

# Master of Science in Chemistry

## Admission Requirements

The applicant must meet the School of Graduate Studies' current minimum general admission requirements as published in the graduate catalog. These requirements pertain to all MS chemistry tracks\* including thesis and non-thesis options, combined and accelerated BS/MS, and professional science master (PSM) degrees.

1. A four-year baccalaureate degree from a regionally accredited college or university.
  - a. For thesis students, a degree with a major in chemistry
  - b. For non-thesis students, a degree with a major in chemistry or related area, with strong background in Chemistry or a minor or its equivalent (on the approval by the Department).
2. A cumulative Grade Point Average (GPA) of at least 2.75 for all undergraduate work or a GPA of at least 3.0 for the junior and senior years of undergrad work (based on a 4.00 scale).
3. Undergraduate credit in mathematics through integral calculus (For the Non-Thesis, BS/MS, and PSM options, Applied Calculus may suffice if approved by the Department).
4. One year of physics.
5. Satisfy the School of Graduate Studies' English Language Proficiency requirements as published in the graduate catalog.
6. Application Requirements.\*\* In addition to the application form and fee, the following must be submitted as part of the application process:
  - a. Three letters of recommendation
  - b. One official copy of all academic transcripts
  - c. Statement of goals and objectives

\*Students in these programs are not a priority for Departmental financial support through Teaching/Research Assistantships and/or tuition waivers.

\*\*For other, program-specific requirements, see below

## Accelerated Program

The **Accelerated Bachelor's/Master's (ABM)** 4+1 program allows exceptional undergraduate students at UND an opportunity to complete the requirements for both the bachelor's and the master's degree at an accelerated pace. All requirements for both degrees must be met, and the students may double count up to 12 graduate-level credits toward the requirements for both their bachelor's and master's degree programs. ABM students must obtain their master's degree within 12 months of completing the bachelor's degree.

## Combined Program

The **Combined Bachelor's/Master's (CBM)** program allows qualified undergraduate students at UND an opportunity to complete the requirements for both the bachelor's and the master's degree on a faster timeline. All requirements for both degrees must be met, and the students may double count up to 6 graduate-level credits toward the requirements for both their bachelor's and master's degree programs.

## ABM/CBM Additional Admission Requirements

1. Students must have completed at least 60 credits toward the bachelor's degree
2. A cumulative Grade Point Average (GPA) of at least 3.00 for all undergraduate work.
3. One year general chemistry, one year organic chemistry. One semester analytical chemistry, and one semester physical chemistry are desired.

Students with a different background in Chemistry will be placed on the level appropriate to their BS degree and/or prior background.

4. Must submit a combined/accelerated program of study with the application

## Degree Requirements

Students seeking the Master of Science Degree at the University of North Dakota must satisfy all general requirements set forth by the School of Graduate Studies as well as particular requirements set forth by the Chemistry Department.

1. A minimum of 32 semester credits in a major field, including the credits granted for the thesis and the research leading to the thesis.
2. At least sixteen (16) credits must be at or above the 500-level in chemistry and related fields.
3. A maximum of one-fourth of the credit hours required for the degree may be transferred from another institution.
4. CHEM 509 Graduate Seminar - minimum 1 credit. (This course requires the commitment of student's technical mentor in the topic area. The spring course is on technical literature review; the fall course is on technical proposal writing.)
5. Scholarly Tools: Up to nine (9) credit hours of foundational classes listed below, in place of non-mandatory classes within the total of 32 credit hours. Some may be stipulated by the Department.

Code	Title	Credits
CHEM 361	Problem Solving in Organic Chemistry I	1
CHEM 362	Problem Solving in Organic Chemistry II	1
CHEM 441	Instrumental Analysis I - Spectroscopy	2
CHEM 442	Instrumental Analysis II - Electrochemistry	2
CHEM 443	Instrumental Analysis III - Chromatography/Mass Spectrometry	2
CHEM 454	Inorganic Chemistry II	3
CHEM 455	Spectroscopy and Structure	3
CHEM 463	Advanced Synthesis Laboratory	3
CHEM 466	Fundamentals of Physical and Biophysical Chemistry	3
CHEM 470	Thermodynamics Kinetics	3
CHEM 471	Quantum Mechanics Spectroscopy	3

## Thesis Option

### 6. Required Courses

1. One (1) credit of Special Topics in Chemistry, CHEM 519
2. Minimum fourteen (14) credits of combined Research and Thesis credits
3. CHEM 599 Research 10-12 credits; some of these credits may be replaced by Scholarly Tools as described above if deemed appropriate as long as the minimum requirement is met.
4. CHEM 998 Thesis 4-6 credits
5. Six (6) credit hours from one of the three specific major sequences below:

