BACHELOR OF PARA MEDICAL TECHNOLOGY (BPMT)
Course Name: - Laboratory Sciences

By the end of the course, the student should be able to :

1. Describe basic anatomy related to different laboratory test relevant to procedure and findings/results.
2. Practice appropriate bio-safety measures in the laboratory.
3. Perform correct procedure for collection of various specimens.
4. Demonstrate ability to properly label specimens andprocedures related to of receiving specimens.
5. Store, transport, preserve and process the specimen properly.
6. Handle laboratory instruments.
7. Follow all steps of maintenance &standardisation.
8. Describe the standard operative procedure of instruments.
9. Perform different laboratory tests using proper precaution.
10. Interpret different laboratory reports with accuracy.
11. Enlist different technical errors, along with corrective steps.
12. Maintain internal & external quality control .
13. Discard biomedical waste as per set protocols.
14. Effectively communicate with the patient.
15. Medical Ethics relevant to the situation.
16. Applying Principles of Medical Ethics.

BACHELOR OF PARA MEDICAL TECHNOLOGY (BPMT)

Course Name: - Laboratory Sciences

1st Year: Assessment System & Syllabus

Sr. No	Paper	Subject	Subject Code	Theory			Practical			Total Marks
				IA	Final	Total	IA	Final	Total	
1	Paper – I	Basic Sciences		30	60	90	30	80	110	200
2	Paper – II	Biochemistry		30	60	90	30	80	110	200
3	Paper - III	Microbiology		30	60	90	30	80	110	200
4	Paper- IV	Pathology		30	60	90	30	80	110	200

*** Students will join the parent department (Department of Pathology) immediately after their admission. They will be posted in Biochemistry and Microbiology for 4 months each, by the parent department for the completion of respective syllabus in these subjects.**

Paper –I

Basic Sciences

Sr. No.	Topics	Theory	Practical/ Demo
1	Bones (Only nomenclature)	**1**	**1**
2	Joints (Only nomenclature)	**1**	**1**
3	Anatomy & Functions of respiratory System (Only Organ nomenclature and brief functions)	**2**	**2**
4	Anatomy & Functions of cardiovascular system (Only Organ nomenclature, important arteries and veins / sites for venepuncture and brief functions)	**2**	**2**
5	Anatomy & Functions of Abdominal Organs , GI system (Only nomenclature and brief functions)	**2**	**2**
6	Anatomy & Functions of Pelvic Organs (Only nomenclature and brief functions)	**2**	**2**
7	Anatomy & Functions of Nervous System (Only nomenclature and brief functions)	**2**	**2**
8	Anatomy & Functions of Endocrine glands (only nomenclature, site and brief functions)	**2**	**2**
9	Organization of Human body, cell	**2**	**2**
10	Composition and functions of blood	**2**	**2**
11	Introduction to medical lab technology Precautions and Safety	**1**	**1**
12	Role and responsibilities of Medical lab technologist	**1**	**-**
13	Biological specimens and their types with methods of collection	**2**	**2**
14	Preservation and disposal of biological specimens	**2**	**1**
15	Standard solutions	**1**	**1**
16	Some standard definitions in units of measurements	**1**	**-**
17	Modes of transmission of diseases	**1**	**-**
18	Control and prevention of infections	**1**	**-**

Practical – Basic Sciences

Sr. No.	Practical	Lecture - Demonstration
1	General measures in laboratory (Cleaning, safety, maintenance etc.)	1
2	Preparation of solutions	1
3	Balance –operations and maintenance	1
4	Demonstration of semi-automated , automated blood analyzers, blood gas analyzers etc	1
5	Demonstration of other lab equipment	1
6	Demonstration of disposal of laboratory waste products	1
7	Blood grouping	1
8	BT & CT	1
9	Cross matching	1
10	Pregnancy tests	1

As all the contents are of basic nature, the lecture are to be conducted by the parent department.

For practical, help from other departments such as anatomy and physiology, may be taken.

