

Chemistry (CHE)**Majors and Minor in Chemistry****Department of Chemistry, College of Arts and Sciences**

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Minors of particular interest to students majoring in Chemistry: Biology (BIO), Environmental Studies (ENS), Marine Sciences (MAR)

Department Information - Chemistry (CHE)

The Bachelor of Science program in Chemistry is designed to prepare the student for graduate study in chemistry or for industrial or other employment. It includes options in biological chemistry, chemical physics, and environmental chemistry, in addition to the traditional chemical science option. The B.S. program of the Department of Chemistry is approved by the Committee on Professional Training of the American Chemical Society.

The Bachelor of Arts program allows more flexibility in the choice of electives, accommodating the needs of pre-medical students and others whose career objectives may call for a substantial introduction to chemistry. It can also accommodate students who wish to obtain a strong undergraduate background in another science or mathematics while earning a degree in chemistry.

Students interested in combining the study of chemistry with the study of materials science should see also the Interdisciplinary Program in Engineering Chemistry.

Requirements for the Majors and Minor in Chemistry (CHE)

The department of Chemistry offers both a Bachelor of Arts and a Bachelor of Science degree in Chemistry.

Requirements for the Major (Bachelor of Science Degree)

All of the courses used to fulfill the requirements of the major (CHE, MAT, PHY, BIO, etc.) must be passed with a letter grade of C or higher, with the exception of three courses, for which the grade may be C-. G/P/NC grades are not acceptable in courses taken for the major. No transferred course with a grade lower than C may be used to fulfill any major requirement.

Completion of the major requires a minimum of 66 credits.

A. Core Requirements

1. CHE 131 (or CHE 129 and CHE 130), CHE 132 General Chemistry I, II or CHE 152 Molecular Science I
2. CHE 133, CHE 134 General Chemistry Lab I, II or CHE 154 Molecular Science Laboratory I
3. CHE 301, CHE 302 Physical Chemistry I, II
4. CHE 303 Solution Chemistry Laboratory
5. CHE 321, CHE 322 Organic Chemistry I, II, or CHE 331, CHE 332 Molecular Science II, III
6. CHE 375 Inorganic Chemistry I
7. CHE 327 Organic Chemistry Laboratory or CHE 383 Introductory Synthetic and Spectroscopic Laboratory Techniques
8. CHE 385 Tools of Chemistry
9. MAT 131, MAT 132 (Calculus I, II) and MAT 203 (Calculus III with applications) (See note 1 for possible substitutions). If students do not place into MAT 125 or 131 on the basis of the math placement examination, MAT 123 (or MAT 119/MAT 123) is a required course for the major.
10. PHY 131/PHY 133, PHY 132/PHY 134 Classical Physics I, II (See note 2 for possible substitutions)

B. Area Requirements

One of the following options:

1. Chemical Science Option

- CHE 304 Chemical Instrumentation Laboratory
- CHE 357 Molecular Structure and Spectroscopy Laboratory
- CHE 328 Synthetic and Spectroscopic Laboratory Techniques or CHE 384 Intermediate Synthetic and Spectroscopic Laboratory Techniques
- CHE 487 Research in Chemistry (3 credits) or CHE 495/CHE 496 Senior Research
- Two electives chosen from: CHE 345/461, CHE 346/461, CHE 348/461, CHE 351, CHE 353, CHE 358, CHE 376, CHE 378, PHY 251, or ESG 281

2. Biological Chemistry Option (See note 3)

- CHE 328 Synthetic and Spectroscopic Laboratory Techniques or CHE 384 Intermediate Synthetic and Spectroscopic Laboratory Techniques
- One organic or inorganic chemistry elective chosen from: CHE 345/461, CHE 346/461 (See note 4), CHE 348/461, CHE 376, CHE 378, or CHE 495/CHE 496
- BIO 202 Fundamentals of Biology: Molecular and Cellular Biology
- CHE 346/461 (recommended) or BIO 361 Biochemistry I
- BIO 310 Cell Biology or BIO 362 Biochemistry II

3. Chemical Physics Option

- CHE 304 Chemical Instrumentation Laboratory
- CHE 351 Quantum Chemistry or CHE 353 Chemical Thermodynamics
- CHE 357 Molecular Structure and Spectroscopy Laboratory
- AMS 210 or MAT 211 or AMS 261 or MAT 303 (See note 5)
- PHY 251/PHY 252 Modern Physics and Laboratory
- One elective chosen from: CHE 358 Computing in Chemistry, PHY 277 Computation for Physics and Astronomy, PHY 300 Waves and Optics, PHY 307 Physical and Mathematical Foundations of Quantum Mechanics, PHY 301 Electromagnetic Theory I, PHY 303 Mechanics, or PHY 306 Thermodynamics, Kinetic Theory, and Statistical Mechanics (the last three courses require other physics prerequisites or permission of the instructor).

