Department of Chemistry and Biochemistry
(Division of Science)
Professor Daniel Akins, Chair • Department Office: MR 1024 • Tel: 212-650-8402

General Information
The City College offers the following undergraduate degree in Chemistry:
- B.S. in Chemistry
- B.S./M.S. in Chemistry (Combined Degree)

Programs and Objectives
The Department of Chemistry and Biochemistry, established in 1849, offers instruction and research training in the following areas:
- Analytical Chemistry
- Biochemistry
- Environmental Chemistry
- Inorganic Chemistry
- Organic Chemistry
- Physical Chemistry

The B.S. program is available for students planning to go into advanced study, government service, the health professions, and secondary school education. There are a number of pathways by which students may specialize in chemistry. The Standard Chemistry curriculum is the program of choice for those who have not yet decided upon their specific career goals and who wish to maximize their opportunities. The Environmental Concentration is for students wishing to pursue an industrial or graduate career in the environmental sciences. Students taking this concentration are trained to identify the effects of chemical species on the environment, to trace the sources, reactions and fates of such species and to devise chemical methods for treating environmental problems and bringing them under control. The Secondary Education Concentration is for students who plan to become secondary school teachers upon graduation. Detailed curricula for each concentration may be obtained by phoning or visiting the Department Office.

There is no "premed major" as such at City College. Premedical students major in biochemistry, biology, chemistry or some other discipline while completing the requirements for admission into medical school. The Department cooperates closely with the Program in Premedical Studies (PPS), a program of the Division of Science. This program features a curriculum which integrates a variety of learning experiences specifically preparing participants to meet the requirements of medical, dental and veterinary schools, and also requires the admission into physician's assistant and physical therapy advanced degree programs.

Honors Research and Independent Study
The Department of Chemistry and Biochemistry maintains an active undergraduate research program. Students may receive up to 9 credits for their research work by enrolling in Honors (CHEM 30100-30400) or Independent Study (CHEM 31001-31004) with permission of the Undergraduate Research Supervisor. Financial support for research may be available for some students through a variety of grant-sponsored programs.

The Combined B.S./M.S. Degree
The primary purpose of the B.S./M.S. degree program is to prepare chemistry majors for positions in industry. In addition, students who want to strengthen their preparation for graduate and professional schools would also benefit from this program. The combined B.S./M.S. degree program is designed to be completed in five years, and is research intensive. Students will complete three semesters of undergraduate research plus another two semesters of research at the graduate level which culminates in a master's thesis.

Prospective students are expected to have a strong undergraduate background in the sciences and a desire to perform research. Students will be considered for admission generally during their junior year after they meet the requirements for admission to the Chemistry major and have three of the five required core Chemistry courses for this program. A total of 75 credits must be fulfilled before an application will be considered. Students must have a 3.0 minimum GPA in chemistry courses and a 3.0 overall GPA. Furthermore, students must be working on a research project with a mentor. A recommendation letter from the research mentor on the student's ability to conduct scientific research will be required. A total of 145 credit hours is required to complete the combined B.S./M.S. degree program, and students will benefit from early faculty advisement and mentoring.

Requirements for Majors
A GPA of 2.0 or higher in the major is required for graduation. The GPA in the major is calculated from courses in the major based in the major department only, and that have been taken at City College or through ePermit, including all courses in excess of the minimum required for the degree.

Foundational Courses
Foundational courses for all undergraduate programs for Chemistry must be completed before embarking upon related courses in the major. Students with appropriate background as demonstrated by the College’s Placement Exam may be exempted from some or all Foundational Courses. The foundational course for Calculus I (Math 20100) is Pre-Calculus (Math 19500), and this course must be passed with a grade of C or higher in order to proceed to the next level. The foundational course for General Chemistry I (CHEM 10301) is Pre-Calculus (Math 19500), and this course must be passed with a grade of C or higher in order to proceed to the next level.

Non-Chemistry Core Requirements
- BIO 10100: Foundations of Biology I 4
- MATH 20100: Calculus I 3
- MATH 20200: Calculus II 3
- MATH 20300: Calculus III 4
- PHYS 20700: General Physics I 4
- PHYS 20800: General Physics II 4
- One of the following two:
  - EAS 10600: Earth Systems Science 4
  - BIO 10200: Foundations of Biology II 4

All Chemistry majors must complete "Chemistry Core Courses" and either the "Standard Chemistry Concentration" or one of the alternative concentrations. Students may also elect to satisfy the American Chemical Society Certification requirements.

