

ERA UNIVERSITY
FACULTY OF ALLIED HEALTH SCIENCES & RESEARCH
BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNIQUES (B.SC MLT)
FRAMEWORK Fifth Semester
FOR THE ACADEMIC YEAR 2023 to 2024
Till the next change in the curriculum

Subject Code	Course Titles	Hours per week			Marks			CR
		L	Theory	Practical	Internal	External	Total	
BLT 501	Applied Clinical Biochemistry – I	3	1	-	30	70	100	4
BLT 502	Applied Histopathology – II	3	1	-	30	70	100	4
BLT 503	Immunology & Bacterial serology	3	1	-	30	70	100	4
BLT 504	Applied Haematology- II	3	1	-	30	70	100	4
BLP 501	Applied Clinical Biochemistry- I- (P)	-	-	4	30	70	100	2
BLP 502	Applied Histopathology-II - (P)	-	-	4	30	70	100	2
BLP 503	Immunology & Bacterial serology- (P)	-	-	4	30	70	100	2
BLP 504	Applied Haematology - II - (P)	-	-	4	30	70	100	2
	Guest Lecture/Tutorial/Seminar/visit to any medical research institution or reputed clinical laboratory	-	2	-	-	-	-	2
Total		12	6	16	240	560	800	26
Total Hours in Semester		550						

NOTE:

1. Abbreviations: L - Lecture, T - Tutorials and P - Practical
Considering four months per semester as working months, total contact hours per semester shall be 550 (Five hundred and Fifty)

Department of Medical laboratory technique

Course Outline Effective From: 2023-24

Name of the Program	Bachelors of Science in Medical Laboratory techniques			Year/ Semester:	3 rd year /5 th sem
Course Name	Applied Clinical Biochemistry-I	Course Code:	BLT 501	Type:	THEORY
Credits	L:3 T:1P:0			Total Sessions Hours:	50
Evaluation Spread	Internal Continuous Assessment:	30		End Term Exam:	70
Type of Course	☐ Compulsory	☒ Core	☐ Creative		☐ Life Skill
Course Objectives	The students will be taught about Hazards & safety measures in a clinical biochemistry lab, Quality control and quality assurance, Principles of assay procedures and Estimation of various Investigations in Biochemistry Lab.				
Course Outcomes (CO): After the successful course completion, learners will develop following attributes:					
Course Outcome (CO)	Course Outcomes (CO): They will be able to Diagnosis of clinical disorders by estimating biomarker, Determine various substances including substrates, enzymes, hormones, etc and their use in diagnosis and monitoring of disease are applied, evaluate the abnormalities which commonly occur in the clinical field, review the information from each category of tests and develop a protocol for disease diagnosis				
CO1	The student will be able to learn about the Hazard & safety measures in a clinical biochemistry lab, Quality control, and quality assurance, Laboratory organization				
CO2	The student will be able to learn about the principles of assay procedures Urea uric acid, SGOT, SGPT, Bilirubin				
CO3	The student will be able to learn about the estimation and assessment of Sodium and Potassium, calcium, chloride, iodine, and phosphorus				
CO4	The student will be able to learn about the techniques used in used in clinical biochemistry lab- RIA/ELISA, Radioactivity				
CO5	The student will be able to learn about the buffer system, metabolic acidosis and alkalosis				
Pedagogy	White board, Seminar, PPT, Classroom teaching, e-Lecture, assignment				
Internal Evaluation Mode	Continuous internal assessment and written examination				
Session Details	Topic			Hours	Mapped CO
Unit 1	1.. Hazards & safety measures in clinical Biochemistry laboratory 2.Quality control and quality assurance in a clinical biochemistry laboratory 3.Laboratory organization 4.Management and maintenance of records			10	CO1
Unit 2	1.Principles of assay procedures, Normal range in blood, Serum, Plasma and Urine and reference values for: Glucose, Proteins 2.Urea, Uric acid 3.Bilirubin, SGOT & SGPT, ALP 4.Lipids			10	CO2

