

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

| COURSE CODE                    | Course Titles                                                                                           | Hours per week |          |           | Marks      |            |            | C R       |
|--------------------------------|---------------------------------------------------------------------------------------------------------|----------------|----------|-----------|------------|------------|------------|-----------|
|                                |                                                                                                         | L              | Theory   | Practical | Internal   | External   | Total      |           |
| BLT 701                        | Immunopathology & Molecular Biology                                                                     | 3              | 1        | -         | 30         | 70         | 100        | 4         |
| BLT 702                        | Blood Banking & Genetics                                                                                | 3              | 1        | -         | 30         | 70         | 100        | 4         |
| BLT 703                        | Medical Virology & Mycology                                                                             | 3              | 1        | -         | 30         | 70         | 100        | 4         |
| BLT 704                        | Research methodology and Biostatistics                                                                  | 3              | 1        | -         | 30         | 70         | 100        | 4         |
| BLT 705                        | Principles of Laboratory Management                                                                     | 3              | 1        | -         | 30         | 70         | 100        | 4         |
| BLP 701                        | Immunopathology & Molecular Biology - (P)                                                               | -              | -        | 4         | 30         | 70         | 100        | 2         |
| BLP 702                        | Blood Banking & Genetics- (P)                                                                           | -              | -        | 4         | 30         | 70         | 100        | 2         |
| BLP 703                        | Medical Mycology and Virology - (P)                                                                     | -              | -        | 4         | 30         | 70         | 100        | 2         |
|                                | Guest Lecture/Tutorial/Seminar/visit to any medical research institution or reputed clinical laboratory | -              | 2        | -         | -          | -          | -          | 2         |
| <b>Total</b>                   |                                                                                                         | <b>15</b>      | <b>7</b> | <b>12</b> | <b>240</b> | <b>560</b> | <b>800</b> | <b>26</b> |
| <b>Total Hours in Semester</b> |                                                                                                         | <b>550</b>     |          |           |            |            |            |           |

**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 theProgram                                                                                        | Bachelors of Science in Medical Laboratory techniques                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                       |                                | Year/ Semester:       | 4 <sup>th</sup> year/ 7 <sup>th</sup> sem |             |
| CourseName                                                                                                | Immunopathology and Molecular Biology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Course Code:                          | BLT701                         | Type:                 | THEORY                                    |             |
| Credits                                                                                                   | L:3 T:1 P:0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |                                | Total Sessions Hours: | 60                                        |             |
| EvaluationSpread                                                                                          | Internal Continuous Assessment:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 30                                    |                                | End Term Exam:        | 70                                        |             |
| Type ofCourse                                                                                             | <input type="radio"/> Compulsory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <input checked="" type="radio"/> Core | <input type="radio"/> Creative |                       | <input type="radio"/> Life Skill          |             |
| Course Objectives                                                                                         | The students will learn how to analyze various clinical patients' samples, for estimation of different components which are the cause of the immune disease or are the diagnostic/prognostic markers. This subject gives information about various clinically important cells of immune system, lymphoid organs, antigen, antibody, Ag-Ab. reactions, transplant immunology etc. & automation techniques. Molecular biology concerns the molecular basis of biological activity between biomolecules in the various systems of a cell, including the interactions between DNA, RNA and proteins and their biosynthesis, as well as the regulation of these interactions. A basic introduction of molecular biology and its techniques like PCR, RTPCR etc. will also be rendered to sensitize students to take up future molecular biology challenges. |                                       |                                |                       |                                           |             |
| Course Outcomes (CO): After the successful course completion, learners will develop following attributes: |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                       |                                |                       |                                           |             |
| Course Outcome (CO)                                                                                       | <ul style="list-style-type: none"><li>• Demonstrate the basic knowledge of immunological processes at a cellular and molecular level</li><li>• Define central immunological principles and concepts</li><li>• Outline, compare and contrast the key mechanisms arid cellular players of innate and adaptive immunity and how they relate</li><li>• Elucidate the genetic basis for immunological diversity and the generation of adaptive immune responses</li><li>• Understand and explain the basis of immunological tolerance, autoimmunity and transplantation</li><li>• Exhibit a knowledge base in genetics, cell and molecular biology, and anatomy and physiology</li><li>• Demonstrate the knowledge of common and advanced laboratory practices in cell and molecular biology</li></ul>                                                      |                                       |                                |                       |                                           |             |
| CO1                                                                                                       | Student will learn about the Immune system, , Types of Immunity, Immune response, cells and organs of the immune system                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                       |                                |                       |                                           |             |
| CO2                                                                                                       | Student will learn about Structure, Function and Classes of Antigen Antibody                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                       |                                |                       |                                           |             |
| CO3                                                                                                       | Students will learn about Hypersensitivity, HLA typing, and Immune tolerance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                       |                                |                       |                                           |             |
| CO4                                                                                                       | Students will learn about molecular biology techniques and their application in Medical diagnostics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       |                                |                       |                                           |             |
| CO5                                                                                                       | Students will learn about replication, damage and repair of DNA molecule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                       |                                |                       |                                           |             |
| Pedagogy                                                                                                  | White Board, Computer Lab, Projector etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                       |                                |                       |                                           |             |
| Internal Evaluation Mode                                                                                  | Online as well as Offline Mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                       |                                |                       |                                           |             |
| Session details                                                                                           | Topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                       |                                |                       | Hours                                     | Mapped CO   |
| Unit 1                                                                                                    | 1. Historical background, general concepts of the immune system,<br>2. innate and adaptive immunity; active and passive immunity<br>3. Primary and secondary immune response.<br>4. Cells andOrgans of the immune system, Lymphoid organs of the Immune system, MHC I & II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                       |                                |                       | 12 Hrs                                    | C<br>O<br>1 |
| Unit 2                                                                                                    | 1. Antigens and haptens : Properties ,foreignness, molecular size, heterogeneity.<br>2. Antibodies: Historical perspective of antibody structure; structure, function and properties of the antibodies<br>3. different classes, subclasses and biological activities of antibodies; concepts of antibody diversity, isotype, allotype,<br>4. Introduction of hybridoma technology, monoclonal antibodies, polyclonal antibody                                                                                                                                                                                                                                                                                                                                                                                                                          |                                       |                                |                       | 12 Hrs                                    | C<br>O<br>2 |

