

Chemistry

Faculty: Bradley, Chair; Arvanitis, Bradley, Dumas, Huang, Keller

The Department of Chemistry offers courses for the entire student population in addition to specialty programs. It prepares students for careers in the chemical industry and research as well as for entrance to graduate school. Careful selection of courses, with advisement by the department, can also prepare a student for the field of teaching or for further study toward degrees in professional fields such as medicine and dentistry. Students interested in pursuing a career in pharmaceutical sales and marketing can combine a major in chemistry (CHMA) with a minor in marketing. See your adviser or the chemistry chairperson for more information.

The chemistry department is accredited by the American Chemical Society. Students completing the chemistry major will receive a Bachelor of Science degree.

Transfer students are required to take a minimum of 15 credits of chemistry courses numbered CHEM 300 or above (including a minimum of two laboratory electives) for graduation as chemistry majors from The College of New Jersey.

Those students wishing honors in chemistry may earn that diploma designation by successfully completing a series of ACS examinations and a research project.

Suggested Course Sequence

During academic year 2003-2004, The College of New Jersey is in the process of transformative curricular change. Therefore only the course of study for the first-year students entering in 2003-2004 is set out below. These students should consult their advisors when planning courses for future years. Supplements to this online bulletin also will be available on an ongoing basis.

First Year Suggested Sequence CHMA

CHEM	100/Freshman Chemistry Seminar	0
CHEM	201, 202/General Chemistry I, II	8
<i>or</i>		
HONR	201, 202/Honors General Chemistry I, II	
PHYS	201, 202/General Physics I, II	8
MAT	127, 128/Calculus A, B	8
WRI	102/Academic Writing	4
IDSC	151/Athens to New York	3 or 4
<i>or</i>		
FSP	101/First Year Seminar	
Total for year		31 or 32

Program Entrance, Retention, and Exit Standards

Every major program at the College has set standards for allowing students to remain in that program, to transfer within the College from one program to another, and to graduate from a program. The following are the standards for chemistry programs. Minimum grades are noted in parentheses:

- Retention in the program is based on the following performance standards in these “critical content courses”: CHEM 201 and 202 General Chemistry I and II (or HONR 201 and 202) (C); CHEM 331 Organic Chemistry I (C).
- Transfer into the program from another program within the College is based upon the following performance standards in these “foundation courses”: CHEM 201/General Chemistry or HONR 201/Honors General Chemistry (C); MAT 127/Calculus A or MATH 127/Calculus I (C).
- Graduation requires a GPA of 2.0 in courses for the program.

Pre-Health Profession Option for Chemistry Majors

Students interested in health-related careers such as medicine, dentistry, pharmacy, etc. may study for admission to these professional schools through chemistry major CHMA (above). Careful selection of courses within this major and within free electives will prepare the student to meet health professional school admission requirements. Those interested in such careers are urged to contact Professor Lynn M. Bradley who is the chemistry department adviser for health careers. (See also Medical Career Advisory Committee.)

Chemistry Major: Teacher Preparation (CHMT)

Candidates for a teacher-education certificate must have a 2.75 cumulative grade point average to successfully complete their teacher education program. They also must meet the state hygiene/physiology requirement, and pass the appropriate Praxis examination before the New Jersey State Department of Education will issue the appropriate certificate. Teacher-education candidates will receive a "certificate of eligibility with advanced standing" which allows a candidate to be provisionally certified for his or her first year of teaching. After one year of successful teaching, the candidate is eligible for a permanent certificate. The teacher candidate will also have to pay a fee during his or her first year of teaching.

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First Year Suggested Sequence CHMT

CHEM	100/Freshman Chemistry Seminar	0
CHEM	201, 202/General Chemistry I, II	8
PHYS	201, 202/General Physics I, II	8
MAT	127, 128/Calculus A, B	8
WRI	102/Academic Writing	4
IDSC	151/Athens to New York	3 or 4
<i>or</i>		
FSP	101/First Year Seminar	
Total for year		31 or 32

Elementary Education M/S/T (ELST) and Early Childhood Education M/S/T (ECST) with a Chemistry Specialization

This interdisciplinary major integrates formal study in mathematics, biology, chemistry, physics, and technology. Students electing a chemistry specialization will complete 42 credits of "core" requirements including Calculus (MAT or MATH 127–128), Principles of Biology (BIOL 181–182), General Chemistry (CHEM 201–202), College Physics (PHYS 191–192), Introduction to Human Technological Behavior (TSNG 171), Principles of Structures and Mechanisms (TSNG 211), and an M/S/T-approved elective. The chemistry specialization consists of a minimum of 21 credits including the core chemistry courses, (CHEM 321–322 Organic I, II), and two chemistry elective courses (five-credit minimum) at the 300 level or higher.

Chemistry Minor

Twenty-one (21) credits in CHEM courses including CHEM 201, 202 or HONR 201, 202 and other CHEM courses numbered 300 or higher, but not including CHEM 316, 317, 318, 340, 490, 495, or 499.