Unit 3	1.Principles, procedures for estimation & assessment of the following including errors involved and their corrections: Sodium, Potassium 2.Chloride, Iodine 3.Calcium 4.Phosphorous and Phosphates	10	CO3
Unit 4	1.Instruments for detection of Radioactivity 2.Applications of Radioisotopes in clinical biochemistry. 3.Enzyme linked immune sorbent assay (ELISA) 4.RIA	10	CO4
Unit 5	1.Acids base balance, action of buffer system 2.Hb buffers 3.Respiratory and metabolic acidosis, respiratory and metabolic alkalosis, 4.Arterial blood gas analysis, blood gas analyzer.	10	CO5

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6
CO1	3	3	3	3	2	3	-	3	-	3	-	3	2	3
CO2	3	3	3	3	2	3	-	-	-	3	-	3	2	3
CO3	3	3	3	3	2	3	-	-	-	3	-	3	2	3
CO4	3	3	3	3	3	3	-	-	-	3	-	3	2	3
CO5	3	3	3	3	2	3	-	-	-	3	-	3	2	3

Strong contribution-3, Average contribution-2, Low contribution--1,

Suggested Readings:-

Text- Books/ Reference Books	1. Text book of Medical Laboratory Technology by P.B. Godkar. 2. Medical Laboratory Science, Theory & Practical by A. Kolhatkar. 3. Practical Clinical Biochemistry by Harold Varley. 4. Biochemistry, U. Satyanarayan & U. Chakrapani. 5. Text book of Medical Biochemistry by Chatterjee & Shinde. 6. Biochemistry by Voet & Voet 7. Biochemistry by Strye 8. Principles of Biochemistry by Lehninger
Para Text	Unit 1: Quality control and Management Unit 2: Biochemical Assay Unit 3: Assay Procedures Unit 4: Techniques in Clinical Biochemistry Unit 5: Buffer system

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Mid Semester	12	MCQ: 4 Short Answer Type Questions: 02 Long Answer Type Question: 01
Interaction In Class	6	
Class Test	4	MCQ: 02 Short Answer Type Questions: 01 Long Answer Type Question: 01
Assignment/ Presentation	4	Hard copy/Softcopy
Attendance	4	
Total Marks	30	

Department of Medical laboratory technique

Course Outline Effective From: 2023-24

Name of the Program	Bachelors of Science in Medical Laboratory techniques			Year/ Semester:	3 rd year/V semester
Course Name	Applied Histopathology -II	Course Code:	BLT 502	Type:	Theory
Credits	L:3 T:1 P:0			Total Sessions Hours:	50
Evaluation Spread	Internal Continuous Assessment:	30		End Term Exam:	
Type of Course	☐ Compulsory	☒ Core	☐ Creative	☐ Life Skill	
Course Objectives	Students will learn about various staining procedures for demonstration of different substances. The students will learn about special staining procedures, its handling & testing of various histological specimens in addition to cryostat sectioning and electron microscopic procedures.				
Course Outcomes (CO): After the successful course completion, learners will develop following attributes:					
Course Outcome (CO)	Justify when to use cryopreservation to preserve tissue and how a cryostat functions; apply the correct stains to enhance particular cellular and tissue structures for examination; explain the underlying principles of microtomy and be able to apply them; and determine the features of common diseases under the microscope using the systems described above.				
CO1	Students will be able to learn about various staining procedures and its application in diagnostic histopathology				
CO2	Students will be able to learn about Staining types and procedures applied for Lipids, Pigments, Amyloids, and Miscellaneous,				
CO3	Students will be able to learn about microorganisms' identification stains, demonstration of macromolecules, tissue processing in histopathology				
CO4	Students will be able to learn about Immunohistochemistry, immunocytochemistry and enzyme histochemistry.				
CO5	Students will be able to learn about Techniques used in Clinical Histopathology Laboratory				
Pedagogy	White board, PPT, Seminar, e-lecture, Classroom teaching, Assignment				
Internal Evaluation Mode	Continuous internal assessment and written exam				
Session Details	Topic			Hours	Mapped CO
Unit 1	1. Cryostat sectioning, and its applications in diagnostic histopathology. 2. Connective tissue stains and staining methods, properties, PTAH, Reticulin, verhoff 3. Masson trichrome,VenGiesson, Heidemhain's Aniline Blue Method 4. Mucin: Types, various stains and staining methods PAS, alcian blue, Mucicarmine.			10	CO1
Unit 2	1. Lipids: Types, identification with various stains and staining method {Sudan ,oil red O}. 2. Pigments: Various pigments, identification with various stains methods and staining (hemosiderin melanin}. 3. Miscellaneous (calcium)Vonkossa's Stains 4. Amyloid :-Toluidineblue, Metachromatic Stains.			10	CO2

