

## Medicinal Chemistry

### Department of Chemistry

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### Overview

The bachelor of science degree program in medicinal chemistry provides (1) a basic chemical understanding of life processes and biological control; (2) a chemical basis for the rational design, synthesis, and mechanism of action of drugs, and selective metabolic inhibition; (3) the basic laboratory skills necessary for research in medicinal chemistry; (4) an appreciation of medicinal chemistry and the chemical aspects of pharmacology; and (5) a chemically oriented foundation for postbaccalaureate research and study in medicinal chemistry and professional studies in the health sciences.

Depending upon the choice of electives, this program can provide an optimum background for employment as a B.S.-level medicinal chemist in research institutes, industry, and government; for entrance to graduate school in this or related areas; and for entrance to professional school in the health sciences.

### About our Degrees

#### Acceptance Criteria

Minimum GPA of 2.0 overall.

#### Acceptance Information

Deadlines: Rolling  
Number of applicants/year: 40  
Number of accepted majors/year: 40  
Total number of majors currently enrolled: 80

#### Degree Requirements

Please see [Degrees and Policies](#).

### About our Courses

#### The typical class size for:

Freshman/introductory courses is: 50-300  
Sophomore/intermediate courses is: 50-300  
Upper level/advanced courses is: 15-30

#### Suggested Introductory Courses

- [BIO 201](#) Cell Biology
- [CHE 105](#) Chemistry: Principles and Applications I (preferred) or [CHE 101](#) General Chemistry I
- [MTH 141](#) College Calculus I (preferred) or [MTH 121](#) Survey of Calculus and Its Applications 1

For course descriptions, please see [Courses](#).

### About our Faculty

## Medicinal Chemistry

The chemistry faculty includes a number of Ph.D. scientists who maintain active research programs in medicinal chemistry. Many of these have grants and contracts awarded in competitions with other scientists to support their research. The majority of outside support is from the National Institutes of Health. Faculty also hold memberships in various national organizations and several have been honored for their contributions to science.

### Transfer Policy

Prerequisite courses taken by students at other institutions are generally accepted as equivalent to University at Buffalo courses that have comparable titles (e.g., general chemistry, organic chemistry, calculus).

### Extracurricular Activities

Medicinal chemistry students are welcome to join the chemistry undergraduate club, the Student Affiliates of the American Chemical Society.

See the [UB Student Association](#).

### Practical Experience and Special Academic Opportunities

#### Notable Program Features

The Medicinal Chemistry program offers an accelerated, 5-year B.S./M.S. for qualified students. Medicinal chemistry majors apply in the junior year. Please contact the Department of Chemistry Graduate Office at 716-645-6800 for more information.

#### Honors, Awards, and Scholarships

Medicinal chemistry students are eligible for the same awards as chemistry students; for a list of these awards, see the Undergraduate Catalog page for Chemistry.

### Career Information and Further Study

#### Career Choices

- Government scientist
- Medicinal chemist in the pharmaceutical industry
- Organic chemist
- Pharmaceutical sales representative
- Teacher
- Technical librarian

#### Alumni in Medicinal Chemistry have found employment in the following fields:

- Academe (Professor of Medicinal Chemistry)
- Government (Food & Drug Administration)
- Medicinal chemistry (pharmaceutical industry)
- Pharmaceutical sales (pharmaceutical industry)

#### What percentage of graduates goes on to graduate school?

Variable; in 1998, 20%; in 1999, 10%

#### What percentage of graduates goes on to find related employment?

Approximately 100% (The department knows of no graduate who is unemployed.)

#### Salary Trends

Beginning salaries paid by the major pharmaceutical firms generally range between \$38,000 and \$44,000, depending on qualifications of the applicants. The industry seeks to hire graduates who have good laboratory experience. In this regard, M.S. graduates are good prospects for employment in the pharmaceutical industry and are paid correspondingly more and given more responsibility.