Paper –II
Biochemistry

Sr. No.	Topics	Hours
1	Introduction and scope of biochemistry Must know: Importance of biochemistry in laboratory medicine and prospects of course for job and commercial use.	2
2	Carbohydrates, proteins, lipids and nucleic acid. (only introduction, definition and classification) DNA and RNA: Structure and properties.	2
3	Elementary knowledge of enzymes. (only introduction and their role) and Iso enzyme	1
4	Introduction to Carbohydrate, protein and fat metabolism: (Only start and end products) Glycolysis, TCA cycle, urea cycle, Boadation of FA Regulation of blood Glucose Concentration, Glycosuria.	4
5	Importance of some minerals- sodium, potassium, calcium, phosphorous, iron, copper, chloride, fluoride.	2
6	Introduction to medical lab technology: General introduction Role of medical lab technologists, and responsibility, safety measures and first aid.	1
7	Cleaning and care of general laboratory glassware and equipment. Elementary knowledge of analytical biochemistry. Principles, functions and uses of balances, centrifuge machines, colorimeters.	2
8	Collection and recording of biological specimens, separation of serum plasma preservation and disposal of biological samples/materials	2
9	Standard solution: Various std. solutions used, their preparation; storage of chemicals	2
10	Units of measurements: S.I units: Definitions, conversions, Measurement of volume: Strength, Normality, Molarity, Molarity Definitions: Mole, molar and normal solutions(preparation, Standardization), pH(Definition, Example) ; Buffer solutions(Definition, preparation of important solutions) pH indicators(pH papers, universal & other indicators); pH measurement : different methods(pH paper, pH meter, structure, working and maintenance) Harmones – definition , classification	2
11	Quality Control: Its importance. Accuracy, Reliability, Precision Internal and external quality control measure, standardization of methods, safety measures and precautions.	1

12	Automation in clinical biochemistry: Principle, types and use of Autoanalysers, Blood gas analyzers, Role of computers in the laboratory	2
13	Universal precautions	1
14	Handling of semi auto and automatic batch and random access analyzers	1

Paper –II
Biochemistry Practical

Sr. No.	Practical and demonstration Topic	Hours
1	Introduction to biochemistry lab, various types of specimens received.	1
2	The reception and recording of specimen, cataloguing and indexing maintenance of laboratory records.	1
3	Maintenance of laboratory, quality control, and first aid	1
4	Cleaning glassware	1
5	Introduction and identification**demonstration and handling** of laboratory instruments.	1
7	**Centrifuge machine insulator flame photometer in handling of Laboratory instruments** (For example Single pan balance, pH-meter, Colorimeters, Distillation of water, Semi automated/ fully automated blood analyzers. Blood gas analyzer, Elisa reader, spectrometers etc)	**2**
8	Preparation of various solutions , standard and Buffers.	1
9	Demonstration of disposal of laboratory waste product and infected material.	1
10	**Urine Examination – Normal & Abnormal constituents of Urine**	**2**

All these lectures and practical are to be conducted by the department of Biochemistry in CCL, during the rotational posting of the students (4 months in Biochemistry)

Paper –III
Microbiology

Sr .No	Topic	Lectures	Demonstration & Practical
1	Introduction & Orientation of various sections of Microbiology Laboratory - Bacteriology, Serology, Virology , Mycology, Immunology, Parasitology	1	1
2	Roles and responsibilities of medical Laboratory Technologist	1	-
3	Laboratory management and planning . Introductions to Biological specimens and their types .Reception and recording of specimens , cataloguing and indexing ,maintenance of laboratory records,	2	2
4	Bio-safety and PPE while working in Laboratory	1	2
5	Specimen collection, handling and transport Sample rejection criteria	1	2
6	Biomedical Waste Disposal and PPE	1	2
7	Hands on training and Maintenance of following Equipments A. Incubator B. Refrigerator C. Water Bath D. Centrifuge	1	2
8	Care and use of microscope A. Compound Microscope B. Dark ground C. Phase contrast D. Fluorescent Microscope	1	2

9	Sterilization Methods –Principles, Care and Uses A. AutoclaveB.InspissatorC.Hot Air Oven D. Filtration E. Sterilization by ultraviolet light	1	2
10	Common staining Techniques used in Microbiology Laboratory A) Simple staining B) Differential staining: Gram staining & Z-N staining C) Negative staining: India Ink D) Special Staining : Albert, Neisser, Modified Z-N	1	2
11	Culture Media Introduction, Types and Uses , Composition and Preparation, Sterilization of Media, Washing of Media and Glassware	1	2
12	Technique oriented processing of specimens such as pus, urine, stool, sputum, throat swab and Body fluids in Bacteriology Laboratory Inoculation of specimens on culture Media, Plating Techniques, Preparation and Inoculation of Sugar sets and Other Biochemical test, Antibiotic sensitivity testing	2	4
13	Pathogenic Gram Positive Cocci,Pathogenic Gram Negative Cocci (Morphology, Cultural characteristics and infection caused by these organisms	1	2
14	Pathogenic Gram Positive bacilli (Morphology, Cultural characteristics and infection caused by these organisms)	1	2
15	Pathogenic Gram Negative bacilli (Morphology, Cultural characteristics and infection caused by these organisms)	1	2
	TOTAL	17	29