Unit 3	1. Identification of microorganisms using various stains. Modified Giemsa Stains, Silver Nitrate GMS. 2. Demonstration of Proteins & nucleic acids. 3. Tissue requiring special treatment i.e. eye ball, bone marrow, and muscle biopsy 4. Under calcified or unclarified bones, whole brain, and whole lungs including other large organs.	10	CO3
Unit 4	1. Immuno histochemical and immuno cytochemical staining, quality control. 2. Enzyme histochemistry: Introduction, Diagnostic applications 3. Demonstration of Phosphatases, Dehydrogenases, 4. Demonstration of Oxidizes & Peroxidases	10	CO4
Unit 5	1. Neuro-pathological techniques. 2. Museum techniques. 3. Electron Microscope: working principle and its components 4. Processing, embedding and ultra-microtomy	10	CO5

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO3	PSO 4	PSO 5	PSO 6
CO1	3	3	2	3	1	3	-	-	2	3	-	3	3	3
CO2	3	3	2	3	1	3	-	-	2	3	-	3	3	3
CO3	3	3	2	3	2	3	-	-	2	3	-	3	3	3
CO4	3	3	2	3	2	3	-	-	2	3	-	3	3	3
CO5	3	3	2	3	3	3	-	-	1	3	-	3	3	3

Strong contribution-3, Average contribution-2, Low contribution-1,

Suggested Readings:

Text- Books/ Reference Books	1. Handbook of Histopathological Techniques by C FA Culling 2. Medical Lab technology by Lynch 3. An Introduction to Medical Lab Technology by F J Baker and Silverton 4. Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft
Para Text	Unit 1: Cryostat staining and preservation Unit 2: Biomolecules staining methods Unit 3: Staining of Histological specimens Unit4: Immunotechniques in Histopathology Unit5: Tools and Techniques in Histopathology

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Mid Semester	12	MCQ: 4 Short Answer Type Questions: 02 Long Answer Type Question: 01
Class Test	4	MCQ: 02 Short Answer Type Questions: 01 Long Answer Type Question: 01
Interaction In Class	6	
Assignment/ Presentation	4	Hard copy/Softcopy
Attendance	4	
Total Marks	30	
Mid Semester	12	MCQ: 4 Short Answer Type Questions: 02 Long Answer Type Question: 01