## Medicinal Chemistry

### Degrees Offered

**Undergraduate:** BS, Minor

**Combined:** BS/MS

**Graduate:** MS, PhD

### Links to Further Information About this Program

- [Undergraduate Catalog](#)
- [Undergraduate Admissions](#)
- [Graduate Admissions](#)
- [Department of Chemistry](#)
- [College of Arts and Sciences](#)

### **Medicinal Chemistry - B.S.**

#### **Acceptance Criteria**

Minimum GPA of 2.0 overall.

#### **Required Courses**

[BIO 201](#) Cell Biology

[CHE 101](#) General Chemistry or [CHE 105](#) Chemistry Principles and Applications

[CHE 102](#) General Chemistry or [CHE 106](#) Chemistry Principles and Applications

[CHE 201](#) Organic Chemistry or [CHE 251](#) Contemporary Organic Chemistry

[CHE 202](#) Organic Chemistry or [CHE 252](#) Contemporary Organic Chemistry

[CHE 214](#) and [CHE 215](#) Analytical Chemistry

[CHE 301](#) Intermediate Organic Chemistry Laboratory

[CHE 312](#) Chemistry of Biological Systems (recommended) or [BCH 403](#) Principles of Biochemistry

[CHE 319](#) Physical Chemistry I

[CHE 320](#) Physical Chemistry II

[CHE 321](#) Inorganic Chemistry I

[CHE 455](#) Synthetic Organic Chemistry

[MCH 401](#) Principles of Med Chem I

[MCH 498](#) Undergraduate Research Participation in Medicinal Chemistry\*

[MTH 141](#) College Calculus I

[MTH 142](#) College Calculus II

[PHY 107](#) General Physics I

[PHY 108](#) General Physics II

[PHY 158](#) General Physics II Lab

One chemistry laboratory elective course chosen from: [CHE 322](#), [CHE 329](#), or [CHE 330](#)

15 credit hours of science electives (approximately 5 courses - see advisor for details)

#### **Summary**

Total required credit hours for the major...82-84

See [Baccalaureate Degree Requirements](#) for general education and remaining university requirements.

#### **Recommended Sequence of Program Requirements**

##### FIRST YEAR

Fall [CHE 101](#) or [CHE 105](#); [MTH 141](#)

Spring [BIO 201](#); [CHE 102](#) or [CHE 106](#); [MTH 142](#)

##### SECOND YEAR

Fall [CHE 201](#) or [CHE 251](#); [CHE 214](#), [PHY 107](#)

Spring [CHE 202](#) or [CHE 252](#); [CHE 215](#), [PHY 108](#), [PHY 158](#)

##### THIRD YEAR

Fall [CHE 301](#), [CHE 319](#), [CHE 321](#), one science elective

Spring [CHE 312](#), [CHE 320](#), one science elective, one chemistry lab elective

## Medicinal Chemistry

### FOURTH YEAR

Fall [MCH 401](#), one science elective

Spring [CHE 455](#), two science electives (if necessary)

*Students should take [BCH 403](#) in the fall semester of the fourth year, if [CHE 312](#) was not taken in the third year.*

### Medicinal Chemistry - B.S./M.S.

#### Acceptance Criteria

Students must see the graduate secretary ([716] 645-6800, ext. 2030) of the Department of Chemistry for admission to the program.

#### Required Courses

[BIO 200](#) Evolutionary Biology

[BIO 201](#) Cell Biology

[CHE 101](#) General Chemistry or [CHE 105](#) Chemistry: Principles and Applications

[CHE 102](#) General Chemistry or [CHE 106](#) Chemistry: Principles and Applications

[CHE 201](#) Organic Chemistry or [CHE 251](#) Contemporary Organic Chemistry

[CHE 202](#) Organic Chemistry or [CHE 252](#) Contemporary Organic Chemistry

[CHE 214](#) and [CHE 215](#) Analytical Chemistry

[CHE 301](#) Intermediate Organic Chemistry Laboratory

[CHE 312](#) The Chemistry of Biological Systems or [BCH 403](#) Principles of Biochemistry

[CHE 349](#) Physical Chemistry for Life Sciences

[CHE 350](#) Physical Chemistry for Life Sciences Laboratory

[CHE 455](#) Synthetic Organic Chemistry

[MCH 498](#) Undergraduate Research Participation in Medicinal Chemistry\*

[MCH 501](#) Medicinal Chemistry

[MCH 524](#) Mechanisms of Drug Action

[MCH 615-MCH 616](#) Graduate Research

[MCH 622](#) Seminar

[MCH 700](#) Thesis Guidance

[MTH 141](#) College Calculus I

[MTH 142](#) College Calculus II

[PHY 107](#) General Physics I

[PHY 108](#) General Physics II

[PHY 158](#) General Physics II Lab

5 credits of science electives

#### Summary

Total required credit hours for the undergraduate portion...72-74

See [Baccalaureate Degree Requirements](#) for general education and remaining university requirements.

