Pharmacology (BCP)

Major and Minor in Pharmacology

Department of Pharmacological Sciences, College of Arts and Sciences

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Minors of particular interest to students majoring in Pharmacology: Biomaterials (BES), Bioengineering (BNG), Biomedical Engineering (BME), Chemistry (CHE), English (EGL), Philosophy (PHI), Political Science (POL)

Pharmacology (BCP)

Pharmacology is an interdisciplinary science which investigates the actions of drugs and chemicals on biological systems. It requires a knowledge of the sources, chemical properties, biological effects, and therapeutic uses of drugs. It is a science that is basic not only to medicine but also to pharmacy, nursing, dentistry, and veterinary medicine. Pharmacological studies range from those that determine the effects of chemical agents upon subcellular mechanisms, to those that deal with the potential hazards of drug therapy for major diseases. By unlocking mysteries of drug action, discovering new therapies, and developing new medicinal products, pharmacology inevitably touches upon all of our lives.

The curriculum in Pharmacology, leading to the Bachelor of Science degree, is designed to prepare students for careers in drug research and development and to provide a solid background for those students who choose to pursue graduate studies in the pharmacological sciences. Focusing on cellular, molecular, and human pharmacology, the program allows students to develop an understanding of this discipline in a basic science teaching and research environment.

Students majoring in Pharmacology have the conceptual and practical knowledge to pursue technical and professional careers in all areas of drug research and development within the pharmaceutical and biotechnology industry, research institutes, and government agencies. The Pharmacology curriculum teaches students the principles of pharmacology and toxicology and mechanisms of drug action to students whose career interests lie in medicine, and other branches of health care and life sciences. Current career objectives in order of choice are Ph.D. programs in pharmacology, M.D./Ph.D., and M.D. degrees, and entry-level scientist positions in industry.

Requirements for the Major and Minor in Pharmacology (BCP)

Acceptance into the Undergraduate Pharmacology Program

Acceptance into the program requires an application process involving reference letters, a personal statement, and an interview. Applications are available through the Undergraduate Pharmacology Web site at http://www.pharm.stonybrook.edu/Undergraduate%20Program/application. Note: Students may not declare a double major among biology, biochemistry, and pharmacology.

Requirements for the Major in Pharmacology (BCP)

The major in Pharmacology leads to the Bachelor of Science degree. All courses offered for the major must be taken for a letter grade. In the requirements listed below, a minimum grade point average of 3.00 must be obtained for all 100-level and upper-division courses.

Completion of the major requires approximately 68-69 credits.

A. Courses in Related Fields

1. CHE 131, CHE 132 General Chemistry
2. CHE 133, CHE 134 General Chemistry Laboratory
3. CHE 321, CHE 322 Organic Chemistry
4. CHE 327 Organic Chemistry Laboratory
5. MAT 131, MAT 132 Calculus I, II (See Note 1). If students do not place into MAT 125 or 131 on the basis of the math placement examination, MAT 123 is a required course for the major.
6. PHY 121, PHY 122 Physics for the Life Sciences and labs (See Note 1)

B. Courses in Biological Sciences

Stony Brook University: www.stonybrook.edu/ugbulletin
1. BIO 202 and BIO 203 Fundamentals of Biology
2. BIO 204 and BIO 205* Fundamentals of Scientific Inquiry I and II
3. BIO 310 Cell Biology
4. HAS 355 Integrative Systems Physiology or HBY 350 Physiology or BIO 328 Mammalian Physiology or ANP 300 Human Anatomy
5. BIO 361, BIO 362 Biochemistry I, II
6. BIO 365 or BIO 311 Biochemistry Laboratory

* BIO 207 may be used as a substitute for BIO 205

C. Pharmacology
1. BCP 400 Writing in Pharmacology
2. BCP 401 Principles of Pharmacology
3. BCP 402 Advanced Pharmacology
4. BCP 403 Principles of Pharmacology Laboratory
5. BCP 404 Advanced Pharmacology Laboratory
6. BCP 406 Pharmacology Colloquium
7. BCP 487 Pharmacology Research (at least three credits are required to graduate, along with a written senior thesis)

D. Upper-Division Writing Requirement
To fulfill the upper-division writing requirement in Pharmacology, a sample of writing from an upper-division course in biological sciences, must be submitted to the Department of Pharmacological Sciences for evaluation by the Pharmacology writing committee. This writing sample can be a laboratory report, a term paper, or a report for a reading or research course, and it must contain at least 750 words of text. It is to be accompanied by a form (available in the Department of Pharmacological Sciences office) signed by the student and the instructor of the course for which the material was written. The student must enroll in BCP 400 Writing in Pharmacology for the semester in which the upper-division writing requirement is being attempted. The deadline for submission of the writing sample is December 1 for students graduating in the following May or August, and May 1 for students graduating in the following December. If the writing in this sample is judged to be satisfactory by the writing committee, the requirement is fulfilled. If the writing is judged unsatisfactory, the student is advised to seek help in writing skills from the Writing Center and must pass a writing examination administered by the Department of Pharmacological Sciences at a scheduled time prior to graduation.