Course Outline Effective From: 2023-24

Name of the Program	Bachelors of Science in Medical Laboratory techniques			Year/ Semester:	3 rd year/V Semester
Course Name	Immunology & Bacterial Serology	Course Code:	BLT 503	Type: Fifth Semester	THEORY
Credits	L: 3 T:1 P:0			Total Sessions Hours:	52
Evaluation Spread	Internal Continuous Assessment:	30		End Term Exam:	70
Type of Course	☐ Compulsory	☒ Core	☐ Creative		☐ Life Skill
Course Objectives	This section will cover the basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utility in laboratory diagnosis of human diseases. It will also cover medically important fungi, infections caused by them and their laboratory diagnosis.				
Course Outcomes (CO): After the successful course completion, learners will develop following attributes:					
Course Outcome (CO)	The ability to understand, implement and troubleshoot the concepts related to the fields of Immunology and Serology which will enable them to analyze and develop solutions to microbiology, immunology and Serology related problems using knowledge and hands-on skills in immunodiagnostics, screening for useful Serological Investigation in relevant protocols.				
CO1	The students will learn about Immunity, its types and its mechanism				
CO2	The students will learn about, Antigen, Antibody and antigen-antibody reactions				
CO3	The students will learn about techniques used in medical microbiology-IFA, ELISA, SDS-PAGE, Weste blotting				
CO4	The students will learn about serological test-Widal, VDRL,ASO, and Complement system				
CO5	The students will learn about Immune responses, Hypersensitivity,vaccine and automation in diagnostic serology				
Pedagogy	White board, seminar, assignment, PPT				
Internal Evaluation Mode	Continuous internal assessment and written examination				
Session Details	Topic			Hours	Mapped CO
Unit 1	1. Immunity 2. Innate 3. Acquired immunity 4. Basic concepts about their mechanisms			10	CO1
Unit 2	1. Definition, types of antigens and determinants of antigenicity 2. Definition, types, structure and properties of immunoglobulin 3. Antigen-Antibody reactions: Definition, Classification, General features and mechanisms 4. Applications of various antigen antibody reactions			10	CO2
Unit 3	1. Principle, procedure and applications of under mentioned in Medical Microbiology: Complement fixation test 2. Immuno- fluorescence, ELISA 3. SDS-PAGE 4. Western blotting			10	CO3
Unit 4	1. Principle, procedure and interpretation of various serological tests: Widal, VDRL, ASO 2. CRP, Brucella tube agglutination, Rose-Waaler 3. Complement system: Definition, Basic concepts about its components 4. Complement activation pathways			10	CO4

Unit 5	1. Immune response: Introduction, Basic concepts of Humeral and Cellular immune responses 2. Hypersensitivity: Definition, Types of hypersensitivity reactions 3. Basic concepts of autoimmunity and brief knowledge about autoimmune diseases Automation in diagnostic serology 4. Vaccines: Definition, Types, Vaccination schedule 5. Brief knowledge about Extended programme of immunization' (EPI) in India	10	CO5
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CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO3	PSO 4	PSO 5	PSO 6
CO1	1	3	2	2	1	2	-	-	1	2	-	3	1	3
CO2	1	3	2	2	1	2	-	-	1	3	-	3	1	3
CO3	3	3	2	3	3	3	-	-	1	3	-	3	3	3
CO4	3	3	2	3	3	3	-	-	1	3	-	3	3	3
CO5	3	3	2	3	3	3	-	-	1	3	-	3	3	3

Strong contribution-3, Average contribution-2, Low co-ntribution-1,

Suggested Readings

Text- Books/ ReferenceBooks	1. Practical Medical Microbiology by Mackie & McCartney Volume 1 and 2 2. Text book of Microbiology by Ananthanarayanan 3. Medical laboratory Technology Vol. I ,II, III by Mukherjee 4. Medical Laboratory manual for tropical countries Vol II Microbiology by Monica Cheesbrough Immunology by Riot 5. Basic & Clinical Immunology by P. Daniel Fudenberg. H. Hugh and Stites 6. Medical Microbiology by Paniker& Satish Gupte 7. Microbiology For Medical Sciences by Bhagat Singh and Renu Singh
Para Text	Unit 1: History and introduction to immunology: Unit 2: Antigen & Antibody Unit 3: Techniques Used in Medical Microbiology: Unit4: Serological Test & Complement System: Unit 5: Immune Response, Hypersensitivity & Vaccines:

