



UNC  
COLLEGE OF  
ARTS & SCIENCES

THE UNIVERSITY  
of NORTH CAROLINA  
at CHAPEL HILL

DEPARTMENT OF CHEMISTRY

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Dear Sir or Madam,

The department of chemistry requests that the following changes be made to the curriculum for a Bachelor of Science Degree.

- CHEM 441, CHEM 441L, CHEM 450 and CHEM 550L will be electives
- Require either CHEM 481L or 482L
- Increase number of hours for advanced electives from 10 to 15
- Increase required advanced labs from 1 to 2 (options are 441L, 481L, 482L, 520L, 530L, 550L)

These changes are motivated by feedback from our chemistry majors who have indicated that they are overwhelmed by the requirements for a BS degree. The students are presently required to take a larger number of advanced classes than is required by our peer institutions such as University of Wisconsin, University of Michigan, University of California at Berkeley, and University of Illinois. The proposed changes to the curriculum will give the students more flexibility in choosing advanced electives.

Changes in the BS Chemistry curriculum will be communicated to the undergraduate majors via several methods. The changes will be emailed to all majors on the chemistry majors' listserv, posted on the chemistry majors' information bulletin boards in the department, made available at the majors' handout station, and scrolled on the department's video monitor (to be installed in August of 2017 outside of Chemistry Student Services). The curriculum changes will also be conveyed to students in both small group advising sessions and one-on-one meetings. Lastly, the chemistry department will provide a short training session to the Natural Science/Mathematics advising team in the Steele Building to update them on the changes.

Sincerely,

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The University of North Carolina at Chapel Hill  
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# CHEMISTRY MAJOR, B.S.

## Contact Information

### Department of Chemistry

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Chemistry is the scientific study of the composition and properties of matter and the investigation of the laws that govern them. All chemists have a common core of knowledge, learned through a highly structured sequence of undergraduate courses in which the content is divided into the classical subdisciplines. Toward the end of students' progress through their four years of undergraduate study, they may choose to concentrate in one or more areas of chemistry through the courses selected to fulfill the chemistry elective requirements and through undergraduate research.

## Department Programs

### Majors

- Chemistry Major, B.A. (<http://catalog.unc.edu/undergraduate/programs-study/chemistry-major-ba>)
- Chemistry Major, B.S. (p. 1)
- Chemistry Major, B.S.–Biochemistry Track (<http://catalog.unc.edu/undergraduate/programs-study/chemistry-major-bs-biochemistry-track>)
- Chemistry Major, B.S.–Polymer Track (<http://catalog.unc.edu/undergraduate/programs-study/chemistry-major-bs-polymer-track>)

### Minor

- Chemistry Minor (<http://catalog.unc.edu/undergraduate/programs-study/chemistry-minor>)

### Graduate Programs

- M.A. in Chemistry (<http://catalog.unc.edu/graduate/schools-departments/chemistry>)
- M.S. in Chemistry (<http://catalog.unc.edu/graduate/schools-departments/chemistry>)
- Ph.D. in Chemistry (<http://catalog.unc.edu/graduate/schools-departments/chemistry>)

## Student Learning Outcomes

Upon completion of the chemistry B.S. program, students are expected to be able to:

- Demonstrate a solid understanding of basic chemical principles (knowledge base in chemistry)
- Demonstrate the ability to apply chemical principles to solve problems (analytical skills)

- Demonstrate the use of critical and creative thinking skills in conducting research with mentoring from a faculty member (critical thinking skills in chemistry)

## Requirements

In addition to the program requirements listed below, students must

- attain a final cumulative GPA of at least 2.0
- complete a minimum of 45 academic credit hours earned from UNC–Chapel Hill courses
- take at least half of their major course requirements (courses and credit hours) at UNC–Chapel Hill
- earn a minimum of 18 hours of C or better in the major core requirements (some majors require 21 hours).

For more information, please consult the degree requirements section of the catalog (<http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/#degreerequirementstext>).