Paper –IV
Pathology

Sr. No.	Topics	Lectures	Practical
1	Introduction and scope of Pathology	1	-
2	Introduction to Pathology lab, various types of specimens received	1	1
3	Laboratory Management and Planning. The reception and recording of specimen, cataloguing and indexing maintenance of laboratory records .	1	1
4	Working and maintenance of instruments	2	2
5	General principles of Haematology techniques collection, fixation, processing & routine staining, Haemoglobin, TLC, DLC, Peripheral smear, automatic cell counter	3	3
6	General principles of Clinical Pathology techniques sample collection, processing for routine test, normal urine & urine examination	3	3
7	General principles of Cytopathology techniques collection, fixation, processing & routine staining	2	2
8	General principles of Histopathology techniques collection, fixation, processing & routine staining	3	3
9	General principles of Blood Bank techniques antigen, antibody, ABO & Rh system	2	2
10	General principles of Autopsy & Museum	2	1
11	General Pathology including introduction to inflammation,	2	1

	circulatory disturbances &neoplasia		
12	Morphology of common disorders like anemia, leukemia, AIDS, TB, Hepatitis & malaria.	2	1
13	Maintenance and medico legal importance of records and specimens.	1	1

BACHELOR OF PARA MEDICAL TECHNOLOGY (BPMT)

Course Name: - Laboratory Sciences

2nd Year Assessment System & Syllabus

Sr. No	Paper	Subject	Subject Code	Theory			Practical			Total Marks
				IA	Final	Total	IA	Final	Total	
1	Paper – I	Biochemistry		30	60	90	30	80	110	200
2	Paper – II	Microbiology		30	60	90	30	80	110	200
3	Paper - III	Pathology		30	60	90	30	80	110	200

Paper –I
Subject: - Biochemistry

Sr. No.	Topics	Hours/Lecture /Lect- demo
1	Dry chemistry analyzer, blood gas analyzer	2
2	Acid base balance : Definition and importance of blood pH and its maintenance, Acidosis and alkalosis	1
3	Serum electrophoresis, Chromatography	1
	Blood analysis for: -	
1	(a) Sugar	2
	(b) Cholesterol (Fluid Profile)	2
	(c) Urea &Creatinine	2
	(d) Bilirubin	2
	(e) Total proteins and AG ratio	2
	(f) Sodium & (g) Potassium	2
	(h) Calcium & (i) Chlorides	2
2	Normal Composition of CSF Examination of cerebro- spinal fluid forProteins,Sugar&Chlorides	**2**
3	Findings in CSF in Common diseases	1

Paper – II
Subject: - Microbiology

Sr. No.	Topics	Lectures	Practical
1	General principles of the methods employed in identifying an unknown isolate	1	2
2	Identification of Pathogenic Gram Positive cocci by conventional techniques	1	2
3	Identification of Pathogenic Gram Negative cocci by conventional techniques	1	2
4	Identification of Pathogenic Gram Positive Bacilli by conventional techniques	1	2
5	Identification of Pathogenic Gram negative Bacilli by conventional techniques	1	2

6	Antibiotic sensitivity testing technique by Disc Diffusion Technique	1	2
7	Dermatophytes and Fungal contaminates	1	-
8	Common Yeast	1	-
9	Media Preparation :SDA, Corn Meal Agar, Potato Dextrose Agar, Assimilation Suga	1	2
10	Processing of Samples received to laboratory : Hair, Skin Scraping, Nail, Blood, Body fluids	1	2
11	Identification of Fungi causing superficial fungal infections by conventional methods	1	2
12	Identification of Candida species and Croptococcus by conventional methods	1	2
13	Role of Serology in Diagnosis of Infectious Diseases	1	-
14	Immunology-Antigen, Antibody, Antigen-Antibody Reaction	1	-
15	Serum separation techniques	1	2
16	Common serological tests – RA,ASO,CRP,VDRL ,RPR,Latex agglutination , and other rapid tests	1	2
17	Widal	1	2
18	Conventional ELISA- Principle ,and technical aspects	1	2
19	Study of SOP related to Bacteriology ,Serology and Mycology	1	2
	TOTAL	19	30

