

# MOLECULAR AND CELLULAR BIOLOGY OF DISEASE, MS

**Degree:** Master of Science (MS)

**Field of Study:** Molecular and Cellular Biology of Disease

## Admissions

Applicants will be screened by the Pathology Department Admissions Committee. Students will be required to supply a GRE, MCAT, or USMLE score, a transcript, three letters of recommendation and an application essay that details the student's interest in the Program. Students will be interviewed on campus or via electronic media (i.e. FaceTime, Skype or Zoom). Although there are no set requirements, successful applicants would be expected to have an MCAT >500, GRE verbal and quantitative >150, and an undergraduate GPA around 3.0. Applications are accepted on a rolling basis for matriculation during any academic term.

## Tuition

Financial aid will not be provided by the Department. Students may apply for financial aid through the federal government.

## Graduate Policies

For graduate policies and procedures, please review the School of Graduate Studies section of the General Bulletin.

## Program Requirements

The Master of Science program in Molecular and Cellular Biology of Disease is intended for students with a background in the biological sciences who are interested in pursuing advanced coursework in the basis of disease. The core curriculum and electives include many topics of medical relevance, including cell and molecular biology, disease pathogenesis, cancer biology, immunology, infectious disease, and neurodegeneration. This coursework is useful for those building credentials for a doctoral degree program (e.g., MD, DO, or PhD) or opportunities in teaching, biotechnology, pharmaceuticals, healthcare, or government. The department offers a non-thesis option (MS-B) and a thesis option (MS-A). To receive either MS degree, students must earn a minimum of 30 credit hours and maintain a GPA of 3.0 or better.

### MS in Molecular and Cellular Biology of Disease (Plan B)

The non-thesis option (MS-B) is 30 credit hours. Degree requirements include core courses in molecular and cellular biology (PATH 475 or IBMS 453/IBMS 455), disease pathogenesis PATH 510, one concentration elective from related disciplines, and a Capstone project in the form of a review paper. In the final two semesters, students register for PATH 630 and PATH 640. The course of study is determined by the student and their academic advisor, and flexible electives allow students to focus on areas of scientific interest.

The MS-B curriculum allows for flexible scheduling. The typical time to degree for full-time students is three semesters, but an accelerated course of study may be completed in 12 months, and part-time study may be completed in two years.

Code	Title	Credit Hours
IBMS 453 & IBMS 455 or PATH 475	Cell Biology I and Molecular Biology I Cell and Molecular Biology: Foundations of Disease	3-6
PATH 510	Basic Pathologic Mechanisms	4
PATH 630	Capstone Project I: Molecular and Cellular Pathology	1
PATH 640	Capstone Project II: Molecular and Cellular Pathology	2
Electives		17-20
<b>Total Credit Hours</b>		<b>30</b>

### MS in Molecular and Cellular Biology of Disease (Plan A)

A **part-time** Master's program with the thesis option (MS-A) is available only to laboratory staff employed by Case Western Reserve University. Students in this program must be full-time university employees and must have the agreement of their supervisor to begin studies part-time. Tuition may be covered as an employee fringe benefit (up to 6 credit hours per semester for Fall and Spring, and 3 credit hours for Summer) as limited by the fringe benefit regulations. The time to degree is two years.

The thesis option (MS-A) is 30 credit hours. Degree requirements include core courses in molecular and cellular biology (PATH 475 or IBMS 453/IBMS 455), PATH 510, and participation in a seminar course (PATH 511 and/or PATH 512) for at least one semester.

Plan A requires a minimum of 30 total coursework credit hours. In addition to the required core courses, the student must take a minimum of 6 credit hours of PATH 651 Thesis, which involves research in the laboratory of the supervisor (who serves as the MS Thesis Mentor) and thesis preparation. The student must register for at least one credit of PATH 651 every semester until graduation. An MS thesis must be prepared based on the research, and the student must pass an oral MS Degree Examination in which the thesis is defended.

A formal application for this program must be submitted to the graduate school. Prior to submission of this application, the employee, the supervisor, and the Director of the Pathology Graduate Program must meet to review and facilitate the student's application for admission.

Code	Title	Credit Hours
IBMS 453 & IBMS 455 or PATH 475	Cell Biology I and Molecular Biology I Cell and Molecular Biology: Foundations of Disease	3-6
PATH 510	Basic Pathologic Mechanisms	4
PATH 511 or PATH 512	Experimental Pathology Seminar I Experimental Pathology Seminar II	1
PATH 651	Thesis M.S.	6
Electives		13-16
<b>Total Credit Hours</b>		<b>30</b>

### Examples of Electives:

Code	Title	Credit Hours
PATH 410	Aging and the Nervous System	1
PATH 416	Fundamental Immunology	4
PATH 422	Current Topics in Cancer	3

PATH 444	Neurodegenerative Diseases: Pathological, Cell. & Molecular Perspectives	3
PATH 465	Advanced Immunobiology	4
PATH 467	Advanced Immunobiology II	4
PATH 481	Immunology of Infectious Diseases	3
PATH 512	Experimental Pathology Seminar II	1
PATH 513	Immunology Journal Club	1
PATH 520	The Cellular and Molecular Hallmarks of Cancer	3
PATH 523	Histopathology of Organ Systems	3
PATH 525	Neurodegenerative Diseases of the Brain and the Eye: Molecular Basis of the Brain-Eye Connection	3
PATH 555	Advanced Topics in Neurodegeneration Research	3
ANAT 401	Multimodal Human Anatomy	4
ANAT 410	Cadaver Dissection-based Human Anatomy with Histology and Physiologic Correlations	6
ANAT 412	Histology and Ultrastructure	4
BIOC 407	Introduction to Biochemistry: From Molecules To Medical Science	4
BIOC 450	Molecular Basis of Cancer	3
BIOC 501	Biochemical and Cellular Techniques for Biotechnology	3
IBMS 456A	Since You Were Born: Nobel Prize Biomedical Research in the Last 21 Years- Section A	1
INTH 484	Global Health Epidemiology	1 - 3
MGRD 410	Introduction to Clinical Inquiry (IQ)	3
NEUR 402	Principles of Neural Science	3
PHRM 409	Principles of Pharmacology	3
RGME 535	Foundations in Regenerative Medicine	3

## Dual Degree Options

- Molecular and Cellular Biology of Disease, MS/Medicine, MD