Biochemistry, Biology (BCH, BIO)

Majors and Minor in Biochemistry, Biology

Department of Biochemistry and Cell Biology, Ecology and Evolution, Neurobiology and Behavior; College of Arts and Sciences

UNDERGRADUATE BIOLOGY WEB ADDRESS: http://www.bio.sunysb.edu

Minors of particular interest to students majoring in Biology or Biochemistry: Biomaterials (BES), Bioengineering (BNG), Environmental Studies (ENS), Health and Wellness (LHW), Philosophy (PHI), Science and Engineering (LSE)

Department of Biochemistry and Cell Biology

INTERIM CHAIRPERSON: Robert Haltiwanger
ASSISTANT TO THE CHAIR: Ann Fuhr
DIRECTOR OF UNDERGRADUATE STUDIES: Harvard Lyman

Faculty

Paul M. Bingham, Associate Professor, Ph.D., Harvard University: Novel approaches to cancer chemotherapy; the biological basis of human origins, evolution, and history.
Deborah Brown, Professor, Ph.D., Stanford University: Structure and function of membrane microdomains and caveolae.
David Bynum, Professor, Ph.D., Dartmouth College: Cell Motility. Recipient of the State University Chancellor’s Award for Excellence in Teaching, 1988; recipient of the President’s Award for Excellence in Teaching, 1988; recipient of the National Science Foundation/Presidential Award for Science, Mathematics and Engineering Mentoring, 2002.
Vitaly Citovsky, Professor, Ph.D., Hebrew University: Nuclear targeting; intercellular communication in plants and chromatin remodeling.
Kevin Czaplinski, Assistant Professor, Ph.D., University of Medicine and Dentistry, Robert Wood Johnson Medical School: mRNA transport and post-transcriptional regulation of gene expression in the nervous system.
Neta Dean, Professor, Ph.D., University of California, Los Angeles: Role of glycans in genetic disorders and fungal pathogenesis.
Dale Deutsch, Professor, Ph.D., Purdue University: Molecular and cell biology of endocannabinoid action.
J. Peter Gerten, Professor, Ph.D., Brandeis University: Drosophila developmental genetics and the mechanisms of translational regulation.
Robert Haltiwanger, Professor, Ph.D., Duke University: Role of glycosylation in signal transduction events.
Bernadette Holdener, Associate Professor, Ph.D., University of Illinois-Chicago: Protein folding and trafficking in mouse development and signal transduction.
Nancy Hollingsworth, Professor, Ph.D., University of Washington, Seattle: Analysis of meiotic chromosome recombination, synopsis, and segregation in yeast.
A. Wali Karzai, Associate Professor, Ph.D., Johns Hopkins University: A system for protein tagging, directed deregulation, and ribosome rescue.
William Lennarz, Distinguished Professor, Ph.D., University of Illinois: The biosynthesis and degradation of glycoproteins in yeast and animal cells.
Hulin Li, Associate Professor, Ph.D., University of Science and Technology, Beijing: Structure of eukaryotic chromosome replication origin recognition complex.
Chang-Jun Liu, Adjunct Assistant Professor, Ph.D., Shanghai Institute of Plant Physiology: Biosynthesis of plant natural products and structure-function relationship of key enzymes in natural product biosynthetic pathways.
Erwin London, Professor, Ph.D., Cornell University: Membrane biochemistry and biophysics.
Harvard Lyman, Associate Professor, Ph.D., Brandeis University: Photoregulation of chloroplast development and replication; redox regulation of phototaxis. Recipient of the State University Chancellor’s Award for Excellence in Teaching, 1991, the President’s Award for Excellence in Teaching, 1991, Bently Glass/Mortimer Kreuter Award for Excellent in Teaching in the School of Professional Development, 2008, Director of Undergraduate Studies, Department of Biochemistry and Cell Biology.
Kenneth Marcu, Professor, Ph.D., Stony Brook University: Cellular gene expression programming in innate and adaptive immune responses and cancer. Foreign Scholar of the Institute of Advanced Studies of the University of Bologna, Italy.
Aaron Neiman, Associate Professor, Ph.D., University of California, San Francisco: Vesicle trafficking and intracellular signaling in yeast.
Nisson Schechter, Professor, Ph.D., Western Michigan University: Molecular basis of nerve growth and regeneration.
John Shanklin, Adjunct Professor, Ph.D., University of Wisconsin-Madison: Structure and function of fatty acid desaturase.
Keith Sheppard, Associate Professor, Ph.D., Columbia University: Fociuses on three areas of science education.
Sanford Simon, Professor, Ph.D., Rockefeller University: Biochemistry and cell biology of inflammatory cells and their proteinases; development of natural and synthetic proteinase inhibitors.
Steven Smith, Professor, Ph.D., University of California, Berkeley: Membrane protein structure and function.
James Staros, Professor and Dean, College of Arts and Sciences, Ph.D., Yale: Molecular mechanisms of transmembrane signaling by the ErbB family of tyrosine kinases.
Rolf Strømgard, Distinguished Professor, Ph.D., Harvard University: Chromatin structure and function.
Gerald H. Thomsen, Professor, Ph.D., Rockefeller University: Molecular embryology, morphogenesis, growth factor signaling and ubiquitin pathways.

