



M.Sc. in Clinical Virology 2 Years (4 Semesters)

Overview: The **M.Sc. in Clinical Virology** is a specialized postgraduate program that focuses on the study of viruses, their impact on human health, and the diagnostic techniques used to detect and treat viral infections. Clinical virology is essential in modern medicine as it deals with understanding, diagnosing, and managing viral diseases such as HIV/AIDS, influenza, hepatitis, dengue, and emerging infections like COVID-19. This program is designed for individuals interested in pursuing careers in clinical diagnostics, research, and public health.

The program combines advanced knowledge of molecular biology, virology, immunology, and clinical diagnostics with practical training in laboratory and clinical settings. Students will learn how to perform diagnostic tests, understand viral pathogenesis, and interpret results to contribute to patient care, as well as gain insights into emerging viral threats and their management.

Affiliated Institution: School of Medical Sciences and Technology, Malla Reddy Vishwavidyapeeth (Deemed to be University) ** The minimum eligibility for M.Sc. in Clinical Virology is a pass in B.Sc with at least 50% marks in qualifying exam.

Key Highlights:

- **Expertise in Viral Diseases:** Provides a deep understanding of the pathogenesis, epidemiology, and clinical management of viral diseases.
- **Diagnostic Techniques:** Training in modern diagnostic methods such as PCR, ELISA, viral culture, and serology to detect and monitor viral infections.
- **Emerging Infectious Diseases:** Focus on emerging viral diseases, including zoonotic infections and pandemic outbreaks like COVID-19, Ebola, and Zika virus.
- **Molecular Virology:** Study the molecular biology of viruses, including their structure, replication, genetic diversity, and the mechanisms by which they cause disease.
- **Immunology and Viral Interactions:** Gain an understanding of the host immune response to viral infections and how viruses evade immune surveillance.
- **Vaccine Development and Antiviral Therapy:** Learn about the development of antiviral drugs and vaccines, as well as strategies for preventing and controlling viral infections.
- **Public Health Virology:** Understand the role of virology in public health, including surveillance, outbreak investigation, and control strategies.

Course Curriculum:

The M.Sc. in Clinical Virology is typically a two-year program that involves a combination of theoretical coursework, laboratory training, and research projects.

Year 1:

Core Modules:



- **Introduction to Virology:** Basic principles of virology, including viral classification, structure, replication cycles, and methods used to study viruses.
- **Molecular Virology:** Study the molecular mechanisms of virus replication, gene expression, and mutation. Focus on the molecular biology of viral pathogens.
- **Diagnostic Virology:** Learn about techniques for viral detection and identification, such as PCR, sequencing, viral culture, immunofluorescence, and enzyme-linked immunosorbent assays (ELISA).
- **Pathogenesis of Viral Diseases:** Study how viruses interact with host cells, causing disease, and understand the mechanisms of viral pathogenesis.
- **Immunology in Virology:** Introduction to the immune system and its response to viral infections, including innate and adaptive immunity and viral evasion mechanisms.
- **Clinical Aspects of Virology:** Focus on the clinical manifestation, diagnosis, treatment, and management of viral infections in humans.

Practical Training:

- Laboratory-based modules for hands-on training in viral culture, PCR techniques, viral antigen detection, and serology.
- Clinical observation in healthcare settings, working with virologists and clinicians to understand the role of virology in patient care.

Year 2:

Advanced Modules:

- **Epidemiology and Surveillance of Viral Diseases:** Study the epidemiology of viral infections, including outbreak investigation, surveillance methods, and control strategies.
- **Emerging and Zoonotic Viruses:** Focus on emerging viral diseases, zoonotic infections (viruses transmitted from animals to humans), and pandemic preparedness.
- **Viral Genetics and Evolution:** Learn about the genetic variability of viruses, including mutation rates, recombination, and the evolution of new viral strains.
- **Antiviral Therapies and Vaccines:** Study the development of antiviral drugs, their mechanisms of action, and the challenges in designing antiviral therapies. Understand vaccine development and strategies for immunization against viral diseases.
- **Viral Immunology:** Explore the role of the immune system in viral infections, the concept of viral latency, and immune evasion strategies employed by viruses.
- **Public Health Virology:** Learn about the role of clinical virology in public health, including global virology surveillance, outbreak response, and virology-based health policies.

Research Project/Dissertation:

- In the second year, students will undertake an independent research project focused on a particular aspect of clinical virology. This could include research in viral diagnostics, antiviral drug discovery, viral pathogenesis, or epidemiological studies. The research project culminates in a dissertation and presentation.