4. Environmental Chemistry Option

- CHE 304 Chemical Instrumentation Laboratory
- CHE 310 Chemistry in Technology and the Environment
- CHE 357 Molecular Structure and Spectroscopy Laboratory or ENV 321 Chemistry for Environmental Science Laboratory
- CHE 328 Synthetic and Spectroscopic Laboratory Techniques or CHE 384 Intermediate Synthetic and Spectroscopic Laboratory Techniques
- BIO 201 Fundamentals of Biology: Organisms to Ecosystems or BIO 113 Applied Ecology
- ATM 397 Air Pollution and Its Control (See note 6 for possible substitutions)

5. Marine and Atmospheric Chemistry Option

- ATM 205 Introduction to Atmospheric Sciences
- MAR 308 Principles of Instrumental Analysis
- MAR 333 Coastal Oceanography
- MAR 351 Introduction to Ocean Chemistry
- Two electives chosen from: MAR 301 Environmental Microbiology, MAR 302 Marine Microbiology and Microbial Ecology, MAR 334 Remote Sensing of the Environment, MAR 336 Marine Pollution, MAR 394 Environmental Toxicology and Public Health, ATM 305 Global Atmospheric Change, ATM 345 Atmospheric Thermodynamics and Dynamics, ATM 397 Air Pollution and Its Control

C. Upper-Division Writing Requirement

Each student majoring in Chemistry must use CHE 303, CHE 304, or CHE 384 to satisfy the writing requirement for the Chemistry major (a satisfactory grade is required). These courses require several papers which are evaluated for cogency, clarity, and mechanics, and satisfy the university Stony Brook Curriculum WRTD learning objective.

Notes:

1. Alternate Mathematics Sequences

The following alternate sequences may be substituted for major requirements or prerequisites: MAT 125 (or MAT 130/MAT 125), MAT 126, MAT 127 or MAT 141, MAT 142 or MAT 171 or AMS 151, AMS 161 for MAT 131, MAT 132; AMS 210 or MAT 211 or AMS 261 for MAT 203. Equivalency for MAT courses as indicated by earning the appropriate score on a placement examination will be accepted as fulfillment of the requirement without the necessity of substituting other credits.

2. Alternate Physics Sequences

The following alternate sequences may be substituted for physics requirements or prerequisites: PHY 141/PHY 133, PHY 142/PHY 134 or PHY 125, PHY 126/PHY 133, PHY 127/PHY 134 for PHY 131/PHY 133, PHY 132/PHY 134.

3. It is recommended that students selecting the biological option take a minimum of one BIO lab (e.g., BIO 204).

- CHE 346/461 may not be used as both an elective and as a substitute for BIO 361.
- The Chemical Physics option requires two math courses in addition to Calculus I and II.
- The following substitutions for ATM 397 need additional prerequisites: ENV 315/GEO 315 Groundwater Hydrology, MAR 336 Marine Pollution, MAR 351 Introduction to Ocean Chemistry.
- Transfer Credit
At least 12 credits of upper-division work in chemistry must be taken at Stony Brook; these must be taken in at least two of the major subdisciplines (inorganic, physical, and organic chemistry).
- The American Chemical Society's Committee on Professional Training has set nationally recognized standards for professional preparation in chemistry. The Chemistry faculty recommends that students intending to pursue careers in the chemical sciences secure ACS certification along with their Bachelor of Science degree.
To obtain ACS certification, students who elect the *chemical science* option must complete CHE 346/461 or BIO 361.
Students who elect the *biological chemistry* option must complete one additional elective in chemistry or a related field, CHE 304, and one of the following: 1. CHE 487 (6 or more credits), 2. CHE 495-496, 3. CHE 357 and CHE 487 (3 or more credits), or 4. a research experience in the chemical sciences at another college, university, or government laboratory of at least 180 hours (see note 10).
Students who elect the *chemical physics* option must complete CHE 346/461 and one of the following:
1. CHE 328 or CHE 384 and CHE 487 (3 or more credits), 2. CHE 487 (6 or more credits), 3. CHE 495-496, or 4. a research experience in the chemical sciences of at least 180 hours at another college, university, or government laboratory (see note 10).
Students who elect the *marine and atmospheric chemistry* option must complete CHE 346/461, CHE 328 or CHE 384, and one of the following: 1. CHE 487 (6 or more credits), 2. CHE 495-496, 3. CHE 357 and CHE 487 (3 or more credits), or 4. a research experience in the chemical sciences at another college, university, or government laboratory of at least 180 hours (see note 10).
Students who elect the *environmental chemistry* option must complete CHE 346/461 and either CHE 487 (3 credits), CHE 495-496, or a research experience in the chemical sciences at another college, university, or government laboratory of at least 180 hours (see note 10).
- Additional Areas of Study
Because knowledge of computer programming is of great value to all chemists, CHE 358 or other course in computer programming is recommended.
- Students who fulfill ACS requirements with an off-campus research experience must register for CHE 487 (0 credits). All students using CHE 487 to fulfill ACS requirements must prepare a written research report that will be evaluated by a Stony Brook Chemistry faculty member.