CHEM 100/Freshman Chemistry Seminar **0 cr.**

(1 class hour)
(annually)

Required of all freshman chemistry majors, this course provides an orientation to The College of New Jersey community; to chemistry faculty; and to the chemistry liberal arts and chemistry education programs offered by the Department of Chemistry including, among other topics, advisement opportunities, curriculum and scheduling, laboratory safety procedures, facilities, professional societies and student affiliates, career options, and the American Chemical Society Code of Ethics. The academic component, involving common readings and assignments, is part of the course requirements. Grade is P/U.

CHEM 101, 102/Principles of Chemistry I, II **8 cr.**

(3 class hours, 3 lab hours each semester)
(annually)

Restriction: Science, nursing, health, or mathematics majors should take CHEM 201, 202; not CHEM 101, 102
Perspectives on the World: Science

Development of modern chemical concepts regarding the structure and behavior of matter on a macroscopic and atomic level. Emphasis upon understanding the vital role of chemistry in our culture. Selected relevant topics such as environmental pollution, atomic energy, food, macromolecules, and biochemical processes are included.

CHEM 201, 202/General Chemistry I, II **8 cr.**

(3 class hours, 3 lab hours each semester)
(every semester)

Laws and theories of matter in its various states: atomic and molecular structure from quantum and orbital interpretations; kinetics and equilibrium; periodicity and properties. Quantitative experiments coordinated with lectures. A working knowledge of elementary algebra is required. A high school chemistry course is strongly recommended. Math basic skills must be satisfactorily completed before registering for this course.

- CHEM 303/Descriptive Inorganic Chemistry** **3 cr.**
(2 class hours, 3 lab hours)
(annually)
Prerequisite: CHEM 202 or HONR 202
The chemistry of families of elements with emphasis on the more important members. Occurrence, metallurgy, properties, compounds, uses, and analytical behavior are stressed.
- CHEM 304/Qualitative and Spectroscopic
Techniques in Inorganic Chemistry** **3 cr.**
(2 class hours, 4 lab hours)
(alternate years)
Prerequisites: CHEM 201, 202 or HONR 201, 202
A descriptive study of the modern concepts of inorganic chemistry emphasizing structure determination by spectroscopic methods in inorganic chemistry including one-dimensional heteronuclear NMR, near and far IR, magnetic susceptibility, and optical rotary dispersion. Qualitative methods are employed to aid in the determination of elemental composition.
- CHEM 310/Analytical Chemistry** **3 cr.**
(2 class hours, 4 lab hours)
(annually)
Prerequisite: CHEM 202 or HONR 202
A study of quantitative analysis including analytical data treatment, equilibrium calculation, volumetric determination, and potentiometry.
- CHEM 316/Sophomore Chemistry Seminar** **1 cr.**
(1 class hour)
(annually)
Prerequisites: Freshman seminar, CHEM 100
A seminar course designed for sophomore chemistry majors. Included in this course are: use of the chemistry computer center for scientific word processing, molecular-modeling programs, and other software computer programs needed by the chemist. Other topics include use of the chemical literature such as *Chemical Abstracts* and the library computer search program DIALOG. Professionalism and ethics will also be discussed.
- CHEM 317/Junior Chemistry Seminar** **1 cr.**
(1 class hour)
(annually)
Prerequisite: CHEM 316
One-credit course designed to explore career options within the field of chemistry. Topics include graduate school applications and opportunities, internships, departmental research, and career presentations. A final oral and written research project is also required.
- CHEM 318/Senior Chemistry Seminar** **1 cr.**
(1 class hour)
(annually)
Prerequisite: CHEM 317
A course designed for senior chemistry majors. Oral and written papers will be presented on current chemical literature and each student will be required to develop, present, and defend an original research proposal to the class.
- CHEM 321, 322/Organic Chemistry I, II** **8 cr.**
(3 class hours, 3 lab hours)
(annually)
Restriction: Chemistry majors require CHEM 331, 332, not CHEM 321, 322
Prerequisite: CHEM 202 or HONR 202
Coverage in lectures is similar to that in CHEM 331, 332 but laboratory meetings are designed in accordance with the needs of students majoring in biology.
- CHEM 331, 332/Organic Chemistry I, II** **8 cr.**
(3 class hours, 4 lab hours)
(annually)
Restriction: Required for chemistry majors
Prerequisite: CHEM 202 or HONR 202
The chemistry of organic compounds with emphasis on reaction mechanisms. Theory and descriptive material on aliphatic, alicyclic, aromatic, and heterocyclic compounds.

CHEM 340/History of Chemistry and Physics **3 cr.**

(3 class hours)

(annually)

Prerequisite: One year of a college science (admission without prerequisite by permission of instructor only)

The principles of chemistry and physics and the interaction of chemistry, physics, and society from earliest times through modern times and on into the future are studied. The work of selected chemists, physicists, the evolution of energy, mechanics, atomic structure and other modern theories, the development of various chemical industries, the importance of environmental concerns, and other currently important subjects will be examined.

CHEM 341/Organic Spectroscopy Laboratory **3 cr.**

(2 class hours, 4 lab hours)

(annually)

Prerequisites: CHEM 321, 322 or 331,332 or HONR 321, 322

A study of the modern concepts of structure determination in organic chemistry by spectroscopic methods, emphasizing one- and two-dimensional ¹H and ¹³C NMR, IR and mass spectroscopies.

