

Biochemistry (BCH)**Major in Biochemistry****Department of Biochemistry and Cell Biology; College of Arts and Sciences**

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Minors of particular interest to students majoring in Biochemistry: Biomaterials (BES), Bioengineering (BNG), Chemistry (CHE), Health and Wellness (LHW), Science and Engineering (LSE)

Departments of Biochemistry and Cell Biology

The Biochemistry Program

The Biochemistry Undergraduate Major Program provides a challenging and exciting introduction to the chemical basis of biological phenomena.

The major is designed to prepare students who intend to pursue graduate study, attend health-related professional schools, pursue secondary school teaching careers, and fill entry-level positions in private, state, and federal laboratories or in pharmaceutical and biotechnical industries.

The undergraduate curriculum provides a fundamental background in biology, chemistry, genetics, cell biology, and biochemistry, with courses in mathematics and physics necessary for advanced understanding of this broad field. Students may not declare a double major among biochemistry, biology, and pharmacology majors.

Requirements for the Major in Biochemistry (BCH)

All courses offered for the major must be taken for a letter grade. A minimum grade of C must be obtained in all courses in requirements A, B, and C below. Completion of the major requires approximately 70 to 74 credits.

Transfer students who wish to complete the requirements for the Biochemistry major must take Biochemistry I and II (BIO 361 and BIO 362) and must complete at least a minimum of nine additional credits at Stony Brook in required upper-division Biology courses (BIO 310, BIO 311, BIO 320, or BIO 365) and/or approved upper-division Biology elective courses.

A. Courses in Related Fields

1. CHE 131, CHE 132 General Chemistry or CHE 141, CHE 142 Honors Chemistry I and II or CHE 152 Molecular Science I
2. CHE 133, CHE 134 General Chemistry Laboratory or CHE 143, CHE 144 Molecular Science Laboratory
3. CHE 321, CHE 322 Organic Chemistry I, II or CHE 331, 332 Molecular Science II and III (See Note 1)
4. CHE 327 Organic Chemistry Laboratory A or CHE 383 Introductory Synthetic and Spectroscopic Laboratory Techniques
5. CHE 301 or CHE 312 Physical Chemistry
6. MAT 125, MAT 126, MAT 127 Calculus A, B, C or MAT 131, MAT 132 Calculus I, II or MAT 141, MAT 142 or MAT 171 or AMS 151 and AMS 161 or level 9 on mathematics placement examination.
7. PHY 121/PHY 123, PHY 122/PHY 124 Physics for the Life Sciences and Labs or PHY 125, PHY 126, PHY 127 Classical Physics A, B, C or PHY 141, PHY 142 Classical Physics I, II: Honors

Note 1: General chemistry students should register for CHE 133 and 134 general chemistry laboratory I and II. Honors Chemistry students and Molecular Science series students should register for CHE 143 and 144.

B. Core Courses in Biology

1. BIO 201 Fundamentals of Biology: Organisms to Ecosystems
2. BIO 202 Fundamentals of Biology: Molecular and Cellular Biology
3. BIO 203 Fundamentals of Biology: Cellular and Organ Physiology
4. BIO 204 Fundamentals of Scientific Inquiry in the Biological Sciences I
5. BIO 205 Fundamentals of Scientific Inquiry in the Biological Sciences II or BIO 207 Fundamentals of Scientific Inquiry in the Biological Sciences II or IIB

C. Advanced Courses in Biology

1. BIO 320 General Genetics
2. BIO 310 Cell Biology
3. BIO 361, BIO 362 Biochemistry I,II (See Note 1)

4. One of the following laboratories: BIO 365 Biochemistry Laboratory (fall only) or BIO 311 Techniques in Molecular and Cellular Biology (See Note 2)
5. Two additional courses, totaling at least five credits, chosen after consultation with an advisor from the following list. It is highly recommended that students take more than the suggested minimum number of electives.
 - AMS 333 Mathematical Biology
 - BCP 401 Principles of Pharmacology
 - BCP 402 Advanced Pharmacology
 - BIO 302 Human Genetics
 - BIO 311 Techniques in Molecular and Cellular Biology or BIO 365 Biochemistry Laboratory (See Note 3)
 - BIO 312 Bioinformatics and Computational Biology
 - BIO 314 Cancer Biology
 - BIO 315 Microbiology
 - BIO 316 Molecular Immunology
 - BIO 317 Principles of Cellular Signaling
 - BIO 321 Introduction to Ecological Genetics and Genomics
 - BIO 325 Animal Development
 - BIO 327 Developmental genetics lab
 - BIO 328 Mammalian Physiology
 - BIO 332 Computational Modeling
 - BIO 334 Principles of Neurobiology
 - BIO 335 Neurobiology Laboratory
 - BIO 337 Neurotransmission and Neuromodulation: Implications for Brain Function
 - BIO 338 From Synapse to Circuit: Self organization of the Brain
 - BIO 339 Molecular Development of the Nervous System
 - BIO 350 Darwinian Medicine
 - BIO 354 Evolution
 - BIO 358 Biology of Human Social and Sexual Behavior
 - BIO 364 Laboratory Techniques in Cancer Biology
 - BIO 367 Molecular Diversity Laboratory
 - BME 304 Genetic Engineering
 - CHE 346 Bio-molecular Structure and Activity

Note 1. BIO 361 and BIO 362 must be taken in order. Students who wish to take BIO 362 before BIO 361 must get permission from the course instructor. A grade of C or higher in BIO 202 and CHE 321 & CHE 326 or CHE 322 is required to enroll in BIO 361 and BIO 362.

Note 2. Neither BIO 311 nor BIO 365 can be used to satisfy both the upper division laboratory and an upper division elective requirements.

D. Upper-Division Writing Requirement

To fulfill the upper-division writing requirement in Biochemistry, a sample of writing from an upper-division course in the biological sciences must be submitted for evaluation and approved. The writing sample must contain a minimum of 750 words of text and can be a graded laboratory report, a graded term paper, or a graded report from a readings or research course. The original graded writing sample and the [Upper Division Writing Requirements \(UDWR\) form](#) should be signed by both the student and instructor and should be submitted to the Undergraduate Biology office. The Writing Center will evaluate the submission and contact the student directly if remediation is needed.

The deadline for submission of the writing sample is February 1 for students graduating the following May or August, and October 1 for students graduating the following December. However, students are urged to submit appropriate materials in their junior year, or by the end of their next-to-last term, in order to allow for evaluation and possible revision. Later submissions are considered, but may delay graduation.

Honors Program in Biochemistry

Graduation with Honors in Biochemistry requires the following:

1. A cumulative g.p.a. of at least 3.50 in all courses required for the major.
2. Presentation of an acceptable thesis based on laboratory research project. Students interested in graduation with Honors must contact the Biochemistry Honors Coordinator for more detailed information no later than the second week of classes during their last semester.

