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I. ABOUT THE DEPARTMENT OF BIOLOGY

The Department of Biology of the School of Science and Engineering in the Ateneo de Manila University is recognized for its excellence in developing students who would eventually pursue studies and professions in medicine, biological research, industry, consultancy, and the academe, among others. It is a closely knit community of students, faculty, staff, and alumni dedicated to studying and immersing themselves in the various biological disciplines. It currently offers two undergraduate honors courses: BS Biology and BS Life Sciences.

Vision and Mission

The Department of Biology envisions itself as the premier provider of excellent education and research in biomedical sciences, biotechnology, ecology and systematics, microbiology, molecular biology, and bio-education, applying a holistic, rigorous and innovative approach to the biological sciences. Its alumni become prime movers and leaders in medicine, research, industry, and the academe, working toward nation-building from a Filipino, Catholic, and Jesuit perspective.

The Department of Biology commits itself to excellence and leadership in undergraduate and graduate programs in the fields of biodiversity, biomedicine, microbiology, molecular biology, and bio-education. It is guided by a dynamic and relevant curriculum that incorporates the strengths of Ateneo tradition and the challenges of the future. As an innovative center of learning, teaching, and research in the life sciences, it is dedicated to serve the University, the country, and all of humanity for the greater glory of God.

History

50s Biology subjects are offered under the Department of Natural Sciences and Mathematics as preparation for medical studies.

1959 Coinciding with the designation of the school as the Ateneo de Manila University, students can now major in Biology. The Section of Chemistry
and Biology is established under the Department of Natural Sciences and Mathematics, with Rev. John J. Bauer, S.J. as its Chairman.

1963  The Department of Biology is established, with Fr. Bauer as its first Chairperson.

1966  The course BS Biology is offered for the first time, along with AB Major in Pre-Medicine or Pre-Dentistry. The Chairperson is Mr. Jaime Joaquin.

1967  Rev. Francisco Perez, S.J. becomes Chairperson of the Department. The current BS Biology curriculum consists of 53 units of departmental courses, 20 units of chemistry, and 10 units of physics.

1971  Albert S. Lapid becomes the first BS Biology graduate.

1975  The student organization Bio-Premed is founded. It will soon come to be known as the Pre-Med Society of Ateneo.

1976  Ma. Cristina S. Santos becomes the first female BS Biology graduate.

1992  Ma. Justina L. Bautista becomes the first from the program to graduate Summa Cum Laude and as Valedictorian.

1998  Coinciding with the restructuring of the college into the four Loyola Schools, the new BS Biology curriculum is introduced. Students can now choose between two tracks: medical research (A) and biological research (B).

2005  The student organization Biological Organization - eXplore. eXperience. eXcel. (BOx) is founded by alumnus and faculty member Ronald Allan L. Cruz (BS Bio ’02).
2008 The Department restructures its programs. BS Biology is now a five-year program, and the four-year BS Life Sciences program is introduced. BBox is accredited as an official organization and is now recognized as the Ateneo Biological Organization.

**Faculty Profile**

The Department of Biology currently has over 15 faculty members with full-time appointments. All have graduate degrees. Nine have Ph.D. degrees from institutions here and abroad, a number of whom have several years of post-doctoral stints from overseas institutions. Many have publications in international journals. Several hold key positions in professional biology organizations. The research interests of the faculty members are varied but fall within these four themes: biomedical science, ecology and systematics, microbiology, and molecular biology.

**Merab A. Chan - Assistant Professor (Department Chairperson)**
Ph.D. Biological Sciences, Macquarie University, Australia
mchan@ateneo.edu
Research interests: plant biotechnology, ecophysiology, natural products, drug discovery, biodiversity and conservation

**Rhea G. Abisado - Instructor**
M.S. Molecular Biology and Biotechnology, University of the Philippines-Los Baños, Philippines
rheaabisado@yahoo.com
Research interests: microbiology (bioremediation), molecular biology and biotechnology

**Ronie J. Calugay - Assistant Professor**
Ph.D. Biotechnology and Life Sciences, Tokyo University of Agriculture and Technology, Japan
rcalugay@ateneo.edu, ronix5@yahoo.com
Research interests: bioactive compounds from microbes

