



### M.Sc. in Infectious Diseases 2 Years (4 Semesters)

**Overview:** The M.Sc. in Infectious Diseases is a specialized postgraduate program designed to provide students with in-depth knowledge of the biology of infectious agents (bacteria, viruses, fungi, and parasites), the mechanisms of infection, and the strategies used to prevent and treat infectious diseases. This program is ideal for individuals seeking careers in public health, clinical microbiology, epidemiology, research, or healthcare sectors related to infectious diseases.

The course focuses on understanding the transmission dynamics, pathogenesis, diagnosis, and treatment of infectious diseases. It covers emerging infectious diseases, antimicrobial resistance, global health issues, and vaccination strategies, among other critical topics. The program combines theoretical learning with laboratory-based training, preparing students for both clinical and research roles in healthcare settings, research institutes, and government organizations.

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

#### Key Highlights:

- **Comprehensive Study of Infectious Agents:** The program covers a range of infectious organisms, including bacteria, viruses, fungi, and parasites, and their role in causing diseases.
- **Focus on Emerging Infectious Diseases:** The program addresses the rise of new infectious diseases (e.g., COVID-19, Ebola, Zika virus) and their global impact on public health.
- **Antimicrobial Resistance (AMR):** Students learn about the challenges posed by antimicrobial resistance and explore strategies for managing and preventing AMR.
- **Clinical Microbiology and Diagnostic Techniques:** The curriculum includes laboratory-based training on diagnostic methods, such as PCR, ELISA, and culture techniques.
- **Epidemiology and Global Health:** The program offers insights into epidemiology, disease surveillance, and control strategies, especially in the context of global health.
- **Research and Evidence-Based Practice:** Students gain experience in research methodology, clinical trials, and evidence-based decision-making to address infectious disease challenges.
- **Fieldwork and Clinical Internships:** Some programs offer field placements or internships in hospitals, research centers, or public health institutions to gain hands-on experience.

#### Course Curriculum:

The M.Sc. in Infectious Diseases is generally a two-year program, consisting of coursework, practical training, and a research dissertation. Below is a typical course structure:



### Year 1:

#### Core Modules:

- **Microbiology and Immunology of Infectious Diseases:** An introduction to the microbial world, including bacteria, viruses, fungi, and parasites, and the immune system's response to infections.
- **Pathogenesis and Transmission of Infectious Diseases:** Study of the mechanisms by which pathogens cause diseases and how they are transmitted.
- **Diagnosis of Infectious Diseases:** Methods and techniques used for the detection and diagnosis of infectious diseases, including laboratory tests, imaging, and clinical evaluation.
- **Epidemiology and Global Health:** Epidemiological principles, the spread of infectious diseases, disease surveillance, and global health challenges.
- **Antimicrobial Therapy and Resistance:** Study of antimicrobial drugs, the mechanisms of resistance, and the strategies for managing antimicrobial resistance (AMR).
- **Vaccinology and Immunization Strategies:** Focus on the development, use, and challenges of vaccines in preventing infectious diseases.

#### Practical Training:

- Laboratory-based training in microbial identification and diagnostic techniques.
- Case studies and practical sessions in managing infectious diseases and outbreak control.

### Year 2:

#### Advanced Modules:

- **Emerging Infectious Diseases:** Study of new and re-emerging infectious diseases such as COVID-19, HIV/AIDS, Zika, and avian influenza.
- **Infection Control and Prevention:** Strategies for preventing the spread of infections in healthcare settings and the community.
- **Global Health and Disease Control Programs:** Public health programs and international responses to infectious diseases, including WHO guidelines and strategies for controlling pandemics.
- **Clinical Microbiology and Diagnostic Applications:** Advanced diagnostic techniques used in clinical practice to identify and treat infectious diseases.
- **Public Health and Policy Responses to Infectious Diseases:** Understanding the role of public health policies in controlling infectious diseases, including government responses and health system strengthening.
- **Outbreak Investigation and Management:** Techniques for investigating and managing outbreaks of infectious diseases, including fieldwork and epidemiological studies.

**Research Project/Dissertation:** Students complete a research project or dissertation on a topic related to infectious diseases. This project may involve laboratory research, fieldwork,



or data analysis related to infectious disease surveillance, epidemiology, or treatment strategies.

**Clinical Rotations:** Some programs may include practical rotations or placements in hospitals or public health agencies to provide hands-on experience in clinical settings.

