

1st Semester

Course No.	Subject	L	T	P	Marks		Total
					Int	Ext	
BMT-101	Communication Skills-I	3	-	-	40	60	100
BMT-103	General Microbiology	4	-	-	40	60	100
BMT-105	Basic Haematology & Haematological Techniques-I	3	-	-	40	60	100
BMT-107	Human Anatomy & Physiology	4	-	-	40	60	100
BMT-109	Basics of Biochemistry	3	-	-	40	60	100
BMT-111	Communication Skills-I Lab	-	-	3	40	60	100
BMT-113	General Microbiology Lab	-	-	5	40	60	100
BMT-115	Basic Haematology & Haematological Techniques-I Lab	-	-	3	40	60	100
BMT-117	Human Anatomy & Physiology Lab	-	-	3	40	60	100
BMT-119	Basics of Biochemistry Lab	-	-	3	40	60	100
	Guest Lecture/ Tutorial/ Seminar	-	2	-			
Total					400	600	1000

2nd Semester

Course No.	Subject	L	T	P	Marks		Total
					Int	Ext	
BMT-102	Communication Skills-II	3	-	-	40	60	100
BMT-104	Systematic Bacteriology	4	-	-	40	60	100
BMT-106	Basic Haematology Techniques –II	3	-	-	40	60	100
BMT-108	Human Anatomy & Physiology –II	4	-	-	40	60	100
BMT-110	Metabolism in Biochemistry	3	-	-	40	60	100
BMT-112	Communication Skills-II Lab	-	-	3	40	60	100
BMT-114	Systematic Bacteriology Lab	-	-	5	40	60	100
BMT-116	Basic Haematology Techniques –II Lab	-	-	3	40	60	100
BMT-118	Human Anatomy & Physiology –II Lab	-	-	3	40	60	100
BMT-120	Metabolism in Biochemistry Lab	-	-	3	40	60	100
	Guest Lecture/ Tutorial/ Seminar	-	2	-			
Total					400	600	1000

BMT-203	Applied Microbiology	4	-	-	40	60	100
BMT-205	Applied Haematology-I	3	-	-	40	60	100
BMT-207	Basic Cellular Pathology	4	-	-	40	60	100
BMT-209	Analytical Biochemistry	3	-	-	40	60	100
BMT-211	Fundamentals of Computers-I Lab	-	-	3	40	60	100
BMT-213	Applied Microbiology Lab	-	-	5	40	60	100
BMT-215	Applied Haematology-I Lab	-	-	3	40	60	100
BMT-217	Basic Cellular pathology Lab	-	-	3	40	60	100
BMT-219	Analytical Biochemistry Lab	-	-	3	40	60	100
	Guest Lecture/ Tutorial/ Seminar	-	2	-			
Total					400	600	1000

4th Semester

Course No.	Subject	L	T	P	Marks		Total
					Int	Ext	
BMT-202	Fundamentals of Computers-II	2	-	-	40	60	100
BMT-204	Immunology & Mycology	4	-	-	40	60	100
BMT-206	Applied Haematology-II	3	-	-	40	60	100
BMT-208	Histotechnology-I	4	-	-	40	60	100
BMT-210	Clinical Biochemistry-I	4	-	-	40	60	100
BMT-212	Fundamentals of Computers-II Lab	-	-	3	40	60	100
BMT-214	Immunology & Mycology Lab	-	-	5	40	60	100
BMT-216	Applied Haematology-II Lab	-	-	3	40	60	100
BMT-218	Histotechnology-I Lab	-	-	3	40	60	100
BMT-220	Clinical Biochemistry-I Lab	-	-	3	40	60	100
	Guest Lecture/ Tutorial/ Seminar	-	2	-			
Total					400	600	1000

5th Semester

Course No.	Subject	L	T	P	Marks		Total
					Int	Ext	
CE-206	Environmental Sciences	3	-	-	40	60	100
BMT-301	Parasitology & Virology	4	-	-	40	60	100
BMT-303	Applied Haematology III and Blood Banking	3	-	-	40	60	100
BMT-305	Histotechnology-II & Cytology	4	-	-	40	60	100
BMT-307	Clinical Biochemistry-II	3	-	-	40	60	100
BMT-309	Environmental Sciences Lab	-	-	3	40	60	100
BMT-311	Parasitology & Virology Lab	-	-	5	40	60	100
BMT-313	Applied Haematology III and Blood Banking Lab	-	-	3	40	60	100
BMT-315	Histotechnology-II & Cytology Lab	-	-	3	40	60	100
BMT-317	Clinical Biochemistry-II Lab	-	-	3	40	60	100
	Guest Lecture/ Tutorial/ Seminar	-	2	-			
Total					400	600	1000

6th Semester

Course No.	Subject	L	T	P	Marks		Total
					Int.	Ext.	
	Professional Training	-	-	-	250	750*	1000

*Out of 750 marks, 250 will be awarded by the healthcare industry where the candidate has taken training, 250 for project/practical file (By external examiner), 250 for practical and viva (by external examiner)

BMT-101 COMMUNICATION SKILLS-I

Internal marks: 40

External Marks: 60

Total Marks: 100

Objectives: To develop communication skills of a graduate technician by emphasizing on writing, speaking & listening skills.