Bachelor of Science Degree in Biochemistry/Master of Science Degree in Chemistry 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 Biochemistry at the end of the fourth year, followed by 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 and begin research. In the fifth year, the student works full-time on research, earning 24 credits in CHE 599. The two 500-level CHE courses taken during the senior year may be counted toward the two electives required by the Biochemistry major. Please visit the Chemistry website <http://stonybrook.edu/chemistry> for further information on the Chemistry graduate degree.

Sample Course Sequence for the Major in Biochemistry

Freshman Fall	Credits	Spring	Credits
First Year Seminar 101		1 First Year Seminar 102	1
D.E.C. A		3 D.E.C. A	3
CHE 131		4 BIO 201 or BIO 202	3
CHE 133		1 CHE 132	4
MAT 125 or MAT 131	3-4	CHE 134	1
D.E.C.		3 MAT 126 or MAT 132	3-4
		D.E.C.	3
Total	15-16	Total	18-19
Sophomore Fall	Credits	Spring	Credits
BIO 203		3 BIO 201 or BIO 202	3
CHE 321		4 CHE 326	4
MAT 127 (if MAT 125, MAT 126, MAT 127 sequence taken)		3 CHE 327	2
BIO 204		2 BIO 205 or BIO 207	2
D.E.C.		3 D.E.C.	3
Total		Total	14
Junior Fall	Credits	Spring	Credits
BIO 361*		3 BIO 362*	3
BIO elective**** or BIO 365 or 311***	2-3	BIO 320	3
PHY 121/PHY 123		4 PHY 122/PHY 124	4
D.E.C.		3 D.E.C.	3
D.E.C.		3 BIO elective****	3
Total	15-16	Total	16
Senior Fall	Credits	Spring	Credits
CHE 301**		3 BIO 310	3
BIO 365 or BIO 311***	2-3	CHE 312**	3
D.E.C.		3 BIO elective****	3
D.E.C.		3 D.E.C.	3
D.E.C. or BIO elective****		3 D.E.C. or Elective	3
Total	14-15	Total	15

*BIO 361 and 362 should be taken in sequence.

**Physical Chemistry I (CHE 301) or Physical Chemistry (short course) (CHE312) may be taken to fulfill the one semester Biochemistry Major physical chemistry requirement. CHE 301 is offered only in the fall; CHE 312 is offered only in the spring.

***BIO 365 is 2 credits; BIO 311 is 3 credits

****BIO electives for the major must be chosen from the approved list. Electives not on the list must be approved by a Biochemistry advisor

BIO

Biology

BIO 101 - E: Human Biology

The major concepts of biology are presented from historical, contemporary, and critical viewpoints. These concepts include the cell, the gene, molecular biology, development, and evolution. The human implications or values associated with each concept are emphasized. Not for Biology major credit.

3 credits

BIO 103 - E: Introduction to Biotechnology

Gene therapy, genetic modification, cloning, stem cells, and vaccines are covered in this course. Lectures and four supplemental laboratory activities use modern equipment and techniques to illustrate core concepts which class discussions relate to health, society, and public policy. Not for Biology major credit.

3 credits

BIO 104 - E: How Science Works

The course aims at expanding students' knowledge about the methods of the natural sciences and to develop the critical thinking abilities to understand scientific claims presented by the media. Students will learn about scientific discoveries as well as the differences between science and pseudoscience. The course includes lectures and discussions based on textbook material, examination of case studies in science, and discussion of items in the news. Not for Biology major credit.

3 credits

BIO 113 - E: General Ecology

A survey of the principles of ecology in the context of finding solutions to local, national, and global environmental problems. Not for Biology major credit.

3 credits

BIO 114 - E: Dinosaur Paleontology

A study of paleontology that includes evolution of dinosaurs, their classification system, a study of the important dinosaur families, dinosaur behavior, ecology, current controversies, hot topics and the KT extinction. Dinosaur paleontology will also cover the excavation of dinosaurs and the colorful history of the 'dinosaur hunters.' This course will emphasize the science and research involved in studying dinosaurs.

Using dinosaurs as a vehicle, students will be exposed to the scientific method of inquiry and will leave this course with a better understanding on how to evaluate science in the real world. Not for Biology major credit.

Advisory prerequisite: Entry level biology

3 credits

BIO 115 - E: Evolution and Society

The historical development of evolutionary thought, the evolutionary diversification of life, and the mechanisms of evolution are presented. The geological, genetic, and other biological principles necessary to comprehend evolutionary concepts are introduced as background. Current controversies over the evidence for evolution are reviewed. Human evolution, medical and agricultural applications of evolutionary theory, and its implications for the development of human and other social systems are considered. Not for Biology major credit.

Advisory Prerequisite: One biology course

3 credits

BIO 201 - E: Fundamentals of Biology: Organisms to Ecosystems

An introduction to the major groups of living organisms. Structure, functions, the ecological roles of organisms in communities and ecosystems, and their evolutionary history are covered. Genetics and demography are discussed in the context of evolution by natural selection. 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: Level 4 or higher on the mathematics placement examination or corequisite MAT 123 or higher

Advisory Prerequisite: High School Biology

3 credits

BIO 202 - E: Fundamentals of Biology: Molecular and Cellular Biology

The fundamentals of cell biology, biochemistry, and genetics. The biochemical and molecular bases of cell structure, energy metabolism, gene regulation, heredity, and development in living organisms from bacteria to man are discussed. 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: CHE 129 or CHE 131 or CHE 141 or CHE 152

Pre- or Corequisite: MAT 125 or higher or AMS 151

3 credits

BIO 203 - E: Fundamentals of Biology: Cellular and Organ Physiology

The fundamentals of cell and organ physiology in mammalian and non-mammalian organisms. The structure and function of cell membranes and the physiology of cell to cell signaling, cellular respiration, and homeostasis of organs and organisms are examined with an emphasis on the comparative physiology of vertebrates and invertebrates. 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: CHE 129 or CHE 131 or CHE 141 or CHE 152

Pre- or Corequisite: MAT 125 or higher or AMS 151

3 credits

BIO 204: Fundamentals of Scientific Inquiry in the Biological Sciences I

First course in the foundational laboratory sequence for all biology students, and students in related fields. Students will experience the laboratory process, research process, a wide range of laboratory tools, methods, skills, learn to read and write scientific presentations, and collaborate in formal inquiry. 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: CHE 123, CHE 129, CHE 131, CHE 141, or CHE 152 *Pre- or Corequisite: BIO 201, BIO 202, or BIO 203*

2 credits

BIO 205: Fundamentals of Scientific Inquiry in the Biological Sciences IIA

Second course in the foundational laboratory sequence for all biology students, and students in related fields. Students will experience the laboratory process, research process, a wide range of laboratory tools, methods, skills, learn to read and write scientific presentations, and collaborate in formal inquiry. 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. Not for credit in addition to BIO 207. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: BIO 204

Pre- or Corequisite: BIO 201, BIO 202, or BIO 203

2 credits

BIO 207: Fundamentals of Scientific Inquiry in the Biological Sciences IIB

An alternative to BIO 205, this course focuses on a relatively narrow range of current research topics but in greater depth. BIO 207 is the second course in the foundational laboratory sequence for all biology majors and students in related fields. Students will experience the laboratory process, research process, a wide range of laboratory tools, methods, and skills, learn to read and write scientific works, and collaborate in formal inquiry. 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. Not for credit in addition to BIO 205. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: BIO 204

Pre- or Corequisite: BIO 201, BIO 202, or BIO 203

2 credits

BIO 208 - H: Cell, Brain, Mind

An introduction to the human brain and how it is the target of diseases, drugs, and psychological disturbances. The course explores these topics through a knowledge of basic cell neurobiology. The implications of brain science for human behavior in society are also considered. Not for major credit.