### Career and Academic Opportunities:

#### Career Opportunities:

Graduates of the M.Sc. in Infectious Diseases can pursue a wide range of career paths across public health, clinical settings, research institutions, and international organizations. Some of the career options include:

- **Infectious Disease Specialist (Physician):** Physicians specializing in the diagnosis, treatment, and management of infectious diseases in clinical settings.
- **Epidemiologist:** Studying the patterns, causes, and effects of infectious diseases in populations, and using data to develop prevention strategies.
- **Microbiologist:** Working in research or clinical laboratories, identifying pathogens and studying their characteristics.
- **Public Health Officer:** Managing public health programs and responses to infectious disease outbreaks at national or international levels.
- **Infection Control Practitioner:** Working in healthcare settings to develop and implement infection control strategies and policies.
- **Research Scientist in Infectious Diseases:** Conducting laboratory-based or clinical research on infectious diseases, pathogen biology, and treatment strategies.
- **Global Health Consultant:** Advising governments, NGOs, or international organizations on strategies for combating infectious diseases and improving global health outcomes.
- **Antimicrobial Stewardship Specialist:** Developing and managing programs to prevent antimicrobial resistance and ensure the rational use of antibiotics.
- **Diagnostic Specialist:** Developing and implementing diagnostic tools for the detection and monitoring of infectious diseases.

#### Academic Opportunities:

After completing the M.Sc. in Infectious Diseases, students can pursue further academic studies to specialize in a specific area of the field. Some options include:

- **Ph.D. in Infectious Diseases:** Conducting advanced research on infectious diseases, including vaccine development, pathogen genetics, or new treatment methods.
- **Master of Public Health (MPH):** Focusing on public health aspects of infectious diseases, including health systems, epidemiology, and policy.
- **Postgraduate Diplomas in Specializations:** Advanced qualifications in specific areas like HIV/AIDS, tropical diseases, or infection control.

#### Research Prospects:





- **Research in Pathogenesis and Immunology:** Graduate students can pursue research to explore the molecular mechanisms behind infections and the body's immune responses.
- **Development of Vaccines and Therapeutics:** Working on the development of vaccines, antiviral drugs, or new therapeutic approaches for treating infectious diseases.
- **Epidemiological Research:** Studying the spread and control of infectious diseases, including analyzing outbreaks and assessing the effectiveness of public health interventions.
- **Antimicrobial Resistance Research:** Investigating the mechanisms behind antimicrobial resistance and exploring strategies to combat resistance in pathogens.

### Professional Opportunities:

- **Certified Infectious Disease Specialist:** Certification for physicians and healthcare providers specializing in the management of infectious diseases.
- **Certified Epidemiologist:** Certification for professionals focusing on epidemiological methods and infectious disease surveillance.
- **Clinical Microbiologist Certification:** For microbiologists working in clinical laboratories diagnosing infectious diseases.
- **Public Health Certification:** For professionals managing infectious disease prevention and control programs, particularly in global health and pandemic preparedness.

### Higher Education and Research Prospects:

- **Ph.D. in Infectious Diseases or Microbiology:** A research-oriented career focused on deepening knowledge of microbial pathogenesis, disease mechanisms, and treatment strategies.
- **Postdoctoral Research:** Graduates can pursue postdoctoral fellowships in universities or research institutions focused on infectious diseases and global health challenges.
- **Specialized Training:** Advanced courses or certifications in specific areas such as **Virology, Immunology, or Tropical Medicine.**

### Conclusion:

The **M.Sc. in Infectious Diseases** is an essential program for individuals aiming to work in the rapidly evolving field of infectious diseases. With a focus on pathogen biology, clinical management, global health issues, and antimicrobial resistance, the program provides graduates with the expertise needed to address global health challenges and contribute to the prevention, diagnosis, and treatment of infectious diseases.

Graduates can pursue diverse career opportunities in healthcare, public health, research, and policy-making, with increasing demand for specialists in the wake of emerging infectious diseases and pandemics. This program also offers excellent opportunities for further academic and research pursuits in the field, ensuring that graduates are well-prepared for a successful and impactful career.



## Labs

### 1. Microbiology Lab

- Bacterial culture and identification
- Gram staining and other staining techniques
- Antibiotic susceptibility testing (Kirby-Bauer method)
- Biochemical tests for bacterial identification
- Molecular diagnostics (PCR, RT-PCR)

### 2. Virology Lab

- Virus isolation and culture techniques
- Serological assays (ELISA, Western blot)
- Nucleic acid extraction and PCR for viral detection
- Electron microscopy for viral identification

### 3. Immunology Lab

- ELISA for antigen-antibody interactions
- Flow cytometry for immune cell analysis
- Immunofluorescence and immunoblotting
- Cytokine assays

### 4. Molecular Biology Lab

- PCR and quantitative PCR (qPCR)
- Gel electrophoresis
- DNA/RNA extraction techniques
- Next-generation sequencing (NGS) applications

### 5. Parasitology Lab

- Microscopic identification of parasites
- Staining techniques for protozoa and helminths
- Culture methods for parasites
- Serodiagnostic tests for parasitic infections