Chemistry Core Courses
- CHEM 10301: General Chemistry I 4
- CHEM 10401: General Chemistry II 4
- CHEM 24300: Quantitative Analysis 4
- CHEM 26100: Organic Chemistry I 3
- CHEM 26300: Organic Chemistry II 3
- CHEM 27200: Organic Chemistry Laboratory I 3
- CHEM 33000: Physical Chemistry I 3

Total Credits for Chemistry Core Courses: 24

Standard Chemistry Concentration

Required Courses
- CHEM 32002: Biochemistry I 3
- CHEM 33100: Physical Chemistry Laboratory I (Spring semester only) 2
- CHEM 33200: Physical Chemistry I 3
- CHEM 37400: Organic Chemistry Laboratory II 3
- CHEM 42500: Inorganic Chemistry 3
- CHEM 43400: Physical Chemistry and Chemical Instrumentation Laboratory II (Fall semester only) 3

Total Credits: 17

Biochemistry Concentration

Required Courses
- CHEM 32002: Biochemistry I 3
- CHEM 32004: Biochemistry Laboratory I 2
- CHEM 37400: Organic Chemistry Laboratory II 3
- CHEM 43500: Physical Chemistry II (Spring semester only) 3
- CHEM 48005: Biochemistry II (Spring semester only) 3
- BIO 10200: Foundations of Biology II 4
- One of the following two:
  - BIO 20600: Introduction to Genetics 4
  - BIO 22900: Cell and Molecular Biology 4

Total Credits: 24

Environmental Concentration

Required Courses
- CHEM 32002: Biochemistry I 3
- CHEM 33100: Physical Chemistry Laboratory I (Spring semester only) 2
- CHEM 33200: Physical Chemistry II 3
CHEM 37400: Organic Chemistry Laboratory II 3
CHEM 40600: Fundamentals of Environmental Chemistry 3
CHEM 40601: Environmental Chemistry Laboratory II 2
CHEM 40700: Environmental Organic Chemistry 3
CHEM 42500: Inorganic Chemistry 3
CHEM 43400: Physical Chemistry and Chemical Instrumentation 3
Laboratory II (Fall semester only)
Total Credits for Environmental Concentration 25

Secondary Education Concentration
Major requirements are listed below. Pedagogical requirements are listed in the Department of Education section in this Bulletin.

Required Courses
CHEM 33100: Physical Chemistry Laboratory I 2
CHEM 33200: Physical Chemistry II 3
CHEM 43400: Physical Chemistry and Chemical Instrumentation 3
Laboratory II
Total Credits for Secondary Ed. Option 8

Additional Requirements
All Chemistry majors must maintain a C average in Chemistry courses. No courses beyond General Chemistry may be taken unless a C is obtained in all prerequisite courses (or permission is received from the Chair).

GENERAL EDUCATION REQUIREMENTS (“PATHWAYS”)
In general, students are required to complete 42 credits of General Education coursework, with some adjustments for transfer students. See the General Education Requirements (Pathways) section of the Bulletin for more information. Chemistry students will satisfy their “Pathways” requirements most efficiently by following these recommendations:

Fixed Core
English Composition I: FIQWS
English Composition II: ENGL 21003
Mathematical and Quantitative Reasoning: MATH 20100
Life and Physical Sciences: CHEM 10301

Flexible Core
World Cultures and Global Issues: any of CLAS offerings in this category
Individual and Society: any of CLAS offerings in this category
U.S. Experience in its Diversity: any of CLAS offerings in this category
Creative Expression: any of CLAS offerings in this category
Scientific World: BIO 10100

Additional course in Scientific World: CHEM 10401 or PHYS 20700

College Option
Speech 1100, 00380 or exemption on the basis of demonstrated proficiency in a foreign language – two semesters of college-level study, or exemption on the basis of two years of high-school level study
Philosophy - any of CLAS offerings in this category

Minor in Chemistry
Procedure for declaring a Minor in Chemistry:
The student, no matter which major they have declared, must meet with the chemistry minor advisor, Prof. Glen Kowach.