*This program meets the requirements of the American Chemical Society for the training of professional chemists.*

### Gateway Course

CHEM 101 & 101L	General Descriptive Chemistry I and Quantitative Chemistry Laboratory I	4
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### Core Requirements

CHEM 102	General Descriptive Chemistry II <sup>H</sup>	3
	or CHEM 102H General Descriptive Chemistry II	
CHEM 102L	Quantitative Chemistry Laboratory II	1
CHEM 241	Modern Analytical Methods for Separation and Characterization <sup>H</sup>	2
CHEM 241L	Laboratory in Separations and Analytical Characterization of Organic and Biological Compounds	1
	or CHEM 245L Honors Laboratory in Separations and Analytical Characterization of Organic and Biological Compound	
CHEM 251	Introduction to Inorganic Chemistry	2
CHEM 430	Introduction to Biological Chemistry <sup>H</sup>	3
CHEM 441	Intermediate Analytical Chemistry	2
CHEM 441L	Intermediate Analytical Chemistry Laboratory	2
CHEM 450	Intermediate Inorganic Chemistry	3
CHEM 481	Physical Chemistry I	3
CHEM 481L	Physical Chemistry Laboratory I	2
CHEM 482	Physical Chemistry II	3
CHEM 482L	Physical Chemistry Laboratory II	2
CHEM 550L	Synthetic Chemistry Laboratory I	2
CHEM 261	Introduction to Organic Chemistry I <sup>H</sup>	3
CHEM 262	Introduction to Organic Chemistry II <sup>H</sup>	3
CHEM 262L	Laboratory in Organic Chemistry	1
	or CHEM 263L Honors Laboratory in Organic Chemistry	
	Ten hours of advanced chemistry elective courses (one must be a laboratory) from the following list:	10
CHEM 395	Research in Chemistry for Undergraduates (may count as a laboratory course) <sup>H</sup>	
	Any course numbered CHEM 420 or higher	
<b>Additional Requirements</b>		
BIOL 101		3

Delete these three courses from requirements

CHEM 481L or CHEM 482L

Delete 550L from requirements

Change 'Ten hours' to 'Fifteen Hours'

two must be a laboratory

MATH 232	Calculus of Functions of One Variable II <sup>1</sup>	4
MATH 233	Calculus of Functions of Several Variables <sup>1,H</sup>	4
MATH 383	First Course in Differential Equations <sup>1,H</sup>	3
PHYS 116	Mechanics <sup>H</sup>	4
or PHYS 118	Introductory Calculus-based Mechanics and Relativity	
PHYS 117	Electromagnetism and Optics <sup>H</sup>	4
or PHYS 119	Introductory Calculus-based Electromagnetism and Quanta	
Total Hours		74

<sup>H</sup> Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

<sup>1</sup> Placement (PL) credits (zero hours) for MATH 232, MATH 233, or MATH 383 do not satisfy chemistry major requirements.

## Sample Plan of Study

Sample plans are provided to identify the courses required to complete the degree and the requirements needed for degree completion. The actual degree plan may differ from the sample plan based on the student's minor, second major, or other requirements. Consult with their academic advisor to create a degree plan that is tailored to their interests. The sample plans represented in this catalog are intended for first-year students entering UNC-Chapel Hill in the fall term. Some courses may not be offered every term.

The recommended course sequence for the bachelor of science degree is listed below. At least 18 chemistry courses above CHEM 101/CHEM 101L are required. Grades of C- do not satisfy this requirement. Courses in chemistry and other courses specifically required (and designated by number) may not be declared Pass/Fail.

### First and Sophomore Years

ENGL 105	English Composition and Rhetoric	3
Foreign language	through level 3 (with level 2 placement)	6
Lifetime fitness		1
MATH 231	Calculus of Functions of One Variable I <sup>H</sup>	4
BIOL 101	Principles of Biology (PL) <sup>H</sup>	3
CHEM 101 & 101L	General Descriptive Chemistry I and Quantitative Chemistry Laboratory I (PX)	4
CHEM 102	General Descriptive Chemistry II <sup>H</sup>	3
or CHEM 102H	General Descriptive Chemistry II	
CHEM 102L	Quantitative Chemistry Laboratory II	1
CHEM 241	Modern Analytical Methods for Separation and Characterization <sup>H</sup>	2
CHEM 241L	Laboratory in Separations and Analytical Characterization of Organic and Biological Compounds	1
or CHEM 245L	Honors Laboratory in Separations and Analytical Characterization of Organic and Biological Compound	
CHEM 251	Introduction to Inorganic Chemistry	2
CHEM 261	Introduction to Organic Chemistry I <sup>H</sup>	3
CHEM 262	Introduction to Organic Chemistry II <sup>H</sup>	3
or CHEM 262H	Introduction to Organic Chemistry II	