### 6. Mycology Lab

- Fungal culture and staining (KOH mount, India ink)
- Identification of pathogenic fungi
- Antifungal susceptibility testing

### 7. Epidemiology and Public Health Lab

- Outbreak investigation simulations



- Data analysis using epidemiological software (SPSS, R)
- GIS mapping for disease surveillance

### 8. Clinical Diagnostics Lab

- Blood, urine, and cerebrospinal fluid (CSF) analysis
- Hematology and serology tests
- Automated diagnostic tools for infectious diseases

## **PROGRAM OUTCOMES (POs)**

PO	Program Outcomes
PO-1	Understand pathogenesis, diagnosis, and treatment of infectious diseases.
PO-2	Apply epidemiological principles to control and prevent disease outbreaks.
PO-3	Utilize molecular diagnostics for pathogen identification and treatment planning.
PO-4	Implement antimicrobial stewardship and infection control policies.
PO-5	Conduct research on emerging and re-emerging infectious diseases.
PO-6	Contribute to public health initiatives for disease surveillance and prevention.



## School of Medical Sciences & Technology

### COURSE STRUCTURE – M.Sc. Infectious Diseases

#### SEMESTER – I

Sl. No.	Broad Category	Course Code	Name of the Subject/Practical	Contact hours/week			Credits
				L	T	P	
1.	Major (Core)	MSPPC101	Fundamentals of Microbiology & Infectious Agents	2	1	0	3
2.		MSPPC102	Basic Epidemiology of Infectious Diseases	2	1	0	3
3.		MSPPC103	Immunity and Mechanisms of Infection	2	1	0	3
4.		MSPPC104	Diagnostics & Laboratory Methods in Infectious Diseases	2	0	2	3
5.	Minor Select any two minor courses, each worth 3 credits, for a maximum of 6 credits per semester	MSPPC105	1. Antimicrobial Resistance 2. Zoonotic Diseases & Public Health 3. Impact of Climate Change on Infectious Diseases	2	0	2	6
			4. Infectious Disease Control & Outbreak Management 5. Emerging Infectious Diseases 6. Research Methodology & Biostatistics	2	0	2	
6.	Skill Enhancement Courses	MSPPC106	1. Laboratory Techniques in Microbiology	0	0	2	2
			2. Data Analysis & Bioinformatics for Infectious Disease Research	0	0	2	
Total				12	3	10	20
Total Contact Hours				25			

Course outcomes for B.Sc. Infectious Diseases MAJOR





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Course Name	Course Outcomes
<b>Fundamentals of Microbiology &amp; Infectious Agents</b>	- Understand the classification, morphology, and physiology of microorganisms (bacteria, viruses, fungi, parasites).- Explain microbial growth, reproduction, and genetic variation.- Analyze the role of microorganisms in health, disease, and environmental applications.- Evaluate microbial pathogenesis, virulence factors, and host interactions.- Apply microbiological techniques in the identification and study of infectious agents.
<b>Basic Epidemiology of Infectious Diseases</b>	- Understand the principles and scope of epidemiology in infectious disease control.- Explain disease transmission dynamics, outbreak investigation, and surveillance methods.- Analyze epidemiological study designs and their applications in public health.- Evaluate risk factors, preventive measures, and control strategies for infectious diseases.- Apply epidemiological data for decision-making in infection prevention and disease control.
<b>Immunity and Mechanisms of Infection</b>	- Understand the components and functions of the immune system (innate and adaptive immunity).- Explain the mechanisms of immune response against bacterial, viral, fungal, and parasitic infections.- Analyze immunopathology, hypersensitivity, autoimmunity, and immunodeficiency disorders.- Evaluate vaccine development, immunotherapies, and antimicrobial resistance mechanisms.- Apply immunological concepts in infection control, diagnostics, and treatment strategies.
<b>Diagnostics &amp; Laboratory Methods in Infectious Diseases</b>	- Understand the principles of laboratory diagnosis for bacterial, viral, fungal, and parasitic infections.- Explain various diagnostic techniques, including microscopy, culture methods, serology, and molecular diagnostics.- Perform laboratory assays for detecting and identifying infectious agents.- Analyze the role of biomarkers, PCR, and immunodiagnostic techniques in infectious disease detection.- Apply biosafety guidelines and quality control measures in diagnostic microbiology laboratories.