Career and Academic Opportunities:

Career Opportunities:

Graduates of the M.Sc. in Clinical Virology have excellent prospects for careers in healthcare, research, pharmaceuticals, and public health. Possible career roles include:

- **Clinical Virologist:** Work in clinical laboratories, diagnosing and identifying viral infections, interpreting test results, and providing guidance for treatment.
- **Virology Researcher:** Conduct research in academic or commercial laboratories, studying the molecular biology of viruses, vaccine development, or antiviral drug discovery.
- **Epidemiologist:** Investigate viral outbreaks, track viral transmission patterns, and work with public health authorities to control the spread of infections.
- **Laboratory Manager:** Oversee the operations of a virology laboratory, ensuring the accuracy and safety of viral diagnostic testing.
- **Pharmaceutical Scientist:** Work in the pharmaceutical industry to develop antiviral drugs or vaccines and conduct preclinical and clinical trials.
- **Infectious Disease Consultant:** Provide expertise on viral diseases to healthcare providers, public health agencies, or governments, advising on prevention, treatment, and control strategies.
- **Public Health Advisor:** Work with international health organizations (such as the WHO) or national health ministries to develop strategies for the surveillance and control of viral diseases.

Academic Opportunities:

Graduates of the M.Sc. in Clinical Virology may choose to pursue further academic qualifications such as:

- **Ph.D. in Virology or Infectious Disease Research:** Specialize in areas such as viral pathogenesis, vaccine development, or emerging viruses. A Ph.D. prepares graduates for academic or research careers in virology.
- **Postdoctoral Research:** Engage in advanced research, focusing on viral pathogenesis, immunology, or antiviral drug discovery.

Research Prospects:

- **Emerging Viruses:** Investigating the biology, transmission, and pathogenesis of emerging viral threats like SARS-CoV-2, Zika virus, and Ebola.
- **Viral Evolution and Genetics:** Research into the genetic diversity of viruses, including mutation, recombination, and their impact on disease transmission and vaccine development.
- **Vaccines and Antiviral Drugs:** Developing new strategies for vaccine development and antiviral treatments for diseases like HIV, hepatitis, and influenza.
- **Viral Immunology:** Studying how the immune system responds to viral infections and the strategies viruses use to evade immune detection.



Professional Opportunities:

- **Certified Clinical Virologist:** Obtain certification in virology through professional bodies or national health authorities to enhance career prospects.
- **Infectious Disease Society Membership:** Join professional societies such as the **American Society for Microbiology (ASM)** or the **International Union of Microbiological Societies (IUMS)** for networking, conferences, and research collaboration opportunities.
- **Viral Diagnostic Specialist:** Specialize in viral diagnostics by becoming an expert in testing and interpreting viral infections using advanced technologies like PCR, sequencing, and bioinformatics.

Higher Education and Research Prospects:

- **Ph.D. in Clinical Virology:** Graduates can pursue doctoral studies to further specialize in viral genetics, viral-host interactions, or infectious disease epidemiology.
- **Postdoctoral Research:** After completing the M.Sc., individuals may engage in postdoctoral research focused on specialized areas of virology, such as the development of new diagnostic techniques or treatments for viral diseases.
- **Medical Degree (MD):** Some graduates may pursue a medical degree to become practicing virologists in clinical settings or infectious disease specialists.

Conclusion:

The **M.Sc. in Clinical Virology** is a specialized and rewarding program that offers in-depth knowledge of viruses, their clinical management, and diagnostic techniques. With a strong focus on both theoretical and practical aspects of clinical virology, this program prepares graduates for careers in healthcare, research, public health, and the pharmaceutical industry.

Graduates are equipped to contribute to global health efforts by investigating viral outbreaks, developing antiviral therapies, and improving diagnostic technologies. The M.Sc. in Clinical Virology offers excellent opportunities for those passionate about virology, infectious diseases, and public health, with avenues for advanced research, professional development, and impactful careers in virology-related fields.