1. Précis and comprehension

2. Correspondence: Official, business, and personal *

3. Grammar: .A brief review of tenses, Narration (Indirect, Direct), Voice (Active, Passive), Punctuation

4. Essay The topic for essay may be taken from:

1. Science
2. Technology
3. General

Preferably on scientific topics from the given out lines**. The essay will be of 250 to 300 words

*** One letter from each category (Official, business and personal) may be set in the examination paper and the students be asked to write one of them.**

**** The paper setter may be instructed to give a choice of attempting one out of three topics. The question paper may provide the outlines. The examiner may select three topics one from each of their following**

BMT-103 GENERAL MICROBIOLOGY

Internal marks: 40

External Marks: 60

Total Marks: 100

Aims /learning Objectives: Students are able to classify, identify, use of instruments, sterilization, cultural requirements and to perform different microbiological tests in clinical microbiology lab.

1. Introduction to Medical Microbiology:

- Definition - History - Host-Microbe relationship.

2. Safety measures in clinical Microbiology

3. Glassware used in Clinical Microbiology Laboratory:

- Introduction - Care and handling of glassware - Cleaning of glassware

4. Equipments used in clinical Microbiology Laboratory:

- Introduction - Care and maintenance

5. Microscopy

- Introduction and history

- Types of microscopes

(a) Light microscope (b) DGI(c) Fluorescent (d) Phase contrast

(e) Electron microscope:

- Transmission
- Scanning

- Principles of operational mechanisms of various types of microscopes

6. Sterilization:

- Definition

- Types and principles of sterilization methods

(a) Heat (dry heat, moist heat with special

Reference to autoclave)

(b) Radiation (c) Filtration

- Efficiency testing to various sterilizers

7. Antiseptics and disinfectants:

- Definition.- Types and properties - Mode of action - Uses of various disinfectants

- Precautions while using the disinfectants - Qualities of a good disinfectant

- Testing efficiency of various disinfectants

8. Biomedical waste management in a Microbiology laboratory:

- Types of the waste generated – Segregation – Treatment - Disposal

9. General characteristics & classification of Microbes : (Bacteria & fungi)

- Classification of microbes with special reference to prokaryotes & eukaryotes

- Morphological classification of bacteria

- Bacterial anatomy (Bacterial cell structures)

10. Growth and Nutrition of Microbes :

- General nutritional & other requirements of the bacteria

- Nutritional types of the bacteria Autotrophs , heterotrophs, phototrophs, chemotrophs, saprotrophs, lithotrophs, & organotrophs, photoautotrophs, chemoheterotrophs, photoorganotrophic, heterotrophs , chemolithotrophic autotrophs mixotrophic.

- Physical conditions required for growth.

- Normal growth cycle of bacteria (growth curve)

-Types of microbial cultures: Synchronous, Static, continuous culture.

11. Culture media:

- Introduction
- Classification of culture media (Example & Uses) solid media, liquid media, semisolid, Media, simple media, complex media, synthetic/defined media, routine culture media, basal media, enriched , enrichment, Selective, Indicator/differential media, sugar fermentation media, transport media, preservation media, aerobic media, anaerobic media.
- Quality control in culture media

12. Aerobic & anaerobic culture methods:

- Concepts
- Methods Used for aerobic cultures
- Methods used for anaerobic cultures.

13. Care & handling of laboratory animals:

- Introduction
- General care & handling
- Ethics & legality in use of laboratory animals

BMT-105 BASIC HAEMATOLOGY & HAEMATOLOGICAL TECHNIQUES-I

Internal marks: 40

External Marks: 60

Total Marks: 100

Aims /learning Objectives: Students will be able to know the basic concepts of Haematology & routine clinical investigations of Haematology lab.

1. Introduction to Haematology

(a) Definition (b) Importance (c) Important equipment used.

2. Laboratory organization and maintenance

3. Introduction to blood, its composition, function and normal cellular components.

4. Basic formation of blood.

(a) Erythropoiesis (b) Leucopoiesis (c) Thrombopoiesis

5. Collection and preservation blood sample for various haematological estimation.

6. Haemoglobin.

(a) Definition and types (b) Normal values (c) Synthesis and breakdown

7. Haemoglobinometry

(a) Haemoglobin estimation techniques. (b) Principles & procedure for Hb estimation

(c) Errors involved and means to minimize errors for Hb estimation.