Requirements for the Major (Bachelor of Arts Degree)

All of the courses used to fulfill the requirements of the major (CHE, MAT, ESG, PHY, etc.) must be passed with a letter grade of C or higher, with the exception of three courses, for which the grade may be C-. G/P/NC grades are not acceptable in courses taken for the major. No transferred course with a grade lower than C may be used to fulfill any major requirement.

Completion of the major requires approximately 55 to 56 credits.

A. Study Within the Area of Chemistry

- CHE 131, CHE 132 General Chemistry I, II or CHE 152 Molecular Science I
- CHE 133, CHE 134 General Chemistry Lab I, II or CHE 154 Molecular Science Laboratory I
- CHE 301, CHE 302 Physical Chemistry I, II
- CHE 303 Solution Chemistry Laboratory and one additional laboratory course (CHE 304 or CHE 384)
- CHE 321, CHE 322 Organic Chemistry I, IIB or CHE 331, CHE 332 Molecular Science II, III
- CHE 327 Organic Chemistry Laboratory or CHE 383 Introductory Synthetic and Spectroscopic Laboratory Techniques
- CHE 375 Inorganic Chemistry I
- CHE 385 Tools of Chemistry

B. Courses in Related Fields

- MAT 131, MAT 132 Calculus I, II and MAT 203 Calculus III with applications (See note 1)
- PHY 131/PHY 133, PHY 132/PHY 134 Classical Physics I, II and labs (See note 2)

C. Upper-Division Writing Requirement

Each student majoring in Chemistry must use CHE 303, CHE 304, or CHE 384 to satisfy the writing requirement for the Chemistry major (a satisfactory grade is required). These courses require several papers which are evaluated for cogency, clarity, and mechanics, and satisfy the university Stony Brook Curriculum WRTD learning objective.

Notes:

- Alternate Mathematics Sequences
The following alternate sequences may be substituted for major requirements or prerequisites: MAT 125 (or MAT 130/MAT 125), MAT 126, MAT 127 or MAT 141, MAT 142 or MAT 171 or AMS 151, AMS 161 for MAT 131, MAT 132; AMS 210 or MAT 211 for MAT 203.

Equivalency for MAT courses as indicated by earning the appropriate score on a placement examination will be accepted as fulfillment of the requirement without the necessity of substituting other credits.

2. Alternate Physics Sequences

The following alternate sequences may be substituted for physics requirements or prerequisites: PHY 125, PHY 126/PHY 133, PHY 127/PHY 134, or PHY 141, PHY 142 for PHY 131/PHY 133, PHY 132/PHY 134.

3. Transfer Credit

At least 12 credits of upper-division work in chemistry must be taken at Stony Brook; these must be taken in at least two of the major subdisciplines (inorganic, physical, and organic chemistry).

Honors Program

Students who have maintained a minimum cumulative grade point average of 3.00 in science and mathematics through the junior year are eligible for departmental honors in chemistry. An additional requirement for honors is the submission of a senior thesis based on research performed during the senior year. The student will be given an oral examination in May by his or her research supervisor and the undergraduate research committee. The awarding of honors requires the recommendation of this committee and constitutes recognition of superior performance in research and scholarly endeavors. If the student has also achieved a 3.40 cumulative grade point average in chemistry courses taken in the senior year, honors will be conferred.

Chemistry Secondary Teacher Education Program

See the Education and Teacher Certification entry in the alphabetical listings of Approved Majors, Minors, and Programs.

Requirements for the Minor

The Chemistry minor requires 18-22 credits, which include a General Chemistry Lecture sequence, a General Chemistry Laboratory sequence, plus 12 credits of CHE 300-level courses or research. A minimum of 9 upper division CHE credits must be earned in courses not used towards the student's major. All courses for the minor must be completed for a letter grade of C or better or S. All students must complete a minimum of 8 upper division credits in 300-level or chemistry research courses in residency at Stony Brook in order to qualify for the minor. All courses for the minor must be completed for a letter grade of C or higher or S. P/NC grades are not acceptable in courses taken for the minor. All students must complete a minimum of 8 upper division credits in 300-level chemistry or chemistry research courses in residency at Stony Brook.

Completion of the minor requires the following courses:

A. General Chemistry lecture sequence

- CHE 129-132 or CHE 131-132 or CHE 152

B. General Chemistry laboratory sequence

- CHE 133-134 or CHE 154

C. 12 credits of CHE 300-level courses or CHE research (CHE 487, CHE 495-496)

Special restriction: A minimum of 9 upper division CHE credits must be earned in courses not required for the student's major.

Bachelor of Science Degree/Master of Science Degree Program

A student interested in this research-intensive graduate program, intended to prepare students for professional employment in the chemical or pharmaceutical industries, may apply for admission at the end of the junior year. The program leads to a Bachelor of Science degree in Chemistry at the end of the fourth year and a Master of Science in Chemistry at the end of the fifth year. During the senior year, the student is expected to take two 500-level CHE courses, GRD 500 Responsible Conduct of Research and Scholarship, and begin research in the senior research sequence. In the fifth year, the student works full-time on research, earning 24 credits in CHE 599.