CHEM 345/Fundamentals of Chemical Instrumentation **3 cr.**

(1 class hour, 4 lab hours)

(occasionally)

Restriction: Not applicable to chemistry major

Prerequisite: CHEM 322 or 332 or HONR 322

A laboratory course emphasizing the use and application of specialized chemical instruments.

CHEM 350/Essentials of Biochemistry **3 cr.**

(3 class hours)

(annually)

Restriction: Not open to chemistry majors

Prerequisites: BIO or BIOL 211; CHEM 322 or 332 or HONR 322

A one-semester lecture course covering amino acids and proteins, intermediary metabolism, lipids, carbohydrates, and the biochemistry of nucleotides, DNA and RNA. Designed for science majors with no background in physical chemistry.

CHEM 365/Chemical Aspects of the Environment **3 cr.**

(3 class hours)

(occasionally)

Prerequisite: Six credits of college science

Chemical processes involved in the environment with emphasis on pollution and its control.

CHEM 391, 392/Physical Chemistry I, II **6 cr.**

(3 class hours)

(annually)

Prerequisites: CHEM 202 or HONR 202, MAT or MATH 128, PHYS 201

A study of thermodynamics, kinetics, quantum mechanics, statistical mechanics, and other areas fundamental to an understanding of the physical behavior of matter.

CHEM 403/Physical Chemistry Laboratory **3 cr.**

(6 lab hours)

(annually)

Prerequisite: CHEM 392

Laboratory experiments that apply physical principles to systems of chemical interest. Use of modern instrumentation is emphasized, as is statistical treatment of data.

CHEM 410/Advanced Analytical Chemistry **3 cr.**

(2 class hours, 4 lab hours)

(annually)

Prerequisites: CHEM 310, 392, 403

A study of principles, applications, and operations of chemical instrumentation.

CHEM 415/Separation Science **3 cr.**

(2 class hours, 4 lab hours)

(alternate years)

Prerequisite: CHEM 410

A study of the principles and applications of a variety of chemical separation processes with an emphasis on modern chromatographic methods.

- CHEM 420/Advanced Organic Chemistry** **3 cr.**
(2 class hours, 4 lab hours)
(alternate years)
Prerequisites: CHEM 322 or 332 or HONR 322 and CHEM 392
A detailed study of the mechanisms and kinetics of organic reactions. Advanced synthetic techniques are also studied.
- CHEM 430/Biochemistry** **3 cr.**
(2 class hours, 4 lab hours)
(occasionally)
Prerequisites: CHEM 322 or 332 or HONR 322 and CHEM 392
The fundamental principles of chemistry as they apply to biological and physiological processes.
- CHEM 450/Inorganic Chemistry** **3 cr.**
(3 class hours)
(annually)
Prerequisites: CHEM 303 and CHEM 392
Modern structural concepts of inorganic chemistry coupled with recent interpretations of inorganic reaction mechanisms.
- CHEM 455/Advanced Inorganic Laboratory** **3 cr.**
Techniques
(2 class hours, 4 lab hours)
(alternate years)
Prerequisites: CHEM 391, 392, 410, 450
A study of advanced techniques in the synthesis, characterization, and identification of inorganic compounds. These techniques will include nuclear magnetic resonance, infrared spectroscopy, chromatography, stereochemical methods, and magnetic measurements.
- CHEM 457/Organometallic Chemistry Laboratory** **3 cr.**
(2 class hours, 4 lab hours)
(alternate years)
Prerequisites: CHEM 391, 392, 450
A study of modern concepts of structure and bonding in organotransition metal chemistry emphasizing synthetic methods, catalysis, and reaction mechanisms.
- CHEM 480/Selected Topics in Chemistry** **3 cr.**
(3 class hours, or 2 class hours and 4 lab hours)
(occasionally)
Prerequisite: Approval of department chair
Selected topics of current relevance and interest in chemistry will be presented by faculty and guest lecturers with special areas of competency. Topics will be announced in advance.
- CHEM 489/Chemistry Teaching Seminar** **1 cr.**
(every semester)
Analysis of student-teaching experience, which must be taken concurrently with CHEM 490.
- CHEM 490/Student Teaching** **10 cr.**
(half time for one semester)
Prerequisite: Meeting all criteria for admission to student teaching
Student teaching during the senior year. Teaching in approved public schools, supervised and observed by college and public school teachers. Observation, participation, and responsible teaching.
- CHEM 495/Internship in Chemistry** **1–6 cr.**
See department chairperson for further information.
- CHEM 499/Independent Study in Chemistry** **3–6 cr.**
(hours to be arranged)
(every semester)
Prerequisites: CHEM 322 or 332 or HONR 322 and CHEM 392
Designed for upper-level students who are majoring in chemistry. Individual research projects are pursued under the guidance of faculty. Chemistry minors may take three credits of this course with approval of the chemistry department chair. (May be repeated for credit with approval of department chair.)
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