|                                                                    |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |       |     |                                                                            |     |     |      |      |      |        |      |      |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------|-----|----------------------------------------------------------------------------|-----|-----|------|------|------|--------|------|------|
| Unit 3                                                             | 1. HLA Typing & Cross matching<br>2. Transplant Immunology.<br>3. Hypersensitivity: Definition, Types, Mechanisms, Autoimmunity<br>4. Immune tolerance : Basic concepts.                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |       |     |                                                                            |     |     |      |      |      | 12 Hrs | CO3  |      |
| Unit 4                                                             | 1. Introduction to Molecular Biology<br>2. Relationship of Mol. Biology with other Science.<br>3. Molecular Biology Techniques: Principle, Reagents used, procedure and applications in Medical diagnostics.<br>4. Polymerase Chain Reaction and its advanced versions, Gel electrophoresis, Western blot. |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |       |     |                                                                            |     |     |      |      |      | 12 Hrs | CO4  |      |
| Unit 5                                                             | 1. Chemical composition of DNA, DNA replication.<br>2. DNA damage and repair.<br>3. Regulation of prokaryotic and eukaryotic gene expression<br>4. Cell Cycle.                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |       |     |                                                                            |     |     |      |      |      | 12 Hrs | CO5  |      |
| CO-PO and PSO Mapping                                              |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |       |     |                                                                            |     |     |      |      |      |        |      |      |
| CO                                                                 | PO1                                                                                                                                                                                                                                                                                                        | PO2                                                                                                                                                                                                                                                                                                                                                                                                                                                          | PO3 | PO4   | PO5 | PO6                                                                        | PO7 | PO8 | PSO1 | PSO2 | PSO3 | PSO4   | PSO5 | PSO6 |
| CO1                                                                | 3                                                                                                                                                                                                                                                                                                          | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2   | 1     | 1   | 3                                                                          | -   | -   | 1    | 1    | -    | 2      | 1    | 2    |
| CO2                                                                | 3                                                                                                                                                                                                                                                                                                          | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2   | 1     | 1   | 3                                                                          | -   | -   | 1    | 1    | -    | 2      | 1    | 2    |
| CO3                                                                | 3                                                                                                                                                                                                                                                                                                          | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2   | 2     | 1   | 3                                                                          | -   | -   | 3    | 3    | -    | 3      | 2    | 3    |
| CO4                                                                | 3                                                                                                                                                                                                                                                                                                          | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3   | 3     | 3   | 3                                                                          | -   | -   | 3    | 3    | -    | 3      | 2    | 3    |
| CO5                                                                | 3                                                                                                                                                                                                                                                                                                          | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2   | 2     | 1   | 3                                                                          | -   | -   | 2    | 3    | -    | 2      | 2    | 3    |
| Strong contribution-3, Average contribution-2, Low contribution-1, |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |       |     |                                                                            |     |     |      |      |      |        |      |      |
| Suggested Readings:                                                |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |       |     |                                                                            |     |     |      |      |      |        |      |      |
| Text- Books/<br>ReferenceBooks                                     |                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"><li>Immunology by Ivan Roitt, Jonathaan Brostoff and David Male</li><li>Immunology by Kuby</li><li>Basic &amp; Clinical Immunology by P. Daniel Fudenberg. H. Hugh and Stites</li><li>Elements of Biotechnology by PK Gupta</li><li>Advanced Molecular Biology by R Twyman</li><li>Principal of Biochemistry by Lehninger</li><li>Medical Immunology by Daniel P Stites</li><li>Watson Molecular Biology of Gene</li></ul> |     |       |     |                                                                            |     |     |      |      |      |        |      |      |
| Para Text                                                          |                                                                                                                                                                                                                                                                                                            | Unit 1: History & Introduction<br>Unit 2: Antigen & Antibody<br>Unit 3: HLA & Hypersensitivity<br>Unit4: Molecular Biology<br>Unit4: Molecular Biology                                                                                                                                                                                                                                                                                                       |     |       |     |                                                                            |     |     |      |      |      |        |      |      |
| 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 |     |     |      |      |      |        |      |      |
| Interaction in class /class participation                          |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     | 06    |     |                                                                            |     |     |      |      |      |        |      |      |
| Class test                                                         |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     | 4     |     |                                                                            |     |     |      |      |      |        |      |      |
| Assignment/ Presentation/ project                                  |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     | 4     |     | Hard copy/Softcopy                                                         |     |     |      |      |      |        |      |      |
| Attendance                                                         |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     | 4     |     |                                                                            |     |     |      |      |      |        |      |      |
| Total Marks                                                        |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     | 30    |     |                                                                            |     |     |      |      |      |        |      |      |

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| Name of theProgram                                                                                        | Bachelors of Science in Medical Laboratory techniques                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                       |         | Year/ Semester:                | 4 <sup>th</sup> year/7 <sup>th</sup> semester |
| CourseName                                                                                                | Blood Banking and Genetics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CourseCode:                           | BLT-702 | Type:                          | THEORY                                        |
| Credits                                                                                                   | Blood banking & molecular biology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                       |         | Total Sessions Hours:          | 60                                            |
| EvaluationSpread                                                                                          | Internal Continuous Assessment:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 30                                    |         | End Term Exam:                 | 70                                            |
| Type ofCourse                                                                                             | <input type="radio"/> Compulsory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <input checked="" type="radio"/> Core |         | <input type="radio"/> Creative | <input type="radio"/> Life Skill              |
| Course Objectives                                                                                         | Blood banking will make students learn about blood grouping & blood, Transfusion. The students will learn about the concept of blood grouping, compatibility testing in blood transfusion &screening of donated blood for various Infection Diseases. Genetics will make students learn about Fundamentals of Heredity. The students will learn about the concept of inheritance in various genetic diseases.                                                                                                                                                                                                                      |                                       |         |                                |                                               |
| Course Outcomes (CO): After the successful course completion, learners will develop following attributes: |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       |         |                                |                                               |
| Course Outcome(CO)                                                                                        | <ul style="list-style-type: none"><li>• Apply advanced blood bank and blood transfusion knowledge to make appropriate and effective on-the-job professional decisions.</li><li>• Perform and interpret commonly utilized procedures in the blood bank laboratory.</li><li>• Recognize normal and abnormal test results and correlate these data with appropriate pathologic conditions to accurately advise health care providers.</li><li>• Adapt immunohematology laboratory techniques and procedures when errors and discrepancies in results are obtained to effect resolution in a professional and timely manner.</li></ul> |                                       |         |                                |                                               |
| CO1                                                                                                       | Student will learn about History and Discovery of Blood group, Various methods used in blood banking and their interpretation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                       |         |                                |                                               |
| CO2                                                                                                       | Students will learn about tools and techniques used in blood banking and genetics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                       |         |                                |                                               |
| CO3                                                                                                       | Student will know about Blood components, Preparation and management.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                       |         |                                |                                               |
| CO4                                                                                                       | Student will know about Blood Transfusion Reactions, Types, Laboratory investigation compatibility test and transfusion transmissible diseases.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       |         |                                |                                               |
| CO5                                                                                                       | Student will know about Genetics-principles, Chromosomes and molecular genetics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       |         |                                |                                               |
| Pedagogy                                                                                                  | White Board, Computer Lab, Projector etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                       |         |                                |                                               |
| Internal EvaluationMode                                                                                   | Online as well as Offline Mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       |         |                                |                                               |
| Session Details                                                                                           | Topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                       |         | Hours                          | MappedCO                                      |
| Unit 1                                                                                                    | 1. History and discovery of blood group system<br>2. ABO and Rhesus blood group system<br>3. Cell and serum grouping<br>4. Various methods, interpretation of results.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                       |         | 12 Hrs                         | CO1                                           |
| Unit 2                                                                                                    | 1. Discrepancies in blood grouping and resolving problems<br>2. Variants of D antigen and weak D typing.<br>3. Compatibility testing:- definition, indication methods.<br>4. Coombs test:- Direct, indirect, principle, procedure, interpretation, applications.                                                                                                                                                                                                                                                                                                                                                                   |                                       |         | 12 Hrs                         | CO2                                           |
| Unit 3                                                                                                    | 1. Blood component: Preparation, labeling, storage, cell separator<br>2. Preparation of packed cells and various fractions of blood for transfusion purposes.<br>3. Preparation of PRP,FP,FFP and Cryoprecipitate<br>4. Total quality management, documentation record keeping.                                                                                                                                                                                                                                                                                                                                                    |                                       |         | 12 Hrs                         | CO3                                           |