Sample Course Sequence for the Major in Chemistry (Chemical Science Option, B.S. Degree)

A course planning guide for this major may be found here. The major course planning guides are not part of the official Undergraduate Bulletin, and are only updated periodically for use as an advising tool. The Undergraduate Bulletin supersedes any errors or omissions in the major course planning guides.

FRESHMAN

FALL	Credits
First Year Seminar 101	1
WRT 101	3
MAT 131	4
CHE 131	4
CHE 133	1
SBC	3
Total	16

SPRING	Credits
First Year Seminar 102	1
WRT 102	3
CHE 132	4
CHE 134	1
MAT 132	4
SBC	3
Total	16

SOPHOMORE

FALL	Credits
CHE 321	4
CHE 383	2
AMS 210 or MAT 211	3
PHY 131	4
SBC	3
Total	16

SPRING	Credits
CHE 326	4
CHE 384	3
CHE 385	1
PHY 132	4
SBC	3
Total	15

JUNIOR

FALL	Credits
CHE 301	4
CHE 303	2
CHE 375	3
SBC	3
SBC	3
Total	15

SPRING	Credits
CHE 302	4
CHE 304	2
SBC	3
SBC	3
SBC	3
Total	15

SENIOR

FALL	Credits
CHE 357	2
CHE 495	3
Upper-division SBC	3
SBC	3
SBC	3
SBC	3
Total	17

SPRING	Credits
CHE 496	3
Upper-division CHE elective	3
Upper-division elective	3
SBC	3
SBC	3
Total	15

Sample Course Sequence for the Major in Chemistry (B.A. Degree)

A course planning guide for this major may be found [here](#).

FRESHMAN

FALL	Credits
First Year Seminar 101	1
WRT 101	3
MAT 131	4
CHE 131	4
CHE 133	1
SBC	3
Total	15

SPRING	Credits
First Year Seminar 102	1
WRT 102	3

CHE 132	4
CHE 134	1
MAT 132	4
SBC	3
Total	16

SOPHOMORE

FALL	Credits
CHE 321	4
CHE 383	2
AMS 210 or MAT 211	3
PHY 131	4
SBC	3
Total	16

SPRING	Credits
CHE 326	4
CHE 384*	3
CHE 385	1
PHY 132	4
SBC	3
SBC	3
Total	18

JUNIOR

FALL	Credits
CHE 301	4
CHE 303	2
SBC	3
SBC	3
SBC	3
Total	15

SPRING	Credits
CHE 302	4
CHE 304*	2
SBC	3
SBC	3
SBC	3
Total	15

SENIOR

FALL	Credits
CHE 375	3
Upper-division elective	3
Upper-division elective	3
Elective	3
SBC	3
Total	15

SPRING	Credits
Upper-division SBC	3
Upper-division SBC	3
Elective	3
Elective	3
Elective	3
Total	15

*Only one of these two laboratory courses is required.

CHE

Chemistry

CHE 115: Chemistry, Life, and Environment

This survey course introduces chemical principles by emphasizing the role chemistry plays in everyday life, the natural environment, the built environment, energy production, and in processes leading to environmental degradation. In addition, the role of chemistry in the development of alternative energy sources, remediation technologies, and eco-friendly products is discussed. This course for non-science majors introduces chemical principles using mostly qualitative approaches rather than quantitative approaches. Interactive tools and interactive visualization tools are extensively used to illustrate concepts, reactions, and processes. May not be taken by students with credit for CHE 129, CHE 131, or CHE 152. This course is offered as both CHE 115 and ENV 115.

DEC: E

SBC: SNW

3 credits

CHE 129: General Chemistry IA

This is the initial course of the four-semester General-Chemistry/Organic-Chemistry sequence CHE 129/132/321/322. This sequence provides the necessary foundation for students who wish to pursue further coursework in chemistry. The General Chemistry Courses provide a broad introduction to the fundamental principles of chemistry, including substantial illustrative material drawn from the chemistry of inorganic, organic, and biochemical systems. The emphasis is on basic concepts, problem-solving, and factual material. Students will be placed into CHE 129 based on their performance in the Online Chemistry Placement and Preparation (OCP) process. Specifically, CHE 129 is for students with chemistry knowledge above the required OCP minimum but who do not meet the math corequisite of CHE 131. The level and content of CHE 129 match that of CHE 131, but since the corequisite differs, students must also attend a CHE 130 session each week. CHE 130 builds essential skills in information processing, critical and analytical thinking, quantitative reasoning, and problem solving. The CHE 129 four-semester sequence is inappropriate for students who satisfy the corequisites of CHE 131. It is also inappropriate for students who have completed an AP course in chemistry and received a score of 4 or 5; such students must enroll

in CHE 152. Three lecture hours, one 80-minute workshop, and one CHE 130 session per week. CHE 129 may not be taken for credit in addition to CHE 131 or CHE 152. This course has been designated as a High Demand/Controlled Access (HD/CA) course. Students registering for HD/CA courses for the first time will have priority to do so. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: Online Chemistry Placement and Preparation (OCP) Process. For information on the OCP, copy and paste the following link into your browser. go.stonybrook.edu/ocpp

Mandatory co requisites: MAT 123 and CHE 130

DEC: E

SBC: SNW

4 credits

CHE 130: Problem Solving in General Chemistry

This course provides a structured environment for completing CHE 129 homework assignments and helping students develop the quantitative reasoning and problem solving skills needed in General Chemistry. Satisfactory/Unsatisfactory grading only. Grading is based on attendance and participation. Required for students taking CHE 129 along with MAT 123.

