# ERA UNIVERSITY
## FACULTY OF ALLIED HEALTH SCIENCES & RESEARCH
### BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNIQUES (B.SC MLT)
### FRAMEWORK Sixth Semester

| Subject Code | Course Titles | Hours per week | | | Marks | | | CR |
|---|---|---|---|---|---|---|---|---|
| | | L | Theory | Practical | Internal | External | Total | |
| BLT-601 | Applied Clinical Biochemistry- II | 3 | 1 | - | 30 | 70 | 100 | 4 |
| BLT-602 | Advanced Hematology | 3 | 1 | - | 30 | 70 | 100 | 4 |
| BLT-603 | Medical Parasitology & Entomology | 3 | 1 | - | 30 | 70 | 100 | 4 |
| BLT-604 | Cytopathology | 3 | 1 | | 30 | 70 | 100 | 4 |
| BLP-601 | Applied Clinical Biochemistry- II-- (P) | - | - | 4 | 30 | 70 | 100 | 2 |
| BLP-602 | Advanced Haematology - (P) | - | - | 4 | 30 | 70 | 100 | 2 |
| BLP-603 | Medical Parasitology & Entomology -(P) | - | - | 4 | 30 | 70 | 100 | 2 |
| BLP-604 | Cytopathology - (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:**

i. **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:** | **3rd year /6th sem** |
| **Course Name** | **Applied clinical Biochemistry -II** | **Course Code:** | **BLT-601** | **Type: 6th semester** | **THEORY** |
| **Credits** | L:3 T:1 P:0 | | | **Total Sessions Hours:** | **60** |
| **Evaluation Spread** | **Internal Continuous Assessment:** | **30** | | **End Term Exam:** | **70** |
| **Type of Course** | ○ Compulsory | ◉ Core | | ○ Creative | ○ Life Skill |
| **Course Objectives** | The students will learn how to analyze various clinical patients sample for estimation of different components which are the cause of the disease or are the diagnostic/prognostic markers. | | | | |
| **Course Outcome (CO)** | Course Outcomes (CO): Students will know basics and procedure of different parameters used to assess organ function. The students will learn to perform assay of clinically important enzyme: serum alkaline phosphatase, serum creatine phosphokinaseand serum acid phosphatase. | | | | |
| **CO1** | The students will learn about the automation in clinical biochemistry | | | | |
| **CO2** | The students will learn about the gastric analysis and Qualitative test | | | | |
| **CO3** | The students will learn about the Organ profile test | | | | |
| **CO4** | The students will learn about the enzyme test in clinical biochemistry | | | | |
| **Pedagogy** | Seminar, PPT, White board, Assignment | | | | |
| **Internal Evaluation Mode** | Continuous Internal Assessment and Written examination | | | | |

| **Session Details** | **Topic** | **Hours** | **Mapped CO** |
|---|---|---|---|
| **Unit 1** | 1.Automation in clinical biochemistry<br>2.Method of estimation and assessment for: Glucosetolerance test<br>3.Method of estimation and assessment for: Insulin tolerance test<br>4.Method of estimation and assessment for: Xylose excretion test. | 12 | CO1 |
| **Unit 2** | Gastric analysis.<br>Clearance test for renal function.<br>Qualitative test for: Urobilinogens, Barbiturates<br>Ketosteroids | 12 | CO2 |
| **Unit 3** | Lipid Profile Test<br>1. Renal Function Test<br>2. Thyroid Function Test<br>3. Liver Function Test & Cardiac Function Test | 12 | CO3 |