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |            |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|
| <b>Unit 4</b> | 1. Transfusion reactions: Definitions, classification & Causes<br>2. Laboratory investigation of transfusion reactions and mismatched, transfusion reactions.<br>3. Compatibility tests in blood transfusion, complications and hazard of blood transfusion.<br>4. Transfusion transmissible diseases, screening methods (Sample collection, processing, handling and disposal).                                                                                                                                                                                        | <b>12 Hrs</b> | <b>CO4</b> |
| <b>UNIT 5</b> | Continuity of life-heredity, variation<br>Mendel's laws of inheritance, Chromosomal basis of inheritance; other patterns of inheritance<br>Incomplete dominance, multi parallelism, quantitative inheritance.<br>Chromosomes-Bacterial cell and eukaryotic cell; parallelism between genes and chromosomes; genome, linkage and crossing over; gene mapping; recombination.<br>Molecular genetics: DNA as a genetic material- its structure and replication; structure of RNA and its role in protein synthesis, Vectors, plasmids, Human Genetics, Microbial genetics. | <b>12 Hrs</b> | <b>CO5</b> |

#### CO-PO and PSO Mapping

| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | 3   | 3   | 3   | 3   | 2   | 3   | 2   | 1   | 1    | 3    | -    | 3    | 2    | 3    |
| CO2 | 3   | 3   | 3   | 3   | 2   | 3   | 2   | 1   | 1    | 3    | -    | 3    | 2    | 3    |
| CO3 | 3   | 3   | 3   | 3   | 2   | 3   | 2   | 3   | 1    | 3    | -    | 3    | 2    | 3    |
| CO4 | 3   | 3   | 3   | 3   | 2   | 3   | 2   | 1   | 1    | 3    | -    | 3    | 2    | 3    |
| CO5 | 3   | 3   | 3   | 3   | 2   | 3   | 2   | 1   | 1    | 3    | -    | 3    | 2    | 3    |

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

#### Suggested Readings:

|                                        |                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text- Books/<br/>ReferenceBooks</b> | 1. Practical Haematology by J.B. Dacie<br>2. Transfusion Science by Overfield, Hamer<br>3. Medical Laboratory Technology by K.L. Mukherjee Volume-I<br>4. Mollison's Blood Transfusion in Clinical Medicine, 12th Edition by Harvey G. Klein<br>5. Genes by Benjamin Lewin<br>6. Genetics by B.D. Singh<br>7. Instant Notes on Genetics by PC Winter, GI Hickey and HL Fletcher<br>8. Principles of Genetics by Gardner |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Para Text</b> | <b>Unit 1: History &amp; Discovery of Blood Group</b><br><b>Unit 2: Techniques</b><br><b>Unit 3: Blood Components</b><br><b>Unit4: Transfusion Reactions</b><br><b>Unit 5: Genetics</b> |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### 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 |
| Interaction in class /class participation | 06        |                                                                            |
| Class test                                | 4         |                                                                            |
| Assignment/ Presentation/ project         | 4         | Hard copy/Softcopy                                                         |
| Attendance                                | 4         |                                                                            |
| <b>Total Marks</b>                        | <b>30</b> |                                                                            |