Students should consult with the department advisor to ensure that their plan for completing the Upper Division Writing Requirement is consistent with university graduation requirements for General Education. Students completing the Stony Brook Curriculum (SBC) must complete a course that satisfies the "Write Effectively within One's Discipline" (WRTD) learning objective to graduate. The Upper Division Writing Requirement is consistent in most cases with the SBC learning outcomes for WRTD.

E. Courses Recommended but not Required for the Major
- BCP 475 Undergraduate Teaching Practicum I
- BCP 488 Internship
- BIO 320 General Genetics
- CHE 301 Physical Chemistry I
- CHE 302 Physical Chemistry II
- CHE 312 Physical Chemistry (Short Course)

Note: The following alternate sequences may be substituted for major requirements:

for MAT 131, MAT 132: MAT 125, MAT 126, MAT 127 or MAT 141, MAT 142 or MAT 171

for PHY 121, PHY 122: PHY 131, PHY 132 and labs or PHY 141, PHY 142 and labs or PHY 125, PHY 126, PHY 127 and labs

Honors Program in Pharmacology
Graduation with honors in Pharmacology requires: 1) a cumulative grade point average of 3.50 or higher in all courses in Requirements A, B, and C above, and 2) presentation of an outstanding thesis based on a research project performed under BCP 487, written in the format of a paper in a scientific journal. A student interested in becoming a candidate for honors should submit an outline of the proposed thesis research project to the pharmacology director, no later than the second week of classes in the last semester. (Acceptance of a project for BCP 487 registration does not imply automatic acceptance of that project for honors.) The director, in consultation with the student, then appoints a thesis committee consisting of the research sponsor and two additional faculty members. Two members of the thesis committee must be members of the Department of Pharmacological Sciences and one must be a member of another department in a related field.

Copies of the finished thesis, approved by the research sponsor, must be presented to the pharmacology director and thesis committee at least 21 days before the date of graduation.

Accelerated Bachelor of Science (BS) in Pharmacology and Master of Public Health (MPH) Evaluative Science Concentration
The BS in Pharmacology is an excellent preparation for the MPH degree, particularly for the MPH Evaluative Sciences concentration which focuses on the highly quantitative areas of biostatistics and demography. The current demand for MPH graduates with quantitative backgrounds is strong.
Admission Requirements: Students must have completed 60 credits of undergraduate coursework with a minimum GPA of 3.0 in all college work before being admitted into any accelerated Bachelor/Masters degree program. Additional entry requirements for this specific accelerated degree consist of: GPA in courses required for the Pharmacology major of at least 3.3, and letters of recommendation from two faculty members in the undergraduate Pharmacology Program. Students in this accelerated BS/MPH program will be able to complete both degrees in 5 years.

Please see the Pharmacology Undergraduate Program Director for further information.

Requirements for the Minor in Pharmacology (BCP)

The Minor in Pharmacological Sciences is an interdisciplinary program for students interested in obtaining an understanding of the mechanisms of drug action and/or the economics, social factors, ethical considerations and drug discovery as well as governmental regulation of drug development and marketing.

The Minor is organized around areas relevant to modern Pharmacology, and allows considerable flexibility in order to match the specific interests of students within the field. Courses offered for the Minor must be taken for a letter grade.

All courses offered for the Minor must be passed with a grade of C or higher. Completion of the minor requires 21 credits. At least nine of these credits must correspond to BCP courses, including at least one 400-level course. Mentored research, either at the bench or faculty guided readings and writing, in relevant areas of Pharmacological Sciences (BCP 487) is an acceptable way to fulfill credit requirements. At least three of the courses must be taken at the upper-division level. Students wishing to pursue a minor in Pharmacological Sciences must develop a specific and explicit plan for its completion, in consultation with the designated advisor. An example of a typical distribution would be the following:

1. Two 100-level courses including BCP 111
2. Two 200-level courses including BCP 201
3. Three 300/400-level courses, including one of the following: BCP 401, 402, 405 or 487. (It is important to note that BCP 405 has no prerequisites and is exclusively an online course. Hence it has already been offered six times since it was first launched a little more than a year ago, and it is currently our plan to offer it continuously hereafter. BCP 487 is also without explicit prerequisites. It is entitled "Research in Pharmacology" and includes both laboratory research AND independent study with a faculty mentor. The latter is maximally flexible.)