Department of Ecology and Evolution

CHAIRPERSON: Jessica Gurevitch
ASSISTANT TO THE CHAIR: Donna DiGiovanni
DIRECTOR OF UNDERGRADUATE STUDIES: John True

Faculty

H. Resit Açıkgöz, Professor, Ph.D., Stony Brook University: Applied ecology; conservation biology; population dynamics; landscape ecology.
Stephen Baines, Assistant Professor, Ph.D., Yale University: Aquatic ecosystem ecology of freshwater and marine environments.
Michael A. Bell, Professor, Ph.D., University of California, Los Angeles: Evolutionary genetics; microstratigraphic variation in fossils; relationship of gene expression, development, and evolution; fish biology.
Liliana M. Dávalos, Assistant Professor, Ph.D., Columbia University: Environmental change and its relationship to phylogeny, population genetics, and biodiversity conservation.
Daniel E. Dykhuizen, Professor, Ph.D., University of Chicago: Population genetics and molecular evolution, especially of bacteria.
Walter F. Eanes, Professor, Ph.D., Stony Brook University: Population and biochemical genetics of Drosophila; molecular evolution.
Douglas J. Futuyma, Distinguished Professor, Ph.D., University of Michigan: Evolutionary biology; coevolution; insects.
R. Geeta, Associate Professor, Ph.D., University of Arizona: Evolution of angiosperms; homeobox genes, genome size.
Lev R. Ginzburg, Professor, Ph.D., Agrophysical Institute, St. Petersburg, Russia: Theoretical and applied ecology.

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BIOCHEMISTRY, BIOLOGY
Catherine Graham, Assistant Professor, Ph.D., University of Missouri at St. Louis: Landscape-level analysis of factors affecting bird assemblages in fragmented landscapes.

Jessica Gurevitch, Professor, Ph.D., University of Arizona: Plant population and community ecology; biological invasions; statistical applications in ecology, particularly meta-analysis. Dean's Award for Excellence in Graduate Teaching, 2006.

John Weins, Professor, Ph.D., University of Arizona: Phylogenetics; multivariate data analysis applied to problems in ecology and evolution; vertebrate paleontology.

Manuel T. Lerdau, Professor, Ph.D., Stanford University: Plant ecology and physiology; global change.

Jeffrey S. Levinton, Distinguished Professor, Ph.D., Yale University: Marine ecology; functional biology and evolution of invertebrates; State University Chancellor's Award for Excellence in Teaching and President's Award for Excellence in Teaching, 1997.

Dianna Padilla, Professor, Ph.D., University of Alberta, Canada: Marine ecology, conservation, invasion biology, phenotypic plasticity; functional ecology.

Massimo Pigliucci, Professor, Ph.D., University of Connecticut, University of Tennessee: Gene-environment interactions; natural selection; invasive species; conceptual and philosophical issues in biological theory.

Joshua Rest, Assistant Professor, Ph.D., University of Michigan: Evolutionary genomics; evolution of gene regulation and protein interactions.

F. James Rohlf, Distinguished Professor, Ph.D., University of Kansas: Geometric morphometrics; multivariate data analysis applied to problems in ecology and evolution; computer software development.

John True, Associate Professor, Ph.D., Duke University: Genetic basis of differences among closely related species; natural selection.

John Weins, Associate Professor, Ph.D., University of Texas: Phylogenetic approaches to questions in evolution and ecology; the theory and methods of systematics, and the systematics, evolution, morphology, and ecology of reptiles and amphibians.

CHAIRPERSON: Lorna W. Role
ASSISTANT TO THE CHAIR: Catherine Costanzo
DIRECTOR OF UNDERGRADUATE STUDIES: John B. Cabot

Faculty

Paul R. Adams, Professor, Ph.D., London University: Models of synaptic learning; neocortical design.

John B. Cabot, Professor, Ph.D., University of Virginia: Autonomic system.

William F. Collins III, Associate Professor, Ph.D., University of Pennsylvania: Motor control and learning; Movement disorders.

L. Craig Evinger, Professor, Ph.D., University of Washington: Motor control and learning; Movement disorders.

Maurice Kernan, Associate Professor, Ph.D., University of Wisconsin-Madison: Mechanosensory transduction in Drosophila. Movement disorders.

Gail Mandel, Distinguished Professor, Ph.D., University of California, Los Angeles: Molecular neurobiology.

Gary G. Matthews, Professor, Ph.D., University of Pennsylvania: Cellular and molecular neurobiology of the retina.

David McKinnon, Associate Professor, Ph.D., University of Texas: Neuronal Growth Factor Neurons in the Brain.