Requirements:
CHEM 10301: General Chemistry I 4
CHEM 10401: General Chemistry II 4
CHEM 26100: Organic Chemistry I 3
CHEM 26300: Organic Chemistry II 3
CHEM 26200: Organic Chemistry Laboratory I 3
Two of the Following:
CHEM 33000: Physical Chemistry I 3
CHEM 32002: Biochemistry I 3
CHEM 42500: Inorganic Chemistry 3
CHEM 40600: Environmental Chemistry OR
CHEM 40700: Environmental Organic Chemistry 3
Total Credits 23

For American Chemical Society Certification
Students wishing to receive American Chemical Society Certification must complete the requirements for their chosen option and the following courses.

Standard Chemistry Concentration
Three graduate level courses chosen in consultation with the advisor (may include up to six credits of Honors Research/Independent Study or three credits of Honors Research/Independent Study and three credits of Environmental Chemistry):

Biochemistry Concentration
CHEM 42500: Inorganic Chemistry 3
Two graduate level courses chosen in consultation with the advisor (may include up to six credits of Honors Research/Independent Study or three credits of Honors Research/Independent Study and three credits of Environmental Chemistry):

Secondary Education Concentration
CHEM 32002: Biochemistry I 3
CHEM 42500: Inorganic Chemistry 3
CHEM 37400: Organic Chemistry Laboratory II 3

Premedical or Predental Students
Pre-medical or pre-dental students who are not chemistry or biochemistry majors are required to take the following:

Required Courses
CHEM 10301: General Chemistry I 4
CHEM 10401: General Chemistry II 4
CHEM 26100: Organic Chemistry I 3
CHEM 26300: Organic Chemistry II 3
CHEM 26200: Organic Chemistry Laboratory I 2

Elective Courses
If additional chemistry electives are desired, the following courses are recommended:
CHEM 24300: Quantitative Analysis 4
CHEM 33000: Physical Chemistry I 3
CHEM 33500: Physical Biochemistry 5
CHEM 37400: Organic Chemistry Laboratory II 3
CHEM 45902: Biochemistry I 3
CHEM 45904: Biochemistry Laboratory 2
CHEM 48005: Biochemistry II 3

Students Planning Graduate Work
For students planning graduate work in chemistry, the following additional courses are recommended:

Mathematics:
MATH 39100: Methods of Differential Equations 3
MATH 39200: Linear Algebra and Vector Analysis 3
Experience in statistics and computer science. Reading proficiency in at least one language with a significant scientific literature.

Requirements for BS/MS Degree
General Requirements
General Education Requirements 21

BS Degree Requirements
BIO 10100: Biological Foundations I 4
CHEM 10301-10401: General Chemistry and Laboratory I and II 8
CHEM 24300: Quantitative Analysis 4
CHEM 26100: Organic Chemistry I 3
CHEM 26300: Organic Chemistry II 3
CHEM 27200: Organic Chemistry Laboratory I 3
CHEM 33000: Physical Chemistry I 3
CHEM 33100: Physical Chemistry Laboratory I 3
CHEM 33200: Physical Chemistry II 3
CHEM 37400: Organic Chemistry Laboratory II 3
CHEM 43400: Physical Chemistry and Chemical Instrumentation 3
CHEM 32004: Biochemistry Laboratory I 2
EAS 10600: Earth Systems Science 4
MATH 21000: Calculus I 3
MATH 22000: Calculus II 3
MATH 23030: Calculus III 4
MATH 39100: Methods of Differential Equations 3
PHYS 20700-20800: General Physics I and II 8
Total Credits 68

Electives
Chemistry Electives 9
Advisement
All students, including premedical and predental students, planning to concentrate in chemistry should consult a Concentration Advisor.

Chemistry
Professor John Lombardi
MR 1119; 212-650-6032

Biochemistry
Professor Michael Green
MR 1130; 212-650-6034

Undergraduate Research Supervisor
Professor Glen Kovach
MR 1116; 212-650-5247

Exemption Examinations
Professor Glen Kovach
MR 1116; 212-650-5247

Undergraduate Research Programs
Minority Access and Research Careers (MARC) Research Initiative for Scientific Enhancement (RISE)
Professor Mark Steinberg
MR 629; 212-650-8560

Center for Analysis of Structures and Interfaces (CASI)
Professor Daniel Akins
MR 1120; 212-650-6953

Pathways Bioinformatics and Biomolecular Center
Professor David Gosser
MR 1102; 212-650-8870

CUNY Institute for Macromolecular Assemblies
Professor Ruth Stark
MR 1208; 212-650-8803

CENTER for Exploitation of Nanostructures in Sensors and Energy Systems (CENSES)
Professor Daniel Akins
MR 1120; 212-650-6953

Tutoring
Limited tutoring services are available for general chemistry students in the Chemistry Learning Center (MR 1029) during each school day. Additional tutoring is offered through CCAPP and several undergraduate research programs.