Paper III
Subject – Pathology

Sr. No.	Topics	Session		
		L	**L/D**	**P**
HAEMATOLOGY INCLUDING BLOOD TRANSFUSION				
1	Introduction to clinical hematology	1	-	
2	Composition of peripheral blood	1	1	1
3	Erythropoiesis	1	1	
4	Leucopoiesis and thrombopoiesis	1	1	
5	Composition of Bone marrow	1	1	1
6	Normal hematological values and physiological Variations	1	-	
7	Collection of blood for hematological investigations		1	
8	Preparation of stains and buffers in hematology	1	1	1
9	Preparation of common anticoagulant bottles		1	
10	Preparation of peripheral blood and bone marrow Smears	1	1	
11	Examination of peripheral blood smear	1	1	1
12	Romanowsky stains		1	
13	Special stains in hematology	1	1	
14	Total RBC counts	1	1	1
15	Total and differential WBC Count	1	1	1
16	Estimation of Hemoglobin	1	1	1
17	Platelet count	1	1	1
18	Normal Haemostasis	1	-	
19	Total	15	3	8
CLINICALPATHOLOGY				
1	Normal composition ofbody fluids(semen,sputum, exudates,transudates)	1	1	1
2	Examination ofsemen	1	1	1
3	Examination ofserous effusions	1	1	1

4	Examination ofCSF	1	1	1
5	Urine Examination Pregnancy tests	1	1	2

BACHELOR OF PARA MEDICAL TECHNOLOGY (BPMT)

Course Name: - Laboratory Sciences

3rd Year Assessment System & Syllabus

Sr. No	Paper	Subject	Subject Code	Theory			Practical			Total Marks
				IA	Final	Total	IA	Final	Total	
1	Paper – I	Biochemistry		30	60	90	30	80	110	200
2	Paper – II	Microbiology		30	60	90	30	80	110	200
3	Paper - III	Pathology		30	60	90	30	80	110	200

Paper III
Subject –Biochemistry

Sr. No.	Topics	Session		
		L	L/D	P
1	Blood Sugar Glucose tolerance test, GlycalilatedHb	1	-	1
2	Liver function tests	1	-	3
3	Kidney function tests	1	-	-
4	Estimation of enzymes - acid phosphatase, Amylase,Lihare CPK LDH CPK, LDH		1	-
5	Blood Glucose, Glycosylated Hemoglobin	1	-	1
6	Hormones and their physiological role	1	1	-
7	Estimation of common hormones (T3, T4, TSH, LH, FSH)	1	-	-
8	Tests in coronary artery disease (CkHb, LDH, Liquid Profile)	1	-	-

Paper III
Subject –Microbiology

Sr. No.	Topics	Lectures	Demonstration /Practical
1	Identification of Pathogenic Gram Positive cocci and Negative cocci by conventional techniques	1	2
2	Identification of Pathogenic Gram Positive Bacilli and gram negative bacilli by conventional techniques	1	2
3	Introduction to Parasitology	1	
4	Protozoa	1	
5	Helminthes	1	
6	Simple diagnostic Techniques of parasitic infestation	1	2
7	Processing of Stool Samples in parasitology Laboratory a) Saline & Iodine Mount b)Concentration Methods	1	2
8	Virology: Techniques involved in diagnosis	1	2
9	Enumerate pathogenic viruses	1	
10	Laboratory Diagnosis of HIV and HBsAg and HCV	1	
11	Laboratory Diagnosis of HBsAg and HCV	1	2
12	Virology : Rapid diagnostic tests for HIV	1	2
13	Study of SOP related to Serology and Virology	1	2
14	Quality Control and Laboratory Accreditation in Microbiology	1	2