CHEM 262L	Laboratory in Organic Chemistry	1
or CHEM 263L	Honors Laboratory in Organic Chemistry	
MATH 232	Calculus of Functions of One Variable II <sup>1</sup>	4
MATH 233	Calculus of Functions of Several Variables <sup>1,H</sup>	4
MATH 383	First Course in Differential Equations <sup>1,H</sup>	3
PHYS 116	Mechanics <sup>H</sup>	4
or PHYS 118	Introductory Calculus-based Mechanics and Relativity	
PHYS 117	Electromagnetism and Optics <sup>H</sup>	4
or PHYS 119	Introductory Calculus-based Electromagnetism and Quanta	

Approaches (<http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements>) (three courses)

Other Connections (<http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements>)

### Junior and Senior Years

CHEM 430	Introduction to Biological Chemistry <sup>H</sup>	3
CHEM 450	Intermediate Inorganic Chemistry	3
CHEM 441	Intermediate Analytical Chemistry	2
CHEM 441L	Intermediate Analytical Chemistry Laboratory	2
CHEM 481	Physical Chemistry I	3
CHEM 481L	Physical Chemistry Laboratory I	2
CHEM 482	Physical Chemistry II	3
CHEM 482L	Physical Chemistry Laboratory II	2
CHEM 550L	Synthetic Chemistry Laboratory I	2

Advanced chemistry electives (10 hours, one must be a laboratory) <sup>2</sup>

Approaches (<http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements>) (three courses)

Other Connections (<http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements>)

<sup>H</sup> Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

<sup>1</sup> Placement (PL) credits (zero hours) for MATH 232, MATH 233, or MATH 383 do not satisfy chemistry major requirements.

<sup>2</sup> CHEM 395 may be counted toward the fulfillment of general education requirements as desired but may not be counted toward the fulfillment of the B.S. chemistry degree (biochemistry track), or B.S. chemistry degree (k). Only one of CHEM 395 or CHEM 396 may be counted as an advanced chemistry elective. Students must sign up for CHEM 395 and CHEM 396 within the first week of classes. CHEM 396 may only be counted as an advanced chemistry elective with departmental permission.

## Special Opportunities in Chemistry

### Honors in Chemistry

Upon the recommendation of the Department of Chemistry, the B.A. or B.S. degree with a major in chemistry may be awarded with honors in chemistry or highest honors in chemistry.

Highest honors in chemistry is a distinction bestowed on a truly exceptional student who has excelled in coursework and who has completed a research project of considerable depth and significance. To

Delete these three lines from requirements (450, 441, 441L)

CHEM 481L or CHEM 482L

Delete CHEM 550L

Change to "Advanced chemistry elective (15 hours, two must be a laboratory)"

attain this distinction the candidate must have nominally satisfied the following guidelines:

- B.A. candidates must have achieved a chemistry major grade point average of 3.85 or higher; B.S. candidates, a chemistry major grade point average of 3.75 or higher.
- Have completed at least five courses in chemistry numbered CHEM 420 or above. For B.A. candidates one of these may be a laboratory course; for B.S. candidates they must all be lecture courses.
- Have completed or be about to complete a research project certified to be of publishable quality by the research advisor and two faculty members appointed by the director of undergraduate studies

Honors in chemistry is a distinction bestowed on an outstanding student who has demonstrated marked competence in the coursework and who has completed a research project of considerable merit. To attain this distinction the candidate must have nominally satisfied the following guidelines:

- Have achieved a chemistry major grade point average of 3.40 or higher
- Have received no grade below B- in junior- or senior-level chemistry courses
- Have completed at least three lecture courses in chemistry numbered CHEM 420 or above
- Have completed or be about to complete a research project certified to be of honors quality by the research advisor and two faculty members appointed by the vice chair for undergraduate studies

Students who wish to qualify for either of these awards should begin planning their course programs and research activities in the junior year so that ample time and effort may be devoted to succeeding in upper-level courses and research.

## Departmental Involvement

Majors are encouraged to participate in AXE (chemistry fraternity) and the undergraduate advisory board.