**Maria Katrina C. Constantino - Instructor**
M.Sc. Molecular Biology and Biotechnology, University of the Philippines-Diliman, Philippines
mccanlas@ateneo.edu, trinket@gmail.com
Research interests: molecular biology, defensin diversity

**Ronald Allan L. Cruz - Instructor**
M.Sc. Marine Science, Marine Science Institute, University of the Philippines-Diliman, Philippines
rcruz@ateneo.edu
Research interests: behavioural ecology and its applications in biodiversity conservation, geometric morphometrics for the biological sciences

**Hendrik Freitag - Associate Professor**
Ph.D. Animal Ecology, Martin-Luther-Universität Halle-Wittenberg, Germany
hfreitag@admu.edu.ph
Research interests: biosystematics, arthropod taxonomy, limnology/freshwater ecology, entomology

**Marc P. Gellynck - Instructor**
M.D., University of Santo Tomas Faculty of Medicine and Surgery, Philippines
mgellynck@yahoo.com
Research interests: biomedical sciences

**Pia Clarisse R. Gulpeo - Assistant Instructor**
M.S. Microbiology, University of Santo Tomas, Philippines
piag_16@yahoo.com
Research interests: microbial ecology
Catherine Genevieve B. Lagunzad - Assistant Professor
Ph.D. Biology, University of the Philippines-Diliman, Philippines
clagunzad@ateneo.edu, cgblagunzad@yahoo.com
Research interests: biodiversity conservation, bioeducation

Zomesh A. Nath Maini - Instructor
M.S. Biology, Ateneo de Manila University, Philippines
mesh_85@yahoo.com
Research interests: plant molecular biology

Vivian A. Panes - Assistant Professor
Ph.D. Biology (Plant Molecular Genetics), University of the Philippines-Diliman, Philippines
vpanes@ateneo.edu, vpanes7@yahoo.com
Research interests: genetics, functional genomics, molecular biology and biotechnology

Nordalyn B. Pedroche - Assistant Professor
Ph.D. Bioscience Engineering, Katholieke Universiteit Leuven, Belgium
npedroche@ateneo.edu
Research interests: phytonematology

Catherine N. Perez - Instructor
M.D., University of the East-Ramon Magsaysay Memorial Medical Center, Philippines
cperez@ateneo.edu
Research interests: biomedical sciences

Janice A. Ragaza - Assistant Professor
Ph.D. Aquaculture Nutrition, Kagoshima University, Japan
janice_a_ragaza@yahoo.com
Research interests: animal physiology, aquaculture, food chemistry
**Student Profile**

The Department of Biology currently has over 400 officially enrolled undergraduate students across the five year levels. Many of our majors graduated with honors from their respective high schools, with a number of them having been Valedictorians. A good number of our majors are scholars, given financial aid based on need and/or academic excellence. There are also many dormers among the majors, most of them staying at the University Residence Halls and Dormitory. Over 400 are currently members of the Ateneo Biological Organization - eXplore. eXperience. eXcel. (BOx), the official organization for Biology and Life Sciences majors.

The number of BS Biology graduates, which as of 2013 totals 1330, has been growing steadily since the 1970s (Fig. 1). A significant majority of our graduates have proceeded directly to medical schools after graduation. Nearly one hundred percent of the Department’s alumni are accepted yearly in at least one of the top medical schools in the Philippines, with a number being accepted in schools abroad. Those who do not pursue medical studies have gone on to graduate studies in microbiology, molecular biology, conservation biology, and related disciplines and subsequently worked in the academe, industry, government, or non-government organizations.

![Figure 1. Distribution of BS Biology graduates across the decades.](image-url)
II. THE CURRICULUM

The Department of Biology offers two undergraduate programs: **BS Biology** and **BS Life Sciences**. Both these programs are structured to give students a competitive advantage in the many expanding fields of Biology; to allow students to develop in their chosen fields of interest; to prepare them to pursue medical studies, master and/or doctorate degrees in Biology or other related disciplines; and to prepare them for employment in industry, GO and NGOs, research institutions, consultancy firms, and health institutions.