Prerequisite: Any BIO course

Advisory Prerequisite: High school chemistry

3 credits

BIO 211 - C: Statistics and Data Analysis: A Conceptual Approach

A conceptually-focused introduction to probability and data analysis emphasizing statistical literacy and critical thinking. Topics will include probability, t-tests, chi-squared tests, correlation, regression, and Analysis of Variance, as well as special topics of interest to undergraduate Biology majors such as case-control studies and meta-analysis. This course includes a one-hour recitation in which students will do hands-on activities, discuss papers from the primary literature, and gain experience with data analysis. May not be taken by students with credit for AMS 110, 310, 311, 312 or ECO 320.

Pre- or Corequisite: MAT 125 or higher or AMS 151

4 credits

BIO 301 - H: Sustainability of the Long Island Pine Barrens

The ecologically diverse Long Island Pine Barrens region provides a habitat for a large number of rare and endangered species, but faces challenges associated with protection of a natural ecosystem that lies in close proximity to an economically vibrant urban area that exerts intense development pressure. In this course we will consider the interaction of the ecological, developmental and economic factors that impact the Pine Barrens and the effectiveness of decision support systems in promoting sustainability of the Pine Barrens. This course is offered as BIO 301, GEO 301, ECO 301, ENV 301, and ESG 301.

Prerequisites: U3 or U4 status and one of the following: BIO 201, CHE 131, ECO 108, ESG 100, ESG 198, GEO 101, GEO 102

3 credits

BIO 302: Human Genetics

An introduction to human genetics. Topics include the principles of inheritance, physical properties of DNA and proteins, molecular techniques for studying DNA, the genetic basis of mutations, using DNA to study ancient human history and human evolution, forensic applications of DNA fingerprinting, and the genetic basis of immunity and cancer. Human genetic diseases are discussed and an introduction is given to human chromosome maps, the Human Genome Project, and methods for mapping disease mutations.

Prerequisites: BIO 201; BIO 202

3 credits

BIO 310: Cell Biology

The cell is studied as the unit of structure, biochemical activity, genetic control, and differentiation. The principles of biochemistry and genetics are applied to an understanding of nutrition, growth, and development.

Prerequisites: C or higher in BIO 202; C or higher in BIO 203; CHE 321 or CHE 331 or CHE 341

3 credits

BIO 311: Techniques in Molecular and Cellular Biology

Techniques used in recombinant DNA and cell biology research. Topics include DNA manipulation and analysis, protein expression and analysis, and microscopy. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisites: BIO 202; BIO 205 or BIO 207; CHE 132 or CHE 142 or CHE 331; MAT 125 or higher or AMS 151

3 credits

BIO 312: Bioinformatics and Computational Biology

This course uses computational methods to analyze current problems and solutions in molecular biology research. Students are exposed to algorithms and tools available for both single gene and larger scale genome research. Emphasis is on practical application. Laboratories allow students to apply their knowledge to real life molecular biology problems.

Prerequisites: BIO 202; BIO 205 or BIO 207; MAT 126 or higher or AMS 161

3 credits

BIO 314: Cancer Biology

An examination of the biology of cancer. Emphasis is on molecular and cellular events, such as regulation of gene expression, genome maintenance, cell growth and death, differentiation, cell-cell recognition, signaling and homeostasis, that are frequently disrupted in cancer. Recent advances in diagnosis and therapy will also be discussed.

Prerequisite: BIO 202

3 credits

BIO 315: Microbiology

The organization, structure, energetics, and reproduction of microorganisms. Interactions of bacteria and viruses are discussed. 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.

Prerequisites: BIO 202; CHE 132 or CHE 331

3 credits

BIO 316: Molecular Immunology

Structure, function, and organization of the immune response at the molecular and cellular levels. Molecular mechanisms of immunological responses to microorganisms and various disease states are explored.

Prerequisites: BIO 202; BIO 203

Pre- or Corequisite: CHE 322 or CHE 326 or CHE 332

3 credits

BIO 317: Principles of Cellular Signaling

Basic principles of cellular signaling and maintenance of cellular and organismic homeostasis through intra- and intercellular signaling mechanisms. The roles of membrane and nuclear receptors, second-messenger pathways and gene regulation in controlling diverse mammalian systems such as sensory

physiology, organic metabolism, growth control, and neuronal development are discussed.

Prerequisite: C or higher in BIO 202

Advisory Prerequisite: BIO 203

3 credits

BIO 319: Landscape Ecology Laboratory

A computer lab course focusing on spatial concepts, methods, and tools for addressing ecological and environmental problems. The course will be based on fundamental concepts in ecology and environmental science and extend that knowledge, as well as teaching technical skills, including the use of geographic information systems (GIS) software, image processing, spatially explicit modeling, and spatial statistics. The lab exercises will introduce a variety of spatial approaches addressing problems in environmental protection, ecotoxicology, natural resource management, conservation biology, and wildlife management.

Pre- or Corequisites: BIO 201; BIO 204

Advisory Prerequisites: AMS 110 or BIO 211; BIO 351

3 credits

BIO 320: General Genetics

Integrates classical and molecular approaches to the transmission and expression of biological information. Topics include: Mendelian and non-Mendelian inheritance; linkage analysis; population genetics; DNA replication, mutation and recombination; gene expression and its regulation; current genetic technology; developmental and cancer genetics, quantitative and complex traits, and relevant ethical issues.

Prerequisite: BIO 202

3 credits

BIO 321: Introduction to Ecological Genetics and Genomics

An introduction to the concepts, research questions, and methods involved in modern ecological genetics and genomics. The goal of the course is to provide a broad conceptual framework for students planning to engage in empirical work in conservation, management, ecology, and evolutionary biology. The course will cover basic Mendelian genetics, meiosis, and mating systems, standard population genetics methods for describing variation within and between populations, basic quantitative genetics, methods for molecular marker genotyping, informatic and genomic concepts, and organism-specific methods and case studies (e.g. plant ecological genetics).

Prerequisites: BIO 201; BIO 202

Advisory Prerequisite: BIO 351

3 credits

BIO 325: Animal Development

An overview of animal embryonic development, emphasizing molecular mechanisms regulating embryonic growth and differentiation. General areas to be discussed include: molecular basis of human birth defects, stem cells, identification of developmental genes, establishing polarity in *Drosophila* and vertebrates, regulation of cell differentiation, morphogenesis and organ development, development of cancer.