	Laboratory		
	Total	14	18

Paper – III

Subject: - Pathology

Sr. No.	Topics	Session		
		L	L/D	P
	(A) HAEMATOLOGY			
1	Determination of ESR Packed cell volume	1	-	1
2	Estimation of Absolute values	1	-	1
3	Peroxidase staining and cytochemistry, NAP scoring	1	1	1
4	Investigations of hemolytic anaemias	1	1	1
5	Investigations of thalassemias and Haemoglobinopathies	1	1	2
6	Hb and serum electrophoresis and HPLC	1	1	1
7	Determination of bleeding time, coagulation time	1	-	1
8	Estimation of prothrombin time	1	1	-
9	Reticulocyte count		1	1
10	Special hematology (Sickling test, LE Cell, Osmotic fragility, G-6-p dehydrogenase deficiency, Cytochemistry)	2	2	3
11	Haemostasis and coagulation	1	1	-
12	Investigations of hemorrhagic disorders	1	1	-
13	Automation in Haematology	1	-	-
14	Introduction to flow cytometry	1	1	-
	(B) Clinical Pathology			
1	Urine Microscope examination	-	1	1
2	Sputum (Cytology, Micro, AFB)	1	-	1
3	Gastric analysis	-	1	-
4	Demonstration of Barr bodies	-	1	-
5	Exam of faeces for occult blood, fats and Stercobilinogen	1	-	1
	(C) Blood Banking			
1	FDA regulation and keeping records as per FDA	1	-	-
2	Principles of ABO/Rh grouping and factors affecting Results	1	1	1
3	Donor selection for transfusion & donor reactions	1	-	-
4	Cross matching	1	1	1
5	Blood bank administration	1	-	-
6	Anticoagulation in blood bank	1	-	-
7	Antiglobulin test-direct and indirect	1	-	1
8	Autologous transfusion	1	-	-
9	Transfusion transmitted infection & reactions	1	-	-
10	Investigation of transfusion reaction	1	-	-
11	Introduction to Blood components	1	1	-
12	Preparation of RDP & SDP	1	-	2
13	Storage and issue of blood components	1	-	-
14	Equipment maintenance	-	1	-
15	Quality control in blood transfusion practice	1	-	1
	(D) Immunology And Serology			
1	Autoimmune diseases and their lab diagnosis	1	-	-
2	Tumour markers, immunoglobin estimation	1	-	-
3	Immuno-fluorescence	-	1	-
4	Markers of Hepatitis B Infections	1	-	-
5	HIV and AIDS	1	-	-
	(E) HISTOPATHOLOGY			
1	Introduction to histology and histopathology, techniques in histopathology	1		
2	Registration, labeling	1		
3	Basic principles of grossing in histopathology	1		

4	Fixatives Various types and their importance	1	1	
5	Freeze drying technique, decalcification	1		
6	Tissue histology processing include Micro wave	1	1	
7	Microtomy& Frozen Section	1		1
11	Introduction to autopsy techniques, Dispatch of autopsy specimen for Histopathological Examination	1	-	1
13	FNAC, including method cytology Processing (Millipore, Cytospin), Cell Block Preparation Touch/ Imprint/Scrape cytology	2	1	2
14	Papanicoulaou staining	1	-	1
15	Immunohistochemistry (Ag retrieval &pitfaals also)	1	3	1
16	Elementary cytogenetics	1	-	-
17	Museum specimen preservation		1	
19	Universal Biosafety precautions	1	1	
20	Preparation of alcohols / buffers	1	-	-
21	Quality control in Laboratory	2	-	-
24	Biomedical Waste Disposal	1	1	-

All theory and practical are conducted in practical hall and in rotational postings

BACHELOR OF PARA MEDICAL TECHNOLOGY (BPMT)

Course Name: - Laboratory Sciences

List of Suggested Books for reading

Sr. No.	Subject / Topic	Author/ Editor	Title of Book	Publisher
1.	Lab Technician			
	Biochemistry 1.	Md. Rafi	Manual of Practical Biochemistry	Universities Press
	2.	Satyanarayan	Biochemistry	Elsevier
	3.	S.K. Gupta	Manual of Practical Biochemistry	Arya Publishing
2.	Pathology	Harshmohan	Text book of Pathology	Jaypee
3.	Hematology	Kawathalkar	Text book of Hematology	Jaypee
		Tejinder Singh	Textbook Of Haematology	
4.	Pathology	Kawathalkar	Text book of Clinical Pathology	
5.	Microbiology	Ananthanarayan and Paniker	Text of microbiology	Universities Press
6.	Parasitology	K.D. Chatterjee	Text book of parasitology	CBS
7.	Technical	KapalePande	Manual of microbiology	