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Mid Semester	12	MCQ: 4 Short Answer Type Questions: 02 Long Answer Type Question: 01
Interaction In Class	6	
Class Test	4	MCQ: 02 Short Answer Type Questions: 01 Long Answer Type Question: 01
Assignment/ Presentation	4	Hard copy/Softcopy
Attendance	4	
Total Marks	30	



Department of Medical laboratory technique
Course Outline Effective From: 2023-24

Name of the Program	Bachelors of Science in Medical Laboratory techniques			Year/ Semester:	3rd year/5th sem
Course Name	Applied Haematology- II	Course Code:	BLT-504	Type:	Theory
Credits	L: 3 T:1 P:0			Total Sessions Hours:	50

Evaluation Spread	Internal Continuous Assessment:	30	End Term Exam:	70	
Type of Course	☐ Compulsory	☒ Core	☐ Creative	☐ Life Skill	
Course Objectives	The students will be made aware of the safety precautions in Haematology, basic concepts of Automation, quantitative assay of coagulation factors, Karyo typing etc. and will learn about concepts such as safety precautions, quality assurance, biomedical waste management and automation in haematology. It will also cover bone marrow examination, red cell anomalies, disorder of leucocytes, LE. cell phenomenon.				
Course Outcomes (CO): After the successful course completion, learners will develop following attributes:					
Course Outcome (CO)	They will be able to perform efficiently routine investigations in clinical hematology laboratory. Students will also be able to carry out different immune-haematological investigations and coagulation profile tests. They will be able to handle automated instruments.				
CO1	The students will be able to learn the automation in Haematology				
CO2	The students will be able to learn the Bone marrow examination, processing and staining of biopsy specimens				
CO3	The students will be able to learn the red cell anomalies MCV, MCH, MCHC and RDW				
CO4	The students will be able to learn the L.E cell phenomenon and factors deficiency				
CO5	The students will be able to learn cytochemical staining used in Haematology-PAS, SBB,NAP and MPO				
Pedagogy	White board, PPT, Classroom Teaching, Seminar, e.t.c				
Internal Evaluation Mode	Continuous internal assessment and written examination				
Session Details	Topic			Hours	Mapped CO
Unit 1	Safety precautions in Haematology Principle of automated blood cell counter; Uses, care, maintenance and calibration of automated blood cell counter Automatic ESR analyzer, urine analyzer Coagulometer			10	CO1
Unit 2	1. Composition and functions, Aspiration of bone marrow (Adults and children) 2. Processing of aspirated bone marrow (Preparation & staining of smear) 3. Brief knowledge about examination of aspirated bone marrow (differential cell counts and cellular ratios) 4. Processing and staining of trephine biopsy specimens			10	CO2
Unit 3	1. Red cell anomalies 2. Morphological changes such as variation in size shape & staining character. 3. MCV, MCH, MCHC & RDW 4. Reticulocytes: Definition, different methods to count, Absolute reticulocyte count			10	CO3
Unit 4	1. Lupus Erythematosus (LE) cell phenomenon: Definition of LE. cell. 2. Demonstration of LE. cell by various methods& Clinical significance. 3. Quantitative assay of coagulation factors : Principle, Procedure 4. Screening of inhibitors			10	CO4

UNIT 5	1. Karyotyping: Chromosomal studies in hematological disorders (PBLC and Bone marrow) 2. Cyto-chemical staining: Principles, method and significance 3. PAS, SBB, NAP& MPO 4. Biomedical waste management in Haematology laboratory (Other than Radioactive material)	10	CO5
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CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO3	PSO 4	PSO 5	PSO 6
CO1	3	3	2	3	3	3	-	-	2	3	-	3	3	3
CO2	3	3	2	2	3	3	-	-	2	3	-	3	3	3
CO3	3	3	2	3	3	3	-	-	2	3	-	3	3	3
CO4	3	3	2	3	3	3	-	-	2	3	-	3	3	3
CO5	3	3	2	3	3	3	-	-	2	3	-	3	3	3