Prerequisite: C or higher in BIO 202

3 credits

BIO 327: Developmental Genetics Laboratory

Exploration of the fundamental concepts in developmental biology and genetics through a combination of classical and modern molecular genetic approaches. Experiments are conducted using *Xenopus* and *Drosophila*, two important animal models for research in developmental biology and genetics. Students gain hands-on experience with the approaches used to investigate processes that control embryonic development on these two model systems, including the use of modern molecular methods for examining the regulation of gene expression during development. Exposure to the genetic approaches that are available in the *Drosophila* system will include participation in a genetic screen for new mutations. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisites: BIO 325; BIO 205 or BIO 207

Pre- or Corequisite: BIO 320 or BIO 321

3 credits

BIO 328: Mammalian Physiology

A continuation of the fundamental principles of cellular and organ physiology introduced in BIO 203. The subject matter includes advanced topics covering the origins of membrane potentials, describing properties of synaptic transmission, identifying the genetics and consequences of channelopathies in cellular and organ cardiac physiology, and advanced treatment of selected topics in endocrine, cardiac, respiratory, renal and nervous system physiology. The focus is on mammals in general and humans more particularly. May not be taken for credit in addition to HBV 350.

Prerequisite: C or higher in BIO 203 Advisory

Prerequisite: CHE 132 or CHE 142 or CHE 331

3 credits

BIO 332: Computational Modeling of Physiological Systems

Introduces students to the fundamental principles underlying computational modeling of complex physiological systems. A major focus of the course will be on the process by which a model of a biological system is developed. Students will be introduced to the mathematical methods required for the modeling of complex systems (including stochastic processes and both temporal and spatial dynamics) as well as to tools for computational simulation. Roughly one half of the class will focus on models for general cellular physiology, while the remaining half will focus on the development of higher-level models of a particular physiological system (for example, the neurobiological systems underlying learning).

Prerequisite: MAT 127 and one of the following: BIO 202, BIO 203, CHE 132 or CHE 331, PHY 127, PHY 132

3 credits

BIO 334: Principles of Neurobiology

The ionic basis of nerve potentials, the physiology of synapses, sense organs and effectors, and the integrative action of the nervous system are discussed.

Prerequisites: C or higher in BIO 203; CHE 129, CHE 131, CHE 141 or CHE 152

3 credits

BIO 335: Neurobiology Laboratory

A laboratory course in physiology with a focus on neuromuscular function. Topics include acquisition and analysis of electrophysiological data; ion channels, electrical excitability and action potentials; synaptic transmission and muscular contraction; development of physiological functions; central control of movement; sensory function and behavior; cardiac function and regulation; and ethical and political issues of physiological relevance. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: C or higher in BIO 203 and the following: PHY 122/PHY 124 or PHY 127 or PHY 132; BIO 205 or 207

3 credits

BIO 336 - H: Conservation Biology

Society and individual lives are increasingly affected by environmental degradation at different scales. From the decline of local fisheries to global climate change, multiple crises threaten the biodiversity and ecosystems

that sustain us humans. This course introduces the scientific foundations of conservation biology, along with examples from real-world conservation. The course reviews the biological concepts that underlie conservation including habitat requirements, population dynamics, biogeography, and population genetics. Analysis of case studies on the effects of human activities on biological diversity and ecosystem services will be used to explore the interdisciplinary nature of the practice of conservation. This course will prepare students for careers in environmental sciences and ecology.

Prerequisite: C or higher in BIO 201

Advisory Prerequisite: BIO 351

3 credits

BIO 337: Neurotransmission and Neuromodulation: Implications for Brain Function

Exploration of fundamental concepts of neurotransmission and neuromodulation of synaptic transmission. The subject matter includes an overview of the basic principles of neurotransmission and of the neuromodulatory systems in the brain. The involvement of these systems in behavior and neurological disorders is emphasized. We will discuss how specific neurological disorders can be investigated experimentally and how experimental results can contribute to understanding and treating these disorders.

Prerequisite: C or higher in BIO 203

3 credits

BIO 338: From Synapse to Circuit: Selforganization of the Brain

Exploration of basic neural and synaptic mechanisms and the operation of representative brain circuits, using both theoretical approaches and experimental evidence. Particular attention is given to Hebb's Rule, its cellular basis, its consequences for circuit selforganization, and its limits. A solid background in a mathematical, physical, or biological science is desirable, but most relevant background material is covered in the course.

Prerequisite: Instructor permission and BIO 203 or CHE 132 or CHE 331 or PHY 122

Advisory Prerequisite: BIO 334

3 credits

BIO 339: Molecular Development of the Nervous System

An introduction to the molecular events that underlie development and plasticity of both the peripheral and central nervous systems, with a focus on neuronal mechanisms. Molecular and genetic approaches to the analysis of neural

induction, neuronal differentiation, neuronal death and survival, neurotrophic factors, synapse formation and plasticity are presented.

Prerequisite: C or higher in BIO 202 or BIO 203

3 credits

BIO 340: Zoology

Aspects of the natural history, morphology, and evolution of selected marine invertebrates, arthropods, and vertebrates. Three hours of lecture and one three-hour laboratory per week. Not for credit in addition to BIO 343 or BIO 344 if passed with C or higher. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: BIO 201 or MAR 104; BIO 205 or BIO 207

4 credits

BIO 341: Plant Diversity

An introduction to the study of plants, especially green plants, including the origin and evolution of land plants. Topics include cellular structure and function, photosynthesis and respiration, gross anatomy, taxonomy and the diversity of organisms, plant ecology, agriculture. Three hours of lecture and one three-hour laboratory per week. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisites: BIO 201; BIO 202; BIO 205 or BIO 207

4 credits

BIO 343: Invertebrate Zoology

Aspects of the diversity, comparative and functional morphology, natural history, evolution, and water-land transitions of invertebrate animals. Three hours of lecture and one three-and-one-half hour laboratory per week. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisites: C or higher in BIO 201 or MAR 104; BIO 205 or BIO 207

4 credits

BIO 344: Chordate Zoology

Introduction to the diversity, natural history, and evolution of chordates, emphasizing the living vertebrates. Three hours of lecture or discussion and one three-hour laboratory per week. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: BIO 201

4 credits

BIO 348: Diversity and Evolution of Reptiles and Amphibians

The course will survey the diversity and natural history of the major groups of reptiles and amphibians, including snakes, lizards, turtles, crocodylians, frogs, and salamanders. Extinct groups (such as dinosaurs and pterosaurs) will also be covered. Furthermore, the course will showcase how studies of reptiles and amphibians have increased our general understanding of evolution and ecology, and will illustrate how diverse aspects of organismal biology (such as physiology, ecology, behavior, morphology) evolve and are interconnected.