Mandatory corequisites: CHE 129 and MAT 123

1 credit, S/U grading

CHE 131: General Chemistry IB

This is the initial course in the four-semester General-Chemistry/Organic-Chemistry sequence CHE 131/132/321/322. This sequence provides the necessary foundation for students who wish to pursue further coursework in Chemistry. The General Chemistry courses provide a broad introduction to the fundamental principles of chemistry, including substantial illustrative material drawn from the chemistry of inorganic, organic, and biochemical systems. The emphasis is on basic concepts, problem-solving, and factual material. The principal topics covered are stoichiometry, the states of matter, chemical equilibrium and introductory thermodynamics, electrochemistry, chemical kinetics, electron structure and chemical bonding, and chemical periodicity. Students will be placed into CHE 131 based on their performance in an Online Chemistry Placement and Preparation (OCP) process. The four-semester sequence is inappropriate for students who have completed an AP

course in chemistry and received a score of 4 or 5; these students are placed into CHE 152. Three lecture hours and one 80-minute workshop per week. May not be taken for credit in addition to CHE 129 or CHE 152. This course has been designated as a High Demand/Controlled Access (HD/CA) course. Students registering for HD/CA courses for the first time will have priority to do so. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: Online Chemistry Placement and Preparation (OCP) Process. For information on the OCP, copy and paste the following link into your browser. go.stonybrook.edu/ocpp Corequisite: MAT 125 or higher

DEC: E

SBC: SNW

4 credits

CHE 132: General Chemistry II

A continuation of either CHE 129 or 131, introducing the fundamental principles of chemistry, including substantial illustrative material drawn from the chemistry of inorganic, organic, and biochemical systems. The principal topics covered are stoichiometry, the states of matter, chemical equilibrium and introductory thermodynamics, electrochemistry, chemical kinetics, electron structure and chemical bonding, and chemical periodicity. The sequence emphasizes basic concepts, problem solving, and factual material. It provides the necessary foundation for students who wish to pursue further coursework in chemistry. Three lecture hours and one 80-minute workshop per week. May not be taken for credit in addition to CHE 152. This course has been designated as a High Demand/Controlled Access (HD/CA) course. Students registering for HD/CA courses for the first time will have priority to do so. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: C or higher in CHE 129 or CHE 131. Pre/Corequisite: MAT 125 for those who took CHE 129 or 130 or BA BIO majors; all others MAT 126 or higher

DEC: E

SBC: SNW

4 credits

CHE 133: General Chemistry Laboratory I

Designed to familiarize students with (1) some chemical and physical properties of substances, (2) techniques of quantitative chemistry, and (3) scientific methodology. Three hours of laboratory or related activity

per week. CHE 133 and CHE 134 may not be taken for credit in addition to CHE 154. This course has been designated as a High Demand/Controlled Access (HD/CA) course. Students registering for HD/CA courses for the first time will have priority to do so. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Pre- or Corequisite: CHE 129 or 131

1 credit

CHE 134: General Chemistry Laboratory II

Designed to familiarize students with (1) some chemical and physical properties of substances, (2) techniques of quantitative chemistry, and (3) scientific methodology. Three hours of laboratory or related activity per week. CHE 133 and CHE 134 may not be taken for credit in addition to CHE 154. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisites: CHE 133

Pre- or Corequisite: CHE 132

1 credit

CHE 152: Molecular Science I

This is the initial course of the three-semester Molecular Science sequence CHE 152/331/332. The topics covered in CHE 152 include atomic and molecular structure, chemical bonding, thermodynamics, equilibrium and aqueous chemistry, electrochemistry, kinetics and basics of organic chemistry. Students will be placed into CHE 152 based on their performance in the Online Chemistry Placement and Preparation (OCPP) process or upon receipt of a score of 4 or 5 in AP chemistry. (Such students cannot enroll in any of the courses CHE 129/130, 131, or 132). May not be taken for credit in addition to CHE 129, 131, or 132. Three lecture hours and one 80-minute workshop per week.

Prerequisite: AP Chem score of 4-5 & satisfactory score on the Online Chemistry Placement & Prep Process (OCPP) or satisfactory score on the OCPP (<http://go.stonybrook.edu/ocpp>); co-registration in MAT 131 (preferred), MAT 125, AMS 151 or higher calculus

DEC: E

SBC: SNW

4 credits

CHE 154: Molecular Science Laboratory I

Designed to familiarize students with chemical and physical properties of substances, techniques of quantitative chemistry, and

aspects of scientific methodology. Four hours of lab per week. CHE 154 may not be taken for credit in addition to CHE 134. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Corequisite: CHE 152

2 credits

CHE 301: Physical Chemistry I

This course is the first half of a two-semester overview of modern physical chemistry, introducing students to the quantitative study of chemical systems. The fundamentals of thermodynamics from both macroscopic and microscopic standpoints are covered, with applications to chemical problems. May not be taken for credit by students who have completed CHE 312.