Seminars
The Department of Chemistry and Biochemistry sponsors weekly seminars on topics of current interest. Advance notice of these seminars will be posted near Room 1024, and all interested students are invited to attend.

Awards, Prizes and Scholarships
Each year the Department presents a number of awards and prizes to its outstanding students.

Baskerville Award
J. Birnbaum Scholarship Award
Frank and Rose Brescia Award
Ernest Borek Scholarship
Freshman Handbook Award
Benjamin Harrow Memorial Award
Robert and Frances Hochman Scholarship
Arthur G. Levy Prize
Seymour Mann Scholarship
Marks Neidle Memorial Prize
Max Pavey Scholarship
Ward Medal in Chemistry

Chemistry Course Descriptions
Students may register for CHEM 10301 if eligible for Calculus on the basis of mathematics placement test scores or completion of MATH 19500. All others are required to take CHEM 10100 (Introduction to Chemistry) prior to 10301.

Non-Chemistry Majors
CHEM 10000: Chemistry and Society
The fundamental principles of chemistry and their application to social issues. (Not Open to Science majors). 3 hr./wk.; 3 cr.

CHEM 21000: Applied Chemistry for Biomedical Engineers
Introduces students to organic chemistry and biochemistry principles relevant to the study of the human body. Topics covered include: hydrocarbons; functional groups; and structure and function of biomolecules (lipids, carbohydrates, proteins, and nucleic acids), along with their interactions; and introduction to molecular genetics. Prereq.: CHEM 10401 (min. C grade). 3 hr./wk.; 3 cr.

Introductory Chemistry Courses
CHEM 10100: Introduction to Chemistry
(For students with limited background in mathematics or the physical sciences.) Problem-solving in chemistry: introduction to chemical and physical concepts. Prereq: C grade in MATH 19500; Coreq.: MATH 19500. 3 hr./wk.; 1 cr.

Chemistry Core Courses
CHEM 10301: General Chemistry I
This is the first semester of a two-semester general chemistry course-sequence. An in-depth introduction to the fundamental laws and techniques of chemistry for majors in science and engineering. Topics include: measurement; stoichiometry; the gaseous state; thermochemistry; atomic structure and chemical bonding; redox reactions; solids, liquids and intermolecular forces. Prereq.: Grade of C or better in MATH 19500 or placement by the department. 3 lect., 2 lab, 2 workshop hr./wk.; 4 cr.

CHEM 10401: General Chemistry II
This is the second semester of a two-semester general chemistry course-sequence. An in-depth introduction to the fundamental laws and techniques of chemistry for majors in science and engineering. Topics include: chemical kinetics; chemical equilibrium; acids and bases; free energy, entropy and the second law of thermodynamics; electrochemistry; advanced bonding concepts; metals and coordination chemistry; and nuclear chemistry. Prereq.: Grade of C or higher in CHEM 10301 or placement by the department. 3 lect., 3 lab, 1 workshop hr./wk.; 4 cr.

CHEM 24300: Quantitative Analysis
Volumetric, spectrophotometric and electrometric analyses. Prereq.: Grade of C or higher in CHEM 10401 or placement by the department. 3 lect., 4 lab, hr./wk.; 4 cr.

CHEM 26100: Organic Chemistry I
An introduction to the chemistry of carbon compounds, current interpretation of the reactions and properties of these compounds. Prereq.: Grade of C or higher in CHEM 10401 or placement by the department. 3 lect., 1 rec., hr./wk.; 3 cr.

CHEM 26200: Organic Chemistry Laboratory I
Prereq.: Grade of C or higher in CHEM 26100 or placement by the department. Coreq.: CHEM 26300. 3 lect., 1 rec., 4 hr./wk.; 2 cr.
CHEM 26300: Organic Chemistry II
A continuation of CHEM 26100. Prereq.: Grade of C or better in CHEM 26100 or placement by the department. 3 lect., 1 rec. hr./wk.; 3 cr.

