BIOTECHNOLOGY AND CHEMICAL SCIENCE, MS

The Master of Science degree in Biotechnology and Chemical Science (BTCS) prepares students for work in a variety of applied science industries, including food science, biopharmaceuticals and clinical diagnostics, or for academic research and graduate study. It is an interdisciplinary program in which a student may concentrate in biotechnology, biotechnology management or chemical science. The program is appropriate for students holding a bachelor’s degree in biology, biochemistry, chemistry and related fields, or for those with other bachelor’s degrees who have completed the prerequisite coursework. Applicants who are preparing for careers in medicine, dentistry or other health professions are encouraged to apply for the Master of Arts in Biomedical Science or the Master of Science in Biology at Roosevelt University.

Students in the program receive:

- Theoretical and practical training through a rigorous, comprehensive graduate curriculum including chemistry, biology, biochemistry, and business coursework.
- Direct experience with laboratory techniques and methods used in the commercial and academic research settings.
- Research, internship, and career exploration opportunities that enhance students’ skills and prepare them to advance in their chosen field.
- Individual advising and mentoring by experienced faculty from across the university.

Coursework for this program is regularly offered during afternoon and evening hours and on weekends, affording an opportunity for working students to extend their professional training. Multiple research and independent study opportunities are available; a research thesis is optional for students in the Biotechnology and Chemical Science concentrations.

Admission

Applicants should consult the graduate admission resources on the Roosevelt University website for information on the application process. The graduate program director and department faculty members will evaluate each applicant’s individual record of academic achievement, professional experience, and self-assessment. Weakness in one or more areas of preparation will not preclude a positive admission decision. Admissions decisions are at the discretion of the graduate program director.

Application Materials

- Graduate application: Application (https://www.roosevelt.edu/admission/apply/) to the College of Arts & Sciences at Roosevelt University.
- Official transcript(s): Applicants must request official transcripts from all undergraduate and graduate institutions attended. Coursework completed outside the U.S. requires a foreign credential evaluation.
- Resume/Curriculum vita: Applicants should provide a detailed account of their academic and extracurricular experiences. Include employment, teaching, leadership, and research experiences as appropriate.
- Letter of intent: Applicants must include a brief (one-page) personal statement which outlines their personal and professional goals, their interest in the program and their qualifications for admission. A personal statement from a central admissions service may be submitted.
- Letters of recommendation: Include or request at least two recommendation letters. Referees may include professors, academic advisors, employment supervisors, or others familiar with the applicant’s preparation for graduate study.
- Proof of English language proficiency (for international students): See the University English Language Proficiency requirement for details. Applicants can receive an admissions decision if this requirement is not met, but may need to complete ELP coursework before they begin graduate studies.

Prerequisites

Applicants to the MS BTCS program must hold a bachelor’s degree with a minimum cumulative GPA of 3.0 (4.0 scale) and should have completed the academic requirements described below.

- Biotechnology concentration: General Chemistry (2 courses), Organic Chemistry (1 course), Physics (1 course), Cellular/Molecular Biology (1 course)
- Biotechnology Management concentration: Same as Biotechnology, plus - Statistics (business statistics or biostatistics), Calculus (1 or 2 courses).
- Chemical Science concentration: Same as Biotechnology, plus - Calculus (1 or 2 courses), Organic Chemistry (2 courses), Analytical/Quantitative Chemistry (1 course), Physics (2 courses)

Students lacking prerequisite coursework may be admitted provisionally until outstanding courses have been completed satisfactorily (grade of B- or better). None of the prerequisite courses may be used toward fulfillment of the requirements for the master’s degree.

Credit Policies

Graduate transfer credit (up to 9 credit hours) may be applied to the MS Biotechnology and Chemical Science degree within one semester of admission. Credits from a previously earned degree are not transferable. Exemptions to degree requirements (up to 9 credit hours) may be granted to students who have previously completed a graduate degree in a related area and maintain good academic standing after one semester of study at Roosevelt. All adjustments to program credit hour requirements must be approved by the graduate program director.

Advising

New students must consult with the graduate program director upon admission to the graduate program. Each graduate student is required to meet with a faculty advisor at least once each semester to select appropriate courses for the following semester. Continuing students who have completed at least one semester of graduate study (or 6 credit hours) with a grade average of 3.0 or higher should consult with their advisors to discuss research, internship, independent study and other career development opportunities.

Requirements

The Master of Science degree in Biotechnology and Chemical Science requires a minimum of 36 credit hours, at least 27 of which must be completed at Roosevelt University. Each student will develop an academic plan in consultation with a faculty advisor. Students
may choose concentrations in Biotechnology, Chemical Science or Biotechnology Management (in conjunction with Roosevelt's College of Business). See below for required and recommended courses in each concentration.