Prerequisite: CHE 132 or 152; MAT 132 or 142 or 127 or 171 or AMS 161

Pre/Co Requisite: MAT 203 or MAT 211 or AMS 210 or AMS 261; PHY 121, 125, 131/133, or 141

SBC: STEM+

4 credits

CHE 302: Physical Chemistry II

Introduction to quantum theory and its application to the study of chemical bonding, molecular spectroscopy, statistical thermodynamics, chemical kinetics and molecular reaction dynamics.

Prerequisites: CHE 301; MAT 203 or MAT 211 or AMS 210 or AMS 261

Pre- or Corequisite: PHY 122 or 132/134 or 142 or PHY 126/127

4 credits

CHE 303: Solution Chemistry Laboratory

Quantitative techniques of solution chemistry. Measurement: accuracy and precision, analysis, computation, and reporting. Spectrophotometry. Solution equilibria and kinetics. Use of computers is introduced. Six hours of laboratory and discussion. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: CHE 134 or CHE 154

Corequisite: CHE 301

SBC: ESI, WRTD

2 credits

CHE 304: Chemical Instrumentation Laboratory

Electrochemical and thermochemical measurements. Electronics in chemical instrumentation. Vacuum techniques.

Electrical and magnetic properties of materials. Data-handling methods. Six hours of laboratory and discussion. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: CHE 303

Corequisite: CHE 302 Advisory Prereq: Knowledge of computer programming

SBC: TECH, WRTD

2 credits

CHE 310: Chemistry in Technology and the Environment

Use of chemical principles in understanding processes that occur in the modern technological world and in the natural environment. Certain ecological problems of a chemical nature are analyzed. Methods of controlling these problems are discussed. Not for credit in addition to ENV 320.

Prerequisite: CHE 132 or CHE 152

DEC: H

SBC: STAS

3 credits

CHE 312: Physical Chemistry for the Life Sciences

A one-semester treatment of fundamental concepts of physical chemistry, intended primarily for students of the biological sciences desiring an introduction to physical chemistry. Topics include equations of state; classical thermodynamics and its application to chemical equilibrium in reaction systems, multiphase systems, and electrochemical cells; kinetic theory of gases; transport properties; chemical kinetics. May not be taken for credit by students who have completed CHE 301. Not for credit toward the chemistry major.

Prerequisite: CHE 132 or 152; MAT 132 or 142 or 127 or 171 or AMS 161

Pre- or Corequisite: PHY 121 or 125 or 131/133 or 141

SBC: STEM+

3 credits

CHE 321: Organic Chemistry I

An introduction to the structure, reactivity, and properties of organic compounds is presented using modern views of chemical bonding. These fundamental ideas are applied to topics ranging from synthetic chemistry to complex functional structures such as lipid bilayers. This course has been designated as a High Demand/Controlled Access (HD/CA) course. Students registering for HD/CA courses for the first time will have priority to do so.

Prerequisite: C or higher in CHE 132

SBC: STEM+

4 credits

CHE 322: Organic Chemistry IIA

Discussion of the structure, reactivity, and properties of organic compounds introduced in CHE 321 is continued. The chemistry of substances important in biology, medicine, and technology is emphasized. CHE 322 may not be taken for credit in addition to CHE 326. This course has been designated as a High Demand/Controlled Access (HD/CA) course. Students registering for HD/CA courses for the first time will have priority to do so.

Prerequisite: C or higher in CHE 321

4 credits

CHE 327: Organic Chemistry Laboratory

Techniques of isolating and handling organic substances, including biological materials. A one-semester course that provides a basic organic laboratory experience. It is recommended that students take CHE 327 at the same time as or immediately following CHE 322 or 332. Four laboratory hours and one lecture hour per week. Not for credit in addition to CHE 383. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: CHE 134 or CHE 154

Pre- or Corequisite: CHE 321 or CHE 331

2 credits

CHE 328: Synthetic and Spectroscopic Laboratory Techniques

Application of fundamental laboratory techniques to organic and inorganic problems including multistep syntheses and structural and mechanistic determinations. Lectures cover material pertaining to the experimental work, with an emphasis on spectroscopy. Not for credit in addition to CHE 384. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: CHE 327

Pre- or corequisite: CHE 322

SBC: TECH

3 credits

CHE 331: Molecular Science II

Topics include the structural, mechanistic and synthetic aspects of organic chemistry, transition metal chemistry, catalysis, supramolecular chemistry, and polymer chemistry. This is the second course in a three semester sequence. Students with a strong background prior to entering

the University can take the 152-331-332 sequence, which covers the same material as 131-132-321-322. Three lecture hours and one 80-minute workshop per week. The laboratory component, CHE 383, must be taken the same semester as the CHE 331 lecture. May not be taken for credit in addition to CHE 321.