Course Offerings

Chemistry

- CHE 129 General Chemistry IA
- CHE 130 Problem Solving in General Chemistry
- CHE 131 General Chemistry IB
- CHE 132 General Chemistry II
- CHE 152 Molecular Science I
- CHE 301 Physical Chemistry I
- CHE 302 Physical Chemistry II
- CHE 312 Physical Chemistry for the Life Sciences
- CHE 314 Cancer Biology
- CHE 315 Microbiology
- CHE 328 Mammalian Physiology
- CHE 332 Computational Modelling
- CHE 334 Principles of Neurobiology
- CHE 361 Biochemistry I
- CHE 362 Biochemistry II

Biology

- BIO 101 Human Biology
- BIO 115 Evolution and Society
- BIO 201 Fundamentals of Biology: Organisms to Ecosystems
- BIO 202 Fundamentals of Biology: Molecular and Cellular Biology
- BIO 203 Fundamentals of Biology: Cellular and Organ Physiology
- BIO 302 Human Genetics
- BIO 310 Cell Biology
- BIO 314 Cancer Biology
- BIO 315 Microbiology
- BIO 328 Mammalian Physiology
- BIO 332 Computational Modelling
- BIO 334 Principles of Neurobiology
- BIO 361 Biochemistry I
- BIO 362 Biochemistry II

Ecological Studies

- EHI 340 Ecological and Social Dimensions of Disease

Economics
Sample Course Sequence for the Major in Pharmacology

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

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**BCP 487 research project is ideally begun by the fall semester of the sophomore year**
BCP

Pharmacology

BCP 111: American Drug Use and Abuse: Biomedical, Socio-economic and Political Factors
This course, to be offered primarily online, introduces beginning students to the current pharmacology landscape, both in the United States and abroad. New drug discovery and the US drug approval process, for both over-the-counter and prescription pharmaceuticals, will be considered in detail and will be compared with comparable processes in other parts of the world. The ethics of American direct-to-consumer marketing of prescription pharmaceuticals will be presented and discussed.

DEC: H
SBC: STAS
3 credits

BCP 201: Introduction to Pharmacology: Drug Use & Its Molecular Basis
This course, to be offered primarily face-to-face, introduces scientifically sophisticated students to all aspects of modern pharmacology including pharmacodynamics (how drugs elicit biological responses) and pharmacokinetics (drug absorption, distribution, metabolism, and excretion). We will discuss major classes of drugs commonly used to treat illness in modern medical and veterinary practice. Agents considered will include those acting on the nervous system, the immune system, the cardiovascular, respiratory and gastrointestinal systems, and those used in treating cancer and infectious diseases. We will also consider vaccination to prevent illness.

Prerequisite: BIO 202 and CHE 132
Advisory Prerequisite: BCP 111
DEC: E
SBC: STEM+
3 credits

BCP 401: Principles of Pharmacology

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

Prerequisites: BCP 401 and 403; minimum of B- in BCP 401
Corequisite: BCP 404
4 credits

BCP 403: Principles of Pharmacology Laboratory

Prerequisite: Permission of instructor
Corequisite: BCP 401
SBC: ESI
2 credits

BCP 404: Advanced Pharmacology Laboratory

Prerequisites: BCP 401 and 403; permission of instructor
Corequisite: BCP 402
SBC: ESI
2 credits

BCP 405: Pharmacology to Pharmacy: Practical Clinical Aspects for Non-Clincians (Didactic)
This course, to be offered exclusively online, is designed for undergraduates interested in health care (either basic medical science-oriented or clinical). The class introduces many aspects of clinical pharmacology, but is geared toward non-clinicians. Clinical vignettes and case discussions will be presented. Several medical procedures will be first described and then demonstrated. Understanding these procedures will be integral to appreciating the vignettes and clinical case discussions. The multidisciplinary course faculty will include physicians, scientists, educators, nurses and pharmacists. Enrolled students will have the opportunity to ask questions directly through online chats.

Prerequisite: U3 or U4 status or permission of the instructor
SBC: ESI
3 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
SBC: SPK
2 credits

BCP 444: Experiential Learning
This course is designed for students who engage in a substantial, structured experiential
learning activity in conjunction with another class. Experiential learning occurs when knowledge acquired through formal learning and past experience are applied to a “real-world” setting or problem to create new knowledge through a process of reflection, critical analysis, feedback and synthesis. Beyond-the-classroom experiences that support experiential learning may include: service learning, mentored research, field work, or an internship.

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

**SBC:** EXP+
0 credit, S/U grading

**BCP 475: Undergraduate Teaching Practicum in Pharmacology**

*Prerequisites:* Pharmacology major; U4 standing; permission of department

**SBC:** EXP+
3 credits, S/U grading

**BCP 480: Introduction to Research Topics in Pharmacology**

Introduces undergraduate students to the research that is occurring in the laboratories of Pharmacology faculty. We will discuss experimental techniques and how they are utilized to investigate scientific questions within the various fields under the umbrella of Pharmacological Sciences. Areas covered will include immunology, neuroscience, cancer, development, structural biology, cell signaling, and stem cells. Students will be required to prepare a presentation on research actively occurring within the Pharmacology department.

*Prerequisite:* BCP 201 or BCP 401 or BIO 310 or BIO 361

**SBC:** TECH
1 credit

**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

**SBC:** EXP+
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

**SBC:** EXP+
0-6 credits, S/U grading