8. Total leucocytes count (TLC)

(a) Normal values (b) Method of estimation

(c) Clinical significance (d) source of errors.

9. Differential leucocytes count (DLC)

(a) Normal values (b) Clinical Significance.

(c) Sources of errors and means to minimize them

10. Erythrocyte Sedimentation rate (ESR)

(a) Normal values (b) Definition

(c) Principle and procedure to determine ESR

(d) Factors influencing ESR and clinical significance

(e) Errors included and their minimization

11. Packed cell volume/ Haematocrit value.

(a) Normal values (b) Estimation by macro and micro method

(c) Merits and demerits of estimation method (d) Factors influencing PCV

(e) Clinical Significance

12. Red cell Indices (RCI)

(a) Definition, procedure and general formula For calculating indices.

(b) Clinical significance (c) Normal value

(d) Numerical problems related to RCI

13. Absolute Eosinophil count

(a) Principle and procedure for counting AEC (b) Clinical significance.

(c) Normal value (d) Risk of error involved if any

14. Reticulocyte count

(a) Principle and procedure (b) Clinical Significance

(c) Normal value (d) Risk of error involved if any

15. Platelets Count.

(a) Normal value (b) Procedure and estimation

(c) Clinical significance (d) Errors and re-correction

16. Preparation of blood Films

(a) Types. (b) Methods of preparation

17. Routine Staining techniques in Haematology

(a) Giemsa stain

(b) Leishman stain

(c) Principle, composition, preparation of staining reagents and procedure.

BMT-107 HUMAN ANATOMY AND PHYSIOLOGY

Internal marks: 40

External Marks: 60

Total Marks: 100

Aims /learning Objectives: Students will be able to learn the terminology of the subject and basic knowledge of cells, tissues, blood and to understand anatomy and physiology of human body.

1. Introduction to human Anatomy and Physiology.

2. Cell and cell organelles.

- (a) Structure and classification (b) Function
- (c) Cell division (Mitosis and Meiosis)

3. Tissues

- (a) Definition (b) Classification with structure and Functions.
- (i) Epithelial tissues
- (ii) Connective tissues
- (iii) Muscular tissues
- (iv) Nervous tissue

4. Blood.

- (a) Composition and function of blood
- (b) Structure and function of blood cells.
- (i) Erythrocytes
- (ii) Leucocytes
- (iii) Thrombocytes
- (c) Blood clotting

5. Muscular skeletal system

- (a) Introduction (b) Classification
- (c) Structure and function of skeletal system, muscles and joints.
- (d) various movements of body.

6. Respiratory system

- (a) Introduction (b) Structure
- (c) Function (d) Mechanism of breathing and respiration
- (e) Various terms involved in respiratory System.
- (i) Vital capacity.
- (ii) Total Volume.
- (iii) Reserve volume.
- (iv) Total lung capacity.

7 Cardiovascular system.

- (a) Anatomy and physiology of heart
- (b) Blood circulation.
- (c) Arteries and veins.
- (d) Conductive system of heart.
- (e) Cardiac cycle.
- (f) Introduction to ECG.

8. Lymphatic system.

- (a) Introduction.
- (b) Structure and function of lymphatics.
- (i) Lymph nodes.
- (ii) Spleen.

9. Structure and function of sense organs.

- (a) Eye. (b) Ear.
- (c) Nose. (d) Tongue.

BMT-109 BASICS OF BIOCHEMISTRY

Internal marks: 40

External Marks: 60

Total Marks: 100

Aims /learning Objectives: The main objective of the subject is to impart the knowledge of apparatus, units, equipments, volumetric analysis in the laboratory of clinical Biochemistry.

1. Introduction to Medical lab Technology.

- (a) Role of Medical labTechnologist (b) Ethics and responsibility.
- (c) Safety measures (d) First aid.

2. Cleaning and care of general laboratory glass ware and equipments.

- (a) Steps involved in cleaning soda lime glass
- (b) Steps involved in cleaning borosil glass.
- (c) Preparation of chromic acid solution.
- (d) Storage.

3. Distilled water.

- (a)Method of preparation of distilled water
- (b) Type of water distillation plants
- (c)Storage of distilled water

4. Units of Measurement.

- (a) S.I unit and CGS units (b) Conversion
- (c) Strength, molecular weight, equivalent weight
- (d)Normality, Molarity, Molality (e) Numericals.