Lonnie Wollmuth, Associate Professor, Ph.D., Albert Einstein College of Medicine: Molecular genetics of vertebrate neural patterning.

Lorna W. Role, Professor, Ph.D., Harvard University: Mechanisms of Synaptic Plasticity.

Paul R. Adams, Professor, Ph.D., London University: Models of synaptic learning; neocortical design.

Affiliated Faculty

Marian Evinger, Pediatrics
Stuart S. McLaughlin, Physiology and Biophysics

David Talmage, Pharmacology

Teaching Assistants (all areas)

Estimated number: 65

Courses in Biology

See the Course Descriptions listing in this Bulletin for complete information.

BIO 101-E Human Biology
BIO 103-E Introduction to Biotechnology
BIO 104 How Science Works
BIO 113-E General Ecology
BIO 115-E Evolution and Society
BIO 150-E The Living World
BIO 201-E Fundamentals of Biology: Organisms to Ecosystems
BIO 202-E Fundamentals of Biology: Molecular and Cellular Biology
BIO 203-E Fundamentals of Biology: Cellular and Organ Physiology
BIO 204 Fundamentals of Scientific Inquiry in the Biological Sciences I
BIO 205 Fundamentals of Scientific Inquiry in the Biological Sciences II
BIO 208-H Cell, Brain, Mind
BIO 310 Cell Biology
BIO 311 Techniques in Molecular and Cellular Biology
BIO 312 Bioinformatics and Computational Biology
BIO 313 Applications of Molecular and Cellular Biology Techniques
BIO 314 Cancer Biology
BIO 315 Microbiology
BIO 316 Molecular Immunology
BIO 317 Principles of Cellular Signaling
BIO 318-H Bioethics and Policy
BIO 319 Landscape Ecology Laboratory
BIO 320 General Genetics
BIO 325 Animal Development
BIO 327 Developmental Genetics Laboratory
BIO 328 Mammalian Physiology
BIO 334 Principles of Neurobiology
BIO 335 Animal Physiology Laboratory
BIO 338 From Synapse to Circuit: Selforganization of the Brain
BIO 339 Molecular Development of the Nervous System

BIOCHEMISTRY, BIOLOGY

Estimated number: 65

Courses in Biology

See the Course Descriptions listing in this Bulletin for complete information.

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BIO 205 Fundamentals of Scientific Inquiry in the Biological Sciences II
BIO 208-H Cell, Brain, Mind
BIO 310 Cell Biology
BIO 311 Techniques in Molecular and Cellular Biology
BIO 312 Bioinformatics and Computational Biology
BIO 313 Applications of Molecular and Cellular Biology Techniques
BIO 314 Cancer Biology
BIO 315 Microbiology
BIO 316 Molecular Immunology
BIO 317 Principles of Cellular Signaling
BIO 318-H Bioethics and Policy
BIO 319 Landscape Ecology Laboratory
BIO 320 General Genetics
BIO 325 Animal Development
BIO 327 Developmental Genetics Laboratory
BIO 328 Mammalian Physiology
BIO 334 Principles of Neurobiology
BIO 335 Animal Physiology Laboratory
BIO 338 From Synapse to Circuit: Selforganization of the Brain
BIO 339 Molecular Development of the Nervous System
### Sample Course Sequence for the Major in Biochemistry

<table>
<thead>
<tr>
<th>Semester</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
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</thead>
<tbody>
<tr>
<td><strong>Freshman</strong></td>
<td>15-16</td>
<td>18-19</td>
</tr>
<tr>
<td><strong>Sophomore</strong></td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td><strong>Junior</strong></td>
<td>15-16</td>
<td>16</td>
</tr>
<tr>
<td><strong>Senior</strong></td>
<td>14-15</td>
<td>15</td>
</tr>
</tbody>
</table>

*Bio 361 and 362 should be taken in sequence.

**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.

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**The Biochemistry Program**

**DIRECTOR OF UNDERGRADUATE STUDIES:**
Harvard Lyman

**DEPARTMENT ADMINISTRATOR:** Ann Fuhr

E-MAIL: Harvard.Lyman@stonybrook.edu

OFFICE: 450 Life Sciences Building

PHONE: (631) 632-8550

WEB ADDRESS:
http://www.sunysb.edu/biochem/BIOCHEM/undergraduate.html

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.

A. Courses in Related Fields
1. CHE 131, 132 General Chemistry or CHE 141, 142 Honors Chemistry
2. CHE 133, 134 General Chemistry Laboratory or CHE 143, 144 Honors Chemistry Laboratory
3. CHE 321, 326 Organic Chemistry I, IIB (See Note)
4. CHE 327 Organic Chemistry Laboratory A or CHE 383 Introductory Synthetic and Spectroscopic Laboratory Techniques
5. CHE 301 or 312 Physical Chemistry
6. MAT 125, 126, 127 Calculus A, B, C or MAT 131, 132 Calculus I, II or MAT 141, 142 or MAT 171 or level 9 on mathematics placement examination.
7. PHY 121/123, 122/124 Physics for the Life Sciences and Labs or PHY 125, 126, 127 Classical Physics A, B, C or PHY 141, 142 Classical Physics I, II: Honors

Note: The Chemistry Department offers two Organic Chemistry II Courses, CHE 322 (IIA) and CHE 326 (IIB). Biochemistry majors must take CHE 326 Organic Chemistry IIB.