| | | | |
|---|---|---|---|
| **Unit 4** | 1.Enzymes: Principles, Clinical significance and Procedures for estimation: Acid phosphatase, Alkaline phosphatase<br>2.Lactate dehydrogenase<br>3.Aspartate transaminase<br>4.Alanine transaminase & Creatine phosphokinase | 12 | CO4 |
| **Unit 5** | 1.Qualitative analysis of Renal calculi.<br>2.Chemical examination of Cerebrospinal fluid.<br>3.Chemical examination of Ascitic fluidn & Pleural Fluid.<br>4.Brief knowledge about rapid techniques in clinical biochemistry | 12 | 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 | 1 | 3 | - | - | 2 | 3 | - | 3 | 2 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 1 | 3 | - | - | 2 | 3 | - | 3 | 2 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 1 | 3 | - | - | 2 | 3 | - | 3 | 2 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 3 | - | - | 2 | 3 | - | 3 | 2 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 3 | - | - | 2 | 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. Practical Clinical Biochemistry by Harold Varley.
3. Text book of Medical Biochemistry by Chaterjee&Shinde.
4. Principal of Biochemistry by Lehninger
5. Biochemistry by Voet&Voet
6. Biochemistry by Stryer
7. Medical Laboratory Science, Theory & Practical by A. Kolhatkar.
8. Biochemistry, U. Satyanarayan& U. Chakrapani.

**Para Text**

**Unit 1: Automation in clinical biochemistry:**
**Unit 2: Gastric analysis & Qualitative Test:**
**Unit 3: Organ Profile Test:**
**Unit4: Enzymes:**
**Unit5: Body Cavity Fluid:**

**Recapitulation & Examination Pattern**

**Internal Continuous Assessment:**

| **Component** | **Marks** | **Pattern** |
|---|---|---|
| Mid Semester | 12 | MCQ: 4<br>Short Answer Type Questions: 02<br>Long Answer Type Question: 01 |
| Class Test | 4 | MCQ: 02<br>Short Answer Type Questions: 01<br>Long Answer Type Question: 01 |
| Interaction In Class | 6 | |
| 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/6th sem** |
| **Course Name** | **Advanced Haematology** | **Course Code:** | **BLT-602** | **Type:** | **THEORY** |
| **Credits** | L:3 T:1 P:0 | | | **Total Sessions Hours:** | **60** |
| **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 different anemia, Leukemia, chromosomal studies, bleeding disorders and radiation hazards. | | | | |
| **Course Outcomes (CO):** *After the successful course completion, learners will develop following attributes:* | | | | | |
| **Course Outcome (CO)** | Students will able to Differentiate and categorize the normal and abnormal morphology of the different cell types in the blood and bone marrow<br>• Analyze and compare the basic pathology related to these different abnormalities in the red and white blood cells<br>• Apply the basic knowledge in hematology for future professional training (e.g. Clinical Laboratory Scientist training program)<br>• Interpret the clinical and laboratory information to understand and classify different types of anemia. | | | | |
| **CO1** | To learn about the Anemia - Definition, Causes, Blood morphology abnormalities and Diagnosis | | | | |
| **CO2** | To learn about the Anemia- Definition, Causes, Blood morphology abnormalities and Special test | | | | |
| **CO3** | To learn about the Leukemia – Definition Morphology and | | | | |
| **CO4** | To learn about the bleeding disorders | | | | |
| **CO5** | To learn about the Radioisotopes measurement used in blood and plasma volume determination | | | | |
| **Pedagogy** | Seminar, PPT, White board, Assignment | | | | |
| **Internal Evaluation Mode** | Continuous Internal Assessment and Written examination | | | | |
| **Session Details** | **Topic** | | | **Hours** | **Mapped CO** |
| **Unit 1** | **Definition , causes, changes in blood morphology due to the following anaemias and special tests-**<br>Iron deficiency anemia<br>Megaloblastic anaemia,<br>Aplastc anaemia<br>Sideroblastic anaemia | | | 12 | CO1 |
| **Unit 2** | **Definition , causes, changes in blood morphology due to the following anaemias and special tests**<br>1. Sickle cell anaemia, Autoimmune hemolytic anaemia,<br>2. Hereditary spherocytosis, G6PD deficiency anaemia<br>3. Thalassemia<br>4. Sickling test, Osmotic fragility test, Schilling test, Serum Iron, Iron binding capacity. | | | 12 | CO2 |