5. Calibration of volumetric apparatus

- (a) Flask (b) Pipettes
- (c) Burettes (d) Cylinders

6. Analytical balance

- (a) Principle (b) Working
- (c) Maintenance

7. Concept of pH

- (a) Definition (b) Henderson Hasselbatch equation
- (c) Pka value (d) pH indicator
- (e) Methods of measurement of pH
 - (i) pH paper
 - (ii) pH meter
 - (iii)Principle, working, maintenance and calibration of pH meter

8. Volumetric analysis

- (a) Normal and molar solutions
- (b) Standard solutions
- (c) Preparation of reagents
- (d)Storage of chemicals

9. Osmosis

- (a) Definition
- (b) Types of osmosis
- (c) Factors affecting osmotic pressure
- (d) Vant Hoff's equation
- (e)Applications of osmosis
- (f)Dialysis

BMT-111 COMMUNICATION SKILLS-I LAB

Internal marks: 60

External Marks: 40

Total Marks: 100

Aims /learning Objectives: To develop communication skills of a graduate technician by emphasizing on writing, speaking & listening skills.

- Locate a specified book in the library
- Find out some words in the dictionary
- Pronunciation, stress and intonation
- Give abbreviations of particular words and vice-versa
- Give meaning of some words
- Spell some words

Practice of handling some communication system like telephone and noting down and conveying message

BMT-113 GENERAL MICROBIOLOGY LAB

Internal marks: 60

External Marks: 40

Total Marks: 100

Aims /learning Objectives: Students are able to classify, identify, use of instruments, sterilization, cultural requirements and to perform different microbiological tests in clinical microbiology lab.

1. To demonstrate safe code of practice for a Microbiology laboratory
2. To prepare cleaning agents & to study the technique for cleaning & sterilization of glassware.
3. To study the working & handling of Compound microscope.
4. To study the method of sterilization by autoclave.
5. To study the method of sterilization by hot air oven.
6. To study the method of sterilization of media/solution by filtration.
7. Demonstration of antiseptics, spirit, cetrimide & Povidone-Iodine .
8. To demonstrate the use of disinfectants.
9. Demonstrate the precaution while using disinfectants.
10. To prepare working dilution of commonly used disinfectants.
11. In use test
12. Rideal walker phenol co-efficient test.
13. To demonstrate the different morphological types of bacteria.
14. Preparation of one culture media from each type.
15. To demonstrate aerobic culture
16. To demonstrate anaerobic culture.
17. Visit to animal house & demonstrate about care of laboratory animals.

BMT-115 BASIC HAEMATOLOGY & HAEMATOLOGICAL TECHNIQUES-I LAB

Internal marks: 60

External Marks: 40

Total Marks: 100

Aims /learning Objectives: Students will be able to know the basic concepts of Haematology & routine clinical investigations of Haematology lab.

1. Demonstration of Equipments used in clinical Haematology.

- (a) Microscope
- (b) Cell counter
- (c) Sahli's apparatus
- (d) Calorimeter

2. Hb Estimation

- (a) Sahli's method
- (b) Cyanmethaemoglobin method
- (c) Oxyhaemoglobin method

3. Total leukocyte count

4. Preparation of smear and staining with Giemsa and Leishman.

5. Differential leucocytes count

6. Platelets count

7. Reticulocyte count

8. Absolute count

9. Red cell indices (RCI)

10 ESR (Winrobe and weslergren method)

11. Packed cell volume (Macro & Micro)

BMT-117 HUMAN ANATOMY AND PHYSIOLOGY LAB

Internal marks: 60

External Marks: 40

Total Marks: 100

Aims /learning Objectives: Students will be able to learn the terminology of the subject and basic knowledge of cells, tissues, blood and to understand anatomy and physiology of human body.

1. Demonstration of human cell from slides/charts.

2. Demonstration of cell division i.e. mitosis and Meiosis from permanent mounted slides.

3. Demonstration of various tissues from permanent slides.

- (a) Epithelial tissue
- (b) Connective tissue.

4. Demonstration of normal blood cells from Slides.

5. Demonstration of individual bone.

6. Demonstration of respiratory system from chart.

7. Pear expiratory flow rate(PEFr)

8. Demonstration of cardiovascular system form chart.

9. Electro cardio gram (ECG)

10. Demonstration of eye, nose, ear and tongue from model and charts.

BMT-119 BASICS OF BIOCHEMISTRY LAB

Internal marks: 60

External Marks: 40

Total Marks: 100

Aims /learning Objectives: The main objective of the subject is to impart the knowledge of apparatus, units, equipments, volumetric analysis in the laboratory of clinical biochemistry

- I. Cleaning of the laboratory glass ware.
- II. Preparation of distilled water.
- III. Principle, working and maintenance of pH meter.
- IV. To prepare 0.1 N NaOH solution.
- V. To prepare 0.2N HCl solution.
- VI. To prepare 0.1 molar H₂SO₄
- VII. To prepare 0.2 Molar Sodium carbonate solution.
- VIII. Demonstration of osmosis and dialysis.