**5-year BS Biology Program**

BS Biology is a 5-year undergraduate honors program that provides a holistic and rigorous approach to the biological sciences. The curriculum covers the most essential concepts, principles, and theories of biology across a diverse range of disciplines through innovative lecture and laboratory courses. The program offers its students both the Thesis and Practicum options, the latter of which would allow them to do laboratory or field research work in an affiliated institution. The Junior Term Abroad (JTA) Program is also now available to BS Biology majors, with affiliates in Asia, America, and Europe prepared to accommodate the students in their laboratories.

The BS Biology program provides the most comprehensive preparation for further education, including medical studies; virtually 100% of our medically inclined graduates have enrolled in one of the top medical schools in the country and even abroad. Graduate research programs are also a common option for our majors. Our alumni are enjoying success in their respective fields, be it in medicine, research, industry, or the academe.

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**SECOND YEAR**

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**FOURTH YEAR SUMMER (0 unit)**

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**TOTAL**

| 18 | 17 |

**FIFTH YEAR SUMMER**

| Bi 191 Bioresearch I/Bi 194 Practicum I | 2/3 |

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| 17/16 | 16/15 |

**GRAND TOTAL**

| 182/181 |

*The student can choose an elective from any Area of Specialization.*
**4-year BS Life Sciences Program**

BS Life Sciences is a 4-year undergraduate honors program that provides more specialized training in the biological sciences. Majors choose from among Specializations, namely: 1) Biomedical Science, 2) Ecology and Systematics, 3) Microbiology, and 4) Molecular Biology and Biotechnology. These being the research areas of the Department, the majors are given rigorous training through innovative lecture and laboratory courses and through the undergraduate Thesis. The Junior Term Abroad (JTA) Program is also now available to BS Life Sciences majors, with affiliates in Asia, America, and Europe prepared to accommodate the students in their laboratories.

The specialization of the BS Life Sciences majors allows them to excel in particular biological fields and prepares them for careers in these disciplines. The program produces the best researchers, practitioners, and educators with interests in medicine, biodiversity and conservation, microbiology, and molecular biology.

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<td>En 11 Communication in English I</td>
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FOURTH YEAR
SUMMER
UNITS

Bi 191 Bioresearch I  2
Bi Specialization Course 4* 3

FIRST SEMESTER  UNITS  SECOND SEMESTER  UNITS

Ph 103 Philosophy of Religion  3  Ph 104 Foundations of Moral Value  3
Th 141 A Theology of the Catholic Social Vision  3  Th 151 The Catholic Commitment of Today’s Filipino: A Synthesis  3
Ec 102 Basic Economics, Agrarian Reform and Taxation  3  Pos 100 Politics and Governance  3
Free Elective 1  3  Hi 166 Philippine History  3
Bi 192 Bioresearch II  2  Free Elective 2  3
Bi Specialization Course 5*  3  Bi 193 Bioresearch III  1
17  Bi Specialization Course 6*  3  19

GRAND TOTAL  162 UNITS

*The student must choose a Specialization course from his/her chosen Area of Specialization.

Biomedical Sciences

Medical knowledge is moving rapidly. Once, penicillin was the wonder drug; now we talk about gene therapy and stem cells. Once, we dealt only with parasites and microscopic bacteria; now we face novel and emerging viruses as well as prions. Whereas large cuts were once necessary to remove a gall bladder, we now do so with robotic arms, minimizing pain and damage.

Despite these innovations, medicine is still very much grounded on its foundations—anatomy, physiology, and chemistry. Foundations in the basic sciences of medicine must be firm, but one must also be up to date with medical innovations. All in the service of one’s patients.

Students specializing in this area are given science courses that are the foundations of all medical knowledge. Pertinent electives like Parasitology, Virology, and Immunology are also offered. Current trends are reflected in the emphasis on molecular studies. Majors also undergo rigorous scientific research using modern methods and equipment, emphasizing the need for the search for innovative solutions to pressing medical problems. Thus, graduates with this specialization are adequately
The Philippines is an area of significant biological diversity, with an astounding number of species and high level of endemicity across taxa. However, the country is at high risk of losing its flora and fauna to extinction due in large part to human activities. The loss of these organisms would prove disastrous not only to global ecology but also
to human society, which has come to depend on them greatly for sustenance, livelihood, and medicines.