Prerequisite: BIO 201

3 credits

BIO 350 - H: Darwinian Medicine

The ecology and evolution of disease, including evolution of human resistance to infection by pathogens, pathogen evolution in response to natural and technological defenses, and the ecological context of disease. Evolutionary phenomena are treated from molecular, organismal, populational, and environmental perspectives.

Prerequisites: BIO 201; BIO 202

3 credits

BIO 351 - H: Ecology

An examination of the interactions of living organisms with their physical and biological environments. Special attention is given to population dynamics and the interactions among organisms that determine the structure, function, and evolutionary development of biological communities.

Prerequisite: C or higher in BIO 201 or permission of instructor

3 credits

BIO 352: Ecology Laboratory

Stresses the collection, analysis, and interpretation of ecological data, mostly in terrestrial settings. Laboratory and field exercises demonstrate the operation of general ecological principles in specific populations and communities. One lecture, one three-hour field trip or laboratory, and one hour of recitation per week. Three all-day Saturday field trips. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: BIO 205 or BIO 207

Pre- or Corequisite: BIO 351 or permission of instructor

3 credits

BIO 353: Marine Ecology

A survey of biotic responses to ecological challenges in different marine realms. Controls of diversity and trophic structure in the marine ecosystem, historical aspects of marine realms, productivity in the oceans, plankton, soft-bottom communities, intertidal habitats, coral reefs, deep-sea environments, and effects of pollution in the ocean are discussed.

Prerequisite: C or higher in BIO 201 or MAR 104

Advisory Prerequisite: BIO 343

3 credits

BIO 354: Evolution

A detailed discussion of the mechanisms of evolution, focusing on the ways in which genetic changes in populations lead to adaptation, speciation, and historical patterns of evolutionary change.

Prerequisites: C or higher in BIO 201; BIO 202

Advisory Pre- or Corequisite: BIO 320 or 321

3 credits

BIO 356: Applied Ecology and Conservation Biology Laboratory

A computer laboratory course introducing students to ecological risk analysis and conservation biology. Laboratories are based on interactive software. Computer simulation techniques for addressing problems in applied ecology are emphasized.

Prerequisites: BIO 201, BIO 202, or BIO 203; BIO 205 or BIO 207; MAT 126 or higher

2 credits

BIO 358 - H: Biology and Human Social and Sexual Behavior

Major features of human social and sexual behavior are examined from a biological perspective. Insights from ethology, evolutionary biology, and neurobiology are synthesized into a picture of human nature and behavior. Implications of this picture for human sexual and social behavior are considered. 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.

Prerequisites: U3 or U4 standing; and one of the following: BIO 101, BIO 115, BIO 201, BIO 202, or BIO 203

3 credits

BIO 359: Behavioral Ecology

A consideration of the patterns of animal behavior in relation to ecological circumstances and evolutionary history. Vertebrate examples are emphasized.

Prerequisites: BIO 201; BIO 203

3 credits

BIO 361: Biochemistry I

First course of a two-semester survey of the major chemical constituents of the cell, including carbohydrates, lipids, and proteins. Emphasis is on enzyme structure, enzyme kinetics, reaction mechanisms, and metabolic pathways.

Prerequisites: C or higher in BIO 202; C or higher in CHE 322 or 326 or permission of instructor

3 credits

BIO 362: Biochemistry II

Second course of a two-semester Biochemistry survey. BIO 362 is the Molecular Biochemistry section that treats nucleic acid structure, replication, and transcription, both in vivo and in vitro. The machinery and regulation of prokaryotic and eukaryotic protein synthesis is also covered, including amino acid activation; transfer RNA; ribosomes; the genetic code; and peptide chain initiation, elongation, and termination.

Prerequisites: C or higher in BIO 361

3 credits

BIO 364: Laboratory Techniques in Cancer Biology

This course will introduce contemporary concepts of cancer initiation, progression, metastasis and therapy. The lectures and recitations will include discussions of appropriate review articles, textbook readings and research articles. In the laboratory, students will be introduced to and recapitulate key techniques used in the selected research articles. This course will require significant work on computers outside of class time (more than 3 hours per week).

Prerequisites: C or higher in BIO 205 or BIO 207 Pre- or Corequisite: BIO 314, C or higher if used as a prereq.

3 credits

BIO 365: Biochemistry Laboratory

series of laboratory experiments and discussions designed particularly to complement BIO 361 and BIO 362. This laboratory covers such topics as enzyme kinetics, spectrophotometry, technology protein purification, the polymerase chain reaction and genotyping mitochondrial evolutionary biology, cellular extraction of DNA, RNA, and proteins, and analytical biochemistry. Four hours of laboratory and discussion per week. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: BIO 205 or BIO 207

Pre- or Corequisite: BIO 310 or BIO 361

2 credits

BIO 366: Molecular Microbiology Laboratory

This course will include both lectures as well laboratory sessions focused on conventional and contemporary Molecular Microbiological techniques. The lectures will cover a variety of microorganisms; Bacteria, Fungi, Viruses, and Protozoans based on textbook readings and current research articles. In the laboratory, students will learn fundamental and applied microbiological methods, biochemical and DNA profiling of microorganisms, and the molecular basis of physiological processes used for the identification of unknown bacteria. This course will serve as an upper-division elective for BIO majors. The course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: BIO 202; BIO 205 or 207; BIO 315 or HBM 320 with a grade of C or better

3 credits

BIO 367: Molecular Diversity Laboratory

Hands-on experience with methods to detect and analyze molecular (DNA, RNA, protein) variation to study ecology, adaptation, and evolutionary history using natural populations of *Drosophila*, plankton, and other locally available species.

Prerequisites: C or higher in BIO 201; C or higher in BIO 202; BIO 205 or BIO 207

Advisory Pre- or Corequisite: One of the following: BIO 320, BIO 321, BIO 351, or BIO 354

3 credits

BIO 371: Restoration of Aquatic Ecosystems

A field and laboratory course designed to introduce students to field methods in assessing the long-term effects of pollution and restoration of aquatic and marsh systems. Students will work in teams to collaborate on measuring exchange of pollutants between a restored Superfund site and adjacent areas, the long-term effects of ecological restoration, habitat assessment, aquatic community structure in restored and adjacent systems, and long-term evolutionary effects on aquatic pollutants. Other restoration systems will be compared. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisites: BIO 201; BIO 202; BIO 205 or BIO 207

Advisory Prerequisite: BIO 353

4 credits

BIO 380: Entomology

A survey of the anatomy, development, classification, biogeography, physiology, ecology, and evolution of the insects. The laboratory stresses a knowledge of insect diversity and morphology. Three hours of lecture and three hours of laboratory per week.

Prerequisites: C or higher BIO 201; BIO 202; BIO 205 or BIO 207

4 credits

BIO 385 - H: Plant Ecology

Basic ecological principles as applied to the biology of individual plants, plant populations, communities, and ecosystems in relation to their environments. Examples from Long Island pine barrens, tropical rain forests, beaches, deserts, and other plant communities are studied. Examination of the connections between human societies and plant communities, which are rapidly being altered or destroyed worldwide.