Refer to the [Graduate School's policies and procedures manual](#) for requirements for master's degree candidates.

#### Recommended Sequence of Program Requirements

##### FIRST YEAR

Fall [BIO 200](#); [CHE 101](#) or [CHE 105](#); [MTH 141](#)

Spring [BIO 201](#); [CHE 102](#) or [CHE 106](#); [MTH 142](#)

##### SECOND YEAR

Fall [CHE 201](#) or [CHE 251](#); [CHE 214](#), [PHY 107](#), one science elective

Spring [CHE 202](#) or [CHE 252](#); [CHE 215](#), [PHY 108/PHY 158](#), two science electives

##### THIRD YEAR

Fall [CHE 301](#), [CHE 349](#), [CHE 350](#)

Spring [CHE 312](#), [MCH 498](#), one science elective

##### FOURTH YEAR

Fall [MCH 498](#), [MCH 501](#), graduate science elective

Spring [CHE 455](#), [CHE 502](#), [MCH 524](#), graduate science electives

## Medicinal Chemistry

Students should take [BCH 403](#) in the fall semester of the fourth year, if [CHE 312](#) was not taken in the third year.

### FIFTH YEAR

Fall [MCH 615](#), [MCH 622](#), graduate science elective  
Spring [MCH 616](#), [MCH 700](#), graduate science elective

### Medicinal Chemistry - Minor

#### Acceptance Criteria

Minimum GPA of 2.0 overall.  
Minimum GPA of 2.0 in prerequisite courses.

#### Prerequisite Courses

[CHE 201](#)-[CHE 202](#) Organic Chemistry

#### Required Courses

[BCH 403](#) Principles of Biochemistry or [CHE 312](#) Chemistry of Biological Systems  
[CHE 301](#) Intermediate Organic Chemistry Laboratory  
[MCH 311](#) The Chemistry of Drug Action  
[MCH 401](#) Principles of Medicinal Chemistry I

#### MCH 401: Drug Discovery Principles

Credits: 3

Semester(s): Fall

Pre-requisites: [CHE 202](#) or [CHE 252](#) and [CHE 319](#) or [CHE 349](#)  
and [CHE 312](#)

Type: LEC

Examines principles of structural, physical, and physical-organic chemistry, including mechanistic considerations involved in synthetic organic chemistry, bioorganic chemistry, and design for chemotherapeutic agents.

#### MCH 402: Principles of Medicinal Chemistry II

Credits: 3

Semester(s): Spring

Type: LEC

Studies mechanisms of action and other factors that influence drug action within specific drug classes of pharmacodynamic and chemotherapeutic drugs, drug structures, and structure-activity relationships.

#### MCH 427: Combinatorial Chemistry

Credits: 2

Semester(s): Fall

Type: LAB

Examines medicinal and synthetic organic chemistry aspects of the design, simultaneous synthesis and computerized tracking, in a highly efficient and automated fashion of many new compounds.

Students may take the lecture module alone, but the lab requires completion of the lecture and permission of the instructor.

#### MCH 498: Undergraduate Research Participation in Medicinal Chemistry

Credits: 1-6

Semester(s): Fall, Spring

Type: LAB

Involves projects in medicinal chemistry involving a literature search and lab work.

#### MCH 499: Independent Studies

Credits: 1-6

Semester(s): Fall, Spring

Type: TUT

*The content of this course is variable and therefore it is repeatable for credit. The [University Grade Repeat Policy](#) does not apply.*

Involves development of a special topic of student interest under a tutorial arrangement.