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

Note: Beginning in fall 2007 BIO 201, 202, and 203 will be only lecture courses. Two new laboratory classes, BIO 204 and BIO 205, will be required of all biochemistry majors. Students having completed one or fewer of BIO 201, 202, 203 prior to Fall 2007 must complete BIO 204 and BIO 205; Students having completed two or more of BIO 201, 202, 203 prior to Fall 2007 are exempt from completing BIO 204 or BIO 205.

C. Advanced Courses in Biology
1. BIO 320 General Genetics (See Note 1)
2. BIO 310 Cell Biology
3. BIO 361, 362 Biochemistry I,II (See Note 2)
4. One of the following laboratories: BIO 365 Biochemistry Laboratory (fall only, See Note 3) BIO 311 Techniques in Molecular and Cellular Biology
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. (See Note 2)

Biology courses:
- BCP 401 Principles of Pharmacology
- BCP 402 Advanced Pharmacology
- BIO 311 Techniques in Molecular and Cellular Biology
- BIO 358-H Biology of Human Social Pathology
- BIO 358-H Biology of Human Social and Sexual Behavior
- BME 304 Genetic Engineering
- CHE 346 Bio-molecular Structure and Activity
- HBP 390 Basic Mechanisms in Pathology

Notes:
1. BIO 361 and 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 & 326 or 322 is required to enroll in BIO 361 and 362.
2. A grade of C or higher in BIO 202 is required to enroll in BIO 320.
3. BIO 365 cannot count for both laboratory and elective credit.

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 to the Department of Biochemistry and Cell Biology for evaluation by the Biochemistry Writing Evaluation Committee. This writing sample can be a graded laboratory report, a graded term paper, or a report for a readings or research course, and it must contain at least 750 words of text. It is to be accompanied by a form (available in the Biochemistry and Cell Biology office) signed by the student and by the instructor of the course for which the material was written. 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. If the writing in this sample is judged satisfactory by the Writing Evaluation Committee, the requirement is fulfilled. If the writing is judged unsatisfactory, the student is advised to seek help from the Writing Center before resubmitting the writing sample.

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
The Biology Program

UNDERGRADUATE DIRECTOR: Eugene R. Katz
ASSISTANT DIRECTOR: Paula Di Pasquale
ASSOCIATE DIRECTOR: Ellen Lopez
E-MAIL: Ellen.Lopez@stonybrook.edu
OFFICE: G-05 Biology Learning Laboratories
PHONE: (631) 632-8530
WEB ADDRESS: http://www.bio.sunysb.edu

Biology is the study of organisms, including the molecular and cellular basis of life, development of the individual and its genetic basis, maintenance of the individual, and interaction of organisms with their biotic and physical environment.

The Biology major introduces students to the concepts and methodologies associated with the multiple levels of biological complexity. Students explore the Fundamentals of Biology (BIO 201, 202, 203), a thorough introduction to organisms, ecosystems, cellular and molecular biology, and physiology. These courses, along with Introductory Biology Laboratory Course (BIO 204, 205), provide a solid background for students interested in the health professions. Students go on to advanced laboratory work and have the opportunity to specialize in any of several areas, including: biomedical engineering, developmental genetics, ecology and evolution, environmental biology, and neuroscience. Students may also elect the General Biology specialization. Students may also elect the General Biology specialization. Students may design their own curriculum, in consultation with an advisor, within the context of these specializations, based on individual interest. The Biology major requires a strong foundation in mathematics, chemistry, and physics.

Majors are encouraged to explore research opportunities in biology, typically beginning in their second or third year.

Most positions for biologists require graduate training. Most students majoring in biology prepare for professional study in the biological or health sciences. Some prepare for secondary school teaching, and others for technical positions in industry, including biotechnology, government agencies, and research institutes.

Students should contact the Undergraduate Biology Office for information and brochures related to the Biology major and minor, and for the forms mentioned in requirements and some course descriptions. The office receives completed forms and petitions concerning the Biology major and minor and all requests for evaluations of transferred biology courses. The office also coordinates advising and processes graduation clearances for major and minor requirements. Students may not declare a double major among biology, biochemistry, pharmacology, marine sciences and marine vertebrate biology.