| | | | |
|---|---|---|---|
| **Unit 3** | 1. Definitions, morphology, identification of various abnormal cells in common Leukemia's<br>2. Acute Leukemia: AML, ALL<br>3. Chronic Leukemia: AML, CLL<br>4. Plasma cell myeloma. | 12 | CO3 |
| **Unit 4** | 1. Hemophilia A, B & Von-Willebrand disease<br>2. DIC,<br>3. Platelet disorder (Qualitative and quantitative)<br>4. Laboratory approach for investigating thrombosis. | 12 | CO4 |
| **Unit 5** | 2. Using radioisotopes measurement of: Blood volume<br>3. Determination of Red cell volume and Plasma volume<br>4. Red cell life span, Platelet life span<br>5. Radiation hazards and its prevention, Disposal of radioactive material | 12 | 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** | 2 | 3 | 3 | 3 | 3 | 2 | 1 | -- | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 2 | 3 | 3 | 3 | 3 | 2 | 1 | - | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO3** | 2 | 3 | 3 | 3 | 3 | 2 | 1 | - | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO4** | 2 | 3 | 3 | 3 | 3 | 2 | 1 | - | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO5** | 2 | 3 | 3 | 3 | 3 | 2 | 1 | - | 3 | 3 | 3 | 3 | 3 | 3 |

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

**Suggested Readings:**

| | |
|---|---|
| **Text- Books** | 1. Text book of Medical Laboratory Technology by Paraful B. Godkar<br>2. Medical laboratory Technology by KL Mukherjee Volume-I<br>3. Practical Haematology by JB Dacie<br>4. Atlas of Haematology {5th edition) by G.A. McDonald<br>5. De Gruchy's clinical Haematology in medical practice<br>6. Postgraduate Haematology by Hoffbrand |
| **Reference Books** | 1. Clinical Diagnosis &Management by Laboratory methods {20th edition) by John Bernard Henary |
| **Para Text** | **Unit 1: Anaemias-I:**<br>**Unit 2: Anaemias-II:**<br>**Unit 3: Leukemia:**<br>**Unit4: Bleeding Disorders**<br>**Unit 5: Radioisotopes Measurement:** |

**Recapitulation & Examination Pattern**

**Internal Continuous Assessment:**

| Component | Marks | Pattern |
|---|---|---|
| Mid Semester | 12 | MCQ: 4<br>Short Answer Type Questions: 02<br>Long Answer Type Question: 01 |
| Class Test | 4 | MCQ: 02<br>Short Answer Type Questions: 01<br>Long Answer Type Question: 01 |
| Interaction in Class | 6 | |
| 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/VI Semester** |
| **Course Name** | **Medical Parasitology & Entomology** | **Course Code:** | **BLT-603** | **Type: Sixth Semester** | **THEORY** |
| **Credits** | L:3 T:1 P:0 | | | **Total Sessions Hours:** | **60** |
| **Evaluation Spread** | **Internal Continuous Assessment:** | **30** | | **End Term Exam:** | **70** |
| **Type of Course** | ○ Compulsory | ◉ Core | | ○ Creative | ○ Life Skill |
| **Course Objectives** | The student will be taught about introduction, general characteristics, life cycle and laboratory diagnosis of various medically important parasites. | | | | |
| **Course Outcomes (CO):** *After the successful course completion, learners will develop following attributes:* | | | | | |
| **Course Outcome (CO)** | Upon successful completion, students will have the knowledge and skills to: On satisfying the requirements of this course, students will have the knowledge and skills to:<br>1. Identify, describe and contrast unicellular parasites and parasitic worm<br>2. Prepare and observe live parasitic specimens and test students' own seropositivity for a particular parasitic infection<br>3. Report on observations of biological specimens such as parasites<br>4. Appraise the impacts of parasitic diseases on human societies<br>5. Assemble a presentation on a current topic in parasitology (literature research, selection of relevant sources of information, evaluation of the information/data, formulation of the research's results) | | | | |
| **CO1** | Student will know about introduction, general characteristics, laboratory diagnosis of medical parasitology and protozoal parasites | | | | |
| **CO2** | Student will know about general characteristics, transmission and laboratory diagnosis of Helminthic parasites | | | | |
| **CO3** | Student will know about general characteristics, transmission and laboratory diagnosis of Helminthic parasites | | | | |
| **CO4** | Student will know about Laboratory diagnosis of parasites from different specimens-Stool and Blood | | | | |
| **CO5** | Student will know about Laboratory diagnosis of Malarial parasites, hydated cyst and cysticercosis | | | | |
| **Pedagogy** | Seminar, PPT, White board, Assignment | | | | |
| **Internal Evaluation Mode** | Continuous Internal assessment and written examination | | | | |