The thrusts of this specialization are to study biodiversity and the many factors that impact it and, above all, to explore ideas and methodologies aimed at curtailing its loss. Majors take courses in allied fields such as evolution, population genetics, population and community ecology, behavioral ecology, and systematics. Research topics are similarly multidisciplinary, allowing the use of a wide array of protocols and technologies in the search for solutions to the pressing problems of conservation.

Graduates who specialize in this area are expected to excel in graduate studies and professions in the field of conservation biology, whether it is working in the academe or with NGOs, the government, research institutions, wildlife reserves, or zoos. Future medical doctors would benefit from knowledge of the products of the natural world and the evolution of organisms, including the most important medical scourges to humans.

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<td>Ecology of Animal Behavior</td>
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<td>Bi 196</td>
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Microbiology

Microbiology is a key area in the study of life. Microorganisms, being ubiquitous, diverse and metabolically versatile, are a treasure of this planet. They play an indispensable role in ecology as decomposers. Some are known agents of diseases but many are tools in production of medicines and important chemicals. The way to elucidation of the biological systems of eukaryotic organisms was paved by studies of the bacterial metabolic pathways and genetic systems. The rapid development of biotechnology and genomics is also mainly due to the tools provided by these tiny yet rich life forms.

Microbiology continues to be at the forefront of scientific investigations. Areas of concentration for research are basic microbiology focusing on study of fundamental microbial processes and applied microbiology in the fields of medicine, agriculture, ecology, industry, biotechnology and nanotechnology.

There are a number of career options available for students specializing in microbiology. They will find opportunities in medicine, industry, academia, public health, biotechnology and law.

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Molecular Biology and Biotechnology

Molecular biology and biotechnology are fields at the center of this “Century of Biology.” Molecular biology emphasizes the study of the molecules that make up organisms and the interactions and forces that operate among these molecules to define “life.” Genetic controls of these molecules define cellular and subcellular processes involved in cellular interaction and development. It is an integration of several fields with applications in biochemistry, cell biology, developmental biology and evolution. Biotechnology applications continue to provide tools to revolutionize these fields and fuel explosive growth in industry, agriculture, molecular medicine and forensics.

Specialization in molecular biology and biotechnology provides strong background for a variety of careers. Students will find opportunities in science careers, the academe and industry. Increasing applications in molecular medicine give students pursuing health-related professional schools such as medicine and public health current understanding of new technologies. Specialization in this course also can lead to pursuing graduate studies at the M.S. and Ph.D. levels.
Bi 175  Biodiversity  
Bi 176  Evolution  
Bi 177  Principles of Conservation Biology  
Bi 179  Molecular Ecology  
Bi 181/181.1  Microbial Physiology, Lecture and Laboratory  
Bi 185  Introduction to Molecular Medicine  
Bi 186/186.1  Pharmacology and Toxicology, Lecture and Laboratory  
Bi 196  Current Trends in Biology  

Courses

Required Major Courses
† - common to BS Biology and BS Life Sciences
* - only for BS Biology
** - only for BS Life Sciences

Bi 100 GENERAL BIOLOGY I Lecture (3 units) †  
Bi 100.1 GENERAL BIOLOGY I Laboratory (2 units) †  
General Biology I (Bi 100, Bi 101.1) is a 3-unit lecture and 2-unit laboratory course designed to provide biology students with the basic concepts of botany. The course is an introduction to plants, including their structural and functional adaptations to the environment, genetic and ecological relationships, evolutionary development, and significant role in the biosphere. At the end of the course, the student is expected to appreciate the relevance of plants, which are vital to the welfare of nearly all organisms that share Earth, including man. Renewed interest in plants should be an important output, as environmental issues have brought the importance of plants back into sharp

Bi 101 GENERAL BIOLOGY II Lecture (3 units) †  
Bi 101.1 GENERAL BIOLOGY II Laboratory (2 units) †  
General Biology II (Bi 101, Bi 101.1) is a 3-unit lecture and 2-unit laboratory course that deals with the diversity of form and function in the animal kingdom. The major topics of discussion are animal taxonomy and biodiversity, and structure-function relationships as seen from the cellular to the organismic level, thus covering the major evolutionary
trends across the major animal taxa and their structures and functions, and also increasing awareness of the plight of animals on Earth.

