CHEMISTRY

608 Altschul Hall
212-854-8460
212-280-2012 (fax)
Department Administrator: Laura Hendrickson (608 Altschul Hall)

The Department of Chemistry

The department aims to provide Barnard College students with a working knowledge of chemistry—the study of matter and its transformations, particularly at the molecular scale—within a vibrant community of students, faculty, and staff. Students gain familiarity with the core areas of the field; inorganic, physical, organic, analytical, and biological chemistry; while developing broadly applicable skills in problem solving and critical thinking. Through extensive laboratory work, students apply chemical concepts and theories to the tangible world, and there are ample opportunities for independent research with faculty members.

Mission

The department strives to prepare majors and non-majors alike to meet post-graduation goals, including graduate study in chemistry, employment in chemistry or related technical fields, science teaching, and professional school (particularly in the health-related professions). The department is an important contributor to Barnard's effort to produce scientifically literate graduates and to be a source of distinguished women scientists.

Student Learning Objectives for Majors in Chemistry and Biochemistry

Students who graduate from Barnard College with a major in chemistry or biochemistry will be able to attain the following objectives:

- Demonstrate a thorough grounding in the core areas of chemistry: inorganic, physical, organic, biological, and analytical;
- Work effectively and safely in the chemistry laboratory, designing and conducting experiments, analyzing experimental results, and drawing conclusions from that data;
- Access, search, and interpret the chemical literature to obtain and critically evaluate scientific information;
- Clearly communicate scientific ideas and results both in writing and orally;
- Conduct themselves professionally and ethically as members of the scientific community;
- Pursue careers that require a high degree of technical expertise, including those in chemistry, science teaching, and the health professions.

Chemistry is the study of the nature of substances and their transformations. In a sequence of core courses, a chemistry or biochemistry major gains familiarity with the basic areas of the field: inorganic, organic, physical, analytical, and biological chemistry. In addition, she acquires sufficient skill in laboratory work that she is prepared for research.

The laboratories of the department are modern and well-equipped for both coursework and independent projects. Students may undertake research projects under the guidance of members of the department during the academic year or the summer. Opportunities are also available for research with Columbia faculty as well as staff members of the many medical schools and research institutions in New York City.

AP Credit

Students with scores of 4 or 5 on the Chemistry AP test or a 5, 6 or 7 on the IB chemistry exam can receive 3 credits of unspecified chemistry credit. Students may not "place out" of CHEM BC2001 unless they have taken the equivalent course(s) in college.

Pre-Medical Program

Non majors who are interested in the pre-health professions should work with the pre-health adviser to determine the best selection of chemistry courses for their goals. information about the topics covered in each chemistry course is available through the prehealth professions office to facilitate student choice.

Introductory Course Selection

Based on their preparation and background in chemistry, most students begin their study with CHEM BC2001 GENERAL CHEMISTRY I, an integrated lecture and laboratory course. Some students will also take CHEM BC1003 CHEMICAL PROBLEM SOLVING, which is a one point corequisite of General Chemistry. Consult the department regarding this choice.

Regardless of a student's background in chemistry, students may also take CHEM BC1050 THE JAZZ OF CHEMISTRY. This 3.0-point seminar is limited to 24 students per section.

Chair: Dina Merrer (Professor)

Assistant Chair: Marisa Buzzeo (Associate Professor)

Professors: Rachel Narehood Austin, Dina Merrer, Christian Rojas

Associate Professors: Marisa Buzzeo

Assistant Professors: Michael Campbell, Andrew Crowther, Christina Vizcarra

Term Assistant Professor: Subhasish Chatterjee, Jonelle White

Senior Lecturer: Meenakshi Rao, Jean Vadakkan

Senior Associate Laboratory Director: SuQing Liu

Laboratory Instructional Support Specialists: Craig Allen, Grace Lee, Judith Kamm

Director of General Chemistry Laboratories: SuQing Liu

Director of Organic Chemistry Laboratories: Meenakshi Rao (Senior Lecturer)

Laboratory and Facilities Administrator: Maisha Rahman

Requirements for the Major

```
Two majors are offered by the department: Chemistry and
Biochemistry. There is also a special track within chemistry
for students who are interested in pursuing graduate study in
chemical engineering
```

A student interested in chemistry or biochemistry should consult any member of the department during her first year. In the first year they should take CHEM BC2001 GENERAL CHEMISTRY I, CHEM BC3328

Introductory Organic Chemistry Laboratory, and CHEM BC3230 ORGANIC CHEMISTRY I-LEC and start or continue the study of calculus.

In addition to required coursework, research experience is strongly recommended and may begin as early as the sophomore year. Interested students should consult with individual faculty members about research opportunities.

Rising seniors making good progress towards the degree may be invited by the faculty to participate in the senior honors thesis program in which students carry out a year-long research project leading to a thesis. Students who do not perform thesis research will satisfy the senior capstone requirement by taking a single semester of research their senior year.