## Department of Medical laboratory technique

### Course Outline Effective From: 2023-24

|                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |         |                                |                                                     |
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| Name of theProgram                                                                                        | Bachelors of Science in Medical Laboratory techniques                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |         | Year/ Semester:                | 4 <sup>th</sup> year / 7 <sup>th</sup> sem Semester |
| CourseName                                                                                                | Medical Virology and Mycology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | CourseCode:                           | BLT 703 | Type:                          | THEORY                                              |
| Credits                                                                                                   | L-3,T-1,P-O                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                       |         | Total Sessions Hours:          | 60                                                  |
| EvaluationSpread                                                                                          | Internal Continuous Assessment:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 30                                    |         | End Term Exam:                 | 70                                                  |
| Type ofCourse                                                                                             | <input type="radio"/> Compulsory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <input checked="" type="radio"/> Core |         | <input type="radio"/> Creative | <input type="radio"/> Life Skill                    |
| Course Objectives                                                                                         | The student will be taught about introduction, general characteristics, life cycle and laboratory diagnosis of various medically important Viruses & Fungi.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                       |         |                                |                                                     |
| Course Outcomes (CO): After the successful course completion, learners will develop following attributes: |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |         |                                |                                                     |
| Course Outcome(CO)                                                                                        | Students will able to Explain viruses, fungi including their classification, morphology, and laboratory diagnosis and prevention measures, Perform laboratory investigations for the diagnosis of infectious diseases caused by viruses, fungi, Discuss various viral fungal diseases of human.                                                                                                                                                                                                                                                                                                                                                                         |                                       |         |                                |                                                     |
| CO1                                                                                                       | To learn about the Medical Virology- Introduction, Morphology, Laboratory diagnosis and staining techniques.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |         |                                |                                                     |
| CO2                                                                                                       | To learn about the Viral culture, Transmission, Multiplication and virus -host interaction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                       |         |                                |                                                     |
| CO3                                                                                                       | To learn about the Viruses: Classification, Types, Diseases, Prevention and Control                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                       |         |                                |                                                     |
| CO4                                                                                                       | To learn about the Medical Mycology-Introduction, Classification and general characteristics of medically important fungi. Students will be able to learn about the tools and techniques used in Laboratory diagnosis of medically important fungi.                                                                                                                                                                                                                                                                                                                                                                                                                     |                                       |         |                                |                                                     |
| CO5                                                                                                       | To learn about the Morphology, Diseases and Lab Diagnosis of yeasts and moulds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |         |                                |                                                     |
| Pedagogy                                                                                                  | White Board, Computer Lab, Projector etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                       |         |                                |                                                     |
| Internal EvaluationMode                                                                                   | Online as well as Offline Mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |         |                                |                                                     |
| Session Details                                                                                           | Topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |         | Hours                          | Mappe dCO                                           |
| Unit 1                                                                                                    | 1. Introduction to medical virology, Introduction to medically important viruses.<br>2. Structure and Classification of viruses<br>3. Collection, transportation and storage of sample for viral diagnosis.<br>4. Staining techniques used in Virology                                                                                                                                                                                                                                                                                                                                                                                                                  |                                       |         | 12                             | CO1                                                 |
| Unit 2                                                                                                    | 1. Processing of samples for viral culture (Egg inoculation and tissue culture).<br>2. Modes of viral transmission: Persistent, non-persistent, vertical and horizontal<br>3. Viral multiplication and replication strategies:<br>4. Interaction of viruses with cellular receptors and entry of viruses. Assembly, maturation and release of virions.                                                                                                                                                                                                                                                                                                                  |                                       |         | 12                             | CO2                                                 |
| Unit 3                                                                                                    | 1. Poxviruses, Herpesviruses, hepaptitis viruses, retroviruses-HIV, Picornaviruses, rhabdoviruses<br>2. Orthomyxoviruses and paramyxoviruses,TORCH profile, Symptoms,mode of transmission, prophylaxis and control of Polio, Herpes, Hepatitis, Rabies, Dengue, HIV<br>3. Influenza with brief description of swine flu, Ebola, Chikungunya, Japanese Encephalitis.<br>4. Introduction to oncogenic viruses, Types of oncogenic DNA and RNA viruses, concepts of oncogenes and proto-oncogenes<br>5. Prevention & control of viral diseases, antiviral compounds and their mode of action, interferon and their mode of action, General principles of viral vaccination |                                       |         | 12                             | CO3                                                 |

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |    |     |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|
| <b>Unit 4</b> | 1. Introduction to Medical Mycology Basic concepts about superficial and deep Mycoses<br>2. Taxonomy and classification and general characteristics of various medically important fungi Normal fungal flora.<br>3. Techniques used for isolation and identification of medically important fungi.<br>4. Direct microscopy in Medical mycology laboratory, Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids. | 12 | CO4 |
| <b>Unit 5</b> | 1. Morphology, Diseases & lab diagnosis of: Candida, Dermatophytes, Mycetoma (Eumycetoma & Actinomycetoma), Cryptococcus, Histoplasmosis<br>2. Opportunistic Fungi, Blastomyces, coccidioidosis, Nocardia.<br>3. Methods for identification of yeasts and moulds, Dimorphism in fungi, Antifungal susceptibility tests.<br>4. Preservation of fungal cultures, Routine myco-serological tests and skin tests.                                                                               | 12 | CO5 |

#### CO-PO and PSO Mapping

| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | 3   | 3   | 3   | 3   | 2   | 3   | 1   | -   | 1    | 3    | 1    | 3    | 3    | 1    |
| CO2 | 3   | 3   | 3   | 3   | 2   | 3   | 1   | -   | 1    | 3    | 1    | 3    | 3    | 1    |
| CO3 | 3   | 3   | 3   | 3   | 2   | 3   | 1   | -   | 1    | 3    | 1    | 3    | 3    | 1    |
| CO4 | 3   | 3   | 3   | 3   | 2   | 3   | 1   | -   | 1    | 3    | 1    | 3    | 3    | 1    |
| CO5 | 3   | 3   | 3   | 3   | 2   | 3   | 1   | -   | 1    | 3    | 1    | 3    | 3    | 1    |

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

#### Suggested Readings:

|                                     |                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text- Books/ Reference Books</b> | 1. Text book of Microbiology by Ananthanarayanan<br>2. Medical laboratory Technology Vol. I, II, III by Mukherjee<br>3. Medical Laboratory manual for tropical countries Vol. II Microbiology by Monica Cheesbrough<br>4. Microbiology For Medical Sciences by Bhagat Singh and Renu Singh<br>5. Medical Mycology by Dr. Jagdish Chander<br>6. Medical Microbiology by Panikar & Satish Gupta |
| <b>Para Text</b>                    | <b>Unit 1: Introduction to Virology:</b><br><b>Unit 2: Virus Culture:</b><br><b>Unit 3: Details of Viruses:</b><br><b>Unit 4: Introduction to Mycology:</b><br><b>Unit 5: Details of Fungi:</b>                                                                                                                                                                                               |

#### 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 |
| Interaction in class /class participation | 06        |                                                                            |
| Class test                                | 4         |                                                                            |
| Assignment/ Presentation/ project         | 4         | Hard copy/Softcopy                                                         |
| Attendance                                | 4         |                                                                            |
| <b>Total Marks</b>                        | <b>30</b> |                                                                            |