**Bi 102 BIOSTATISTICS (3 units) †**

Biostatistics (Bi 101) is a 3-unit lecture course that covers descriptive and inferential statistical methods used in the collection, tabulation, analysis, and interpretation of biological data. Emphasis is also given to the analysis of both parametric and non-parametric data obtained from real-life experiments.

Pre-requisites: Bi 100, Bi 101, Ma 18a, or consent of the adviser

**Bi 120 INTRODUCTION TO MICROBIOLOGY Lecture (2 units) †**

Introduction to Microbiology, Lecture (Bi 120) is a 2-unit lecture course that deals with the basic principles of microbiology covering cell structure and function, diversity, growth and metabolism, molecular biology and genetics, and ecology of both prokaryotic and eukaryotic microorganisms. Introductory topics on microbial biotechnology, medical and industrial microbiology are also presented.

Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser

Co-requisite: Bi 120.1

**Bi 120.1 INTRODUCTION TO MICROBIOLOGY Laboratory (1 unit) †**

Introduction to Microbiology, Laboratory (Bi 120.1) is a 1-unit laboratory course that covers the essential techniques in manipulating microorganisms and special techniques in handling microorganisms of medical and industrial importance. An introduction to specialized fields of microbiology is also taken up.

Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser

Co-requisite: Bi 120

**Bi 130 GENETICS Lecture (2 units) †**

Bi 130.1 GENETICS Laboratory (1 unit) †
Genetics (Bi 130, Bi 130.1) is a 2-unit lecture and 1-unit laboratory course that serves as an introduction to the fundamental concepts and principles of genetics. The programs include topics on genome organization, evolution and medical genetics. Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, Ch 151, or consent of the adviser

**Bi 140 CELL AND MOLECULAR BIOLOGY Lecture (2 units) †**
Cell and Molecular Biology, Lecture (Bi 140) is a 2-unit lecture course that deals with a discussion of current models relating cell structure and function. The biomedical and morphological evidence upon which such models are based is critically evaluated. Some discussion focuses on the histological comparison of organelle functions in different cell types. Molecular topics include nucleotide biosynthesis, structure, replication, transcription and translation of nucleic acids; control of gene expression in bacteria and higher organisms.
Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser
Pre/co-requisite: Bi 140.1, Ch 21, Ch 22

**Bi 140.1 CELL AND MOLECULAR BIOLOGY Laboratory (1 unit) †**
Cell and Molecular Biology, Laboratory (Bi 140.1) is a 1-unit laboratory course that offers hand-on experience in laboratory protocols in genetics and molecular biology. Topics may include applied PCR techniques, electrophoresis techniques, vector construction and modification, affinity chromatography, site-directed-mutagenesis, microarrays, and prokaryotic and eukaryotic expression systems.
Pre/co-requisite: Bi 130, Bi 140, Ch 151, Ch 152, or consent of the adviser

**Bi 150 COMPARATIVE VERTEBRATE ANATOMY Lecture (2 units) †**
Comparative Vertebrate Anatomy, Lecture (Bi 150) is a 2-unit lecture course that deals with important anatomical principles and theories with emphasis on the study of comparative anatomy, phylogeny and an introduction to relationship in structure, function and evolution in vertebrates.
Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser
Co-requisite: Bi 150.1
Bi 150.1 COMPARATIVE VERTEBRATE ANATOMY Laboratory (1 unit) †
Comparative Vertebrate Anatomy, Laboratory (Bi 150.1) is a 1-unit laboratory course that provides skills-based learning of common techniques in anatomical laboratory work, as applied in the study of vertebrate form and function. Through dissections and comparison of various vertebrate specimens, evolutionary trends in this animal group are explored.
Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser
Co-requisite: Bi 150