Chemistry

The courses required for the chemistry major are:

Core		
CHEM BC2001	GENERAL CHEMISTRY I	5
CHEM BC3328 - CHEM BC3230	Introductory Organic Chemistry Laboratory and ORGANIC CHEMISTRY I-LEC	5.5
CHEM BC3231	Organic Chemistry II	3
CHEM BC3333	Modern Techniques of Organic Chemistry Laboratory	3
CHEM BC3242	QUANTITATIVE ANALYSIS	3
CHEM BC3338	QUANTITATVE-INSTRMNTL TECH-LAB	3
CHEM BC3253	QUANTUM CHEMISTRY	3
CHEM BC3252	THERMODYNAMICS-KINETICS	3
CHEM BC3348	Advanced Spectroscopy and Analysis Laboratory	3
CHEM BC3271	INORGANIC CHEMISTRY	3
CHEM BC3358	Advanced Chemical Synthesis Laboratory	5
MATH UN1101	CALCULUS I *	3
MATH UN1102	CALCULUS II	3
or MATH UN1201	Calculus III	
PHYS BC2001 - PHYS BC2002	Physics I: Mechanics and Physics II: Electricity and Magnetism	9
Elective		
Select one of the following:		
CHEM BC3254	Methods and Applications in Physical Chemistry	
CHEM BC3282	BIOLOGICAL CHEMISTRY	
CHEM BC3280	Advanced Organic Chemistry	
CHEM GU4103	Organometallic Chemistry	
Senior Requirement		
Select one of the following:		
Senior Honors Thesis:		
CHEM BC3901 - CHEM BC3902	Senior Honors Thesis and Senior Honors Thesis (by invitation of the department)	
Guided Research at Barnard or Columbia:		
CHEM BC3597	PROBLEMS IN CHEMISTRY	
or CHEM BC3599	PROBLEMS IN CHEMISTRY	
Elsewhere:		
CHEM BC3598	PROBLEMS IN CHEMISTRY	
Recommended		

* For Class 2021 and beyond:

1. Two semesters of math taken at college
2. Completion of Calculus through Calculus II.

Further mathematics experience is always encouraged strongly for Chemistry and Biochemistry majors.

† Students having advanced placement credit for one or two semesters of calculus may fulfill the two-semester requirement with additional mathematics, statistics, or computer science courses. Any calculus-based statistics course is acceptable. Also, many computer science courses are acceptable (e.g., COMS W1004 Intro to Programming in Java , COMS W3101 Program Languages (Python), ENV BC3050 Working with Big Data), although COMS W1002 Computing in Context is not.

‡ *For the major in Chemistry, at least 61.5 credits are required (46.5 credits in chemistry + 6.0 in math + 9.0 in physics).*

A list of major requirements, several possible course sequences, and information about the senior requirement can be obtained from any member of the department.

Biochemistry

The courses required for the biochemistry major are:

Core		
CHEM BC2001	GENERAL CHEMISTRY I	5
CHEM BC3328 - CHEM BC3230	Introductory Organic Chemistry Laboratory and ORGANIC CHEMISTRY I-LEC	5.5
CHEM BC3231	Organic Chemistry II	3
CHEM BC3333	Modern Techniques of Organic Chemistry Laboratory	3
CHEM BC3242	QUANTITATIVE ANALYSIS	3
CHEM BC3338	QUANTITATVE-INSTRMNTL TECH-LAB	3
CHEM BC3253	QUANTUM CHEMISTRY	3
MATH UN1101	CALCULUS I *	3
MATH UN1102	CALCULUS II	3
or MATH UN1201	Calculus III	
PHYS BC2001 - PHYS BC2002	Physics I: Mechanics and Physics II: Electricity and Magnetism	9
BIOL BC1502 - BIOL BC1503	INTRO CELL AND MOLECULAR BIOL and Introductory Lab in Cell and Molecular Biology	5
CHEM BC3282	BIOLOGICAL CHEMISTRY	3
CHEM BC3283	Biological Chemistry II	3
CHEM BC3355	Biochemistry Laboratory Techniques	5
Elective		
An elective course from the following list:		
CHEM BC3271	INORGANIC CHEMISTRY	
CHEM BC3280	Advanced Organic Chemistry	
CHEM BC3252	THERMODYNAMICS-KINETICS	
CHEM BC3254	Methods and Applications in Physical Chemistry	
CHEM BC3348	Advanced Spectroscopy and Analysis Laboratory	
CHEM BC3358	Advanced Chemical Synthesis Laboratory	
Senior Requirement		
Select one of the following:		
Senior Honors Thesis:		

CHEM BC3901 - CHEM BC3902	Senior Honors Thesis and Senior Honors Thesis (by invitation of the department)
Guided Research at Barnard or Columbia:	
CHEM BC3597	PROBLEMS IN CHEMISTRY
or CHEM BC3599	PROBLEMS IN CHEMISTRY
Elsewhere:	
CHEM BC3598	PROBLEMS IN CHEMISTRY
Recommended:	

* For Class of 2020 and before:
1)Two Semesters of math taken at college, including Cal. I or either II or III is required.
For Class of 2021 and beyond:
1) Two Semesters of math taken at college
2) Completion of Calculus through Calculus II.
Further mathematics experience is always encouraged strongly for Chemistry and Biochemistry majors.