## Department of Medical laboratory technique

### Course Outline Effective From: 2023-24

|                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                |                                  |                                                |
|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------------------------|----------------------------------|------------------------------------------------|
| Name of the Program                                                                                       | Bachelors of Science in Medical Laboratory techniques                                                                                                                                                                                                                                                                                                                   |                                       |                                | Year/ Semester:                  | 4 <sup>th</sup> year/ 7 <sup>th</sup> semester |
| CourseName                                                                                                | Research Methodology and Biostatistics                                                                                                                                                                                                                                                                                                                                  | CourseCode:                           | BLT-704                        | Type:                            | THEORY                                         |
| Credits                                                                                                   | L:3 T:1 P:0                                                                                                                                                                                                                                                                                                                                                             |                                       |                                | Total Sessions Hours:            | 40                                             |
| EvaluationSpread                                                                                          | Internal Continuous Assessment:                                                                                                                                                                                                                                                                                                                                         | 30                                    |                                | End Term Exam:                   | 70                                             |
| Type ofCourse                                                                                             | <input type="radio"/> Compulsory                                                                                                                                                                                                                                                                                                                                        | <input checked="" type="radio"/> Core | <input type="radio"/> Creative | <input type="radio"/> Life Skill |                                                |
| Course Objectives                                                                                         | The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings. The students will also be made aware of the need of biostatistics and understanding of data, sampling methods, in addition to being given information about the relation between data and variables |                                       |                                |                                  |                                                |
| Course Outcomes (CO): After the successful course completion, learners will develop following attributes: |                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                |                                  |                                                |
| Course Outcome(CO)                                                                                        | Students will realize the significance of Research Methodology and statistics for their career progression. Students will be able to formulate the statistical analysis and Data processing by different methods.                                                                                                                                                       |                                       |                                |                                  |                                                |
| CO1                                                                                                       | Students will be able to learn about the research methodology and basic concepts of Biostatistics                                                                                                                                                                                                                                                                       |                                       |                                |                                  |                                                |
| CO2                                                                                                       | Students will be able to learn about the tools and techniques used in the sampling and collection of different types of data and their sampling                                                                                                                                                                                                                         |                                       |                                |                                  |                                                |
| CO3                                                                                                       | Students will be able to learn about the Biostatistics, its use and the relationship between data and variables                                                                                                                                                                                                                                                         |                                       |                                |                                  |                                                |
| CO4                                                                                                       | Students will be able to learn about the Data processing and its interpretation by calculating standard deviation, standard errors, coefficient of variation and chi-square test                                                                                                                                                                                        |                                       |                                |                                  |                                                |
| CO5                                                                                                       | Students will be able to learn about constructing and summarizing data and to evaluate the statistical analysis                                                                                                                                                                                                                                                         |                                       |                                |                                  |                                                |
| Pedagogy                                                                                                  | Seminar, PPT, White board, e-Lecture, Classroom teaching                                                                                                                                                                                                                                                                                                                |                                       |                                |                                  |                                                |
| Internal Evaluation Mode                                                                                  | Continuous internal assessment and written examination                                                                                                                                                                                                                                                                                                                  |                                       |                                |                                  |                                                |
| SessionDetails                                                                                            | Topic                                                                                                                                                                                                                                                                                                                                                                   |                                       |                                | Hours                            | Mapped CO                                      |
| Unit 1                                                                                                    | 1. Research Methodology: Introduction to research methods<br>2. Identifying research problem.<br>3. Ethical issues in research- Research design<br>4. Basic Concepts of Biostatistics.                                                                                                                                                                                  |                                       |                                | 08                               | CO1                                            |
| Unit 2                                                                                                    | 1. Types of Data<br>2. Research tools and Data collection methods<br>3. Sampling methods<br>4. Developing a research proposal                                                                                                                                                                                                                                           |                                       |                                | 08                               | CO2                                            |

|               |                                                                                                                                                                                                                                                                                                     |    |     |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|
| <b>Unit 3</b> | 1. Biostatistics: Need of biostatistics, what is biostatistics: beyond definition<br>2. Understanding of data in biostatistics<br>3. How & where to get relevant data, Relation between data & variables.<br>4. Type of variables: defining data set, Collection of relevant data: sampling methods | 08 | CO3 |
| <b>Unit 4</b> | 1. Normal Distribution<br>2. Standard deviation, Standard errors.<br>3. Coefficient of Variation<br>4. t-test, Chi square test.                                                                                                                                                                     | 08 | CO4 |
| <b>UNIT 5</b> | 1. Construction of study: population, sample, normality and its beyond (not design of study, perhaps)<br>2. Summarizing data on the pretext of underlined study.<br>3. Understanding of statistical analysis (not methods)                                                                          | 08 | CO5 |

#### 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   | 1   | 1   | 3   | -   | 3   | 3     | 3     | 3    | 3     | 2     | 3    |
| CO2 | 3   | 3   | 2   | 1   | 1   | 3   | -   | 3   | 3     | 3     | -    | 3     | 3     | 3    |
| CO3 | 3   | 3   | 3   | 1   | 1   | 3   | -   | 3   | 3     | 3     | -    | 3     | 3     | 3    |
| CO4 | 3   | 3   | 3   | 1   | 1   | 3   | -   | 3   | 3     | 3     | -    | 3     | 3     | 3    |
| CO5 | 3   | 3   | 3   | 1   | 1   | 3   | -   | 3   | 3     | 3     | -    | 3     | 3     | 3    |

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

#### Suggested Readings:

|                                        |                                                                                                                                                                                                           |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text- Books/<br/>ReferenceBooks</b> | 1. Methods in biostatistics for medical students by B.K.Mahajan<br>2. RPG Biostatistics by HimanshuTyagi<br>3. Statistical Methods by S.P. Gupta                                                          |
| <b>Para Text</b>                       | <b>Unit 1: Introduction</b><br><b>Unit 2: Data collection methods</b><br><b>Unit 3: Biostatistics: DATA distribution</b><br><b>Unit4: Methods in Biostatistics</b><br><b>Unit 5: Statistical analysis</b> |

#### 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 |
| Interaction in class /class participation | 06        |                                                                            |
| Class test                                | 4         |                                                                            |
| Assignment/ Presentation/ project         | 4         | Hard copy/Softcopy                                                         |
| Attendance                                | 4         |                                                                            |
| <b>Total Marks</b>                        | <b>30</b> |                                                                            |