Labs

1. Virus Isolation & Cell Culture Lab

- **Biosafety Requirements:**
 - ✓ Biosafety Level 2 (BSL-2) or BSL-3 facility (depending on virus type)
 - ✓ Class II & III biosafety cabinets for virus handling
 - ✓ HEPA-filtered air ventilation and negative pressure rooms
- **Cell Culture Facilities:**
 - ✓ CO₂ incubators for viral propagation



- ✓ Laminar flow hoods for aseptic techniques
- ✓ Inverted phase-contrast microscopes
- ✓ Cryopreservation storage (liquid nitrogen tanks)

➤ **Virus Propagation & Titration:**

- ✓ Plaque assay, TCID₅₀ assay for viral quantification
- ✓ Cytopathic effect (CPE) monitoring systems
- ✓ Cell lines (Vero, HEK293, MDCK, BHK-21) for viral culture

2. Molecular Virology Lab

➤ **Viral Genome Detection:**

- ✓ PCR, RT-PCR, and qPCR for viral nucleic acid detection
- ✓ Digital droplet PCR (ddPCR) for viral load estimation
- ✓ Gel electrophoresis for DNA/RNA analysis

➤ **Genetic Sequencing & Bioinformatics:**

- ✓ Next-generation sequencing (NGS) platforms
- ✓ Bioinformatics software for phylogenetic analysis
- ✓ Viral genome editing tools (CRISPR-based)

3. Serology & Immunology Lab

➤ **Antibody & Antigen Testing:**

- ✓ ELISA readers and kits for IgM/IgG detection
- ✓ Immunofluorescence assay (IFA) for viral antigen detection
- ✓ Western blotting for protein analysis

➤ **Neutralization & Cytokine Studies:**

- ✓ Virus neutralization assays
- ✓ Multiplex cytokine analyzers (Luminex)

4. Clinical & Diagnostic Virology Lab

➤ **Point-of-Care Diagnostics:**

- ✓ Rapid antigen and molecular test kits
- ✓ Biosensors for real-time viral detection

➤ **Automated Analyzers:**

- ✓ Chemiluminescence immunoassay (CLIA) systems
- ✓ Microarray platforms for viral panels

5. Antiviral Research & Drug Testing Lab



➤ **Antiviral Susceptibility Testing:**

- ✓ High-content screening (HCS) systems
- ✓ Fluorescent/luminescent assays for drug efficacy

➤ **Viral Pathogenesis Models:**

- ✓ Animal models (if applicable)
- ✓ Organoid cultures for viral-host interactions

6. Epidemiology & Surveillance Lab

➤ **Virus Tracking & Surveillance:**

- ✓ GIS mapping for outbreak tracking
- ✓ Statistical software (SPSS, R, EpiInfo)

➤ **Environmental & Zoonotic Virus Studies:**

- ✓ Water and air sampling for viral contamination
- ✓ Vector monitoring for arboviruses

PROGRAM OUTCOMES (POs)

PO	Program Outcomes
PO-1	Fundamentals of Virology- Understand the classification, structure, replication, and pathogenesis of viruses affecting humans.
PO-2	Viral Diagnostics & Laboratory Techniques- Develop expertise in traditional and molecular diagnostic techniques, including PCR, ELISA, and viral culture.
PO-3	Epidemiology & Public Health Virology- Analyze patterns of viral infections, outbreak investigation, and strategies for prevention and control.
PO-4	Antiviral Therapies & Vaccine Development- Understand antiviral agents, resistance mechanisms, vaccine development, and immunization strategies.
PO-5	Host-Virus Interactions & Immunity- Study viral immune evasion strategies, host immune responses, and the role of immunopathology in viral diseases.
PO-6	Emerging & Re-Emerging Viral Infections- Evaluate the impact of emerging viruses (e.g., SARS-CoV-2, Ebola) and preparedness strategies for outbreaks.
PO-7	Biosafety & Infection Control in Virology- Apply biosafety protocols, biosecurity measures, and infection control practices in virology laboratories.
PO-8	Research & Scientific Communication in Virology-



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Develop skills in research methodology, scientific writing, and presentation of virology-related findings.

COURSE STRUCTURE – M.Sc Clinical Virology

SEMESTER – I

Sl. No.	Broad Category	Course Code	Name of the Subject/Practical	Contact hours/week			Credits
				L	T	P	
1.	Major (Core)	MSCV 101	Fundamentals of Virology	2	1	0	3
2.		MSCV102	Medical Virology	2	1	0	3
3.		MSCV103	Molecular Biology of Viruses	2	1	0	3
4.		MSCV104	Viral Diagnostics & Laboratory Techniques	2	0	2	3
5.	Minor Select any two minor courses, each worth 3 credits, for a maximum of 6 credits per semester	MSCV105	1. Epidemiology of Viral Infections 2. Antiviral Therapies & Drug Development	2	0	2	6
			3. Clinical Microbiology & Infectious Diseases 4. Research Methodology & Biostatistics	2	0	2	
6.	Skill Enhancement Courses	MSCV106	1. Basic Laboratory Techniques in Virology	0	0	2	2
			2. Molecular Diagnostic Techniques	0	0	2	
Total				12	3	10	20
Total Contact Hours				25			