† Students having advanced placement credit for one or two semesters of calculus will fulfill this requirement with additional mathematics, statistics, or computer science courses.

‡ *For the major in Biochemistry, at least 63.5 credits are required (43.5 credits in chemistry + 5.0 in biology + 6.0 in math + 9.0 in physics).*

A list of major requirements, including possible elective courses, and information about the senior requirement may be obtained from any member of the department.

Requirements for the Minor

Courses required for the Chemistry minor are:

CHEM BC2001	GENERAL CHEMISTRY I	5
CHEM BC3328	Introductory Organic Chemistry Laboratory	2.5
CHEM BC3230	ORGANIC CHEMISTRY I-LEC	3
CHEM BC3231	Organic Chemistry II	3
CHEM BC3333	Modern Techniques of Organic Chemistry Laboratory	3
CHEM BC3338	QUANTITATVE-INSTRMNTL TECH-LAB	3
Select one of the following:		3-3.5
CHEM BC3232	Chemistry IV	3
CHEM BC3242	QUANTITATIVE ANALYSIS	3
CHEM BC3252	THERMODYNAMICS-KINETICS	3
CHEM BC3271	INORGANIC CHEMISTRY	3
CHEM BC3282	BIOLOGICAL CHEMISTRY	3

Students whose major requires in excess of 40 points, including CHEM BC2001 GENERAL CHEMISTRY I, CHEM BC3328 Introductory Organic Chemistry Laboratory, and/or CHEM BC3230 ORGANIC CHEMISTRY I-LEC, may count up to two of these courses towards the Chemistry minor with a petition from the Chemistry Department Chair. There is no minor in Biochemistry.

Transfer students who took CHEM BC2001 General Chemistry I and II at another institution can complete the minor by taking any one of the following courses on the list EXCEPT CHEM BC3232, which is not an acceptable course for students who have already had a two semester sequence of introductory chemistry elsewhere.

CHEM BC1003 CHEMICAL PROBLEM SOLVING. *1.00 point*.
Prerequisites: Barnard students only. Permission of instructor required.
Corequisites: CHEM BC2001
BC1003x Chemical Problem Solving is designed to helpd students develop stron chemical problem solving skills and succeed in CHEM BC2001x, General Chemistry lecture and lab. Students enrolled in General Chemistry are not required to take Chemical Problem Solving but may elect to. Please contact the instructor regarding this choice. Co-requisite: CHEM BC2001x

Fall 2022: CHEM BC1003

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 1003	001/00413	T 6:10pm - 7:25pm 805 Altschul Hall	Christina Vizcarra	1.00	0/10
CHEM 1003	002/00434	W 8:40am - 9:55am 805 Altschul Hall	Christina Vizcarra	1.00	0/10

CHEM BC1004 Special Topics in Chemistry. *0.50 points*.
CHEM BC1004 Special Topics in Chemistry is designed to give students the opportunity to explore their interests in chemistry while simultaneously taking CHEM BC2001, General Chemistry lecture and lab. Only students currently enrolled in CHEM BC2001 are eligible to take the course and students must select one of the FIVE topics. The topics included are: MONDAY Chemistry and Racism, TUESDAY The Chemistry of Color, WEDNESDAY The Chemistry of Covid-19, THURSDAY An Introduction to Chemical Engineering, FRIDAY The Chemistry of Lead. Students who have previously taken CHEM BC2001 may enroll with special permission of the instructor but priority will be given to current CHEM BC2001 students

CHEM BC1050 THE JAZZ OF CHEMISTRY. *3.00 points*.
The contribution of chemistry to everyday life is immense. The applications of chemistry in medicine, petrochemicals, cosmetics, and fertilizers are readily apparent. However, the knowledge and applications of chemistry come in handy in many other fascinating fields, some of which may be less than obvious. Examples of areas in which chemistry plays a key role include forensic science; art restoration and forgery detection; and flavors and fragrances in food, beverages and other consumer products. The goal of this course is to provide insights and spur discussion of several areas and applications of chemistry, while gaining hands-on experience in techniques used in these fields

CHEM BC2001 GENERAL CHEMISTRY I. *5.00 points*.
Students enrolled in CHEM BC2001 must also register for a section of,CHEM BC2012.

Corequisites: CHEM BC2012
Atoms; elements and compounds; gases; solutions; equilibrium; acid-base, precipitation, and oxidation-reduction reactions; thermochemistry. Laboratory one day a week. Laboratory experience with both qualitative and quantitative techniques. Counts towards Lab Science Requirement

Fall 2022: CHEM BC2001

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 2001	001/00415	T Th 8:40am - 9:55am 202 Altschul Hall	Marisa Buzzeo	5.00	0/32
CHEM 2001	002/00414	T Th 11:40am - 12:55pm 405 Milbank Hall	Michael Campbell	5.00	0/32
CHEM 2001	003/00416	T Th 10:10am - 11:25am LI103 Diana Center	Andrew Crowther	5.00	0/32

CHEM BC2012 General Chemistry Lab. *0 points*.
Corequisites: CHEM BC2001
Required laboratory section for BC2001 General Chemistry. All students enrolled in BC2001 must also be enrolled in one section of BC2012.