CHEM 27200: Organic Chemistry Laboratory I
(For Chemistry majors). Exercises stressing the techniques involved in the preparation, isolation, purification, and analysis of carbon compounds. Prereq.: Grade of C or higher in CHEM 10401, MATH 20300, and PHYS 20700 or placement by the department. Coreq.: PHYS 20800 (recommended as a prereq.). Students who feel that they would benefit from workshops should also take CHEM 33001. 3 hr./wk.; 3 cr.

CHEM 33000: Physical Chemistry I
Ideal and real gases, kinetic molecular theory, thermodynamics and phase equilibria, solutions. Prereq.: Grade of C or higher in CHEM 10401, MATH 20300, and PHYS 207000 or placement by the department. Coreq.: PHYS 20800 (recommended as a prereq.). Students who feel that they would benefit from workshops should also take CHEM 33001. A GPA of 3.0 in chemistry courses is required. Approval of Department Undergraduate Research Supervisor required prior to registration. 3 cr./sem.

Advanced Chemistry Courses

CHEM 33100: Physical Chemistry Laboratory I
Vapor pressures; phase diagram; combustion calorimetry; gas viscosities; electrochemical determination of thermodynamic quantities and other experiments based on topics covered in CHEM 33000. Prereq.: CHEM 24300; pre-or coreq: CHEM 33000. (W) Spring Semester only. 5 hr./wk.; 2 cr.

CHEM 33200: Physical Chemistry II
Spectroscopy, quantum mechanics, and statistical thermodynamics. Students who feel that they would benefit from workshops should also take CHEM 33201. Prereq: CHEM 33000 or (CHE 22900 and CHE 33000). MATH 39100 is highly recommended. 3 hr./wk.; 3 cr.

CHEM 33201: Physical Chemistry II Workshop
(Optional workshop) Coreq.: CHEM 33200. 2 hr./wk.; 0 cr.

CHEM 37400: Organic Chemistry Laboratory II
A continuation of CHEM 27200 stressing qualitative organic analysis. Prereq.: CHEM 27200 or (the discretion of the chair) and CHEM 26300. 6 hr./wk.; 3 cr.

CHEM 38200: Chemistry-Physics-Engineering Seminar I
Required for certain undergraduate students; emphasis on topics in physical, organic and inorganic chemistry. Fall semester only. 1 cr.

CHEM 38300: Chemistry-Physics-Engineering Seminar II
Required for certain undergraduate students; emphasis on topics in physical, organic and inorganic chemistry. Spring semester only. 1 cr.

CHEM 40300: Chemical Information Sources
An introduction to the retrieval of chemical information. Topics covered: primary, secondary and tertiary literature, including the major abstract journals, data sources, compendia, patents, current awareness, and computer readable sources. Prereq.: CHEM 10401 and CHEM 26100. Spring semester only. 1 hr./wk.; 1 cr.

CHEM 40500: Safety in Chemistry
Laboratory and plant safety and toxicology; safety regulations. Prereq.: CHEM 10401 and CHEM 26100. Spring semester only. 1 hr./wk.; 1 cr.

CHEM 40600: Environmental Chemistry
Chemical cycles, aquatic chemistry and microbial biochemistry, phase interactions, water pollution and treatment, atmospheric chemistry and pollution, geochemistry, soil chemistry, energy resources, hazardous wastes, toxicological chemistry, and analytical methods. Intended to broaden the students' understanding of chemical processes taking place in our environment. The relationship between atmospheric, soil and water chemistry will be underlined. This course draws upon general, analytical and organic chemistry experience. Prereq.: CHEM 24300 and CHEM 26100. 3 hr./wk.; 3 cr.

CHEM 40601: Environmental Chemistry Laboratory
Introduction to environmental analysis. Samples of water, air, soil, food, etc. will be obtained and analyzed both qualitatively and quantitatively for pollutants. The effects of these pollutants on the environment will be discussed and linked to urban problems. Analytical techniques will include titrations, separations (GC, HPLC, GC/MS), and polarography. Prereq.: CHEM 40600. 4 hr./wk.; 2 cr.