Strong contribution-3, Average contribution-2, Low contribution-1,

Suggested Readings:

Text- Books/ Reference Books	1. Text book of Medical Laboratory Technology by Paraful B. Godkar 2. Medical laboratory Technology by KL Mukherjee Volume-I 3. Practical Haematology by JB Dacie 4. Clinical Diagnosis & Management by Laboratory methods (20th edition) by John Bernard Henary 5. Atlas of Haematology (5th edition) by G.A. McDonald 6. De Gruchy's clinical Haematology in medical practice
Para Text	Unit 1: Automation in Haematology: Unit 2: Bone Marrow Examination Unit 3: Red Cells Indices: Unit4: LE Cells & Factors Deficiency Unit 5: Cytochemical Stains Used in Haematology:

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Mid Semester	12	MCQ: 4 Short Answer Type Questions: 02 Long Answer Type Question: 01
Interaction In Class	6	
Class Test	4	MCQ: 02 Short Answer Type Questions: 01 Long Answer Type Question: 01
Assignment/ Presentation	4	Hard copy/Softcopy
Attendance	4	
Total Marks	30	



Department of Medical laboratory technique Course Outline Effective From: 2023-24

Name of the Program	Bachelors of Science in Medical Laboratory techniques			Year/ Semester:	3rd year/5th sem
Course Name	Applied Clinical Biochemistry	Course Code:	BLP-501	Type:	Practical
Credits	L:0 P:0 T:4			Total Sessions Hours:	30
Evaluation Spread	Internal Continuous Assessment:	30		End Term Exam:	70

Type of Course	☐ Compulsory	☒ Core	☐ Creative	☐ Life Skill										
Course Outcomes (CO): After the successful course completion, learners will develop following attributes:														
CO1	Students will learn about the assay procedures and estimation of various investigation from clinical samples in the clinical biochemistry lab. Urea, Protein, Glucose, uric acid Cholesterol and serum bilirubin													
Pedagogy	Hands on/Demonstration													
Internal Evaluation Mode	Continuous internal assessment and written examination													
Session Details	Topic			MappedCO										
Unit 1	Estimation of Glucose in Urine and in Blood. Estimation of Protein in Urine and Blood. Estimation of Urea in blood. Estimation of uric acid in blood. Estimation of serum Bilirubin Estimation of Total Cholesterol in blood. Estimation of HDL Cholesterol. Estimation of LDL Cholesterol. Estimation of TG Estimation of Creatinine in Blood Estimation of serum calcium, Inorganic phosphate To measure electrolytes Sodium, Potassium & Chloride.			CO1										
CO-PO and PSO Mapping														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3	3	1	2	3	-	3	3	3
<i>Strong contribution-3, Average contribution-2, Low contribution-1,</i>														
Suggested Readings:														
Text- Books	1. Practical Clinical Biochemistry by Harold Varley.													
Para Text	Unit 1: Staining Methods in Clinical Biochemistry													
Recapitulation & Examination Pattern														
Internal Continuous Assessment:														
Component		Marks	Pattern											
Mid Semester		12	Spotting: 4 Exercise: 04 Viva :02 File:02											
Class Test		6	MCQ: 02 Short Answer Type Questions: 01 Long Answer Type Question: 01											
Online Test/ Objective Test		4	MCQ: 4											
Assignment/ Presentation		4	Hard copy/Softcopy											
Attendance		4												
Total Marks		30												



Department of Medical laboratory technique
Course Outline Effective From: 2023-24

Name of the Program	Bachelors of Science in Medical Laboratory techniques			Year/ Semester:	3rd year/V Semester
Course Name	Applied Histopathology	Course Code:	BLP-502	Type:	Practical
Credits	L:0 T:0 P:4			Total Sessions Hours:	30
Evaluation Spread	Internal Continuous Assessment:	30		End Term Exam:	70
Type of Course	C Compulsory	C Core	C Creative	C Life Skill	