Fall 2022: CHEM BC2012

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 2012	001/00417	M 8:30am - 12:20pm Room TBA	Marisa Buzzeo, Suqing Liu	0	0/12
CHEM 2012	002/00427	M 1:10pm - 5:00pm Room TBA	Marisa Buzzeo, Suqing Liu	0	0/12
CHEM 2012	003/00428	T 1:10pm - 5:00pm Room TBA	Marisa Buzzeo, Suqing Liu	0	0/12
CHEM 2012	004/00429	W 8:30am - 12:20pm Room TBA	Marisa Buzzeo, Suqing Liu	0	0/12
CHEM 2012	005/00430	W 1:10pm - 5:00pm Room TBA	Marisa Buzzeo, Suqing Liu	0	0/12
CHEM 2012	006/00431	Th 1:10pm - 5:00pm Room TBA	Marisa Buzzeo, Suqing Liu	0	0/12
CHEM 2012	007/00432	F 8:30am - 12:20pm Room TBA	Marisa Buzzeo, Suqing Liu	0	0/12
CHEM 2012	008/00433	F 1:10pm - 5:00pm Room TBA	Marisa Buzzeo, Suqing Liu	0	0/12

CHEM BC2900 Research Methods Seminar. *1 point*.
Instructor's Permission Required

Prerequisites: Students must be sophomores with a strong interest in pursuing research in the biological or chemical sciences
Skills to facilitate into biology and chemistry research. Students will learn to think and work like scientists and to identify, apply for and gain entry to research lab groups. Focus on writing and oral presentation skills. Additional readings and discussions on laboratory safety, women in science, and scientific ethics.

CHEM BC3000 Integrated Chemistry Laboratory. *2.00-3.00 points*.
This course is designed to provide hands-on chemical training to reinforce laboratory techniques learned remotely due to the COVID-19 pandemic. Experiments will integrate topics and techniques from analytical, organic, physical, and biological chemistry. The course is open to students of varying class years, and thus experiments will be tailored to the individuals' completed coursework

CHEM BC3230 ORGANIC CHEMISTRY I-LEC. *3.00 points*.
Prerequisites: CHEM BC2001 or equivalent. Credit will not be given for any course below the 3000 level after completing CHEM BC3230 or its equivalent. Lecture: MWF: 10:00 - 10:50 AM
Corequisites: With lab, counts towards Lab Science requirement.
Prerequisites: CHEM BC2001 or equivalent. Credit will not be given for any course below the 3000 level after completing CHEM BC3230 or its equivalent. Corequisites: With lab, counts towards Lab Science requirement. Atomic and molecular structure; stereochemistry of organic molecules; introduction to organic reactions, reaction mechanisms, and synthesis

Spring 2022: CHEM BC3230

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3230	001/00098	M W F 10:00am - 10:50am 202 Altschul Hall	Dina Merrer	3.00	164

CHEM BC3231 Organic Chemistry II. *3 points*.
Prerequisites: CHEM BC3230. Lecture: MWF 10:00-10:50.
Extension of concepts from Organic Chemistry I to conjugated systems; chemistry of the carbonyl group; NMR and IR spectroscopy; bioorganic chemistry.

Fall 2022: CHEM BC3231

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3231	001/00435	M W F 10:00am - 10:50am 304 Barnard Hall	Christian Rojas	3	0/100

CHEM BC3232 Chemistry IV. *3 points*.
Prerequisites: CHEM BC2001. Selected aspects of general chemistry, primary for pre-health professions and biological science students who have taken Organic Chemistry. Thermodynamics, equilibrium, kinetics, complex ions and coordination compounds, and radiochemistry, with applications to analytical chemistry and biochemistry.

CHEM BC3242 QUANTITATIVE ANALYSIS. *3.00 points*.
Prerequisites: CHEM BC3231, MATH UN1101, and permission of instructor. Survey of topics appropriate for a student majoring in chemistry or biochemistry, including examinations of uncertainty analysis and data processing, use of basic laboratory equipment, complex equilibria (pH, solubility, etc.), advanced solution chemistry and chemical activity, and the theoretical foundations of modern techniques in electrochemistry, chromatography and analytical experimental techniques

Spring 2022: CHEM BC3242

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3242	001/00104	M W 10:10am - 11:25am 903 Altschul Hall	Subhasish Chatterjee	3.00	45/50

CHEM BC3252 THERMODYNAMICS-KINETICS. *3.00 points*.
Prerequisites: CHEM BC3231, PHYS BC2001, PHYS BC 2002, MATH UN1102 or MATH UN1201. Introduction to the laws of thermodynamics; application primarily to ideal systems. Free energy and equilibrium. Kinetics: rate laws and mechanisms, experimental techniques

Spring 2022: CHEM BC3252

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3252	001/00118	T Th 11:40am - 12:55pm 805 Altschul Hall	Marisa Buzzeo	3.00	6/15