Sample Course Sequence for the Major in Biology

<table>
<thead>
<tr>
<th>Sample Course Sequence for the Major in Biology</th>
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<tbody>
<tr>
<td><strong>Freshman Fall</strong></td>
</tr>
<tr>
<td>First Year Seminar 101</td>
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<tr>
<td>CHE 131</td>
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<tr>
<td>CHE 133</td>
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<tr>
<td>MAT 125</td>
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<tr>
<td>D.E.C.</td>
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<tr>
<td>Total</td>
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<tr>
<td><strong>Spring</strong></td>
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<tr>
<td>First Year Seminar 102</td>
</tr>
<tr>
<td>CHE 132</td>
</tr>
<tr>
<td>BIO 201, 202 or 203</td>
</tr>
<tr>
<td>CHE 134</td>
</tr>
<tr>
<td>MAT 126</td>
</tr>
<tr>
<td>D.E.C.</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

| **Sophomore Fall** | Credits |
| CHE 321 | 4 |
| AMS 110 | 3 |
| BIO 201 or 202 | 3 |
| and BIO 204 | 2 |
| D.E.C. | 3 |
| D.E.C. | 3 |
| Total | 18 |

| **Junior Fall** | Credits |
| PHY 121/123 | 4 |
| BIO Area | 3 |
| BIO Area | 3 |
| D.E.C. | 3 |
| Upper-Division elective | 3 |
| Total | 16 |
| **Spring** | Credits |
| PHY 122/124 | 4 |
| BIO Area | 3 |
| BIO Lab | 2-3 |
| D.E.C. | 3 |
| Upper-Division elective | 3 |
| Total | 15-16 |

| **Senior Fall** | Credits |
| BIO Area | 3 |
| BIO Lab | 2-3 |
| Upper-Division elective | 3 |
| D.E.C. | 3 |
| Electives | 6 |
| Total | 17-18 |
| **Spring** | Credits |
| BIO Area | 3 |
| Upper-Division elective | 3 |
| D.E.C. | 3 |
| Electives | 6 |
| Total | 15 |
No Credit option may not be used to satisfy major requirements.

Completion of the major requires approximately 67 to 69 credits.

A. Biology Core
1. BIO 150 The Living World (See Note 1)
2. BIO 201, 202, 203 Fundamentals of Biology (See Note 2)
3. BIO 204 and 205 Fundamentals of Scientific Inquiry in the Biological Sciences I and II

B. Courses Required in Related Fields
1. MAT 125, 126 Calculus A, B or MAT 131, 132 Calculus I, II
   or MAT 141, 142 Calculus I, II: Honors
   or MAT 171 Accelerated Single Variable Calculus
   or level 8 or 9 on the Mathematics Placement Examination.
2. CHE 129/130 or 131, 132 General Chemistry and CHE 133, 134 General Chemistry Laboratory
   or CHE 141, 142 Honors Chemistry and CHE 143, 144 Honors General Chemistry Laboratory
3. CHE 321, 322 or 326 Organic Chemistry I, IIA or IIB or CHE 331, 332 Honors Organic Chemistry
4. CHE 327 Organic Chemistry Laboratory or CHE 383 Introductory Synthetic and Spectroscopic Laboratory Techniques
5. PHY 121/123, 122/124 Physics for Life Sciences I, II and labs or PHY 125, 126, 127 Classical Physics A, B, C or PHY 131/133, 132/134 Classical Physics I, II and labs or PHY 141, 142 Classical Physics I, II: Honors
6. AMS 110 Probability and Statistics in Life Sciences or AMS 310 Survey of Probability and Statistics

C. Advanced Courses
All advanced Biology courses have one or more 200 level courses as a prerequisite. A grade of C or higher is required in each 200 level prerequisite in order to enroll in any 300 level Biology course. Students must complete one of the following specializations using the advanced biology lecture and laboratory courses listed below, and courses offered by related departments where specified:

Advanced Lecture Courses:
Area I: Cell Biology and Biochemistry
   BIO 310, 314, 315, 316, 317*, 361, 362
Area II: Genetics and Development
   BIO 320, 325, 339*
Area III: Neurobiology and Physiology
   BIO 317*, 328, 334, 338, 339*
Area IV: Organisms
   BIO 340, 341, 343, 344, 348, 380, MAR 370, 371
Area V: Ecology and Evolution
   BIO 301, 350, 351, 353, 354, 358, 359, 385, 386, MART 301, 302, 366, ANP 325.02, 350.02, 391.02
* BIO 317 and 339 may each be used to satisfy only one area.