| **Session Details** | **Topic** | **Hours** | **Mapped CO** |
|---|---|---|---|
| **Unit 1** | 1. Introduction to Medical Parasitology with respect to terms used in Parasitology.<br>2. Protozoology/ ProtozoaI parasites: General characteristics of protozoa.<br>3. Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Entamoeba sp.<br>4. Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Intestinal and vaginal flagellates i.e. Giardia, Trichomonas sp.<br>5. Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of blood and tissue flagellates i.e. Plasmodium and Toxoplasma sp. | 12 | CO1 |
| **Unit 2** | 1. General characteristics of Cestodes, Trematodes and Nematodes<br>2. Geographical distribution, Habitat, Morphology, life cycle, Mode of infection | 12 | CO2 |

| | | | |
|---|---|---|---|
| | and laboratory diagnosis of: Taeniasolium and saginata<br>3. Echinococcusgranulosus, Hymenolepis nana<br>4. Chistosoma haematobium and mansoni | | |
| **Unit 3** | 1. Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of : Fasciola hepatica and buski<br>2. Trichuristrichura, Trichinellaspirales<br>3. Strongyloidesstercoralis, Ancylostomaduodenale, Enterobiusvermicularis<br>4. Ascarislumbricoides, Wuchereriabancrofti, Dracunculusmedinensis | 12 | CO3 |
| **Unit 4** | 1. Examination of Stool for parasites For intestinal protozoa! infections: Collection of stool samples, Preparation of material for unstained and stained preparations, Staining methods i.e. Iodine staining and permanent staining<br>2. For Helminthic infections: Concentration techniques i.e. Flotation and sedimentation techniques, Egg counting techniques<br>3. Examination of blood for parasites: Preparation of thin and thick blood film, Leishman stainining of thick and thin smear: Field's stain, JSB stain | 12 | C04 |
| **Unit 5** | 1. Morphology, life cycle and lab-diagnosis of Malarial parasite with special reference to P.vivax and P. falciparum<br>2. Examination of blood film for Malarial parasite and Microfilariae<br>3. Laboratory diagnosis of hydated cyst and cysticercosis<br>4. Concentration techniques for demonstration of Ova and Cysts (Principles and applications) | 12 | 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 | 3 | 3 | 2 | 3 | - | - | 2 | 3 | - | 3 | 2 | 2 |
| **CO2** | 3 | 3 | 3 | 3 | 2 | 3 | - | - | 2 | 3 | - | 3 | 2 | 2 |
| **CO3** | 3 | 3 | 3 | 3 | 2 | 3 | - | - | 2 | 3 | - | 3 | 2 | 2 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 2 | 3 | - | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 2 | 3 | - | 3 | 3 | 3 |

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

**Suggested Readings:**

| | |
|---|---|
| **Text-Books/reference book** | 1. Parasitology in relation to Clinical Medicine by K D Chhatterjee<br>2. Medical Entomology by A.K. Hati, Pub. Allied Book Agency<br>3. Medical Parasitology by D.R. Arora<br>4. Clinical Parasitology by Paul Chester Beaver<br>5. Microbiology For Medical Sciences by Bhagat Singh and Renu Singh |
| **Para Text** | Unit 1: Introduction to Medical Parasitology & Protozoology:<br>Unit 2: Helminthology/ Helminthic parasites-I:<br>Unit 3: Helminthology/ Helminthic parasites-II:<br>Unit4: Diagnostic Procedure-I:<br>Unit 5: Diagnostic Procedure-II: |