**Interdisciplinary and Required Coursework**

- **Biotechnology concentration:** At least 18 credit hours in biology (BIOL) and at least eight credit hours in chemistry (CHEM) or biochemistry (BCHM), subject to approval of the graduate program director. BIOL 480 APPLICATIONS OF BIOTECHNOLOGY, BIOL 482 BIOTECHNOLOGY INDUSTRY PRACTICE and research experience are required for this concentration.

- **Chemical Science concentration:** At least 18 credit hours in chemistry (CHEM) or biochemistry (BCHM) and eight credit hours in biology (BIOL), subject to approval of the graduate program director. BCHM 493 BIOCHEMISTRY SEMINAR, at least one chemistry laboratory course and research experience are required for this concentration.

- **Biotechnology Management concentration:** Specific requirements in natural science, industry practice and management are described in the concentration course listing below. Contact the graduate program director for up-to-date course availability for this concentration.

**Research and Independent Study Opportunities**

All students in the Biotechnology and Chemical Science concentrations must complete at least three credit hours of research training by enrolling in either research independent study under the sponsorship of a faculty member (BIOL 492 RESEARCH IN BIOLOGY/BCHM 492 RESEARCH IN BIOCHEMISTRY/ CHEM 492 RESEARCH IN CHEMISTRY) or in the scheduled Research Methods course (BIOL 468 RESEARCH METHODS). It is recommended that independent research study be undertaken for 3 credit hours in a single term, but it may be taken in increments to total 3 credit hours.

A research thesis is optional for students in the Biotechnology and Chemical Science concentrations. In addition to the independent research courses listed above, thesis candidates will register for up to 6 additional credit hours of research credit (BIOL 485 THESIS/BCHM 485 THESIS/CHEM 485 THESIS). Details on the thesis preparation process are available from the graduate program director.

Independent study in literature research (BIOL 495 INDEPENDENT STUDY/CHEM 495 INDEPENDENT STUDY) and internship options are also available to students. These options are included in the total graduate credit hours but do not substitute for research requirements. No more than 10 total credit hours from independent study and research may be applied to the degree, unless approved by the graduate program director.

**Recommended Courses**

The coursework for the degree will be chosen from the list below, from other scheduled courses (https://www.roosevelt.edu/coursefinder/) in BIOL, CHEM or BCHM at the 400-level or through individualized registration as described above.

## Biotechnology Concentration

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>BIOL 480</td>
<td>APPLICATIONS OF BIOTECHNOLOGY</td>
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<tr>
<td>BIOL 482</td>
<td>BIOTECHNOLOGY INDUSTRY PRACTICE</td>
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It is recommended that independent research study be undertaken for 3 credit hours in a single term, but it may be taken in increments to total 3 credit hours. A research thesis is optional for students in the Biotechnology and Chemical Science concentrations. In addition to the independent research courses listed above, thesis candidates will register for up to 6 additional credit hours of research credit (BIOL 485 THESIS/BCHM 485 THESIS/CHEM 485 THESIS). Details on the thesis preparation process are available from the graduate program director.

Independent study in literature research (BIOL 495 INDEPENDENT STUDY/CHEM 495 INDEPENDENT STUDY) and internship options are also available to students. These options are included in the total graduate credit hours but do not substitute for research requirements. No more than 10 total credit hours from independent study and research may be applied to the degree, unless approved by the graduate program director.

**Core Research (required)**

- BIL 468 RESEARCH METHODS
- BIOL 492 RESEARCH IN BIOLOGY
- or BCHM 493 RESEARCH IN BIOCHEMISTRY
- or CHEM 492 RESEARCH IN CHEMISTRY

**Electives**

- **Biology (minimum 11 credits)**
  - BIOL 418 BIOSTATISTICS
  - BIOL 450 CANCER BIOLOGY
  - BIOL 451 GENERAL GENETICS
  - BIOL 453 MOLECULAR BIOLOGY
  - BIOL 458 CELL BIOLOGY
  - BIOL 460 MICROBIOLOGY
  - BIOL 461 INFORMATION TECHNOLOGY FOR SCIENCES
  - BIOL 463 INTRODUCTION TO GENOME ANALYSIS
  - BIOL 464 PROTEIN STRUCTURE DETERMINATION
  - BIOL 466 ECOL & EVOL OF MICRO ORG
  - BIOL 467 IMMUNOLOGY
  - BIOL 483 SPECIAL TOPICS IN BIOLOGY