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Course outcome for the major course of Clinical Virology

Course Name	Course Outcomes
Fundamentals of Virology	<ul style="list-style-type: none">- Understand the basic principles of virology, including viral structure, classification, and replication.- Explain the mechanisms of virus-host interactions and viral pathogenesis. - Describe different modes of viral transmission and factors influencing viral spread.- Analyze host immune responses to viral infections.- Evaluate emerging viruses and their impact on public health.
Medical Virology	<ul style="list-style-type: none">- Identify clinically significant viruses and their associated diseases.- Explain the pathophysiology, clinical presentation, and epidemiology of viral infections.- Discuss available antiviral therapies, vaccines, and preventive strategies. - Analyze the impact of viral infections on immunocompromised individuals.- Evaluate public health measures for controlling viral outbreaks and pandemics.
Molecular Biology of Viruses	<ul style="list-style-type: none">- Understand the molecular mechanisms of viral replication, gene expression, and assembly.- Explain the role of viral oncogenes and their contribution to cancer development.- Analyze the interaction between viral and host cell factors in disease progression.- Evaluate molecular diagnostic techniques used for detecting viral infections.- Explore advancements in antiviral drug development and targeted therapies.
Viral Diagnostics & Laboratory Techniques	<ul style="list-style-type: none">- Understand the principles and applications of serological, molecular, and culture-based diagnostic methods.- Perform and interpret results of PCR, ELISA, and other laboratory techniques for virus detection.- Explain biosafety and quality control measures in virology laboratories.- Evaluate emerging diagnostic technologies and point-of-care testing for viral infections.- Analyze case studies of viral outbreaks and their diagnostic challenges.

Course outcome for the minor course of Clinical Virology

Course Name	Course Outcomes
Epidemiology of Viral Infections	<ul style="list-style-type: none">- Understand the principles of viral epidemiology and patterns of disease transmission.- Analyze risk factors influencing the spread and emergence of viral infections.- Evaluate surveillance systems and outbreak investigation strategies.- Interpret epidemiological data to guide public health policies and preventive measures.- Assess the impact of global pandemics and zoonotic viral infections on healthcare systems.



Course Name	Course Outcomes
Antiviral Therapies & Drug Development	<ul style="list-style-type: none">- Understand the mechanisms of action of antiviral drugs and resistance development.- Analyze current antiviral therapies for major viral infections (e.g., HIV, Hepatitis, Influenza).- Evaluate the drug discovery and development process, including preclinical and clinical trials.- Discuss the role of vaccines and monoclonal antibodies in viral disease prevention.- Assess emerging therapeutic approaches, including gene editing and immunomodulators.
Clinical Microbiology & Infectious Diseases	<ul style="list-style-type: none">- Understand the role of clinical microbiology in diagnosing and managing infectious diseases.- Explain laboratory techniques for identifying viral, bacterial, fungal, and parasitic infections.- Analyze host-pathogen interactions and immune responses to infections.- Evaluate antimicrobial stewardship programs and infection control measures in healthcare settings.- Discuss the challenges in diagnosing co-infections and emerging infectious diseases.
Research Methodology & Biostatistics	<ul style="list-style-type: none">- Understand the fundamentals of research design, hypothesis formulation, and study methodology.- Apply statistical techniques for analyzing virology and infectious disease research data.- Interpret clinical trial data, epidemiological studies, and public health research findings.- Use biostatistical software for data management and analysis.- Develop skills for critically evaluating scientific literature and conducting evidence-based research.