Prerequisite: C or higher in BIO 201

Advisory Pre- or Corequisite: BIO 351

3 credits

BIO 386 - H: Ecosystem Ecology and the Global Environment

Ecosystem ecology with an emphasis on biogeochemical cycling in oceans and on land, as well as on biosphere-atmosphere interactions. Topics include earth system processes such as climate and atmospheric composition, the hydrological cycle, cycling of chemicals such as nutrients and metals in the oceans, the soil cycle, and the fate and transport of materials in the atmosphere. Natural and perturbed systems are discussed. This course is offered as both BIO 386 and ENS 311.

Prerequisites: C or higher in BIO 201; CHE 129 or CHE 131 or CHE 141 or CHE 152

Advisory Prerequisite: MAR 104

3 credits

BIO 401: Seminar in Biology

Discussions of a specific area of current interest in biology. The work of each semester covers a different area of biology. Semester Supplements to this Bulletin contain topic description when standard course is offered. May be repeated as the topic changes.

Prerequisite: Permission of instructor

2-3 credits

BIO 402: Seminar in Biology

Discussions of a specific area of current interest in biology. The work of each semester covers a different area of biology. Semester Supplements to this Bulletin contain topic description when standard course is offered. May be repeated as the topic changes.

Prerequisite: Permission of instructor

2-3 credits

BIO 403: Seminar in Biology

Discussions of a specific area of current interest in biology. The work of each semester covers a different area of biology. Semester Supplements to this Bulletin contain topic description when standard course is offered. May be repeated as the topic changes.

Prerequisite: Permission of instructor

2-3 credits

BIO 404: Seminar in Biology

Discussions of a specific area of current interest in biology. The work of each semester covers a different area of biology. Semester Supplements to this Bulletin contain topic description when standard course is offered. May be repeated as the topic changes.

Prerequisite: Permission of instructor

2-3 credits

BIO 405: Seminar in Biology

Discussions of a specific area of current interest in biology. The work of each semester covers a different area of biology. Semester Supplements to this Bulletin contain topic description when standard course is offered. May be repeated as the topic changes.

Prerequisite: Permission of instructor

2-3 credits

BIO 446: Readings in Neurobiology and Physiology

Tutorial readings in the biological sciences. These courses may be repeated, but not more than two credits may be used toward biology major requirements. Limit of one topic per semester.

Prerequisites: Written permission of instructor and undergraduate studies committee

1-2 credits, S/U grading

BIO 447: Readings in Molecular, Cellular, and Developmental Biology

Tutorial readings in the biological sciences. These courses may be repeated, but not more than two credits may be used toward biology major requirements. Limit of one topic per semester.

Prerequisites: Permission of instructor and Department of Biochemistry and Cell Biology

1-2 credits, S/U grading

BIO 449: Readings in Ecology and Evolution

Tutorial readings in the biological sciences. These courses may be repeated, but not more than two credits may be used toward biology major requirements. Limit of one topic per semester.

Prerequisites: Written permission of instructor and undergraduate studies committee

1-2 credits, S/U grading

BIO 475: Undergraduate Teaching Practicum in College Biology I

Study of the literature, resources, and teaching strategies in a field of biology, coordinated with a supervised clinical experience in instruction. Not for major credit. Students may not serve as teaching assistants in the same course twice.

Prerequisites: Permission of instructor and undergraduate studies committee

0-3 credits, S/U grading

BIO 476: Undergraduate Teaching Practicum in College Biology II

Study of the literature, resources, and teaching strategies in a field of biology, coordinated with a supervised clinical experience in instruction. Not for major credit. Students may not serve as teaching assistants in the same course twice.

Prerequisites: BIO 475; permission of instructor and undergraduate studies committee

0-3 credits, S/U grading

BIO 484: Research in Biology and Society

In these courses, the student works under the supervision of a faculty member in developing an individual project that makes use of the knowledge and techniques acquired in previous courses. The student prepares an appropriate report on the project. Any of the courses may be taken for more than two semesters, but no more than four credits of research and internship may be used for biology major requirements. Limit of one topic per semester.

Prerequisite: Written permission of instructor and undergraduate studies committee. Request for committee approval must be submitted no later than two days prior to the last day of the add/drop period as scheduled in the academic calendar.

0-6 credits, S/U grading

BIO 486: Research in Neurobiology and Physiology

In these courses, the student works under the supervision of a faculty member in developing an individual project that makes use of the knowledge and techniques acquired in previous courses. The student prepares an appropriate report on the project. Any of the courses may be taken for more than two semesters, but no more than four credits of research and internship may be used for biology major requirements. Limit of one topic per semester.

Prerequisite: Written permission of instructor and undergraduate studies committee. Request for committee approval must be submitted no later than two days prior to the last day of the add/drop period as scheduled in the academic calendar.

0-6 credits, S/U grading

BIO 487: Research in Molecular, Cellular, and Developmental Biology

In these courses, the student works under the supervision of a faculty member in developing an individual project that makes use of the knowledge and techniques acquired in previous courses. The student prepares an appropriate report on the project. Any of the courses may be taken for more than two semesters, but no more than four credits of research may be used for biology major requirements. Limit of one topic per semester.

Prerequisite: Permission of instructor and Department of Biochemistry and Cell Biology

0-6 credits, S/U grading

BIO 488: Internship in Biological Sciences

May be repeated up to a limit of 12 credits. Not for biology major credit.

Prerequisites: BIO 201, 202, 203; CHE 132; permission of faculty sponsor and biology internship committee

0-6 credits, S/U grading

BIO 489: Research in Ecology and Evolution

In these courses, the student works under the supervision of a faculty member in developing an individual project that makes use of the knowledge and techniques acquired in previous courses. The student prepares an appropriate report on the project. Any of the courses may be taken for more than two semesters, but no more than four credits of research may be used for biology major requirements. Limit of one topic per semester.

Prerequisite: Written permission of instructor and undergraduate studies committee. Request for committee approval must be submitted no later than two days prior to the last day of the

add/drop period as scheduled in the academic calendar.

0-6 credits, S/U grading

CHE

Chemistry

CHE 115 - E: 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. This course is offered as both CHE 115 and ENV 115.

3 credits

CHE 125: Learning Strategies Essential for Success in Chemistry

Focuses on developing techniques, strategies, and advanced learning skills that are essential for success in college-level chemistry. Real world contexts, issues, and problems are explored from a chemistry perspective. Provides a bridge from high school to college courses and from CHE 131 to CHE 132. A grade of C or higher in CHE 125 satisfies the prerequisite for entry into CHE 132, provided CHE 129 or CHE 131 have been completed with a passing grade (D or higher).