Bi 151 PLANT MORPHO-ANATOMY Lecture (2 units) *
Plant Morpho-Anatomy, Lecture (Bi 151) is a 2-unit lecture course that deals with the external and internal organization and structure of seed plants with emphasis on angiosperms. The study of the structure of plant cells, tissues and organs are dealt with in detail. Focus is on the structural and functional specialization of the cells, tissues and plant organs. The course will also cover the development of the seed plant.
Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser
Co-requisite: Bi 151

Bi 151.1 PLANT MORPHO-ANATOMY Laboratory (1 unit) *
Plant Morpho-Anatomy, Laboratory (Bi 151.1) is a 1-unit laboratory course on the actual microscopic examination and characterization of cells and tissues of the root, stem, leaf, flower, fruit and seeds. The different stages of development of the plant organs will be traced. Macroscopic examination and diagnostic features of the plant organs will be observed.
Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser
Co-requisite: Bi 151

Bi 160 DEVELOPMENTAL BIOLOGY Lecture (2 units) †
Bi 160.1 DEVELOPMENTAL BIOLOGY Laboratory (1 unit) †
Developmental Biology (Bi 160, Bi 160.1) is a 2-unit lecture and 1-unit laboratory course that discusses principles of development of plants and animals at the organismal and molecular levels. Emphasis is on the formation and development of the germ layers and later organogenesis of representative types of plants and animals.

Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser

**Bi 170 ECOLOGY Lecture (3 units) †**
**Bi 170.1 ECOLOGY Laboratory (2 unit) †**
Ecology (Bi 170, Bi 170.1) is a 3-unit lecture and 2-unit laboratory course designed to introduce students to basic ecological principles and concepts and provide training on sampling methodologies that they will need in studying and understanding the structure and function of natural and man-made ecosystems.

Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser

**Bi 171 PRINCIPLES OF SYSTEMATICS Lecture (2 units) †**
Principles of Systematics, Lecture (Bi 171) is a 2-unit lecture course that covers modern systematic phylogeny schemes in determining evolutionary trends across the kingdoms of life using cladistics, morphometric analysis, and DNA and protein homologies.

Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser

Co-requisite: Bi 171.1

**Bi 171.1 PRINCIPLES OF SYSTEMATICS Laboratory (1 unit) †**
Principles of Systematics, Laboratory (Bi 171.1) is a 1-unit laboratory course that introduces students to various taxonomic processes that include description, nomenclature, identification, and classification; and trains students in field and laboratory procedures involved in the documentation of selected groups of microorganisms, plants, and animals.

Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser

Co-requisite: Bi 171

**Bi 182 PLANT PHYSIOLOGY Lecture (2 units) ***
Bi 182.1 PLANT PHYSIOLOGY Laboratory (1 unit) *
Plant Physiology (Bi 182, Bi 182.1) is a 2-unit lecture and 1-unit laboratory course dealing with the function and activities of a living plant. The course will focus on how the plant body functions in its environment, by looking into the mechanism by which its component parts grow, develop and are maintained and reproduced. An overview on some basic concepts on plant metabolism such as respiration, photosynthesis, absorption and transport systems is discussed. At the end of the course, the student should be able to relate the structural features of the plant with its functions.
Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, Ch 7, Ch 8, Ps 14, Ps 15, or consent of the adviser

Bi 183 ANIMAL PHYSIOLOGY Lecture (2 units) *
Bi 183 .1 ANIMAL PHYSIOLOGY Laboratory (1 unit) *
Animal Physiology (Bi 183, Bi 183.1) is a 2-unit lecture and 1-unit laboratory course that uses an integrated approach to the study of organismic form and function in the maintenance of homeostasis by the investigation of vital processes using physio-chemical technique.
Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, Ch 7, Ch 8, Ps 14, Ps 15, or consent of the adviser