**Recapitulation & Examination Pattern**

**Internal Continuous Assessment:**

| Component | Marks | Pattern |
|---|---|---|
| Mid Semester | 12 | MCQ: 4<br>Short Answer Type Questions: 02<br>Long Answer Type Question: 01 |
| Class Test | 4 | MCQ: 02<br>Short Answer Type Questions: 01<br>Long Answer Type Question: 01 |
| Interaction In Class | 6 | |
| 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/6th semester** |
| **Course Name** | **Cytopathology** | **Course Code:** | **BLT-604** | **Type:** | **Theory** |
| **Credits** | L:3 T:1 P:0 | | | **Total Sessions Hours:** | **58** |
| **Evaluation Spread** | **Internal Continuous Assessment:** | **30** | | **End Term Exam:** | **70** |
| **Type of Course** | ○ Compulsory | ◉ Core | | ○ Creative | ○ Life Skill |
| **Course Objectives** | The students will learn about various staining procedures for demonstration of different substances & various cytological investigations. This will include special staining procedures &handling & testing of various cytological specimens. | | | | |
| **Course Outcomes (CO):** *After the successful course completion, learners will develop following attributes:* | | | | | |
| **Course Outcome (CO)** | Identifies various specimens and processing techniques employed in cytology Students will able to collect and proceed various Specimens in different sections of Cytopathology lab. The will able to used Automation in Cytopathology | | | | |
| **CO1** | To learn about the definition, branches, equipment and sample preparation in Cytopathology lab | | | | |
| **CO2** | To learn about the sample fixation and block preparation in diagnostic cytopathology | | | | |
| **CO3** | To learn about the enzyme cytochemistry and Fluid cytology: sample preparation, smearing and staining. | | | | |
| **CO4** | To learn about the automation in cytology and staining procedure | | | | |
| **CO5** | To learn about the special staining used in Cytopathology | | | | |
| **Pedagogy** | Seminar, PPT, White board, Assignment | | | | |
| **Internal Evaluation Mode** | Continuous Internal Assessment and Written examination | | | | |

| **Session Details** | **Topic** | **Hours** | **Mapped CO** |
|---|---|---|---|
| **Unit 1** | 1. Introduction, Definition, Branches of Cytopathology.<br>2. Aspiration cytology- Principles, indications and utility of the technique with special emphasis on role of cytotechnician in FNAC clinics<br>3. Equipments used in FNAC clinics.<br>4. Exfoliative Cytology- Principles, indications and utility of the technique, Sampl collection, labelling, preparation, processing of cervical, endometrial, respiratory tract, gastrointestinal tract and urinary tract sample, Smear preparation. | 12 | CO1 |
| **Unit 2** | 1. Fixatives and fixations: - types, uses, merits, demerits.<br>2. Cell Block preparation.<br>3. .Cryostat sectioning, its applications in diagnostic cytopathology<br>4. Vital staining for Sex Chromatin | 12 | CO2 |
| **Unit 3** | 1. Enzyme Cytochemistry: Diagnostic applications<br>2. Demonstration of Phosphatases, Dehydrogenases, Oxidases & Peroxidases<br>3. Fluid Cytology:- Sample Collection, Assessment of smearing and staining<br>4. Urine, CSF, Body Fluids (Pleural, Pericardial, Ascitic) | 12 | CO3 |

| | | | |
|---|---|---|---|
| | | | |
| **Unit 4** | 1. Liquid based cytology: Principles and preparation<br>2. Cytocentrifuge, molecular cytology<br>3. Immune-cytochemistry<br>4. MGG & PAP Stainig | 12 | CO41 |
| **Unit 5** | 1. PAS<br>2. Alcian Blue<br>3. Mucicarmin<br>4. Giemsa, Sudan. | 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 | 3 | 3 | 2 | 3 | - | - | 2 | 3 | - | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 2 | 3 | - | - | 2 | 3 | - | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 2 | 3 | - | - | 2 | 3 | - | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 2 | 3 | - | - | 2 | 3 | - | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | 2 | 3 | - | - | 2 | 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<br>2. Medical Lab technology by Lynch<br>3. An Introduction to Medical Lab Technology by F J Baker and Silverton<br>4. Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft<br>5. Diagnostic Cytology by Koss Volume -II |
| **Para Text** | **Unit 1: Introduction:**<br>**Unit 2: Diagnostic Cytopathology:**<br>**Unit 3: Enzyme Cytochemistry & Fluid Cytology:**<br>**Unit4: Automation in Cytology.& Staining:**<br>**Unit: 5Special Stains Used in Cytopathology:** |

