

MS IN MEDICINAL CHEMISTRY

Satisfactory completion of a bachelor's degree in chemistry, biology, pharmacy or a related discipline is required. It is assumed the undergraduate training will include differential and integral calculus, college physics, a one-year course in general and inorganic chemistry including a laboratory, a one-year course in organic chemistry including a laboratory, and training in analytical chemistry. An undergraduate course in physical chemistry is recommended.

The admission requirements of the College of Graduate Studies of the University apply. The Graduate Record Exam (GRE) is not required for admission, but is highly recommended for international students.

Medicinal and Biological Chemistry (MBC) Major & Master of Science (M.S.) in Medicinal Chemistry (MC) Option

Students need to meet the requirements for entry into the Bachelor of Science of Pharmaceutical Science (BSPS) program. At the beginning of the second semester of their P1 year (spring semester, third year of study) the student applies for provisional acceptance into the graduate program and identifies an MBC faculty mentor for an in-house internship to be taken during the summer between the P1 and P2 year. Once the BSPS degree is awarded the student will be fully accepted into the graduate program. The internship mentor will become the graduate advisor of the student.

Master's students need to complete the following courses as partial fulfillment of their requirement for an M.S. degree:

Code	Title	Hours
MBC 5100	Ethical Conduct Research	1
MBC 5900	Medicinal Chemistry Seminar ¹	3-4
MBC 6190	Advanced Medicinal Chemistry	4
MBC 6960	M.s. Thesis Research In Medicinal Chemistry ²	6-16
Electives ³		5

¹ One hour can be taken during each semester (fall or spring, not summer). A minimum of 3 credit hours are required, up to 4 count towards degree completion.

² A minimum of 6 hours are required, up to 16 hours count toward degree completion.

³ Other 5000- to 6000-level courses should be taken as electives, as advised. A minimum of 5 hours of electives are required, but more than 5 hours can be taken and will be counted towards degree completion. Typically, students with more biological interests will take MBC 6550 and/or MBC 6200 as electives and students with more chemical interests will take CHEM 6400 and CHEM 6410.

The total number of credit hours at the graduate level (course numbers 5000 and 6000) including classroom courses, seminar and M.S. Thesis Research needs to be at least 30. This total can be achieved in different ways by varying the number of seminar, research and electives while maintaining the range limits for each category specified above.

In addition, the following items also must be completed:

1. Preparation of a written M.S. thesis based upon the results of an original research investigation performed by the student during the M.S. program at The University of Toledo.
2. Successful oral defense of the thesis before the thesis advisory committee (consisting of the thesis adviser and two other members) and presentation of the results of the thesis research in a seminar before the Department of Medicinal and Biological Chemistry.
3. Acceptance of this thesis by the M.S. thesis adviser and the thesis advisory committee.
4. Maintenance of a cumulative graduate GPA of 3.0 or higher.
5. One semester of experience as a teaching assistant. The program believes experience in teaching is critical to solidifying the student's understanding of the basics of the field and improving communication skills.

Program Requirements for the combined BSPS/MS in Medicinal Chemistry

The pre-professional division (year 1 and 2) requirements are the same as for the BSPS program as are the requirements for entry into the professional division. When students enter the professional division of the College of Pharmacy and Pharmaceutical Sciences they are in their P1 year (3rd year of study). The requirements for the P1 and P2 years are listed below:

Medicinal and Biological Chemistry Professional Division Curriculum

First Term	Hours
MBC 3310 Medicinal Chemistry I: Drug Action And Design	2
MBC 3330 Techniques in Pharmaceutical and Medicinal Chemistry	2
MBC 3340 Techniques in Pharmaceutical and Medicinal Chemistry Laboratory	1
PHCL 3700 Pharmacology I: Principles of Pharmacology, Autonomic Pharmacology and Related Pharmacology	3
MBC 3550 Physiological Chemistry I: Structure And Function Of Biological Macromolecules	3
Major Elective ²	2
Hours	13

Second Term

At the beginning of the second term the student identifies a MBC faculty mentor for an in-house internship and applies for provisional acceptance to the graduate school.

MBC 3100 Ethical Practice in Research	1
MBC 3320 Medicinal Chemistry II: Drug Design and Drug Action	3
MBC 3560 Physiological Chemistry II: Chemical Regulation Of Cells And Organisms	3
PHCL 3730 BSPS Pharmacology II: Endocrine and CNS Pharmacology	3

MBC 3880	Medicinal And Biological Chemistry Laboratory (Recommend MBC Laboratory course) ¹	3
MBC 3100	Ethical Practice in Research (Recommend Major Elective) ²	1
MBC 4870	Biomedical Chemistry Laboratory (Recommend Major Elective) ²	1-4
Hours		15-18
Third Term		
MBC 4780	Internship in Medicinal Chemistry ³	6-12
Hours		6-12
Fourth Term		
MBC 4710	Targeted Drug Design ⁴	3
MBC 4850	Advanced Immunology And Tissue Culture Laboratory (Recommend Major Elective) ²	1-10
Recommended MBC4880 Laboratory or select a major elective		3
Hours		7-16
Total Hours		41-59

following year. Therefore the two degrees, B.S.P.S. MBC and M.S. MC, could be accomplished in 5 calendar years.

- PLO 1. Interpret and critically evaluate the literature in the respective discipline and identify gaps in current knowledge.
- PLO 2. Design, implement, and analyze the results of an independent research project in the respective discipline.
- PLO 3. Effectively communicate and defend research findings orally and in writing.
- PLO 4. Describe and comply with standards of ethical conduct of research.
- PLO 5. Effectively work in a team of colleagues within the discipline.
- PLO 6. Describe new developments in the general field of pharmaceutical sciences and related fields.
- PLO 7. Communicate and negotiate with leaders in these fields to find employment.

¹ The MBC major requires that 3 semester hours of laboratory instruction be taken at the 3000 level or higher in a course taught by the MBC Department. Completion of 3 semester hours of any of the following courses will satisfy this requirement: MBC 3880, MBC 4850, MBC 4870, MBC 4880, MBC 4900, MBC 4950, or MBC 4960. MBC 3850 Microbiology & Immunology Lab, 1 semester hour credit does not satisfy this requirement *unless* it is taken with an additional 2 credit hours of any of the other approved laboratories listed above.

² To be chosen from the MBC electives list. (See College of Pharmacy and Pharmaceutical Sciences Catalogue.)

³ Internship must be taken in the summer before the P2 year with an in house MBC faculty mentor who will then be the mentor for the M.S. degree.

*Once the B.S.P.S. degree is awarded the student can move from provisional to accepted in the graduate program. Requirements to be fulfilled for the MS MC degree are given directly above.

⁴ MBC 4720, Advances in Drug Design, when offered, will also fulfill the requirement.

*At the beginning of the second semester the student identifies a MBC faculty mentor for an in-house internship and applies for provisional acceptance to the graduate school.

Graduation should be in December giving 3.5 years for the B.S.P.S. MBC degree completion. Once the B.S.P.S. degree is awarded the student can move from provisional to accepted in the graduate program. Requirements to be fulfilled for the MS MC degree are given directly above.

The student would begin the master's portion in the spring semester following the B.S.P.S. MBC graduation at the end of the Fall term, and could complete the M.S. degree by the end of the Spring semester of the