Bi 190 RESEARCH METHODS IN BIOLOGY (1 unit) †
Research Methods in Biology (Bi 190) is a 1-unit preparatory course for undergraduate research. The goal of this course is to familiarize the students with the basic tools of scientific inquiry. Under the supervision of a biology faculty mentor, the students will select a research topic, write a research proposal and present this proposal before a selected panel. Upon completion of this course, the students will be able to locate printed and online articles from professional scientific literature, write a literature review, develop a hypothesis, summarize and present data in the appropriate format, interpret and evaluate data as supporting or refuting a proposed hypothesis and prepare a research proposal with a sound experimental design.
Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1
**Bi 191 BIORESEARCH I (2 units) †**
Bioresearch I (Bi 191) is the first part of a three-course series in conducting an undergraduate thesis. The course deals with the implementation and conduct of a research plan to gain experience in the management of a major field of study and laboratory experiment.
Pre-requisite: Bi 190

**Bi 192 BIORESEARCH II (2 units) †**
Bioresearch II (Bi 192) is the second part of a three-course series in conducting an undergraduate thesis. The course deals with continuation and completion of the research plan, with the goal of finishing data gathering and analysis in preparation for writing the thesis paper.
Pre-requisite: Bi 191

**Bi 193 BIORESEARCH III (1 unit) †**
Bioresearch III (Bi 193) is the third part of a three-course series in conducting an undergraduate thesis. The course deals with the drafting of the thesis paper, defence of the research in front of a pre-determined panel and audience of peers in the scientific community, and submission of the final paper as fulfilment of requirements for the program.
Pre-requisite: Bi 192

**Bi 194 PRACTICUM I (3 units) * **
Practicum I (Bi 194) is a 3-unit course for Biology majors opting for on-the-job trainings or work placement in institutions in lieu of the research courses during their fifth year. This will enable them to integrate and apply the knowledge and skills they have gained from previous courses to actual laboratory, clinical or industrial scenario.
Pre-requisites: Bi 190 and one 2-unit Biology Lecture or Laboratory Elective recommended by the academic adviser. It must be related to the nature of the institution in which the practicum will be conducted.
Bi 195 PRACTICUM II (1 unit) *
Practicum II (Bi 195) is a 1-unit course for manuscript writing and oral defense presentation. After completion of the total number of hours required by the institution and passing of the practicum proper through a written evaluation accomplished by the immediate supervisor, the student can enrol in this remaining 1-unit course.
Pre-requisite: Bi 194

Bi 197 BIOSEMINAR (2 units) **
Bioseminar (Bi 197) is a 2-unit course that teaches students basic skills in verbal and written communication in biological research. Toward this end, the emphasis is on choosing topics for research, doing the actual research, writing the scientific paper, and presenting it orally both in the classroom setting and in the form of seminars. Steps in evaluating a seminar delivered by a peer are also discussed and applied in this course. The training is further enhanced by required attendance in Department-sponsored lectures and talks and in thesis defense sessions of current seniors.
Pre-requisite: Bi 100, Bi 100.1, Bi 101. Bi 101.1

Biology Electives/Specialization Courses
BM - Biomedical Science
ES - Ecology and Systematics
MB - Microbiology
MBB - Molecular Biology and Biotechnology

Bi 105 ENTOMOLOGY (3 units) BM, ES
Entomology (Bi 105) is a 3-unit lecture course that discusses the biology and diversity of insects, including species that act as vectors for some of the important human diseases. Current trends in the collection and cataloguing of insect diversity and in the biological control of these vectors are also discussed.
Pre-requisites: Bi 100, Bi 101, or consent of the adviser
Bi 106 PROTOZOOLOGY (3 units)  
Protozoology (Bi 106) is a 3-unit lecture course that deals with the systematics, ecology, and life cycles of the diverse protozoans (unicellular eukaryotes), with particular emphasis on those that cause disease to humans.  
Pre-requisites: Bi 100, Bi 100.1, or consent of the adviser

Bi 107 HELMINTHOLOGY (3 units)  
Helminthology (Bi 107) is a 3-unit lecture course that deals with the anatomy and physiology of medically important worms (cestodes, trematodes, nematodes) and the epidemiology and treatment of diseases caused by these organisms, particularly in the tropics.  
Pre-requisites: Bi 100, Bi 100.1, or consent of the adviser