**Recapitulation & Examination Pattern**

**Internal Continuous Assessment:**

| **Component** | **Marks** | **Pattern** |
|---|---|---|
| Mid Semester | 12 | MCQ: 4<br>Short Answer Type Questions: 02<br>Long Answer Type Question: 01 |
| Class Test | 6 | MCQ: 02<br>Short Answer Type Questions: 01<br>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<br>Short Answer Type Questions: 02<br>Long Answer Type Question: 01 |

# Course Outline Effective From: 2023-24

| | | | | | |
|---|---|---|---|---|---|
| **Name of the Program** | **Bachelors of Science in Medical Laboratory techniques** | | | **Year/ Semester:** | **3rd year/6th sem** |
| **Course Name** | **Applied Clinical Biochemistry-II-** | **Course Code:** | **BLP601** | **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** | The students will learn about the estimation and assessment of glucose tolerance and insulin tolerance from various clinical patients' sample |
| **CO2** | The students will learn about the estimation of uric acid, Creatinine clearance, and Urea clearance test |
| **CO3** | The students will learn about the estimation of Serum acid phosphatase, Alkaline phosphatase Lactate dehydrogenase and T3, T4 and TSH |
| **Pedagogy** | Hands on/Demonstration |
| **Internal Evaluation Mode** | Continuous internal assessment and written examination |

| **Session Details** | **Topic** | **MappedCO** |
|---|---|---|
| **Unit 1** | 1. Estimation of Glucose tolerance test (GTT}.<br>2. Estimation of Insulin tolerance test (ITT). | CO1 |
| **Unit 2** | 1. Determination of Uric acid in Urine.<br>2. Determination of Creatinine clearance.<br>3. Determination of Urea clearance. | CO2 |
| **Unit3** | 1. Determination of Serum acid phosphatase.<br>2. Determination of Serum Alkaline phosphatase.<br>3. Determination of Serum Lactate dehydrogenase.<br>4. Determination of T3, T4 and TSH | CO3 |

**CO-PO and PSO Mapping**

| **CO** | **PO 1** | **PO 2** | **PO 3** | **PO4** | **PO5** | **PO 6** | **PO 7** | **PO 8** | **PS O1** | **PS O2** | **PSO 3** | **PSO 4** | **PS O5** | **PS O6** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 2 | 3 | 1 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 2 | 3 | 1 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 2 | 3 | 1 | 3 | 3 | 3 |

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

**Suggested Readings:**

| | |
|---|---|
| **Reference /Text- Books** | 1.Practical Clinical Biochemistry by Harold Varley. |

| **Recapitulation & Examination Pattern** | | |
|---|---|---|
| **Internal Continuous Assessment:** | | |
| **Component** | **Marks** | **Pattern** |
| Mid Semester | 12 | Spotting: 4<br>Exercise: 04<br>Viva :02<br>File:021 |
| Class Test | 6 | MCQ: 02<br>Short Answer Type Questions: 01<br>Long Answer Type Question: 01 |
| Online Test/ Objective Test | 4 | MCQ: 4 |
| Assignment/ Presentation | 4 | Hard copy/Softcopy |
| Attendance | 4 | |
| **Total Marks** | **30** | |