CHEM 40700: Environmental Organic Chemistry
An examination of processes that affect the behavior and fate of anthropogenic organic contaminants in aquatic environments. Students learn to predict chemical properties that are influencing the transfers between hydrophobic organic chemicals, air, water, sediments and biota. This knowledge will be based on a fundamental understanding of intermolecular interactions and thermodynamic principles. Mechanisms of important thermochemical, photochemical, and biochemical transformation reactions are also investigated, leading to the development of techniques (such as structure-reactivity relationships) for assessing environmental fate or human exposure potential. Prereq.: CHEM 26100. 3 hr./wk.; 3 cr.

CHEM 42500: Inorganic Chemistry
Concepts of inorganic chemistry including bonding theory, structure of complexes, symmetry, and reaction mechanisms. Prereq.: CHEM 26100, CHEM 26300, CHEM 33000; pre- or coreq: CHEM 33200 or CHEM 33500 recommended. 3 hr./wk.; 3 cr.

CHEM 43400: Physical Chemistry and Chemical Instrumentation Laboratory II
This course will introduce students to experimental methods in physical chemistry, instrumental analysis and the principles and applications of chemical instrumentation. The course will acquaint the student with the behavior of real chemical systems, the theory of the chemical phenomenon under observation and the design and methodology of measurement systems to detect the chemical phenomenon. Prereq.: CHEM 33100; pre or coreq: CHEM 33200. Fall semester only. 1 lect., 5 lab. hr./wk.; 3 cr.

CHEM 43801: Physical Chemistry Laboratory I
Chromatography, electrophoresis, spectroscopy, and other quantitative laboratory techniques will be applied to the isolation and analysis of amino acids, proteins, enzymes, carbohydrates, lipids, and nucleic acids. Prereq.: Grade of C or better in CHEM 26100 and CHEM 26300 or placement by the department. 4 hr./wk.; 2 cr. Materials fee: $30

CHEM 48005: Biochemistry II
Molecular basis of enzyme action, membranes (transport and transduction), protein structure, signal transduction, virology, bioinformatics, genomics, proteomics, molecular basis of replication, transcription and translation of genetic information, and immunology. Prereq.: CHEM 45902. Spring semester only. 3 hr./wk.; 3 cr.

CHEM 55808: RNA Biochemistry and Molecular Biology
Chemistry, structure and function of the ribonucleic acids (RNA), and the increasingly important role this ancient biopolymer is recognized to play in Biochemistry and other life sciences, including medicine. Theoretical and methodological concepts will be will be explored in lectures and in class discussion of classic and contemporary RNA research papers. Prereq: A minimum grade of C in CHEM 32002 and CHEM 48005, or equivalents. 3 hours/week; 3 credits.

Honors Research, Independent Study and Special Courses
Students can register for undergraduate research projects in the Honors Program or the Independent Study Program. In order to graduate "with Honors," the student must maintain a "B" average or better in the Major subject, submit an Honors paper which is a report in research publication format, and be given 9 credits of "A" for this work by the mentor. A maximum of nine credits may be credited toward the degree. Students are trained to design and perform experiments, to keep a notebook, to write a report and research paper, and to make oral and poster presentations. Research reports are required for all undergraduate research students for every term for which a grade is given. Every student in these programs must have a conference with the designated departmental advisor (Prof. Simms), every term he or she is working in research. An information form, including the student’s major, the name of the mentor, the title of the research project and the projected graduation date must be on file with the advisor. Please make an appointment with Prof. Kowach.

CHEM 30100-30400: Honors
Students are provided the opportunity to do individual laboratory research under the direction of a member of the faculty which culminates in a term paper. A GPA of 3.0 in chemistry courses is required. Approval of Department Undergraduate Research Supervisor required prior to registration. 3 cr./sem.
CHEM 31001-31004: Independent Study
Students are provided the opportunity to do individual library, special project or laboratory research under the direction of a member of the faculty which culminates in a term paper. A GPA of 2.5 in chemistry courses is required. Approval of Department Undergraduate Research Supervisor required prior to registration. 1-4 cr./sem.

CHEM 31100-32000: Selected Topics in Chemistry
Special topics not covered in the usual department offerings. Topics will vary from semester to semester depending on student and instructor interest. Credits and hours to be determined by instructor and department with a maximum of 4 cr. per course.

Graduate Courses Open to Undergraduates
Qualified students with departmental approval may take any course available in the master’s programs or the first year of the doctoral programs in Chemistry or Biochemistry. These courses are described in their appropriate bulletins.