- **Chemistry and Biochemistry (minimum 8 credits)**
  - CHEM 418 SYNTHETIC ORGANIC CHEMISTRY
  - CHEM 419 ORGANOMETALLIC CHEMISTRY
  - CHEM 437 INSTRUMENTAL ANALYSIS
  - CHEM 452 MEDICINAL CHEMISTRY
  - BCHM 444 BIOINORGANIC CHEMISTRY
  - BCHM 455 BIOCHEMISTRY
  - BCHM 456 EXP. MTHDS BIOCHEM & BIOTECH
  - BCHM 457 ADVANCED BIOCHEMISTRY
  - BCHM 493 BIOCHEMISTRY SEMINAR

List of electives subject to change - consult graduate advisor for details

**Total Credit Hours**

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## Biotechnology Management Concentration

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<tr>
<td>BIOL 480</td>
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<tr>
<td>BIOL 482</td>
<td>BIOTECHNOLOGY INDUSTRY PRACTICE</td>
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**Core Industry (required)**

- BADM 401 GRADUATE BUSINESS ORIENTATION
- ACCT 405 ACCOUNTING FOR EXECUTIVES
- MKTG 406 MARKETING STRATEGY: THEORY & PRACTICE
- MGMT 407 EXECUTIVE LEADERSHIP
- FIN 408 FINANCE FOR DECISION MAKERS

**Core Science (select three)**

- BIOL 453 MOLECULAR BIOLOGY (required)
- BIOL 458 CELL BIOLOGY
- or BIOL 467 IMMUNOLOGY

**Core Management (required)**

- BIOL 480 APPLICATIONS OF BIOTECHNOLOGY
- BIOL 482 BIOTECHNOLOGY INDUSTRY PRACTICE

List of electives subject to change - consult graduate advisor for details

**Total Credit Hours**

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The Chemical Sciences Concentration is designed to provide a strong foundation in both chemical and biological sciences, preparing students for careers or further study in these fields. The concentration includes core research courses, chemistry electives, and additional courses in biological sciences.

### Core Research (required)
- CHEM 492: Research in Chemistry
  - or BCHM 492: Research in Biochemistry
  - or BIOL 468: Research Methods
  - Credit Hours: 3

### Core Chemistry (required)
- CHEM 493: Chemistry Seminar
  - or BCHM 493: Biochemistry Seminar
  - Credit Hours: 1

### Electives
- Chemistry and Biochemistry (minimum 17 credits)
  - CHEM 413: Advanced Organic Chemistry
  - CHEM 418: Synthetic Organic Chemistry
  - CHEM 419: Organometallic Chemistry
  - CHEM 437: Instrumental Analysis
  - CHEM 441: Inorganic Chemistry
  - CHEM 444: Bioinorganic Chemistry
  - CHEM 452: Medicinal Chemistry
  - BCHM 420: Physical Chemistry for Bioscience
  - BCHM 455: Biochemistry
  - BCHM 456: Exp. Mthds Biochem & Biotech
  - BCHM 457: Advanced Biochemistry
  - Credit Hours: 17-24

- Biology (minimum 8 credits)
  - BIOL 453: Molecular Biology
  - BIOL 458: Cell Biology
  - BIOL 461: Information Technology for Sciences
  - BIOL 464: Protein Structure Determination
  - BIOL 467: Immunology
  - BIOL 480: Applications of Biotechnology
  - BIOL 482: Biotechnology Industry Practice
  - Credit Hours: 8-16

### Additional courses may apply - consult graduate advisor for details

### Total Credit Hours
- Year 1: 37
- Year 2: 36

Your degree map is a general guide suggesting courses to complete each term on the academic pathway to your degree. It is based on the most current scheduling information from your academic program. Your program's degree map is reviewed annually and updated as schedules change (although you retain the same course requirements as long as you are continuously enrolled in your degree program).

Always work closely with your academic advisor to understand curriculum requirements and scheduling, as each student's academic plan will be different. No more than two grades of C (not C-) may be applied toward the 36 hours used for the degree.

### Year 1
- Fall
  - BIOL 480: 3
  - BIOL 453: 5
  - BCHM 493: 1
- Spring
  - BIOL 482: 3
  - BCHM 4XX: 3

### Year 2
- Fall
  - BIOL 468: 3
  - CHEM 4XX: 3
  - BCHM 4XX: 3
- Spring
  - BIOL 4XX: 3
  - CHEM 4XX: 3
  - BCHM 4XX: 3

### Total Credit Hours
- Year 1: 37
- Year 2: 36

Total Credit Hours: 36-40
Your degree map is a general guide suggesting courses to complete each term on the academic pathway to your degree. It is based on the most current scheduling information from your academic program. Your program’s degree map is reviewed annually and updated as schedules change (although you retain the same course requirements as long as you are continuously enrolled in your degree program).

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### Year 1

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<th>Fall</th>
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<td>BIOL 460 or 466</td>
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<td>BADM 401</td>
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<td>ACCT 405</td>
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### Year 2

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Total Credit Hours 38