3 credits, ABC/U grading

CHE 129 - E: General Chemistry IA

A broad introduction to the fundamental principles of chemistry, including substantial illustrative material drawn from the chemistry of inorganic, organic, and biochemical systems. Basic concepts, problem solving, and factual material are emphasized. This course provides the necessary foundation for students who wish to pursue further coursework in chemistry. CHE 129 is inappropriate for students who satisfy the prerequisites for CHE 131 or 151. Three lecture hours, one 80-minute workshop, and one problem-solving session per week. The content and grading match that of CHE 131 (see course description for CHE 131), but the math prerequisites differ, and students attend a CHE 130 problem-

solving session per week. The problem-solving session provides a structured environment for developing quantitative reasoning and problem-solving skills. CHE 129 may not be taken for credit in addition to CHE 123/124, CHE 131 or 151. 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.

Mandatory co requisites: MAT 123 and CHE 130

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 - E: General Chemistry IB

A broad introduction to 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. This sequence is inappropriate for students who have completed an AP course or more than one year of chemistry in high school; such students should take 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.

Corequisite: MAT 125 or higher

4 credits

CHE 132 - E: 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. This sequence is inappropriate for students who have completed two or more years of chemistry in high school; such students should take CHE 141, 142. 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.

Prerequisite: C or higher in CHE 129 or CHE 131; or C or higher in CHE 125 and D or higher in CHE 129 or CHE 131. Pre- or Corequisite: MAT 125 for those who took CHE 129 or 130; MAT 126 or higher for all others
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. Four hours of laboratory and discussion per week. CHE 133 may not be taken for credit in addition to CHE 143, and CHE 134 may not be taken for credit in addition to CHE 144. 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. Four hours of laboratory and discussion per week. CHE 133 may not be taken for credit in addition to CHE 143, and CHE 134 may not be taken for credit in addition to CHE 144. 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 143: Molecular Science Laboratory I

Laboratory program similar in content to CHE 133, 134 but conducted at a more intensive and stimulating level. Four hours of laboratory and discussion per week. CHE 143 may not be taken for credit in addition to CHE 133, and CHE 144 may not be taken for credit in addition to CHE 134. Priority given to students in the University's honors programs. 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.

Corequisite: CHE 152
1 credit

CHE 144: Molecular Science Laboratory II

Laboratory program similar in content to CHE 133, 134 but conducted at a more intensive and stimulating level. Four hours of laboratory and discussion per week. CHE 143 may not be taken for credit in addition to CHE 133, and CHE 144 may not be taken for credit in addition to CHE 134. Priority given to students in the University's honors programs. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: CHE 143
Corequisite: CHE 331
1 credit

CHE 152 - E: Molecular Science I

Topics include atomic and molecular structure, chemical bonding, thermodynamics, equilibrium and aqueous chemistry, electrochemistry, kinetics and basics of organic chemistry. This is the initial 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. Recommended for students who took advanced placement chemistry in high school or equivalent or students who have performed well on the summer chemistry placement exam. Three lecture hours and one 80-minute workshop per week. May not be taken for credit in addition to CHE 129, 131, 132, 141, or 142.

Prerequisite: Advanced Placement Chemistry score of 4 or 5 or satisfactory performance on the summer chemistry placement exam; co-registration in MAT 131 (preferred), MAT 125, AMS 151 or a higher calculus course
4 credits

CHE 301: Physical Chemistry I

The quantitative study of microscopic and macroscopic chemical systems, covering introductory quantum theory of atoms and molecules (energy levels and states), statistical thermodynamics, and fundamental thermodynamics with application to chemical reactions and simple systems. May not be taken for credit by students who have completed CHE 312.

Prerequisite: CHE 132 or 142; MAT 132 or 142 or 127 or 171 or AMS 161
Pre- or Corequisite: PHY 121/123 or 125 or 131/133 or 141
4 credits

CHE 302: Physical Chemistry II

Applications of thermodynamics to chemical equilibria, electrochemistry, and ideal solutions. Applications of quantum theory to chemical bonding, molecular structure, and spectroscopy.

Prerequisites: CHE 301; MAT 211 or 203 or 205 or AMS 161
Pre- or Corequisite: PHY 122/124 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 144
Corequisite: CHE 301
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. *Corequisites:* CHE 302 and 385

Advisory Prereq: Knowledge of computer programming

2 credits

CHE 310 - H: 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

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 major credit.

Prerequisite: CHE 132 or 142; MAT 132 or 142 or 127 or 171 or AMS 161 *Pre- or Corequisite:* PHY 121/123 or 125 or 131/133 or 141

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

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 326: Organic Chemistry IIB

Similar to CHE 322 but providing a more fundamental view of organic compounds, reaction mechanisms, and synthesis, based somewhat more explicitly on thermodynamics and kinetics. Especially for those who may major in chemistry, biochemistry, or another physical science. CHE 326 may not be taken for credit in addition to CHE 322. 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 133 or 143; CHE 134 or 144 *Pre- or Corequisite:* CHE 321 or CHE 331

2 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. May not be taken for credit in addition to CHE 321.

Prerequisite: C or higher in CHE 152

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 341: Organic Chemistry Honors Seminar I

Advanced topics in organic chemistry within the scope but beyond the reach of CHE 321 (Organic Chemistry I) will be discussed along with an introduction to contemporary research topics. Permission to enroll will be granted to students who have demonstrated excellence in their General Chemistry courses.

Prerequisites: CHE 132 or 142; permission of instructor

Corequisite: CHE 321

1 credit

CHE 342: Organic Chemistry Honors Seminar II

Advanced topics in organic chemistry within the scope but beyond the reach of CHE 322 and CHE 326 (Organic Chemistry II) will be discussed along with topics in contemporary research. Permission to enroll will be granted to students who have demonstrated excellence in CHE 321.

Prerequisites: CHE 321; permission of instructor

Corequisite: CHE 322 or 326

1 credit

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: Scientific Computing

The basic methods of numerical analysis and the design of computer programs that use them are discussed within the framework of solving a variety of exciting problems chosen from many areas of science. The presentation makes extensive use of powerful scientific computational environments, such as Mathematica, and Matlab, but guidance to

other scientific high-level computer languages is also provided. No previous knowledge of scientific programming is assumed. Extensive use of personal or SINC-site computers outside the classroom is required

Prerequisite: MAT 127 or MAT 132 or MAT 142 or MAT 171 or AMS 161

2 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 who require substantial laboratory skills, such as those planning careers in research. Not for credit in addition to CHE 327. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: CHE 134 or 144

Corequisite: CHE 321 or CHE 331

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. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: CHE 383

Corequisites: CHE 322, CHE 326, or CHE 332; CHE 385

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. Should be taken concurrently with the student's second 300-level chemistry laboratory course. Satisfactory completion of the course fulfills the Chemistry department's upper division writing requirement. A through C/Unsatisfactory grading only.

Corequisite: CHE 304 or 384

1 credit, ABC/U grading

CHE 386: Professional Skills

Development and refinement of the professional skills used by scientists. The exploration of more sophisticated presentation skills used in oral and poster presentations. The incorporation of collaborative problem solving that mimics real world situations, including simple proposal writing. An exposure to professional societies and meetings. An exploration of career options and employment resources. Tips for resume preparation, and interviews will be presented. Recommended for upper division undergraduates and Masters students.