## Department of Medical laboratory technique

### Course Outline Effective From: 2023-24

|                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |         |                                |                                               |
|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------|--------------------------------|-----------------------------------------------|
| Name of the Program                                                                                       | Bachelors of Science in Medical Laboratory techniques                                                                                                                                                                                                                                                                                                                                                   |                                       |         | Year/ Semester:                | 4 <sup>th</sup> year/7 <sup>th</sup> semester |
| CourseName                                                                                                | Principles of Laboratory Management                                                                                                                                                                                                                                                                                                                                                                     | CourseCode:                           | BLT-705 | Type:                          | Theory                                        |
| Credits                                                                                                   | L:3 T:1 P: 0                                                                                                                                                                                                                                                                                                                                                                                            |                                       |         | Total Sessions Hours:          | 48                                            |
| EvaluationSpread                                                                                          | Internal Continuous Assessment:                                                                                                                                                                                                                                                                                                                                                                         | 30                                    |         | End Term Exam:                 | 70                                            |
| Type ofCourse                                                                                             | <input type="radio"/> Compulsory                                                                                                                                                                                                                                                                                                                                                                        | <input checked="" type="radio"/> Core |         | <input type="radio"/> Creative | <input type="radio"/> Life Skill              |
| Course Objectives                                                                                         | The objective of this module is to help the students will be made aware of the basic ethics, good lab practices including awareness/ safety in a clinical lab & aware various Accrediting body.                                                                                                                                                                                                         |                                       |         |                                |                                               |
| Course Outcomes (CO): After the successful course completion, learners will develop following attributes: |                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |         |                                |                                               |
| Course Outcome (CO)                                                                                       | Students would be competent enough to understand sample accountability, quality management system, biomedical waste management, calibration and validation of clinical laboratory instruments, Laboratory Information system (LIS}, Hospital Information system (HIS) and financial management.                                                                                                         |                                       |         |                                |                                               |
| CO1                                                                                                       | Students will be able to lean about the Laboratory ethics, Good Laboratory Practices and Accreditation in a clinical laboratory                                                                                                                                                                                                                                                                         |                                       |         |                                |                                               |
| CO2                                                                                                       | Students will be able to lean about sample management and pre-and post-exposure guideline for HIV & Hep B, C                                                                                                                                                                                                                                                                                            |                                       |         |                                |                                               |
| CO3                                                                                                       | Students will be able to lean about clinical sample analysis factors and release of examination results                                                                                                                                                                                                                                                                                                 |                                       |         |                                |                                               |
| CO4                                                                                                       | Students will be able to lean about quality management principles and medical laboratory ethics                                                                                                                                                                                                                                                                                                         |                                       |         |                                |                                               |
| CO5                                                                                                       | Students will be able to lean about Audit: Introduction and importance of NABL                                                                                                                                                                                                                                                                                                                          |                                       |         |                                |                                               |
| Pedagogy                                                                                                  | Seminar, Assignment, whiteboard, PPT                                                                                                                                                                                                                                                                                                                                                                    |                                       |         |                                |                                               |
| Internal Evaluation Mode                                                                                  | Continuous internal assessment and written examination                                                                                                                                                                                                                                                                                                                                                  |                                       |         |                                |                                               |
| SessionDetails                                                                                            | Topic                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |         | Hours                          | MappedCO                                      |
| Unit 1                                                                                                    | 1. Ethical Principles and standards for a clinical laboratory professional duty to the patient, duty to colleagues and other professionals<br>2. Good Laboratory Practice {GLP), Introduction to Basics of GLP and Accreditation<br>3. Aims of GLP and Accreditation, Advantages of Accreditation<br>4. Brief knowledge about National and International Agencies for clinical laboratory accreditation |                                       |         | 10                             | CO1                                           |

|                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |     |     |       |     |     |         |       |       |      |       |       |      |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-------|-----|-----|---------|-------|-------|------|-------|-------|------|
| Unit 2                                                             | 1. Awareness/ Safety in a clinical laboratory, General safety precautions.<br>2. HIV: pre- and post-exposure guidelines, Hepatitis B & C: pre- and post-exposure guidelines;<br>3. Drug Resistant Tuberculosis Patient management for clinical samples collection, transportation and preservation.<br>4. Sample accountability, Purpose of accountability, Methods of accountability                                                                                  |     |     |     |       |     |     |         |       | 10    | CO2  |       |       |      |
| Unit 3                                                             | 1. Sample analysis: Introduction, factors affecting sample analysis.<br>2. Reporting results, basic format of a test report, reported reference range.<br>3. Clinical alerts, abnormal results, results from referral laboratories.<br>4. Release of examination results, alteration in reports                                                                                                                                                                        |     |     |     |       |     |     |         |       | 10    | CO3  |       |       |      |
| Unit 4                                                             | 1. Quality Management system: Introduction, Quality assurance, Quality control system.<br>2. Internal and External quality control, quality control chart and importance of calibration and Validation of Clinical Laboratory instrument.<br>3. Ethics in Medical laboratory Practice, Ethics in relation to PreExamination procedures, Examination procedures, reporting of results, preserving medical records<br>4. Procurement of equipment and Inventory Control. |     |     |     |       |     |     |         |       | 10    | CO4  |       |       |      |
| Unit 5                                                             | 1. Audit in a Medical Laboratory.<br>2. Introduction and Importance, NABL & CAP.<br>3. Responsibility, Planning, Horizontal, Vertical and Test audit.<br>4. Frequency of audit, Documentation                                                                                                                                                                                                                                                                          |     |     |     |       |     |     |         |       | 08    | CO5  |       |       |      |
| 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   | 1   | 1       | 3     | 3     | 1    | 3     | 2     | 3    |
| CO2                                                                | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 3   | 3   | 3   | 3     | 3   | 1   | 1       | 3     | 3     | 1    | 3     | 2     | 3    |
| CO3                                                                | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 3   | 3   | 3   | 3     | 3   | 1   | 1       | 3     | 3     | 1    | 3     | 2     | 3    |
| CO4                                                                | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 3   | 3   | 3   | 3     | 3   | 1   | 1       | 3     | 3     | 1    | 3     | 2     | 3    |
| CO5                                                                | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 3   | 3   | 3   | 3     | 3   | 1   | 1       | 3     | 3     | 1    | 3     | 2     | 3    |
| Strong contribution-3, Average contribution-2, Low contribution-1, |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |     |     |       |     |     |         |       |       |      |       |       |      |
| Suggested Readings:                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |     |     |       |     |     |         |       |       |      |       |       |      |
| Text- Books                                                        | 1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, ElsevierPublications<br>2. Bishop(2013},Clinical Chemistry,7th edition, WileyPublications<br>3. Henry's Clinical Diagnosis and Management by LaboratoryMethods,(2011),22ndedition, Elsevier                                                                                                                                                                                                            |     |     |     |       |     |     |         |       |       |      |       |       |      |
| Para Text                                                          | Unit 1: Introduction<br>Unit 2: Patient safety and sample management<br>Unit 3: Sample analysis and reporting<br>Unit4: Laboratory quality management<br>Unit 5: Laboratory Audit                                                                                                                                                                                                                                                                                      |     |     |     |       |     |     |         |       |       |      |       |       |      |
| 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 |
| Interaction in class /class participation | 06        | MCQ: 4<br>Short Answer Type Questions: 02<br>Long Answer Type Question: 01 |
| Class test                                | 4         |                                                                            |
| Assignment/ Presentation/ project         | 4         | Hard copy/Softcopy                                                         |
| Attendance                                | 4         |                                                                            |
| <b>Total Marks</b>                        | <b>30</b> |                                                                            |