ERA UNIVERSITY

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

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|---|---|---|---|---|---|
| **Name of the Program** | **Bachelors of Science in Medical Laboratory techniques** | | | **Year/ Semester:** | **3rd year/6th sem** |
| **Course Name** | **Advanced Haematology-** | **Course Code:** | **BLP 602** | **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 the following attributes:*

| | |
|---|---|
| **CO1** | The students will learn about the Interpretation of histogram of automated blood cell counter, estimation of serum iron, and screening of enzyme deficiency |
| **CO2** | The students will learn about the estimation of hemoglobin in the blood sample by different methods |
| **CO3** | The students will learn about the screening methods for bleeding disorder detection |
| **Pedagogy** | Hands on/Demonstration |
| **Internal Evaluation Mode** | Continuous internal assessment and written examination |

| **Session Details** | **Topic** | **MappedCO** |
|---|---|---|
| **Unit 1** | 1. Study and interpretation of Histogram of Automated Blood cell counter<br>2. To estimate serum iron and total iron binding capacity.<br>3. Screening tests for enzymes deficiency: Pyruvate Kinase, GGPD | CO1 |
| **Unit 2** | 1. To estimate Hb-F, Hb-A2 in a given blood sample.<br>2. To estimate plasma and urine Hemoglobin in the given specimens.<br>3. To demonstrate the presence of Hb-S by Sickling and Solubility tests.<br>4. Perform Hb electrophoresis (alkaline) | C02 |
| **Unit 3** | 1. Perform osmotic red cell fragility.<br>2. Detection of Fibrin degradation products (FDPs)<br>3. To perform various platelet function tests such as whole blood clot retraction test, prothrombin consumption index (PCI) Platelet adhesion, aggregation and PF3 availability test.<br>Peripheral Blood Lymphocyte Culture for chromosome studies in Leukemia | C03 |

| CO-PO and PSO Mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO** | **PO 1** | **PO 2** | **PO 3** | **PO4** | **PO5** | **PO 6** | **PO 7** | **PO 8** | **PS O1** | **PS O2** | **PSO 3** | **PS O4** | **PS O5** | **PS O6** |
| **CO1** | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 1 | 3 | - | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 1 | 3 | - | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 1 | 3 | - | 3 | 3 | 3 |

| **Suggested Readings:** | |
|---|---|
| **Text- Books** | Practical Haematology by JB Dacie |

| **Recapitulation & Examination Pattern** | | |
|---|---|---|
| **Internal Continuous Assessment:** | | |
| **Component** | **Marks** | **Pattern** |
| Mid Semester | 12 | Spotting: 4<br>Exercise: 04<br>Viva :02<br>File:021 |
| Class Test | 6 | MCQ: 02<br>Short Answer Type Questions: 01<br>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**

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|---|---|---|---|---|---|
| **Name of the Program** | **Bachelors of Science in Medical Laboratory techniques** | | | **Year/ Semester:** | **3rd year/ 6th sem** |
| **Course Name** | **Medical Parasitology & Entomology-** | **Course Code:** | **BLP-603** | **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** | The students will learn about the routine stool examination for detection of intestinal parasites with different methods |
| **CO2** | The students will learn about the routine identification of adult worms by using models and slides |
| **CO3** | The students will learn about the routine identification of malarial parasites, preparation, staining and examination. |
| **Pedagogy** | Hands on/Demonstration |
| **Internal Evaluation Mode** | Continuous internal assessment and written examination |

| **Session Details** | **Topic** | **MappedCO** |
|---|---|---|
| **Unit 1** | A. Routine stool examination for detection of intestinal parasites with concentration methods:<br>1. Saline preparation<br>2. Iodine preparation<br>3. Floatation method<br>4. Centrifugation method<br>5. Formal ether method<br>6. Zinc sulphate method<br>B. Identification of adult worms from models/slides:<br>1. Tapeworm<br>2. Tapeworm segments<br>3. Ascaris (Round worm)<br>4. Hookworms<br>C. Pinworms<br>1. Malarial parasite:<br>2. Preparation of thin and thick smears<br>3. Staining of smears<br>4. Examination of smears for malarial parasites (P. vivax and P. falciparum) | CO1- CO3 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO-PO and PSO Mapping** | | | | | | | | | | | | | | |
| **CO** | **PO 1** | **PO 2** | **PO 3** | **PO4** | **PO5** | **PO 6** | **PO 7** | **PO 8** | **PS O1** | **PS O2** | **PSO 3** | **PS O4** | **PS O5** | **PSO 6** |
| **CO1** | 3 | 3 | 3 | 2 | 3 | 3 | - | - | 1 | 3 | - | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 2 | 3 | 3 | - | - | 1 | 3 | - | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 2 | 3 | 3 | - | - | 1 | 3 | - | 3 | 3 | 3 |
| ***Strong contribution-3, Average contribution-2 , Low contribution-1,*** | | | | | | | | | | | | | | |
| **Suggested Readings:** | | | | | | | | | | | | | | |
| **Text- Books** | 1Clinical Parasitology by Paul Chester Beaver | | | | | | | | | | | | | |