Advanced Laboratory Courses:
Area I BIO 311, 365
Area II BIO 327
Area III BIO 335
Area IV BIO 340, 341, 343, 344, 380, MAR 380
Area V BIO 319, 352, 356, 367, 371, MAR 301, 303, 305, 320, 388
Area VI BIO 312

1. General Biology Specialization
   a. Advanced Lecture Courses: At least one lecture course in four of the five areas above. Students in the Biology Secondary Teacher Education Program must take a course in each of the five areas.
   b. Advanced Laboratory Courses: Two advanced laboratory courses chosen from any two of the six areas above.
   c. Study in Depth: A second lecture course in one of the five areas of inquiry or any 400-level BIO course for majors or SCI 454 (for students enrolled in the Biology Secondary Teacher Education Program). NOTE: BIO 318 can be used as a second course for any lecture area.
   d. Biology Electives: Additional advanced biology lecture, laboratory, independent research and reading courses, as needed, for a minimum of 33 credits in Requirements A and C. (See Note 3)

2. Biomedical Engineering Specialization
   Unlike other specializations, this one requires MAT 127 Calculus C, but not AMS 110. Students who complete this specialization will automatically receive a Biomedical Engineering minor (BNG).
   a. Lecture/Laboratory Courses Requirement:
      BME 100 Introduction to Biomedical Engineering
      ESG 111 Programming for Engineers
      or MEC 112 Practical C/C++ for Scientists and Engineers
      or ESE 124 Computer Techniques for Electronic Design I
      or CSE 130 Introduction to Programming in C
   b. Subspecializations:
      Students in this specialization must choose one of the three subspecializations described below.
      i. Biomechanics Subspecialization
         MEC 260 Engineering Statics
         BME 303 Engineering Methods in Biomechanics
         AMS 261 Applied Calculus III (or equivalent)
         One of the following two courses:
         BME 304 Genetic Engineering
         BME 381 Nanofabrication in Biomedical Applications
      ii. Bioelectricity Subspecialization
         ESE 271 Electrical Circiut Analysis I
         BME 301 Bioelectricity
         AMS 210 Applied Linear Algebra
         BME 313 Bioinstrumentation
      iii. Molecules and Cells Subspecialization
         BME 304 Genetic Engineering
         BME 381 Nanofabrication in Biomedical Applications
         ESG 332 Materials Science I: Structures and Properties of Materials
One of the following three courses:
BME 353 Biomaterials: Manufacture, Properties and Applications
BME 404 Essentials of Tissue Engineering
BME 430 Engineering Approaches to Drug and Gene Delivery

c. Breadth Requirement:
i. One advanced biology lecture or one advanced lecture/laboratory course chosen from any area.
ii. One advanced biology laboratory course chosen from any area. Note: Students who complete this specialization will automatically receive a biomedical engineering minor.

3. Developmental Genetics Specialization
a. Lecture/Laboratory Courses Requirement:
i. BIO 320 General Genetics
ii. BIO 325 Animal Development
iii. BIO 327 Developmental Genetics Laboratory
iv. BIO 310 Cell Biology or BIO 339 Molecular Development of the Nervous System
b. Breadth Requirement
i. Two advanced biology lecture courses from outside the Developmental Genetics specialization chosen in consultation with the undergraduate biology advisor.
ii. One advanced biology laboratory (or lecture with laboratory) from outside the Developmental Genetics specialization.
c. Biology Electives
Additional advanced biology lecture, laboratory, independent research and reading courses, as needed, for a minimum of 33 credits in Requirements A and C. (See Note 3)

4. Ecology and Evolution Specialization
a. BIO 351 Ecology
b. BIO 354 Evolution
c. Area Lecture/Laboratory Requirement: Students must choose one course from
i. Lecture/Laboratory Courses or one course each from ii. Lecture Courses and iii. Laboratory Courses below.
   i. Lecture/Laboratory Courses
      BIO 340 Zoology
      BIO 341 Plant Diversity
      BIO 343 Invertebrate Zoology
      BIO 344 Chordate Zoology
      BIO 380 Entomology
      MAR 301 Environmental Microbiology
   ii. Lecture Courses
      MAR 301 Sustainability of the Long Island Pine Barrens
      BIO 348 Diversity and Evolution of Reptiles
      BIO 350 Darwinian Medicine
      BIO 353 Marine Ecology
      BIO 358 Biology and Human Social and Sexual Behavior
      BIO 359 Behavioral Ecology
      BIO 385 Plant Ecology
      BIO 386 Ecosystem Ecology in a Changing World
      MAR 302 Marine Microbiology and Microbial Ecology
      MAR 366 Plankton Ecology
      MAR 370 Marine Mammals
      MAR 371 The Biology and Conservation of Marine Birds and Sea Turtles
      ANP 325.02 Primate Behavior (Madagascar)
      ANP 350.02 Methods of Studying Primates (Madagascar)
      ANP 391.02 Topics in Physical Anthropology (Madagascar)
   iii. Laboratory Courses
      BIO 319 Landscape Ecology Laboratory
      BIO 352 Ecology Laboratory
      BIO 356 Applied Ecology and Conservation Biology Laboratory
      BIO 367 Molecular Diversity Laboratory
      BIO 371 Restoration of Aquatic Ecosystems
   d. Breadth Requirement
   i. Two advanced biology lecture or lecture/laboratory courses chosen from any area excluding Area V, Ecology and Evolution above.
   ii. One advanced biology laboratory (or lecture with laboratory) course chosen from any area excluding Area V, Ecology and Evolution above.