|                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       |         |                                |                                           |     |     |     |       |       |      |       |       |       |
|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------|--------------------------------|-------------------------------------------|-----|-----|-----|-------|-------|------|-------|-------|-------|
| Name of theProgram                                                                                        | Bachelors of Science in Medical Laboratory techniques                                                                                                                                                                                                                                                                                                                                                                                                                              |                                       |         | Year/ Semester:                | 4 <sup>th</sup> year/ 7 <sup>th</sup> sem |     |     |     |       |       |      |       |       |       |
| CourseName                                                                                                | Immunopathology & Molecular Biology-                                                                                                                                                                                                                                                                                                                                                                                                                                               | Course Code:                          | BLP-701 | Type:                          | Practical                                 |     |     |     |       |       |      |       |       |       |
| Credits                                                                                                   | L-0,P-0,P-4                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                       |         | Total Sessions Hours:          | 30                                        |     |     |     |       |       |      |       |       |       |
| EvaluationSpread                                                                                          | Internal Continuous Assessment:                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 30                                    |         | End Term Exam:                 | 70                                        |     |     |     |       |       |      |       |       |       |
| Type ofCourse                                                                                             | <input type="radio"/> Compulsory                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <input checked="" type="radio"/> Core |         | <input type="radio"/> Creative | <input type="radio"/> Life Skill          |     |     |     |       |       |      |       |       |       |
| Course Outcomes (CO): After the successful course completion, learners will develop following attributes: |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       |         |                                |                                           |     |     |     |       |       |      |       |       |       |
| CO1                                                                                                       | Student will be able to learn about techniques used in the immunopathology laboratory to isolate PBMC, T&B Cell separation, ANA, ANCA, Agglutination Reactions                                                                                                                                                                                                                                                                                                                     |                                       |         |                                |                                           |     |     |     |       |       |      |       |       |       |
| CO2                                                                                                       | Student will be able to learn about Molecular biology techniques used in diagnostic laboratory                                                                                                                                                                                                                                                                                                                                                                                     |                                       |         |                                |                                           |     |     |     |       |       |      |       |       |       |
| Pedagogy                                                                                                  | White Board, Computer Lab, Projector etc.                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                       |         |                                |                                           |     |     |     |       |       |      |       |       |       |
| Internal EvaluationMode                                                                                   | Online as well as Offline Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                       |         |                                |                                           |     |     |     |       |       |      |       |       |       |
| SessionDetails                                                                                            | Topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                       |         |                                | MappedCO                                  |     |     |     |       |       |      |       |       |       |
| Unit 1                                                                                                    | Peripheral blood mononuclear cell (PBMC) isolation by gradient centrifugation<br>T and B cell separation<br>immunofluorescence<br>Anti- Nuclear Antibody (ANA)<br>Anti- Neutrophil Cytoplasmic Antibody (ANCA)<br>AIDS Immunology and Pathogenesis (AIP)<br>Thyroid Microsomal antigen (TMA)- Agglutination reactions<                                                                                                                                                             |                                       |         |                                | CO1                                       |     |     |     |       |       |      |       |       |       |
| Unit 2                                                                                                    | Electrophoresis<br>Gel diffusion<br>Nephelometry<br>HLA<br>Typing Serology & Cross match<br>Molecular Typing<br>Nitro blue Tetrazolium Chloride Test (NBT)<br>FACS for CD4 and CD8<br>ELISA for lab. diagnosis of AIDS<br>Polymerase Chain Reaction and its advanced versions<br>Gel electrophoresis<br>Western blotting<br>Isolation of DNA and RNA<br>Estimation of DNA and RNA<br>Determination of molecular weight and quantification of DNA using agarose gel electrophoresis |                                       |         |                                | CO2                                       |     |     |     |       |       |      |       |       |       |
| 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     |
| CO2                                                                                                       | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3                                     | 3       | 3                              | 3                                         | 3   | -   | -   | 3     | 3     | -    | 3     | 3     | 3     |

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

**Suggested Readings:**

|                    |                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text- Books</b> | 1. Watson Molecular Biology of Gene<br>2. Advanced Molecular Biology by R Twyman<br>3. Basic & Clinical Immunology by P. Daniel Fudenberg. H. Hugh and Stites |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                  |                                                                                |
|------------------|--------------------------------------------------------------------------------|
| <b>Para Text</b> | <b>Unit 1: Immunotechniques</b><br><b>Unit 2: Molecular Biology Techniques</b> |
|------------------|--------------------------------------------------------------------------------|

**Recapitulation & Examination Pattern**

**Internal Continuous Assessment:**

| Component                   | Marks     | Pattern                                                                     |
|-----------------------------|-----------|-----------------------------------------------------------------------------|
| Mid Semester                | 12        | Exercise :0 4<br>Spotting: 04<br>File: 02<br>Viva: 01                       |
| 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         |                                                                             |
| <b>Total Marks</b>          | <b>30</b> |                                                                             |

## Department of Medical Laboratory Techniques

### Course Outline Effective From: 2023-24

|                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |                                |                       |                                           |
|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------------------------|-----------------------|-------------------------------------------|
| Name of the Program                                                                                       | Bachelors of Science in Medical Laboratory techniques                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       |                                | Year/ Semester:       | 4 <sup>th</sup> year/ 7 <sup>th</sup> sem |
| Course Name                                                                                               | Blood Banking & Genetics-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Course Code:                          | BLP-702                        | Type:                 | Practical                                 |
| Credits                                                                                                   | L:0 T:0 P:1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                       |                                | Total Sessions Hours: | 60                                        |
| Evaluation Spread                                                                                         | Internal Continuous Assessment:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 30                                    |                                | End Term Exam:        | 70                                        |
| Type of Course                                                                                            | <input type="radio"/> Compulsory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <input checked="" type="radio"/> Core | <input type="radio"/> Creative |                       | <input type="radio"/> Life Skill          |
| Course Outcomes (CO): After the successful course completion, learners will develop following attributes: |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |                                |                       |                                           |
| CO1                                                                                                       | To learn about the preparation of reagents, collection and preservation of blood, blood screening, cross matching, and fraction of blood preparation in a blood banking laboratory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                |                       |                                           |
| Pedagogy                                                                                                  | Hands-on/demonstration                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                       |                                |                       |                                           |
| Internal Evaluation Mode                                                                                  | Online as well as Offline Mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |                                |                       |                                           |
| Session Details                                                                                           | Topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       |                                |                       | MappedCO                                  |
| Unit 1                                                                                                    | <ul style="list-style-type: none"><li>To prepare Acid Citrate Dextrose (ACD) and Citrate Phosphate Dextrose (CPD) Solutions</li><li>Screening of blood donor: physical examination including medical history of the donor</li><li>Collection and preservation of blood for transfusion purpose</li><li>Screening of blood for Malaria, Microfilaria, HBs Ag, Syphilis and HIV</li><li>To determine the ABO &amp; Rh grouping 5.1 Direct or preliminary grouping</li><li>Indirect or proof grouping</li><br/><li>Rh grouping and determination of Du in case of Rh negative</li><li>To perform Direct and Indirect Coomb's test</li><li>To perform cross matching</li></ul> |                                       |                                |                       | CO1                                       |

- Major cross matching
- Minor cross matching
- Preparation of various fractions of blood.