Code	Title	Credits
<b>Analysis and Applications</b>		
Select two of the following:		6
CHEM 541	Analytical Spectroscopy	
CHEM 542	Electrochemical Methods	
CHEM 543	Chromatography	
<b>Synthetic</b>		
Select any two of the following:		6
CHEM 511	Advanced Inorganic Chemistry	
CHEM 512	Organometallic Chemistry	
CHEM 520	Advanced Organic Chemistry I	3
CHEM 521	Advanced Organic Chemistry II	
CHEM 522	Advanced Organic Chemistry III	
CHEM 475	Materials Chemistry	
<b>Theory</b>		

Select two of the following: 6

- CHEM 530 Chemical Thermodynamics  
or PHYS 543 Statistical Physics  
or CHE 509 Advanced Chemical Engineering Thermodynamics
- CHEM 531 Chemical Dynamics
- CHEM 532 Quantum Mechanics in Chemistry  
or PHYS 533 Quantum Mechanics

7. Six (6) credit hours of 500-level chemistry courses from two sequences other than the major. Foundational classes from other divisions may be included. Three (3) of these credits may be from other Departments.

## Non-Thesis, ABM/CBM and PSM Options

6. Satisfactory completion of an appropriate standardized American Chemical Society (ACS) exam(s) to be determined by the student's Advisory Committee (not required for PSM).

7. Required Courses:

1. At least twelve (12) credit hours from the following list:

Code	Title	Credits
CHEM 541	Analytical Spectroscopy	3
CHEM 542	Electrochemical Methods	3
CHEM 543	Chromatography	3
CHEM 510	Intermediate Inorganic Chemistry	3
CHEM 511	Advanced Inorganic Chemistry	3
CHEM 512	Organometallic Chemistry	3
CHEM 520	Advanced Organic Chemistry I	3
CHEM 521	Advanced Organic Chemistry II	3
CHEM 522	Advanced Organic Chemistry III	3
CHEM 475	Materials Chemistry	3
CHEM 530	Chemical Thermodynamics	3
CHEM 531	Chemical Dynamics	3
CHEM 532	Quantum Mechanics in Chemistry	3
CHE 509	Advanced Chemical Engineering Thermodynamics	3
PHYS 539	Quantum Mechanics	3
PHYS 543	Statistical Physics	3

2. Experiential component to be determined by the student's advisory committee. The final experiential component has two options. Both options must include the final product, both written (report) and oral (presentation) to be evaluated by the Advisory Committee.

Option 1: Two (2) credits of CHEM 997, Independent Studies, or CHEM 519, Special Topics in Chemistry. Preparation of a written independent study and oral presentation of results to the advisor and interested faculty are required for successful completion of this course.

Option 2: A 3-6 credit research experience via Chem 599 research credit.

## Remaining course work for Non-thesis and ABM/CBM options

8. The rest of the classes (15 credits for non-thesis, up to 9 credits for ABM/CBM including the double counted course work) may be taken from other Departments, based on student interests (including upper-level undergraduate classes if allowed for graduate credit and approved by the Advisory Committee). The Department of Chemistry encourages students to take interdisciplinary coursework. The following areas are recommended: Physics, Chemical Engineering, Atmospheric Sciences, Education. ABM/CBM may include up to three undergraduate foundation courses as Scholarly Tools with prior approval of student's committee.

## Remaining course work for PSM options

8. At least 13 PSM core credits from the following list (one credit of CHEM 509 is required, if taken for PSM, 2nd seminar should be taken) with a minimum one in each area:

Code	Title	Credits
<b>Quantitative/Analytic Skills Courses:</b>		
EFR 513	Large Dataset Management and Analysis	3
EFR 515	Statistics I	3
EFR 516	Statistics II	3
EFR 518	Multivariate Analysis	3
EFR 535	Data Analytics and Visualization with R	3
ENE 530	Applied Engineering Business Analysis	3
PSYC 540	Foundations of Behavioral Data Analytics	3
<b>Professional Skills Courses:</b>		
COMM 516	Principles of Professional Communication	3
COMM 524	International/Intercultural Communication for Professionals	3
COMM 527	Persuasion & Persuasive Communication	3
COMM 529	Science Communication	3
ENGL 408	Advanced Public and Professional Writing	3
ENGL 540	Science Writing	3
ENGR 554	Applied Project Management	3
ESSP 562	Environmental Economics, Policy and Management	3
ESSP 570	Communicating Environmental Information	3
ENE 533	Project Dynamics & Strategy Modeling	3
POLS 532	Public Policy	3
POLS 533	Administrative Ethics in the Public Sector	3