Faculty
Daniel L. Akins, Professor and Chair
B.S., Howard Univ.; Ph.D., Univ. of California, Berkeley

Valeria Balogh-Nair, Professor
B.Sc., Univ. of Louvain (Belgium); Ph.D., Univ. of Louvain (Belgium)

Teresa Bandosz, Professor
B.S., M.S., Univ. of Mining Metallurgy (Cracow, Poland); Ph.D., Technical Univ. of Cracow

Ronald Birke, Professor
B.S., Univ. of North Carolina; Ph.D., M.I.T.

Mark Bosco, Assistant Professor
B.A., Wesleyan Univ.; Ph.D., Columbia Univ.

Sean Boson, Lecturer
B.S., M.S., Jahangirnagar Univ., (Bangladesh); Ph.D., Univ. of Cambridge (UK)

Zimei Bu, Associate Professor
B.Eng., Chengdu Univ., of Science & Technology, (China); Ph.D., Louisiana State Univ.

David H. Calhoun, Professor
B.A., Birmingham-Southern College; Ph.D., Univ. of Alabama

Dorthe Eisele, Assistant Professor
Dip-Phys (MS equiv), Technical Univ. of Berlin; Dr.rer.nat (Ph.D. equiv), Humboldt Univ. of Berlin

Kevin Gardner, Einstein Professor of Chemistry, Director of the ASRC Structural Biology Initiative
B.S., Univ. of California, Davis; Ph.D., Yale Univ.

Ranajeet Ghose, Associate Professor
B.Sc., Presidency College (India); M.S. Yale Univ.; Ph.D., Yale Univ.

David K. Gosser, Professor
B.S., St. Joseph’s Univ.; Ph.D., Brown Univ.

Michael E. Green, Professor
A.B., Cornell Univ.; M.S., Yale Univ.; Ph.D., Yale Univ.

Edward Hohenstein, Assistant Professor
B.S., Washington College; Ph.D., Georgia Institute of Technology

Urs Jans, Associate Professor
Diploma in Chemistry, Swiss Federal Inst. of Technology; Ph.D., Swiss Federal Inst. of Technology

David Jeruzalmi, Professor
B.S., Univ. of Kerala (India); M.S., Ph.D., Yale University

George John, Professor
B.S., Univ. of Kerala (India); Ph.D., Univ. of Kerala (India)

Reza Khayat, Assistant Professor
B.S., Univ. of California, Irvine; M.S., Ph.D., Columbia University

Glen Kowach, Associate Professor, Exemption Examinations and Minor Advisor
B.S., Univ. of Wisconsin, Madison; Ph.D., Cornell Univ.

Mahesh Lakshman, Professor
B.S., University of Bombay (India); M.S.; Ph.D., University of Oklahoma

Themis Lazaridis, Professor
Diploma in Chemical Engineering, Aristotle Univ. (Greece); Ph.D., Univ. Of Delaware

John R. Lombardi, Professor

Stephen O’Brien, Associate Professor
B.Sc., Sussex Univ. (UK); D. Phil., Oxford Univ. (UK)

Kevin Ryan, Associate Professor
B.S., Providence College; M.S., Univ. of Rochester; Ph.D., Univ. of Rochester

Issa Salame, Lecturer and Master Teaching Fellow
B.S., The City College; M.Phil., CUNY; Ph.D., CUNY

Simon A. Simms, Associate Professor
B.S., The City College; Ph.D., Princeton Univ.

Ruth Stark, Distinguished Professor
A.B., Cornell Univ., Ph.D. Univ. of California (San Diego)

Mark L. Steinberg, Professor
B.A., Univ. of Michigan; Ph.D., Univ. of Pennsylvania

Maria Tamargo, Professor
B.S., Univ. of Puerto Rico; M.S., Johns Hopkins Univ.; Ph.D., Johns Hopkins Univ.

Barbara Zajc, Professor
B.S., Univ. of Ljubljana M.S.; Univ. of Ljubljana Ph.D., Univ. of Ljubljana

Professors Emeriti
John S. Arens
Theodore Axenrod
Vernon G.S. Box
Thomas Haines
Neil McKelvie
Jack I. Morrow
Stanley R. Radel
Henri L. Rosano
Charlotte S. Russell
Horst Schulz
Amos Turk
Arthur E. Woodward