Prerequisite: CHE 385 or permission of instructor

2 credits, 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

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

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

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

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

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

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

3 credits

BCP**Pharmacology****BCP 400: Writing in Pharmacology**

See requirements for the major in pharmacology, upper-division writing requirement.

Prerequisites: Pharmacology major; U3 or U4 standing; permission of instructor

S/U grading

BCP 401: Principles of Pharmacology

Basic principles and mechanisms of drug distribution, absorption, metabolism, and elimination. Principles of chemical carcinogenesis and tumor promotion. Autonomic, smooth-muscle, and CNS pharmacology. Pharmacology of specific drugs of historical interest including alcohol, antibiotics, aspirin, nicotine, and morphine. Review of anticoagulants and thrombolytic agents, antiparasitics, and drugs for the treatment of allergic conditions and gout.

Prerequisites: BIO 362; CHE 322 and 327; a g.p.a. of 3.00 or higher in these courses and their prerequisites.

Corequisite for pharmacology majors: BCP 403

4 credits

BCP 402: Advanced Pharmacology

Advanced concepts of drug metabolism, pharmacokinetics, biochemical, and molecular mechanisms of drug action, and drug resistance in human disease states. Toxicological agents and environmental pollutants. The pharmacology of autocoids, anti-inflammatories, immunosuppressants, and antiasthmatics. Rational drug design and drug receptor interactions using computer molecular modeling techniques.

Prerequisites: BCP 401 and 403; minimum of B- in BCP 401

Corequisite: BCP 404

4 credits

BCP 403: Principles of Pharmacology Laboratory

The use of molecular modeling software for the understanding of structure activity relationships. In vivo studies to demonstrate the pharmacological mechanism of action of drugs acting on the autonomic, cardiovascular, and renal systems. Pharmacokinetic studies, using HPLC, to determine the rate of absorption, distribution, and excretion of therapeutic agents. Radio- and enzyme-immunoassays for the detection of circulating hormones. Cell culture techniques for drug determination and evaluation.

Prerequisite: Permission of instructor

Corequisite: BCP 401

2 credits

BCP 404: Advanced Pharmacology Laboratory

The use of molecular modeling software for the understanding of structure activity relationships. In vivo studies to demonstrate the pharmacological mechanism of action of drugs acting on the autonomic, cardiovascular, and renal systems. Pharmacokinetic studies, using HPLC, to determine the rate of absorption, distribution, and excretion of therapeutic agents. Radio- and enzyme-immunoassays for the detection of circulating hormones. Cell culture techniques for drug determination and evaluation. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisites: BCP 401 and 403; permission of instructor

Corequisite: BCP 402

2 credits

BCP 406: Pharmacology Colloquium

Seminars on research in pharmacology and toxicology presented by faculty and distinguished scientists from academic and industrial institutions. Students are expected to develop an understanding of the scientific principles presented in the colloquium. Speakers meet with the students after the seminar to discuss research concepts and to answer questions. One hour Journal Club/Discussion followed by one hour seminar. May be repeated.

Prerequisites: BIO 202 and 203; CHE 322; a g.p.a. of 3.00 in these courses and their prerequisites

2 credits

BCP 475: Undergraduate Teaching Practicum in Pharmacology

Prerequisites: Pharmacology major; U4 standing; permission of department

3 credits, S/U grading

BCP 487: Research in Pharmacology

Completion of an individual student research project under the supervision of a faculty member. Previously acquired laboratory course techniques and new procedures are utilized. Experimental results must be submitted to the department for grade evaluation in the format of a research report. Not for credit in addition to HBH 396, 398, and 399. May be repeated.

Prerequisites: BIO 202 and 203; CHE 322 and 327; a g.p.a. of 3.00 in these courses and their

prerequisites; permission of instructor and department

0-6 credits

BCP 488: Internship

Research participation in off-campus laboratories, the pharmaceutical industry, and other academic and public agencies. Repeatable up to 12 credits.

Prerequisites: BIO 361; CHE 322; g.p.a. of 3.00 or higher in these courses and their prerequisites; permission of department

0-6 credits, S/U grading

HBH

Pharmacology

HBH 330: Fundamentals of Pharmacology I

HSC Bulletin Information Covers the basic principles that underlie the action of drugs on physiological processes. These principles are applied to the specific action of drugs on the autonomic nervous system. In addition, the pharmacology of cardiovascular drugs are covered in detail.

Prerequisite: Admission to Undergraduate Health Sciences Center program

2 credits

HBH 331: Fundamentals of Pharmacology II

A continuation of HBH 330. Covers the action of drugs on individual systems as well as drug-drug interactions emphasizing the mechanisms of drug action. Surveys therapeutic applications and adverse drug reactions. Prerequisite: HBH 330

Prerequisite: Admission to Undergraduate Health Sciences Center program

3 credits

HBH 332: Pharmacology in Cardiorespiratory Sciences

Includes the basic principles of drug actions and covers drug applications in the autonomic, cardiovascular and respiratory systems. For cardiorespiratory sciences students enrolled in The School of Health Technology and Management.

Prerequisite: Admission to Undergraduate Health Sciences Center program

3 credits

HBH 393: Topics in Pharmacology

Tutorial readings in pharmacology with periodic conferences, reports, and examinations arranged with the instructor.

Open to juniors and seniors. May be repeated. May not be used toward the requirements for the major in pharmacology.

Prerequisites: U3 or U4 standing; permission of instructor

1-5 credits

HBH 394: Topics in Pharmacology

Tutorial readings in pharmacology with periodic conferences, reports, and examinations arranged with the instructor. Open to juniors and seniors. May be repeated. May not be used toward the requirements for the major in pharmacology.

Prerequisites: U3 or U4 standing; permission of instructor

1-5 credits

HBH 396: Research Project in Pharmacology

An independent research project under faculty supervision, with emphasis on the principles of experimental design, data collection, evaluation of findings, and reporting of results. The student is expected to prepare a report on the project. May be repeated. May not be taken for credit in addition to BCP 487.

Prerequisites: U3 or U4 standing; laboratory experience; permission of supervising instructor

0-6 credits

HBH 398: Research Project in Pharmacology

An independent research project under faculty supervision, with emphasis on the principles of experimental design, data collection, evaluation of findings, and reporting of results. The student is expected to prepare a report on the project. May be repeated. May not be taken for credit in addition to BCP 487.

Prerequisite: U3 or U4 standing

1-6 credits

HBH 399: Research Project in Pharmacology

An independent research project under faculty supervision, with emphasis on the principles of experimental design, data collection, evaluation of findings, and reporting of results. The student is expected to prepare a report on the project. May be repeated. May not be taken for credit in addition to BCP 487.

Prerequisite: U3 or U4 standing

1-6 credits