M.Sc. in Clinical Virology – Course Structure & Syllabus

Course Duration: 2 Years (4 Semesters)

Total Credits: 80–100

Total Teaching & Training Hours: ~3,600

Total Teaching Hours Distribution

- **Theory Classes:** ~1,200–1,500 hours
- **Practical & Laboratory Training:** ~800–1,000 hours
- **Clinical Internship & Hands-on Training:** ~800–1,000 hours
- **Research Project & Dissertation:** ~300–500 hours



Assessment Methods

Assessment Component	Weightage (%)	Details
Continuous Internal Assessment (CIA)	40%	Includes internal exams, assignments, presentations, case studies, and practical performance
End-Semester Examination (ESE)	60%	Divided into theory (40%) and practical (20%)
Mid-Semester Exams	20% (Part of CIA)	Two internal tests per semester
Assignments & Case Studies	5% (Part of CIA)	Research-based assignments, literature reviews, clinical case reports
Seminars & Presentations	5% (Part of CIA)	Oral/poster presentations on diabetes management
Practical Performance & Clinical Evaluation	5% (Part of CIA)	Skill-based assessments in labs/hospitals
Attendance & Participation	5% (Part of CIA)	Regularity in theory & practical sessions
Theory Examination (Final)	40% (Part of ESE)	Structured written paper covering subject knowledge
Practical Examination (Final)	20% (Part of ESE)	Includes viva, skill demonstration, case handling
Dissertation/Research Project	Mandatory	Evaluated in the final year by internal & external examiners
Clinical Internship/Training	Pass/Fail	Logbook-based evaluation with hospital mentor review

Marking System & Grading

Marks (%)	Grade	Grade Point (GPA/CGPA Equivalent)	Classification
90 - 100	O (Outstanding)	10	First Class with Distinction
80 - 89	A+ (Excellent)	9	First Class with Distinction
70 - 79	A (Very Good)	8	First Class
60 - 69	B+ (Good)	7	First Class
50 - 59	B (Satisfactory)	6	Second Class
<50 (Fail)	F (Fail)	0	Fail (Re-exam Required)



Pass Criteria:

- **Minimum 50% marks in each subject** (Theory & Practical separately).
- **Aggregate of 55% required for progression** to the next semester.
- **No more than two backlogs** allowed for promotion to the final year.

Exam Pattern for Theory & Practical

A. Theory Examination Pattern

Total Marks: 100 (Converted to 40% for End-Semester Assessment)

Duration: 3 Hours

Section	Question Type	No. of Questions	Marks per Question	Total Marks
Section A	Short Answer Type (SAQ)	10 (Attempt all)	2	20
Section B	Long Answer Type (LAQ)	5 (Attempt any 4)	10	40
Section C	Case-Based/Clinical Scenario	3 (Attempt any 2)	15	30
Section D	MCQs/Objective Type	10 (Compulsory)	1	10
Total				100

Weightage:

- General & Systemic Virology – 40%
- Clinical Diagnosis & Viral Pathogenesis – 30%
- Research & Case Studies in Virology – 20%
- Infection Control & Public Health Strategies – 10%

Passing Criteria: Minimum 50% (50/100 marks)

B. Practical Examination Pattern

Total Marks: 100 (Converted to 20% for End-Semester Assessment)

Duration: 4–6 Hours



Component	Marks Distribution
Clinical Case Presentation & Viral Disease Assessment	30
OSCE (Objective Structured Clinical Examination) – Skill Demonstration	25
Diagnostic Techniques for Viral Infections	20
Lab-Based Examination (PCR, ELISA, Viral Culture, Serological Testing)	15
Record Work (Logbook & Assignments)	10
Total	100

OSCE (Skill-based Assessment) includes stations on:

- Sample Collection & Processing for Viral Diagnosis (Blood, Swabs, CSF)
- PCR & RT-PCR for Viral Genome Detection
- ELISA & Serological Testing for Viral Antibodies
- Biosafety & Infection Control Measures in Virology Labs

Passing Criteria: Minimum 50% (50/100 marks) in practicals.

Recommended Books & E-Resources

Textbooks

- **"Fields Virology"** – David M. Knipe & Peter M. Howley
- **"Medical Virology"** – David O. White & Frank Fenner
- **"Principles of Virology"** – S. Jane Flint
- **"Molecular Virology of Human Pathogenic Viruses"** – Wang-Shick Ryu

E-Resources & Journals

- **Journal of Virology** – ASM
- **Clinical Infectious Diseases – Virology Section**
- **World Health Organization (WHO) Virology Updates**
- **Virology Research (Elsevier Journal)**

Career Opportunities after M.Sc. in Clinical Virology

- **Virologist** in Diagnostic & Research Labs
- **Epidemiologist & Public Health Specialist**
- **Vaccine Development Scientist** in Pharma & Biotech



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- **Clinical Researcher in Infectious Diseases**
- **Biosafety & Biosecurity Specialist**