Course Outcomes (CO): After the successful course completion, learners will develop following attributes:

CO1	Students will learn about the staining procedure and preparation of various reagents required in histopathology lab.	
Pedagogy	Hands on/Demonstration	
Internal Evaluation Mode	Continuous internal assessment and written examination	
Session Details	Topic	MappedCO
Unit 1	1. To cut frozen section and stain for Haematoxylin and Eosin, Metachromatic stain Toluidine blue and Oil Red 'O' staining for the demonstration of fat 1. To prepare Schiff's reagent in the lab and do Periodic Acid Schiff's (PAS) stain on a Paraffin section 2. To stain a paraffin section for the demonstration of smooth muscle by Van Gieson's Stain 3. To perform Masson's trichrome stain on a paraffin section for the demonstration of collagen fiber, muscle fiber and other cell elements. 4. To stain the paraffin section for the demonstration of the elastic fibers (EVG). 5. To stain Decalcified paraffin embedded section for the presence of calcium salts (Von Kossa's method). 6. To stain a paraffin section for the following Mucicarmine, Alcian blue. 7. To stain a paraffin section for the demonstration of iron (Perl's stain) 8. To demonstrate the presence of bacteria and fungi in paraffin embedded sections using The following staining procedures: a. Gram's staining b. AFB staining (Ziehl Neelson's staining) for M. tuberculosis and leprae c. Grocott's stain for fungi d. Schmorl's reaction for reducing substances (melanin) e. To stain for nucleic acid (DNA and RNA) f. Feulgen Staining g. Methyl Green-Pyronin Staining h. Enzymatic methods	CO1

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3	-	-	3	3	-	3	3	3

Strong contribution-3, Average contribution-2, Low contribution-1,

Suggested Readings:

Text- Books	Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft
Para Text	Unit 1: Staining techniques in Histopathology

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Mid Semester	12	Spotting: 4 Exercise: 04 Viva :02 File:02
Class Test	6	MCQ: 02 Short Answer Type Questions: 01 Long Answer Type Question: 01
Online Test/ Objective Test	4	MCQ: 4
Assignment/ Presentation	4	Hard copy/Softcopy
Attendance	4	
Total Marks	30	

Department of Medical laboratory technique

Course Outline Effective From: 2023-24

Name of the Program	Bachelors of Science in Medical Laboratory techniques			Year/ Semester:	3 rd year/5 th sem									
CourseName	Immunology & Bacterial Serology-	Course Code:	BLP 503	Type:	Practical									
Credits	L:0 T:0 P:4			Total Sessions Hours:	30									
EvaluationSpread	Internal Continuous Assessment:	30		End Term Exam:	70									
Type ofCourse	☐ Compulsory	☒ Core	☐ Creative	☐ Life Skill										
Course Outcomes (CO): After the successful course completion, learners will develop following attributes:														
CO1	Students will learn about the techniques used in the testing of blood sample													
CO2	Students will learn about the preparation of phosphate buffer used in bacteriology lab													
CO3	Students will learn about different serological techniques used in clinical microbiology lab													
CO4	Students will learn about different Immunotechniques													
Pedagogy	Hands on/Demonstration													
Internal Evaluation Mode	Continuous internal assessment and written examination													
SessionDetails	Topic				MappedCO									
Unit 1	1. Collection of blood sample by vein puncture, separation and preservation of serum 2. Performing Haemolysin titration for Rose-Waaler test				O1									
Unit 2	1. Preparation of Phosphate buffers, Verinol buffer, ASO buffer, Richardson's buffer, Buffers of different pH and Molarity, Tris buffer 2. Standardization of cell concentration by Spectrophotometer				CO2									
Unit 3	Performance of Serological tests i.e. Widal, Brucella Tube Agglutination, VDRL (including Antigen Preparation), ASO (Anti-Streptolysin =O')C-Reactive Protein (Latex agglutination) Rheumatoid factor (RF) Latex agglutination				CO3									
Unit 4	1. Demonstration of antigen/antibody determination by Immune fluorescence (IF) 2. Immunodiffusion, precipitation in Agarose gel (Ouchterlony)CCIEP, ELISA, SOS - PAGE and Western blotting				CO4									
CO-PO and PSO Mapping														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO3	PSO 4	PSO 5	PSO6
CO1	3	3	3	3	3	3	-	-	3	3	-	3	3	3
CO2	3	3	3	3	3	3	-	-	3	3	-	3	3	3