e. Biology Electives
Additional advanced biology lecture, laboratory, independent research and reading courses, as needed, for a minimum of 33 credits in Requirements A and C. (See Note 3)

5. Environmental Biology Specialization
a. BIO 351 Ecology
b. Area Lecture/Laboratory Requirement: Two courses chosen from the lists below. In choosing courses, students must include at least one course with laboratory. Students may take no more than one course from i. Organisms, and no more than one course from iii. The Environment.
   i. Organisms
      BIO 340 Zoology (with lab)
      BIO 341 Plant Diversity (with lab)
      BIO 343 Invertebrate Zoology (with lab)
      BIO 344 Chordate Zoology (with lab)
      BIO 348 Diversity and Evolution of Reptiles
      MAR 366 Plankton Ecology
      MAR 370 Marine Mammals
      MAR 371 The Biology and Conservation of Marine Birds and Sea Turtles
      ANP 340.01 Great Apes (Madagascar)
      ANP 341.01 Propithecus (Madagascar)
      ANP 344.01 Chimpanzees and Human Evolution (Madagascar)
   ii. Ecology
      MAR 303 Long Island Marine Habitats
      MAR 305 Experimental Marine Biology
      MAR 320 Limnology
      MAR 380 Ichthyology
      MAR 388 Tropical Marine Ecology
   c. Area Lecture/Laboratory Requirement: Students must choose one course from
      i. Lecture/Laboratory Courses or one course each from ii. Lecture Courses and iii. Laboratory Courses below.
      i. Lecture/Laboratory Courses
         MAR 301 Sustainability of the Long Island Pine Barrens
         BIO 348 Diversity and Evolution of Reptiles
         BIO 350 Darwinian Medicine
         BIO 353 Marine Ecology
         BIO 358 Biology and Human Social and Sexual Behavior
         BIO 359 Behavioral Ecology
         BIO 385 Plant Ecology
         BIO 386 Ecosystem Ecology in a Changing World
         MAR 302 Marine Microbiology and Microbial Ecology
         MAR 366 Plankton Ecology
         MAR 370 Marine Mammals
         MAR 371 The Biology and Conservation of Marine Birds and Sea Turtles
         ANP 325.02 Primate Behavior (Madagascar)
         ANP 350.02 Methods of Studying Primates (Madagascar)
         ANP 391.02 Topics in Physical Anthropology (Madagascar)
      ii. Lecture Courses
         MAR 303 Long Island Marine Habitats
         MAR 305 Experimental Marine Biology
         MAR 320 Limnology
         MAR 380 Ichthyology
         MAR 388 Tropical Marine Ecology
      d. Breadth Requirement
         i. Two advanced biology lecture or lecture/laboratory courses chosen from any area excluding Area V, Ecology and Evolution above.
         ii. One advanced biology laboratory (or lecture with laboratory) course chosen from any area excluding Area V, Ecology and Evolution above.
      e. Biology Electives
         Additional advanced biology lecture, laboratory, independent research and reading courses, as needed, for a minimum of 33 credits in Requirements A and C. (See Note 3)
BIO 301 Sustainability of the Long Island Pine Barrens
BIO 319 Landscape Ecology Laboratory
BIO 350 Darwinian Medicine
BIO 352 Ecology Lab
BIO 353 Marine Ecology
BIO 354 Evolution
BIO 356 Applied Ecology and Conservation Biology Laboratory
BIO 358 Biology and Human Social and Sexual Behavior
BIO 359 Behavioral Ecology
BIO 367 Molecular Diversity Laboratory
BIO 385 Plant Ecology
BIO 386 Ecosystem Ecology in a Changing World
MAR 301 Environmental Microbiology (with lab)
MAR 302 Marine Microbiology and Microbial Ecology
MAR 303 Long Island Marine Habitats (with lab)
MAR 305 Experimental Marine Biology (lab)
MAR 320 Limnology (lab)
MAR 328 Mammalian Physiology
MAR 388 Tropical Marine Ecology (lab)
MAR 325.02 Primate Behavior (Madagascar)
MAR 350.02 Methods of Studying Primates (Madagascar)
MAR 391.02 Topics in Physical Anthropology (Madagascar)

iii. The Environment
ATM 305 Global Atmospheric Change
ATM 397 Air Pollution and its Control
MAR 318 Engineering Geology and Coastal Processes
MAR 333 Coastal Oceanography

b. two laboratory reports from a single upper-division course in biological sciences at Stony Brook.

A list of currently participating courses is available in the Undergraduate Biology Office. Students who wish to use material from a participating course should obtain the necessary form and present it to the course director prior to submission of the material. The course director will provide a special evaluation of the writing (in addition to a grade), and send the completed form to the Biology Writing Committee (through the Undergraduate Biology Office). Materials from other biology courses may be used if they include a suitable writing component. They must be submitted to the writing committee, together with the form signed by the instructor.

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 remedial effort. Later submissions are considered, but may delay graduation. If material is rejected, the student is urged to attend the Writing Center (or to take an appropriate course) before resubmitting the paper or material from another biology course.