CHEM BC3253 QUANTUM CHEMISTRY. *3.00 points*.
Prerequisites: 2 semesters of calculus-based introductory physics, Calculus II, BC3242 Quantitative Analysis, or permission of instructor. Exact and approximate solutions to the Schrodinger equation. The structure of atoms and molecules. Chemical bonding and spectroscopy. Computer-based molecular modeling

Fall 2022: CHEM BC3253

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3253	001/00436	M W F 11:00am - 11:50am 805 Altschul Hall	Andrew Crowther	3.00	0/40

CHEM BC3254 Methods and Applications in Physical Chemistry. *3 points*.
Prerequisites: (CHEM BC3253) CHEM BC3253 or permission of instructor.
Lecture: MWF 11:00-11:50.
Advanced topics in physical chemistry, including statistical mechanics, reaction dynamics, materials science, catalysis, and nanotechnology. Particular emphasis will be placed on topics related to climate and energy.

Spring 2022: CHEM BC3254

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3254	001/00142	M W F 11:00am - 11:50am 530 Altschul Hall	Andrew Crowther	3	3/20

CHEM BC3271 INORGANIC CHEMISTRY. *3.00 points*.
Prerequisites: CHEM BC3231 or Permission of Instructor. Structure, bonding and spectroscopy in inorganic compounds: applications of group theory to chemistry; ligand field theory; vibrational and electronic spectroscopy of transition metal complexes; selected topics from coordination chemistry, organometallics, bioinorganic chemistry, solid state and materials chemistry, mineralogy, and biogeochemistry

Spring 2022: CHEM BC3271

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3271	001/00143	T Th 10:10am - 11:25am 302 Barnard Hall	Michael Campbell	3.00	29/40

CHEM BC3272 Advanced Inorganic Chemistry. *3 points*.
Prerequisites: CHEM BC3271 Inorganic Chemistry
This course combines builds on the foundation developed in Inorganic Chemistry (CHEM BC3271) and applies inorganic chemical concepts and techniques to specific applications. A particular focus will be on understanding the roles of the transition metals in biological systems.

Fall 2022: CHEM BC3272

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3272	001/00437	M W 1:10pm - 2:25pm Room TBA	Michael Campbell	3	0/15

CHEM BC3280 Advanced Organic Chemistry. *3 points*.
Prerequisites: One year of organic chemistry.
Survey of topics in structural, mechanistic, and synthetic organic chemistry, including molecular orbital treatment of structure, bonding, and chemical reactivity; elucidation of organic reaction mechanisms; pericyclic reactions; stereoelectronic effects; reactive intermediates; asymmetric reactions; and natural product total synthesis.

CHEM BC3282 BIOLOGICAL CHEMISTRY. *3.00 points*.
Prerequisites: (CHEM BC3230) and (CHEM BC3231) BIOL BC1502.
Introduction to biochemical building blocks, macromolecules, and metabolism. Structures of amino acids, lipids, carbohydrates, nucleic acids. Protein structure and folding. Enzyme mechanisms, kinetics, allostery. Membranes and biosignaling. Catabolism and anabolism with emphasis on chemical intermediates, metabolic energy, catalysis by specific enzymes, regulation.

Spring 2022: CHEM BC3282

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3282	001/00144	M W 11:40am - 12:55pm 903 Altschul Hall	Jonelle White	3.00	37/45

Fall 2022: CHEM BC3282

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3282	001/00438	T Th 11:40am - 12:55pm 805 Altschul Hall	Rebecca Donegan	3.00	0/40

CHEM BC3283 Biological Chemistry II. *3 points*.
Prerequisites: CHEM BC3282 or equivalent.
Advanced topics in the field of biochemistry, including enzyme mechanisms, pharmaceutical drug design, and disease therapies. Emphasis will be placed on discussion of current scientific literature.

Spring 2022: CHEM BC3283

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3283	001/00145	M W 10:10am - 11:25am 805 Altschul Hall	Christina Vizcarra	3	12/25

CHEM BC3284 Current Topics in Biochemistry. *3 points*.
Prerequisites: CHEM BC3282 and CHEM BC3355 or instructor approval.
This course is designed to expose students to a range of current research topics in the field of biochemistry and develop their ability to understand and evaluate primary scientific literature. The first half of the course will focus on current research on fundamental biochemistry systems and processes; the second half will addres biomedicinal application and advances.

CHEM BC3328 Introductory Organic Chemistry Laboratory. *2.5 points*.
Prerequisites: (CHEM BC2001) General Chemistry I with lab.
Corequisites: CHEM BC3230
Basic techniques of experimental organic chemistry. Principles and methods of separation, purification, and characterization of organic compounds. Selected organic reactions.