CO3	3	3	3	3	3	3	-	-	3	3	-	3	3	3
CO4	3	3	3	3	3	3	-	-	3	3	-	3	3	3

Strong contribution-3, Average contribution-2, Low contribution-1,

Suggested Readings:

Text- Books	Practical Medical Microbiology by Mackie & McCartney Volume 1 and 2
Para Text	Unit 1: Blood sample collection Unit 2: Buffer system Unit 3: Antigen-Antibody serological test Unit4: Immunotechniques

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Mid Semester	12	Spotting: 4 Exercise: 04 Viva :02 File:02
Class Test	6	MCQ: 02 Short Answer Type Questions: 01 Long Answer Type Question: 01
Online Test/ Objective Test	4	MCQ: 4
Assignment/ Presentation	4	Hard copy/Softcopy
Attendance	4	
Total Marks	30	

Department of Medical laboratory technique

Course Outline Effective From: 2023-24

Name of the Program	Bachelors of Science in Medical Laboratory techniques			Year/ Semester:	3rd year/5th sem
Course Name	Applied Haematology-II-	Course Code:	BLP-504	Type:	Practical
Credits	L: 0 T:0 P: 4			Total Sessions Hours:	30
Evaluation Spread	Internal Continuous Assessment:	30		End Term Exam:	70
Type of Course	☐ Compulsory	☒ Core	☐ Creative	☐ Life Skill	

Course Outcomes (CO): After the successful course completion, learners will develop following attributes:

CO1	Students will learn about the morphological evaluation of blood cells in the Haematology lab	
CO2	Students will learn about the quantitative assay of coagulation factors.	
CO3	Students will learn about the red cell anomalies, karyotyping and disorders of leucocytes	
Pedagogy	Hands on/Demonstration	
Internal Evaluation Mode	Continuous internal assessment and written examination	
Session Details	Topic	MappedCO
Unit 1	Review the morphology of Normal and abnormal RBCs Review the morphology of normal and immature WBCs Calculating INR and determining the ISi of thromboplastin Quantitative Factor assays: Factor VIII Factor IX Factor VII Factor X Factor V Quantification of inhibitors (Bethesda method) APLA : Lupus Anticoagulant (LA) Anti-cardiolipin antibodies (ACA) Perform Euglobulin clot lysis test (ELT) Urea clot solubility test for factor XIII.	CO1

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3	-	-	3	3	-	3	3	3
CO2	3	3	3	3	3	3	-	-	3	3	-	3	3	3
CO3	3	3	3	3	3	3	-	-	3	3	-	3	3	3
CO4	3	3	3	3	3	3	-	-	3	3	-	3	3	3

Strong contribution-3, Average contribution-2, Low contribution-1,

Suggested Readings:

Text- Books	Practical Haematology by JB Dacie
Para Text	Unit 1: Microscopic examination of blood cells Unit 2: Coagulation factor study Unit 3: Leucocytes disorders test

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Mid Semester	12	Spotting: 4 Exercise: 04 Viva :02 File:02
Class Test	6	MCQ: 02 Short Answer Type Questions: 01 Long Answer Type Question: 01
Online Test/ Objective Test	4	MCQ: 4
Assignment/ Presentation	4	Hard copy/Softcopy
Attendance	4	
Total Marks	30	