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| **Recapitulation & Examination Pattern** | | |
|---|---|---|
| **Internal Continuous Assessment:** | | |
| **Component** | **Marks** | **Pattern** |
| Mid Semester | 12 | Spotting: 4<br>Exercise: 04<br>Viva :02<br>File:02 |
| Class Test | 6 | MCQ: 02<br>Short Answer Type Questions: 01<br>Long Answer Type Question: 01 |
| Online Test/ Objective Test | 4 | MCQ: 4 |
| Assignment/ Presentation | 4 | Hard copy/Softcopy |
| Attendance | 4 | |
| **Total Marks** | **30** | |

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## Course Outline Effective From: 2023-24

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|---|---|---|---|---|---|
| **Name of the Program** | **Bachelors of Science in Medical Laboratory techniques** | | | **Year/ Semester:** | **3rd year/6th sem** |
| **Course Name** | **Cytopathology** | **Course Code:** | **BLP-604** | **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 the following attributes:*

| | |
|---|---|
| **CO1** | The students will learn about different staining techniques used in the cytopathology Lab |
| **CO2** | The students will learn about section cutting of Gynaec tissue and processing of CSF sample and body fluids by cytospin |
| **CO3** | The students will learn about various stains used in Cytology lab |
| **Pedagogy** | Hands on/Demonstration |
| **Internal Evaluation Mode** | Continuous internal assessment and written examination |

| **Session Details** | **Topic** | **MappedCO** |
|---|---|---|
| **Unit 1** | 1. To perform Papnicolaou's stain on cervical smear<br>2. To perform Guard's staining for demonstration sex chromatin (Barr bodies on a buccal smear)<br>3. To perform Shorr's staining for Hormonal assessment | CO1 |
| Unit 2 | 1. To cut frozen sections of Gynaec tissue<br>2. To perform CSF sample and body fluids by cytospin | CO2 |
| **Unit 3** | 1. Should know the various stains used in Cytology lab:11 May Grunwald Giemsa, H&E, PAS, Grocott's. | CO3 |

**CO-PO and PSO Mapping**

| **CO** | **PO 1** | **PO 2** | **PO 3** | **PO4** | **PO5** | **PO 6** | **PO 7** | **PO 8** | **PS O1** | **PS O2** | **PSO 3** | **PS O4** | **PS O5** | **PSO 6** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 2 | 3 | - | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 2 | 3 | - | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 2 | 3 | - | 3 | 3 | 3 |

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

**Suggested Readings:**

| | |
|---|---|
| **Text- Books** | 1.Diagnostic Cytology by Koss Volume -II |

| | |
|---|---|
| **Para Text** | **Unit 1: Diagnostic Cytopathology**<br>**Unit 2: Fluid Cytology Methods**<br>**Unit 3: Special staining in Cytopathology** |

| **Recapitulation & Examination Pattern** | | |
|---|---|---|
| **Internal Continuous Assessment:** | | |
| **Component** | **Marks** | **Pattern** |
| Mid Semester | 12 | Spotting: 4<br>Exercise: 04<br>Viva :02<br>File:021 |
| Class Test | 6 | MCQ: 02<br>Short Answer Type Questions: 01<br>Long Answer Type Question: 01 |
| Online Test/ Objective Test | 4 | MCQ: 4 |
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| Attendance | 4 | |
| **Total Marks** | **30** | |

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