Spring 2022: CHEM BC3328

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3328	001/00146	M 1:10pm - 5:00pm 716 Altschul Hall	Meenakshi Rao, Jean Vadakkan, Craig Allen	2.5	19/23
CHEM 3328	002/00147	T 1:10pm - 5:00pm 716 Altschul Hall	Meenakshi Rao, Grace Lee, Jean Vadakkan	2.5	23/23
CHEM 3328	003/00148	W 1:10pm - 5:00pm 716 Altschul Hall	Meenakshi Rao, Jean Vadakkan, Judith Kamm	2.5	22/23
CHEM 3328	004/00149	Th 1:10pm - 5:00pm 716 Altschul Hall	Meenakshi Rao, Jean Vadakkan, Craig Allen	2.5	22/23
CHEM 3328	005/00150	F 1:10pm - 5:00pm 716 Altschul Hall	Meenakshi Rao, Grace Lee, Jean Vadakkan	2.5	21/23
CHEM 3328	006/00151	T 8:30am - 12:20pm 716 Altschul Hall	Meenakshi Rao, Grace Lee, Jean Vadakkan, Craig Allen	2.5	21/23
CHEM 3328	007/00152	Th 8:30am - 12:20pm 716 Altschul Hall	Meenakshi Rao, Jean Vadakkan	2.5	20/20

Fall 2022: CHEM BC3328

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3328	001/00439	Th 8:30am - 12:20pm Room TBA	Meenakshi Rao	2.5	0/20

CHEM BC3333 Modern Techniques of Organic Chemistry Laboratory. *3 points*.
Prerequisites: (CHEM BC3328) or (CHEM BC3230) CHEM BC3328 with a grade of C- or better and CHEM BC3230.
Corequisites: CHEM BC3231,CHEM BC3334
Advanced experimental organic techniques and introduction to qualitative and quantitative organic analysis. Emphasis on instrumental and chromatographic methods. Selected reactions. Students enrolling in this course must register for CHEM BC3334x.

Fall 2022: CHEM BC3333

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3333	001/00440	M 1:10pm - 5:30pm Room TBA	Meenakshi Rao, Grace Lee, Craig Allen	3	0/15
CHEM 3333	002/00441	W 1:10pm - 5:30pm Room TBA	Meenakshi Rao, Grace Lee, Craig Allen	3	0/15

CHEM BC3338 QUANTITATVE-INSTRMNTL TECH-LAB. *3.00 points*.
Prerequisites: (CHEM BC3231 and CHEM BC3333) Co-requisite for students not majoring in chemistry or biochemistry: CHEM BC3232. For students majoring in chemistry or biochemistry, CHEM BC3242.
Corequisites: CHEM BC3232,CHEM BC3242
Prerequisites: CHEM BC3231 and CHEM BC3333 Quantitative techniques in volumetric analysis, pH measurement, UV-Visible, absorption, and fluorescence spectroscopy, and chromatographic separations. Data analysis with spreadsheets

Spring 2022: CHEM BC3338

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3338	001/00153	T 1:10pm - 5:30pm 813 Altschul Hall	Subhasish Chatterjee, Judith Kamm	3.00	19/24
CHEM 3338	002/00154	Th 1:10pm - 5:30pm 813 Altschul Hall	Subhasish Chatterjee, Judith Kamm	3.00	7/24

CHEM BC3346 Advanced Spectroscopy Laboratory . *0 points*.
Corequisites: CHEM BC3348
This course combines chemical synthesis, inorganic chemistry, physical chemistry, and nanoscience into experiments with an emphasis using spectroscopy to determine chemical structure and reactivity. you will gain experience with a range of instruments, techniques, calculations, and theories. Instrumentation will include UV-Visible, infrared, near-infrared, fluorescence, and Raman spectroscopy.

Spring 2022: CHEM BC3346

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3346	001/00170	M 1:10pm - 2:00pm LI104 Diana Center	Andrew Crowther, Christina Vizcarra	0	12/13

CHEM BC3348 Advanced Spectroscopy and Analysis Laboratory. *3 points*.
Prerequisites: CHEM BC3333 and CHEM BC3253
Corequisites: CHEM BC3271
This course combines chemical synthesis, inorganic chemistry, physical chemistry, and nanoscience into experiments with an emphasis using spectroscopy to determine chemical structure and reactivity. You will gain experience with a range of instruments, techniques, calculations, and theories. Instrumentation will include UV-Visible, infrared, near-infrared, fluorescence, and Raman spectroscopy.

Spring 2022: CHEM BC3348

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3348	001/00155	M 2:10pm - 6:00pm 606 Altschul Hall	Andrew Crowther, Christina Vizcarra	3	7/7
CHEM 3348	002/00171	W 1:10pm - 5:00pm 606 Altschul Hall	Andrew Crowther, Christina Vizcarra	3	5/7

CHEM BC3355 Biochemistry Laboratory Techniques. *5 points*.
Prerequisites: Organic II lab (CHEM BC3333, BC3335, or equivalent); Quantitative analysis lab (BC3338, BC3340, or equivalent); Biochemistry (CHEM BC3282y, CHEM C3501, or equivalent). Lecture: T 1:10-12:50; Laboratory two afternoons: T 2:10-6:00 / TH 1:10-5:00.
Theory and application of fundamental techniques for the isolation, synthesis and characterization of biological macromolecules including proteins, lipids, nucleotides and carbohydrates. Techniques include spectroscopic analysis, gel electrophoresis, chromatography, enzyme kinetics, immunoblotting, PCR, molecular cloning and cell culture, as well as modern laboratory instrumentation, such as UV-Vis, GC-MS and HPLC.

