

# RKMVERI Curriculum / Syllabus for MSc MLT 3<sup>rd</sup> Sem – Molecular Pathology

**Course duration in Molecular Pathology Lab at TMCK – 6 months**

Course	Course Code	Credit
Introduction to Molecular Biology and Laboratory Techniques	MP301	2+1
PCR and its application	MP302	2+1
Molecular Diagnostics Techniques – Real-time PCR	MP303	2
Molecular Diagnostics Techniques – Sequencing	MP304	2
Basic Bio-informatics in Molecular Laboratory.	MP305	2 + 1
Infectious Disease Molecular Diagnostics.	MP306	2 + 1
Basics of Cloning and Quality Management in Molecular Laboratory	MP307	2
Total		18

## **Objective of the course:**

At the end of the MSc MLT Molecular Biology course the student should be able to:

- 1) Develop basic problem-solving ability in Diagnostic Molecular Biology field
- 2) Acquire knowledge of diagnostic tests/techniques and reagents.
- 3) May be able to contribute to the analytical decision-making process in lab
- 4) Participate in related academia and the R&D industry.

The curriculum should allow the students to develop critical thinking and problem-solving abilities.

Students should learn how to perform and interpret laboratory tests, maintain laboratory equipment, and ensure quality control in laboratories.

They also should learn how to handle various samples, such as blood, bone marrow and tissue specimens.

## **Books for reference:**

- 1) Cell and Molecular Biology – Lippincott Illustrated Reviews.
- 2) PCR The Basics – Michael Mcpherson and Simon Moller.
- 3) Practical Oncologic Molecular Pathology – Yi Ding and Linsheng Zhang.
- 4) Medical Biotechnology – Bernard Glick.
- 5) Practical Medical Microbiology – Mackie and McCartney.

## **Curriculum :**

### **MP301: Introduction to Molecular Biology and Laboratory Techniques**

Week 1: Introduction to Molecular Biology, Basics of DNA Replication and Central Dogma of Molecular Biology.

Week 2: Overview of Laboratory and Introduction to Laboratory Equipment and Basic Techniques (Pipetting, Centrifugation, etc.). Good Laboratory Practise in Molecular Laboratory.

Week 3: Principles of Nucleic Acid Isolation and Purification

Week 4: Quality check Nucleic acid extraction and Quantification of Nucleic acids. Storage of Nucleic acids

Tutorial: Presentation by student – Basics of DNA replication

Hands-on wet lab: Sample Collection, Handling, and Processing in Molecular laboratory. Nucleic acid extraction (DNA/RNA from blood/Bone marrow and FFPE tissue block).

### **MP 302: PCR and its application**

Week 1: Introduction to Polymerase Chain Reaction (PCR).

Week 2: Different applications of PCR and different Modifications of PCR

Week 3 and 4: Gel electrophoresis and Nucleic acid visualization.

Tutorial: Presentation by student - Nucleic acid extraction: Different techniques

Hands-on wet lab: Gel preparation for PCR and Observing basic PCR set-up.

### **Molecular Diagnostics Techniques - PCR.**

Week 1 and 2: Basic PCR – AS-PCR/RT-PCR

Week 3 and 4: Interpretation of Basic PCR gel electrophoresis.

Tutorial: Presentation by student – PCR and its application.

Hands-on: Setting up basic PCR.

### **MP303: Molecular Diagnostics Techniques – Real-time PCR**

Week 1: Principle of Real-time PCR

Week 2: Applications of Real-time PCRs

Week 3 and 4: Data analysis and Interpretation of Real-time PCR.

Tutorial: Presentation by student – Real-time PCR and interpretation.

Hands-on: Observing Real-time PCRs.

### **MP304: Molecular Diagnostics Techniques – Sequencing**

Week 1: Nucleic Acid Sequencing(Sanger Sequencing) and Applications

Week 2: GeneScan Fragment Analysis and Applications

Week 3 and 4: Interpretation of Sanger Sequencing and different types of mutations.

Tutorial: Presentation by student – DNA sequencing

Hands-on: Observing the Sanger Sequencing technique and interpreting the Sanger Sequence.

### **MP305: Basic Bio-informatics in Molecular Laboratory.**

Week 1 : Introduction to Bioinformatics Tools for Molecular Data Analysis

Week 2 and 3 : Sequence Alignment and Basic Bioinformatics Analysis. Primer synthesis tools

Week 4 : Overview of NGS and ddPCR

Hands-on: Interpretation of Sanger Sequencing and practical use of basic bio-informatics tool in routine analysis.

Tutorial: Presentation by student – Basic Bio-informatic tools.

### **MP306: Infectious Disease Molecular Diagnostics.**

Week 1: Nucleic Acid extraction – Viral/Fungal/Bacteria

Week 2 to 4: Different Techniques in Molecular Microbiology

Hands-on: Wet lab work in Molecular Microbiology.

### **MP307: Basics of Cloning and Quality Management in Molecular Laboratory**

Week 1: Basic principles of Cloning in Molecular laboratory.

Week 2: Different techniques for Cloning (Plasmid Preparation, Transformation)

Week 3: Quality control and assessment in Molecular Laboratory. Overview of Laboratory Safety Practises.