Prerequisite: C or higher in CHE 152

Corequisite: CHE 383

SBC: STEM+

4 credits

CHE 332: Molecular Science III

Topics include advanced structural, mechanistic and synthetic aspects of organic chemistry, the organic chemistry of biological pathways and biosynthesis. This is the final course in a three semester sequence. Students with a strong background prior to entering the University can take the 152-331-332 sequence, which covers the same material as 131-132-321-322. Three lecture hours and one 80-minute workshop per week. May not be taken for credit in addition to CHE 322.

Prerequisite: C or higher in CHE 331

4 credits

CHE 345: Structure and Reactivity in Organic Chemistry

Electronic and stereochemical theories relating to organic structure and reactions. Topics such as bonding, strain, aromaticity, MO theory, molecular rearrangements, pericyclic reactions, and photochemistry are covered.

Prerequisite: CHE 322, CHE 326, or CHE 332

Pre- or Corequisite: CHE 301 or 312

3 credits

CHE 346: Biomolecular Structure and Reactivity

The reactivity and physiological function of biological macromolecules and their monomeric constituents are described at the chemical level. The course reflects the most recent advances at the interface of organic chemistry and biochemistry. Specific topics include catalysis, biomimicry, protein and DNA modification, binding and target recognition, and correlation between three-dimensional structure and reactivity.

Pre- or Corequisites: CHE 322, CHE 326, or CHE 332; CHE 301 or CHE 312

3 credits

CHE 348: Reaction Mechanisms in Organic Chemistry

Important classes of mechanisms of reactions useful in synthesis are explored. The kinetics and thermodynamics of these reactions are analyzed using modern structural theories.

Examples of reaction types are substitutions, rearrangements, additions, eliminations, and selected organometallic reactions.

Prerequisite: CHE 322, CHE 326, or CHE 332
3 credits

CHE 351: Quantum Chemistry

Concepts of quantum theory, Schrodinger wave mechanics, and related mathematical techniques illustrated by application to systems of chemical bonding, spectroscopy, molecular structure, and molecular collision phenomena.

Prerequisites: CHE 302; MAT 203 or 205

3 credits

CHE 353: Chemical Thermodynamics

A rigorous development of thermodynamics and its application to systems of interest to chemists, including electrochemical cells, gases, polymers, and homogeneous and heterogeneous equilibrium. An introduction to statistical mechanics is included.

Prerequisites: CHE 302; CHE 321

3 credits

CHE 357: Molecular Structure and Spectroscopy Laboratory

Optical and magnetic resonance spectroscopy are used to investigate the structural, dynamic, and quantum mechanical properties of some basic chemical systems. Emphasis is on the quantitative measurement of molecular parameters and transformations. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisites: CHE 304 and 383

2 credits

CHE 358: Computing in Chemistry

The basic elements of scripting, design of computer programs, and numerical analysis are discussed within the framework of solving a variety of exciting problems chosen from all areas of chemistry. Topics include automation of repetitive tasks, fitting of data, numerical integration of rate equations, signal and image analysis, and quantum chemistry. No previous knowledge of computer programming is assumed.

Prerequisite: CHE 302 and CHE 304

3 credits

CHE 361: Nuclear Chemistry

Properties of radioactive substances and their use in the study of chemical problems, nuclear stability and structure, nuclear reactions, radioactive decay, interactions of radiation with matter, nuclear medicine, isotope

applications, and environmental control.
Offered in summer only.

Prerequisites: Four semesters of chemistry; PHY 126 and 127, or 132/134 or 142 or 171; AMS 161 or MAT 127 or 132 or 142; permission of department through application by January 30; permission of instructor
Corequisite: CHE 362

3 credits

CHE 362: Nuclear Chemistry Laboratory

Detection and measurement of radiation, electronic instrumentation, radiation safety, and application of radioactivity to chemical problems. Offered in summer only.

Corequisite: CHE 361

3 credits

CHE 375: Inorganic Chemistry I

A survey of inorganic chemistry covering various classes of inorganic compounds and reactions with emphasis on the structural aspects. Wherever possible, the subject is treated on the basis of modern concepts of chemical bonding. Thermodynamic and kinetic aspects of inorganic reactions are included.

Prerequisite: CHE 322, CHE 326, or CHE 332

3 credits

CHE 376: Inorganic Chemistry II

The chemistry of the elements with an emphasis on the transition metals. Reaction mechanisms, synthesis, and structure are covered. Specific areas of concern include coordination chemistry, organometallic chemistry, bioinorganic chemistry, and selected topics from solid-state and non-transition metal chemistry.

Prerequisite: CHE 375

3 credits

CHE 378: Materials Chemistry

Our high-technology world is driven forward by advances in materials chemistry. This class will discuss some of the materials that underpin these technologies, as well as some of the novel classes of materials that are being developed for future applications. The course will cover the synthesis, structures, and properties of advanced materials, focusing on a range of topics with current societal importance (e.g. energy, computers, nanoscience, etc.). Specific topics may include batteries, fuel cells, catalysts, metals, semiconductors, superconductors, magnetism, and polymers.