## Laboratory Teaching Internships and Assistantships

Undergraduates have the opportunity to serve as laboratory teaching assistants for entry-level undergraduate laboratory courses.

## Special Topics

Special topics not offered through the normal course sequence may be pursued through directed reading and registration in CHEM 396 with the approval of the supervising faculty member, advisor, and vice chair for undergraduate studies. An approved learning contract is required, and students must be registered no later than the end of the first week of classes.

## Undergraduate Awards

Excellent performances by undergraduates in chemistry are recognized by the department through the following awards:

- Francis P. Venable Medal: A medallion and cash award are presented to the two most outstanding graduating seniors majoring in chemistry in honor of Dr. Francis P. Venable, who was chair of the department, president of the University from 1900 to 1914, and president of the American Chemical Society.

- Emmett Gladstone Rand Premedical Scholarship: A scholarship is presented to an exceptionally talented graduating senior intending to pursue a career in medicine.
- Jason D. Altom Memorial Award for Undergraduate Research: This cash award recognizes research potential of an undergraduate chemistry major.
- J. Thurman Freeze Scholarship: This scholarship serves to fund summer research between a student's junior and senior years.
- E.C. Markham Summer Research Fund: The department chair selects the recipient of this award, who will use the salary to perform research between the junior and senior years.
- Carrie Largent Award for Research Excellence: This award is given annually to a graduating senior who has excelled in research.
- David L. Stern Scholar: Top students from upper-division laboratory courses are chosen for this cash award.
- AXE Sophomore Chemist Award: A cash award and certificate are presented to an outstanding sophomore chemistry major.
- James H. Maguire Memorial Award: This award goes to an outstanding and academically gifted junior honors student majoring in chemistry.
- Tanya R. Ellison Scholarship: A female, junior or senior B.S. chemistry major is selected for this cash award on the basis of character and academic commitment.
- Hypercube Scholar Award: An outstanding senior majoring in chemistry is given this chemical software package.

## Undergraduate Research

Almost every undergraduate chemistry major who has undertaken a research project has found it to be an exciting and rewarding experience. The reasons are many. One certainly is that it affords an opportunity to make pioneering discoveries at the forefront of science, using instrumentation and techniques far more sophisticated than those usually encountered in standard laboratory courses.

More than 80 students are involved in undergraduate research projects in chemistry each year. Although successful completion of an undergraduate research project is a requirement for graduation with honors or highest honors (see above), it is not necessary to be a participant in Honors Carolina to undertake a research project.

The usual mechanism for becoming involved in a research project is to register for CHEM 395. This process begins well in advance of a preregistration or registration period with a visit to the Chemistry Student Services office, where a student may obtain a list of undergraduate research opportunities and a form titled Request for Registration in CHEM 395.

Most students begin research during the spring semester of their junior year and continue throughout their senior year. CHEM 395 and CHEM 396 together may be taken for credit as many times as desired but may be counted for no more than nine hours total credit toward graduation in either the B.A. or B.S. traditional and polymer tracks and for no more than six hours in the B.S. biochemistry track. In the B.S. curriculum CHEM 395 may be counted no more than once as an advanced chemistry elective.

## UNC-BEST

The UNC Baccalaureate Education in Science and Teaching (UNC-BEST) Program is a collaboration between the School of Education and the College of Arts and Sciences and is designed to allow undergraduate science majors interested in teaching high school science the opportunity to earn their science degree and obtain licensure as a North

Carolina high school science teacher in four years. UNC–BEST students meet all the degree requirements for their chemistry degree using CHEM 410 as one of their upper-level chemistry courses. UNC–BEST students also fulfill teaching licensure coursework requirements as well as many General Education and elective requirements as they complete courses in teaching and learning.

<b>Code</b>	<b>Title</b>	<b>Hours</b>
EDUC 516	Introduction to the Education of Exceptional Learners	3
or EDUC 689	Foundations of Special Education	
EDUC 532	Introduction to Development and Learning	3
EDUC 615	Schools and Community Collaboration	3
or EDUC 533	Social Justice in Education	
EDUC 593	Internship/Student Teaching (final semester)	12
EDUC 601	Education Workshops (final semester)	1
Total Hours		22

For more details on admission requirements, application deadlines, and instructions for submitting an online application, visit the School of Education Web site (<http://soe.unc.edu/academics/uncbest>).