#### 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    |

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

#### Suggested Readings:

|                    |                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>Text- Books</b> | 1. Practical Haematology by J.B. Dacie<br>2. Mollison's Blood Transfusion in Clinical Medicine, 12th Edition by Harvey G. Klein |
| <b>Para Text</b>   | <b>Unit 1: Blood sample collection, screening, Transfusion, Cross matching and Fractions</b>                                    |

#### Recapitulation & Examination Pattern

#### Internal Continuous Assessment:

| Component                   | Marks     | Pattern                                                                     |
|-----------------------------|-----------|-----------------------------------------------------------------------------|
| Mid Semester                | 12        | Exercise :0 4<br>Spotting: 04<br>File: 02<br>Viva: 01                       |
| 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         |                                                                             |
| <b>Total Marks</b>          | <b>30</b> |                                                                             |

## Department of Medical Laboratory Techniques

### Course Outline Effective From: 2023-24

| Name of the Program                                                                                       | Bachelors of Science in Medical Laboratory techniques                                                                                                                                                                                                     |                                       |                                | Year/ Semester:       | 4 <sup>th</sup> year/7 <sup>th</sup> semester |
|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------------------------|-----------------------|-----------------------------------------------|
| Course Name                                                                                               | Medical Virology and Mycology                                                                                                                                                                                                                             | Course Code:                          | BLP-703                        | Type:                 | Practical                                     |
| Credits                                                                                                   | L:0 T:0 P: 4                                                                                                                                                                                                                                              |                                       |                                | Total Sessions Hours: | 60                                            |
| Evaluation Spread                                                                                         | Internal Continuous Assessment:                                                                                                                                                                                                                           | 30                                    |                                | End Term Exam:        | 70                                            |
| Type of Course                                                                                            | <input type="radio"/> Compulsory                                                                                                                                                                                                                          | <input checked="" type="radio"/> Core | <input type="radio"/> Creative |                       | <input type="radio"/> Life Skill              |
| Course Outcomes (CO): After the successful course completion, learners will develop following attributes: |                                                                                                                                                                                                                                                           |                                       |                                |                       |                                               |
| CO1                                                                                                       | To learn about the preparation of culture media, stains and reagents required in a medical mycology laboratory                                                                                                                                            |                                       |                                |                       |                                               |
| CO2                                                                                                       | To learn about the identification of yeast and mould by different identification techniques                                                                                                                                                               |                                       |                                |                       |                                               |
| CO3                                                                                                       | To learn about the laboratory diagnosis of fungal infections from Skin, Nail, Hair, Body fluids and Secretions                                                                                                                                            |                                       |                                |                       |                                               |
| CO4                                                                                                       | To learn about the Virus structure and different stains used in medical virology and mycology lab.                                                                                                                                                        |                                       |                                |                       |                                               |
| Pedagogy                                                                                                  | White Board, Computer Lab, Projector etc.                                                                                                                                                                                                                 |                                       |                                |                       |                                               |
| Internal Evaluation Mode                                                                                  | Online as well as Offline Mode.                                                                                                                                                                                                                           |                                       |                                |                       |                                               |
| Session Details                                                                                           | Topic                                                                                                                                                                                                                                                     |                                       |                                |                       | MappedCO                                      |
| Unit 1                                                                                                    | To prepare culture media used routinely in mycology<br><br>To perform KOH preparation, Gram stain, Potassium Hydroxide - Calcofluor White method, India Ink preparation, Modified Kinyoun Acid Fast Stain for Nocardia, LCB preparation.                  |                                       |                                |                       | CO1                                           |
| Unit 2                                                                                                    | 1. To identify given yeast culture by performing various identification techniques studied in theory.<br>2. To identify given mould culture by performing various identification techniques studied in theory.<br>3. To demonstrate dir:norphism in fungi |                                       |                                |                       | CO2                                           |
| Unit 3                                                                                                    | To collect and process clinical samples for laboratory diagnosis of fungal infections i.e.<br><br>1. Skin<br>2. Nail<br>3. Hair<br>4. Body fluids and secretions                                                                                          |                                       |                                |                       | CO3                                           |

|  |                                                                                                                                                                                                                                                                                                                                                                                               |     |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|  | <ol style="list-style-type: none"> <li>1. To demonstrate structure of viruses and their multiplication from charts etc.</li> <li>2. To perform Giemsa stain, Seller's stain, immunofluorescent staining procedures for diagnosis of viral infections</li> <li>3. Demonstration of fertilized hen egg</li> <li>4. Demonstration of various inoculation routes in fertilized hen egg</li> </ol> | CO4 |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|

#### 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     |
| 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:

|                    |                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text- Books</b> | <ol style="list-style-type: none"> <li>1. Practical Medical Microbiology by Mackie &amp; Maccartney Volume 1 and 2</li> <li>2. Medical Laboratory manual for tropical countries Vol. II Microbiology by Monica Cheesbrough</li> </ol> |
| <b>Para Text</b>   | <b>Unit 1: Staining in Mycology</b><br><b>Unit 2: Fungus identification</b><br><b>Unit 3: Sample collection: Nail, Hair, Skin, Body Fluids</b><br><b>Unit 4: Virus staining</b>                                                       |

#### Recapitulation & Examination Pattern

#### Internal Continuous Assessment:

| Component                   | Marks     | Pattern                                                                     |
|-----------------------------|-----------|-----------------------------------------------------------------------------|
| Mid Semester                | 12        | Exercise :0 4<br>Spotting: 04<br>File: 02<br>Viva: 01                       |
| 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         |                                                                             |
| <b>Total Marks</b>          | <b>30</b> |                                                                             |