Spring 2022: CHEM BC3355

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3355	001/00156		Jonelle White, Rebecca Donegan	5	11/14

CHEM BC3358 Advanced Chemical Synthesis Laboratory. *5 points*.
Prerequisites: CHEM BC3333, CHEM BC3271, and CHEM BC3338
Corequisites: CHEM BC3253
Multistep and multi-day experiments in organic and inorganic synthesis via advanced synthetic methods. Experiments include solution phase, solid state, and photochemical syntheses. Products will be analyzed and characterized by a variety of methods, including: IR, NMR, and UV-Vis spectroscopy, and also by polarimetry, chiral GC, and GC/MS.

Fall 2022: CHEM BC3358

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3358	001/00442	T Th 1:10pm - 5:30pm Room TBA	Jean Vadakkan, Judith Kamm	5	0/12

CHEM BC3597 PROBLEMS IN CHEMISTRY. *2.00 points*.
Prerequisites: CHEM BC3328 and permission of instructor.
Individual research projects at Barnard or Columbia, culminating in a comprehensive written report

Spring 2022: CHEM BC3597

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3597	001/00294		Christian Rojas	2.00	0
CHEM 3597	002/00295		Marisa Buzzeo	2.00	0
CHEM 3597	003/00297		Dina Merrer	2.00	0
CHEM 3597	004/00302		Andrew Crowther	2.00	1
CHEM 3597	005/00305		Michael Campbell	2.00	0
CHEM 3597	006/00308		Subhasish Chatterjee	2.00	0
CHEM 3597	007/00311		Rachel Austin	2.00	0
CHEM 3597	008/00312		Christina Vizcarra	2.00	0
CHEM 3597	009/00313		Marisa Buzzeo, Dina Merrer	2.00	2
CHEM 3597	010/00317		Meenakshi Rao	2.00	0
CHEM 3597	011/00318		Rebecca Donegan	2.00	0

Fall 2022: CHEM BC3597

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3597	001/00498		Christian Rojas	2.00	0/2
CHEM 3597	002/00500		Marisa Buzzeo	2.00	0/2
CHEM 3597	003/00501		Dina Merrer	2.00	0/2
CHEM 3597	004/00502		Andrew Crowther	2.00	0/2
CHEM 3597	005/00503		Michael Campbell	2.00	0/2
CHEM 3597	006/00504		Subhasish Chatterjee	2.00	0/2
CHEM 3597	007/00506		Rachel Austin	2.00	0/2
CHEM 3597	008/00507		Christina Vizcarra	2.00	0/2
CHEM 3597	009/00508		Marisa Buzzeo, Christian Rojas	2.00	0/2
CHEM 3597	010/00509		Rebecca Donegan	2.00	0/2

CHEM BC3599 PROBLEMS IN CHEMISTRY. *4.00 points*.
Prerequisites: CHEM BC3328 and permission of instructor.
Individual research projects at Barnard or Columbia, culminating in a comprehensive written report

Spring 2022: CHEM BC3599

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3599	001/00322		Christian Rojas	4.00	0
CHEM 3599	002/00325		Marisa Buzzeo	4.00	2
CHEM 3599	003/00327		Dina Merrer	4.00	0
CHEM 3599	004/00331		Andrew Crowther	4.00	0
CHEM 3599	005/00335		Michael Campbell	4.00	0
CHEM 3599	006/00338		Subhasish Chatterjee	4.00	0
CHEM 3599	007/00340		Rachel Austin	4.00	0
CHEM 3599	008/00342		Christina Vizcarra	4.00	0
CHEM 3599	009/00343		Marisa Buzzeo, Dina Merrer	4.00	1
CHEM 3599	010/00344		Rebecca Donegan	4.00	0

Fall 2022: CHEM BC3599

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3599	001/00510		Christian Rojas	4.00	0/2
CHEM 3599	002/00511		Marisa Buzzeo	4.00	0/2
CHEM 3599	003/00512		Dina Merrer	4.00	0/2
CHEM 3599	004/00513		Andrew Crowther	4.00	0/2
CHEM 3599	005/00514		Michael Campbell	4.00	0/2
CHEM 3599	006/00515		Subhasish Chatterjee	4.00	0/2
CHEM 3599	007/00517		Rachel Austin	4.00	0/2
CHEM 3599	008/00518		Christina Vizcarra	4.00	0/2
CHEM 3599	009/00519		Marisa Buzzeo	4.00	0/2
CHEM 3599	010/00520		Rebecca Donegan	4.00	0/2

CHEM BC3901 Senior Honors Thesis. *4 points*.
Enrollment restricted by invitation of the department.

Weekly seminar to accompany Senior Honors Thesis Lab (CHEM BC3903). Focus is on scientific presentation and writing skills and research conduct.

Fall 2022: CHEM BC3901

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3901	001/00443	F 2:10pm - 4:00pm 805 Altschul Hall	Marisa Buzzeo	4	0/8

CHEM BC3902 Senior Honors Thesis. *4 points*.
Enrollment restricted by invitation of the department.

Weekly seminar to accompany Senior Honors Thesis Lab (CHEM BC3903). Focus is on scientific presentation and writing skills and research conduct.