Prerequisite: CHE 375 or ESG 332

3 credits

CHE 383: Introductory Synthetic and Spectroscopic Laboratory Techniques

Fundamental laboratory techniques including methods of separation, purification, synthesis, and analysis. Emphasis is on organic with an introduction to inorganic problems. For students in the Molecular Sciences sequence. Not for credit in addition to CHE 327. Three lecture hours and one 80-minute workshop per week. The lecture component, CHE 331, must be taken the same semester as the CHE 383 laboratory. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: CHE 154

Corequisite: CHE 331

SBC: ESI

2 credits

CHE 384: Intermediate Synthetic and Spectroscopic Laboratory Techniques

Application of fundamental laboratory techniques to organic and inorganic problems including multistep syntheses and structural and mechanistic determinations. Lectures cover material pertaining to the experimental work, with an emphasis on spectroscopy. Not for credit in addition to CHE 328. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: CHE 383

Corequisite: CHE 332

SBC: TECH, WRTD

3 credits

CHE 385: Tools of Chemistry

A seminar course covering topics common to all areas of chemistry: scientific ethics, chemical literature and information retrieval, scientific writing, and oral presentation. A through C/Unsatisfactory grading only.

Pre- or corequisite: CHE 327 or CHE 383

SBC: CER, SPK

1 credit, ABC/U grading

CHE 444: Experiential Learning

This course is designed for students who engage in a substantial, structured experiential learning activity in conjunction with another class. Experiential learning occurs when knowledge acquired through formal learning and past experience are applied to a "real-world" setting or problem to create new knowledge through a process of reflection, critical analysis, feedback and synthesis. Beyond-the-classroom experiences that support experiential learning may include: service learning, mentored research, field work, or an internship.

Prerequisite: WRT 102 or equivalent; permission of the instructor and approval of the EXP+ contract (http://sb.cc.stonybrook.edu/bulletin/current/policiesandregulations/degree_requirements/EXPplus.php)

SBC: EXP+

0 credit, S/U grading

CHE 459: Write Effectively in Chemistry

A zero credit course that may be taken in conjunction with any 300- or 400-level CHE course, with permission of the instructor. The course provides opportunity to practice the skills and techniques of effective academic writing and satisfies the learning outcomes of the Stony Brook Curriculum's WRTD learning objective.

Prerequisite: WRT 102; permission of the instructor

SBC: WRTD

0 credit, S/U grading

CHE 461: Selected Topics in Chemistry

Semester supplements to this Bulletin contain specific description when course is offered. May be repeated as the topic changes.

Prerequisite: Varying with topic

1-3 credits

CHE 475: Undergraduate Teaching Practicum I

Work with a faculty member as an assistant in one of the faculty member's regularly scheduled classes. The student is required to attend all the classes, do all the regularly assigned work, and meet with the faculty member at regularly scheduled times to discuss the intellectual and pedagogical matters relating to the course. Students may participate only in courses in which they have excelled.

Prerequisite: Permission of department

SBC: EXP+

3 credits, S/U grading

CHE 476: Undergraduate Teaching Practicum II

Work with a faculty member as an assistant in one of the faculty member's regularly scheduled classes. Students assume greater responsibility in such areas as leading discussions and analyzing results of tests that have already been graded. Students may participate only in courses in which they have excelled. The course in which the student is permitted to work as a teaching assistant must be different from the course in which he or she previously served.

Prerequisite: Permission of department

SBC: EXP+

3 credits, S/U grading

CHE 477: Undergraduate Teaching Practicum III

Work with a faculty member as an assistant in one of the faculty member's regularly scheduled classes. Students may participate only in courses in which they have excelled. May be repeated.

Prerequisites: CHE 476; permission of instructor and department

SBC: EXP+

0 credit, S/U grading

CHE 487: Research in Chemistry

Students pursue research or tutorial study in specialized areas of chemistry. May be repeated.

Prerequisites: Permission of instructor and department

SBC: EXP+

0-6 credits

CHE 488: Internship

Research participation in off-campus laboratories. Students are required to submit to the department a proposal at the time of registration and a research report at the end of the semester. May be repeated up to a limit of 12 credits.

Prerequisites: CHE 384; permission of instructor and department

SBC: EXP+

0-6 credits, S/U grading

CHE 495: Senior Research

First course of a two-semester research program to be carried out under the supervision of a staff member. The results of this work are to be submitted to the department in the form of a senior research report. The student is given an oral examination in May by a faculty committee consisting of the student's supervisor and three other faculty members. Students receive only one grade upon completion of the sequence CHE 495-496.

Prerequisite: U4 standing; permission of instructor and department

SBC: EXP+

3 credits

CHE 496: Senior Research

Second course of a two-semester research program to be carried out under the supervision of a staff member. The results of this work are to be submitted to the department in the form of a senior research report. The

student is given an oral examination in May by a faculty committee consisting of the student's supervisor and three other faculty members. Students receive only one grade upon completion of the sequence CHE 495-496.

Prerequisite: U4 standing; permission of instructor and department

SBC: ESI, EXP+, SPK

3 credits