Notes:

1. Students with a high school Biology course and a math placement score of 3 or better can receive a waiver of BIO 150 The Living World. A waiver of BIO 150 does not count toward the minimum 33 credits in Requirements A and C. Although not a required course, BIO 150 is recommended for majors with a math placement score of less than 3 and/or without prior biology training. The three credits of BIO 150 will count toward the Biology major, but not the minor.

2. Requests for waivers of major requirements must be approved by the Undergraduate Biology Studies Committee. Biology majors must meet the major requirements of the bulletin of their latest matriculation date.

3. Up to six credits of electives may be chosen from a list of courses offered outside the department; see the Undergraduate Biology Office for the current list.
4. Students having completed one or fewer of BIO 201, 202, 203 prior to Fall 2007 must complete BIO 204 and 205; Students having completed two or more of BIO 201, 202, 203 prior to Fall 2007 are exempt from completing BIO 204 AND BIO 205.

Advanced Courses
All advanced Biology courses have one or more 200-level BIO courses as a prerequisite(s). A C or better grade is required in each 200-level prerequisite in order to enroll in any 300-level Biology course.

Application of Transfer Credits to Biology Requirements
Biology courses taken elsewhere apply to major requirements only if authorized by the biology transfer evaluator or if listed as equivalent to a Stony Brook course in Stony Brook Transfer Guides. Transfer students must take at least 15 of the 33 credits in Requirements A and C at Stony Brook in courses for majors at the 200 level or higher. At least 12 of the 15 credits must be in BIO-designator courses. Both of the two advanced laboratory experiences, including one area laboratory, must be taken at Stony Brook. Transfer students may meet Section B requirements with transferred courses, if the courses are approved as being equivalent (even if the number of credits is different).

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

Honors Programs in Biology and in Biology and Society
Graduation with departmental honors in Biology or in Biology and Society requires both of the following:

1. A cumulative grade point average of 3.50 or higher in all courses for the major.
2. Presentation of an honors thesis based on a research project (see list of approved research and internship courses for each specialization below) written in the form of a paper for a scientific journal. The completed thesis must be approved by a thesis committee.

A student interested in becoming a candidate for honors should submit an outline of the proposed thesis research project to the director of undergraduate biology as early as possible but no later than the second week of classes in the last semester. The director of undergraduate biology and the research sponsor appoint a thesis committee consisting of the research sponsor and two additional faculty members, one of them from a department different from that of the research sponsor. The student must present a copy of the finished thesis to each member of the thesis committee for their approval at least 28 days before the date of graduation.

Approved Research and Internship Courses
1. General Biology Specialization
   - BIO 484, 486, 489 Independent Research
   - BIO 488 Internship
2. Bioengineering Specialization
   - BIO 488 Internship
   - BME 499 Research in Bioengineering
3. Developmental Genetics Specialization
   - BIO 487 Independent Research
   - BIO 488 Internship
4. Ecology and Evolution Specialization
   - BIO 489 Research in Ecology and Evolution
   - BIO 488 Internship
5. Environmental Biology Specialization
   - One of the following:
     - ATM 487, BIO 489, MAR 487 Independent Research
     - BIO 488, MAR 488 Internship
6. Neuroscience Specialization
   - BIO 486 Research in Neurobiology and Physiology
   - BIO 488 Internship

Requirements for the Minor in Biology (BIO)
Only students with majors other than Biology, Biochemistry, Pharmacology, Marine Sciences or Marine Vertebrate Biology may elect the Biology minor. All courses for the minor must be taken for a letter grade. (See Note 1) All credits for the minor, except for those in Requirement A, must be in BIO major courses taken at Stony Brook. Requests for waivers of minor requirements must be approved by the Undergraduate Biology Studies Committee.

Completion of the minor requires at least 20 credits in those biology courses designed for the Biology major, including:

A. At least two of the following courses:
   - BIO 201 Fundamentals of Biology: Organisms to Ecosystems
   - BIO 202 Fundamentals of Biology: Cell and Molecular Biology
   - BIO 203 Fundamentals of Biology: Cellular and Organ Physiology

B. Both of the following courses:
   - BIO 204 Fundamentals of Scientific Inquiry in the Biological Sciences I and
   - BIO 205 Fundamentals of Scientific Inquiry in the Biological Sciences II

C. At least nine credits at the 300 level

D. A lecture course in at least two of the five areas of inquiry (I-V) listed under the biology major.

Note:
1. All 20 credits of biology courses intended for the biology minor must be passed with a grade of C or higher, including 9 credits at the 300 level. A grade of Satisfactory in readings and research courses apply to the quality requirements within credit limitations noted below:

Up to two credits of biology independent research (BIO 484, 486, 487, 489) and one credit of tutorial readings (BIO 444, 446, 447, 449) may be applied toward the minor. The list of substitute electives for the major does not apply to the minor.