Spring 2022: CHEM BC3902

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3902	001/00157	F 1:10pm - 3:00pm 805 Altschul Hall	Michael Campbell	4	8/10

CHEM BC3903 Senior Honor Thesis Lab. *0 points*.
Corequisites: CHEM BC3901
Guided research in Chemistry or Biochemistry, under the sponsorship of a faculty member, leading to the senior thesis. A minimum of 8 hours of research per week, to be arranged.

Fall 2022: CHEM BC3903

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3903	001/00445		Christian Rojas	0	0/2
CHEM 3903	002/00466		Marisa Buzzeo	0	0/2
CHEM 3903	003/00490		Dina Merrer	0	0/2
CHEM 3903	004/00491		Andrew Crowther	0	0/2
CHEM 3903	005/00493		Michael Campbell	0	0/2
CHEM 3903	007/00494		Rachel Austin	0	0/2
CHEM 3903	008/00495		Christina Vizcarra	0	0/2
CHEM 3903	009/00496		Marisa Buzzeo, Christian Rojas	0	0/2
CHEM 3903	010/00497		Rebecca Donegan	0	0/2

CHEM BC3904 Senior Honors Thesis Lab. *0 points*.
Corequisites: CHEM BC3902
Guided research in Chemistry or Biochemistry, under the sponsorship of a faculty member, leading to the senior thesis. A minimum of 8 hours of research per week, to be arranged.

Spring 2022: CHEM BC3904

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 3904	001/00346		Christian Rojas	0	4
CHEM 3904	002/00347		Marisa Buzzeo	0	1
CHEM 3904	003/00348		Dina Merrer	0	0
CHEM 3904	004/00349		Andrew Crowther	0	1
CHEM 3904	005/00351		Michael Campbell	0	1
CHEM 3904	006/00352		Subhasish Chatterjee	0	0
CHEM 3904	007/00353		Rachel Austin	0	0
CHEM 3904	008/00354		Christina Vizcarra	0	0
CHEM 3904	009/00355		Marisa Buzzeo, Dina Merrer	0	1
CHEM 3904	010/00356		Rebecca Donegan	0	0

Cross-Listed Courses

Chemistry

CHEM GU4071 Inorganic Chemistry. *4.5 points*.
CC/GS: Partial Fulfillment of Science Requirement

Prerequisites: (CHEM UN1403 and CHEM UN1404) or (CHEM UN1604) or (CHEM UN2045 and CHEM UN2046) , or the equivalent.
Principles governing the structure and reactivity of inorganic compounds surveyed from experimental and theoretical viewpoints. Topics include inorganic solids, aqueous and nonaqueous solutions, the chemistry of selected main group elements, transition metal chemistry, metal clusters, metal carbonyls, and organometallic chemistry, bonding and resonance, symmetry and molecular orbitals, and spectroscopy.

Fall 2022: CHEM GU4071

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 4071	001/11728	M W 10:10am - 11:25am 320 Havemeyer Hall	Jonathan Owen	4.5	0/42

CHEM G4103 Organometallic Chemistry. *4.5 points*.
Prerequisites: elementary organic chemistry. (Some background in inorganic and physical chemistry is helpful but not required.)
Main group and transition metal organometallic chemistry: bonding, structure, reactions, kinetics, and mechanisms.

CHEM GU4147 Advanced Organic Chemistry. *4.5 points*.
Prerequisites: elementary organic and physical chemistry.
The mechanisms of organic reactions, structure of organic molecules, and theories of reactivity. How reactive intermediates are recognized and mechanisms are deduced using kinetics, stereochemistry, isotopes, and physical measurements.

Fall 2022: CHEM GU4147

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 4147	001/11730	T Th 8:40am - 9:55am 320 Havemeyer Hall	Tomislav Rovis	4.5	0/42

BIOC G4170 Biophysical Chemistry. *4.5 points*.
Not offered during 2021-22 academic year.

Prerequisites: elementary physical and organic chemistry. Recommended preparation: elementary biochemistry.
Tactics and techniques for the study of large molecules of biological importance; analysis of the conformation of proteins and nucleic acids, hydrodynamic, scattering, and spectroscopic techniques for examining macromolecular structure.

CHEM G4172 Biorganic Topics. *4.5 points*.
Not offered during 2021-22 academic year.

Prerequisites: elementary organic chemistry.
Recommended preparation: advanced organic chemistry. Various topics in bioactive molecules in the field centered on natural-products chemistry, metabolic transformations, and enzyme mechanisms. Biosysnthesis of natural products and some other bioorganic topics.

CHEM GU4221 Quantum Chemistry. *4.5 points*.
Prerequisites: elementary physical chemistry.
Basic quantum mechanics: the Schrodinger equation and its interpretation, exact solutions in simple cases, methods or approximation, angular Mementum and electronic spin, and an introduction to atomic and molecular structure.

Fall 2022: CHEM GU4221

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
CHEM 4221	001/11733	M W 11:40am - 12:55pm 320 Havemeyer Hall	Timothy Berkelbach	4.5	0/42