### Course outcomes for B.Sc. Infectious Diseases MINOR

Course Name	Course Outcomes
<b>Antimicrobial Resistance</b>	- Understand the mechanisms of antimicrobial resistance in bacteria, viruses, fungi, and parasites.- Explain the impact of antibiotic misuse





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Course Name	Course Outcomes
	and overuse in clinical and agricultural settings.- Analyze the genetic and biochemical basis of resistance development.- Evaluate global strategies for antimicrobial stewardship and novel therapeutic approaches.- Apply laboratory techniques for detecting antimicrobial resistance and assessing drug efficacy.
<b>Zoonotic Diseases &amp; Public Health</b>	- Understand the transmission dynamics of zoonotic diseases and their impact on human and animal health.- Explain the role of wildlife, domestic animals, and vectors in zoonotic disease outbreaks.- Analyze strategies for zoonotic disease prevention, surveillance, and control.- Evaluate public health policies and One Health approaches in combating zoonotic threats.- Apply diagnostic, epidemiological, and molecular tools to study zoonotic infections.
<b>Impact of Climate Change on Infectious Diseases</b>	- Understand the relationship between climate change and the emergence/spread of infectious diseases.- Explain how temperature, humidity, and extreme weather events influence pathogen transmission.- Analyze the impact of climate variability on vector-borne, waterborne, and foodborne infections.- Evaluate global mitigation and adaptation strategies for climate-sensitive diseases.- Apply predictive modeling and public health interventions to climate-related disease outbreaks.
<b>Infectious Disease Control &amp; Outbreak Management</b>	- Understand the principles of infectious disease prevention, control, and outbreak response.- Explain surveillance systems, contact tracing, and quarantine strategies.- Analyze case studies of past outbreaks (e.g., COVID-19, Ebola, Influenza) and lessons learned.- Evaluate the role of public health agencies, WHO, and emergency response frameworks.- Apply epidemiological and laboratory techniques to outbreak investigations and containment measures.
<b>Emerging Infectious Diseases</b>	- Understand the factors driving the emergence and re-emergence of infectious diseases.- Explain the role of globalization, urbanization, and environmental changes in disease emergence.- Analyze novel pathogens, spillover events, and their pandemic potential.- Evaluate diagnostic, therapeutic, and vaccine strategies for emerging threats.- Apply genomic and epidemiological tools for tracking and monitoring new infectious diseases.
<b>Research Methodology &amp; Biostatistics</b>	- Understand the principles of scientific research design and hypothesis formulation.- Explain data collection methods, sampling techniques, and study designs.- Analyze statistical methods used in infectious disease research and epidemiology.- Evaluate data interpretation, statistical significance, and error analysis.- Apply biostatistical software for data analysis and public health decision-making.

### M.Sc. in Infectious Diseases – Course Structure & Syllabus



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



Assessment Component	Weightage (%)	Details
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



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Section	Question Type	No. of Questions	Marks per Question	Total Marks
<b>Section D</b>	MCQs/Objective Type	10 (Compulsory)	1	10
<b>Total</b>				<b>100</b>

### Weightage:

- Microbiology & Pathogenesis of Infectious Diseases – 40%
- Clinical Diagnosis & Treatment of Infections – 30%
- Research & Case Studies in Infectious Diseases – 20%
- Public Health & Epidemiology of Infectious Diseases – 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 & Infectious Disease Assessment	30
OSCE (Objective Structured Clinical Examination) – Skill Demonstration	25
Diagnostic Techniques & Infection Control Practices	20
Lab-Based Examination (Microbial Culture, PCR, Serological Testing)	15
Record Work (Logbook & Assignments)	10
<b>Total</b>	<b>100</b>

### OSCE (Skill-based Assessment) includes stations on:

- Collection & Handling of Clinical Specimens (Blood, Sputum, Urine)
- Interpretation of Microbial Culture & Sensitivity Tests
- Infection Prevention & Control Measures (Hand Hygiene, PPE Usage)
- Rapid Diagnostic Tests for Infectious Diseases (HIV, Malaria, Tuberculosis)

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





### Recommended Books & E-Resources

#### Textbooks

- **"Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases"** – John E. Bennett, Raphael Dolin, Martin J. Blaser
- **"Sherris Medical Microbiology"** – Kenneth J. Ryan, C. George Ray
- **"Infectious Diseases: A Clinical Short Course"** – Frederick Southwick
- **"Tropical Infectious Diseases: Principles, Pathogens, and Practice"** – Richard L. Guerrant, David H. Walker

#### E-Resources & Journals

- **Lancet Infectious Diseases**
- **Journal of Clinical Microbiology (ASM)**
- **World Health Organization (WHO) Reports on Infectious Diseases**
- **Centers for Disease Control & Prevention (CDC) Resources**

#### Career Opportunities after M.Sc. in Infectious Diseases

- **Infectious Disease Specialist** in Hospitals & Clinics
- **Clinical Microbiologist** in Diagnostic Labs
- **Epidemiologist & Public Health Researcher**
- **Vaccine Research & Development Scientist**
- **Global Health Consultant**