Bi 110 BIOETHICS IN BIOMEDICAL RESEARCH (3 units)  
Bioethics in Biomedical Research (Bi 110) is a 3-unit lecture course that covers currently accepted international ethical standards and guidelines in experiments involving humans and other animals. As such, existing laws and policies on animal welfare will be discussed. Ethical guidelines governing the practice of clinical trials are also introduced.  
Pre-requisites: Bi 100, Bi 100.1, or consent of the adviser

Bi 121 VIROLOGY (3 units)  
Virology (Bi 121) is a 3-unit lecture course dealing with the important principles of virology. Introductory part is about what viruses are and how they spread within individuals and populations of bacteria, plants and animals. The molecular biology of viral replication; virus-host interactions; methods of diagnosis, detection, natural and artificial control of viruses; emerging viruses and their impact to science and society; and the current uses of viruses in various scientific fields are discussed.  
Pre-requisites: Bi 120, 120.1, or consent of the adviser

Bi 122 BACTERIOLOGY, Lecture (2 units)
Bacteriology, Lecture (Bi 122) is a 2-unit lecture course that deals on advanced understanding of bacteria with emphasis on their interaction with other organisms particularly humans.  
Pre-requisites: Bi 120, 120.1, or consent of the adviser  
Co-requisite: Bi 122.1

**Bi 122.1 BACTERIOLOGY, Laboratory (1 unit)**  
BM, MB, MBB

Bacteriology, Laboratory (Bi 122.1) is a 1-unit laboratory course which emphasizes the techniques in bacterial isolation and identification. Basic aseptic techniques such as cultivation, transferring and plating methods are reviewed in preparation for the identification. Morphological, cultural and biochemical characteristics of bacteria area studied in detail to aid in the identification of bacterial isolates.  
Pre-requisites: Bi 120, 120.1, or consent of the adviser  
Co-requisite: Bi 122

**Bi 123 MYCOLOGY (3 units)**  
BM, ES, MB, MBB

Mycology (Bi 123) is a 3-unit lecture course on the study of fungi, dealing specifically with the biology, diversity, taxonomy, and phylogeny of fungi. The emphasis is on their life cycles, genetics, evolution, morphology, ecology, and their interaction with and significance to plants, animals, man and medicine. This well-rounded approach will also enable the students to learn the identification and management of plant, animal, and human fungal infections.  
Pre-requisites: Bi 100, Bi 101, or consent of the adviser

**Bi 124 PARASITOLOGY Lecture (2 units)**  
BM, MB

**Bi 124.1 PARASITOLOGY Laboratory (1 unit)**  
BM, MB

Parasitology (Bi 124, Bi 124.1) is a 2-unit lecture and 1-unit laboratory course that discusses morphology and life histories of protozoa, helminth and arthropod parasites, as well as host-parasite relationships and control.  
Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser
Bi 125 MEDICAL MICROBIOLOGY (3 units) $^{BM, MB}$
Medical Microbiology (Bi 125) is a 3-unit lecture course that covers mechanisms of bacterial, fungal, and viral pathogenesis, basis for antimicrobial resistance, emerging and rediscovered infectious agents, medical outbreaks, and topics from current medical research literature. Several small-scale laboratory demonstrations are presented to focus on the diagnosis of infectious diseases, such as but not limited to: microbial culturing, antimicrobial susceptibility testing, staining, conventional and recent laboratory testing for the identification of infectious organisms, and evaluation of host immune parameters.
Pre-requisite: Bi 120 or consent of the adviser

Bi 126 MICROBIAL ECOLOGY (3 units) $^{ES, MB}$
Microbial Ecology (Bi 126) is a 3-unit lecture course that deals with the basic principles of the inter-relationships of bacteria, virus, fungi, algae and protozoa in natural environments. The interaction of microbes with animals and plants as well as the ecological significance of microbial activities are discussed.
Pre-requisites: Bi 120, Bi 120.1, or consent of the adviser

Bi 127 IMMUNOLOGY (3 units) $^{BM, MB, MBB}$
Immunology (Bi 127) is a 3-unit lecture course that deals with the components and aspects of the immune system (natural and adaptive) as well as the function of these components in both health and disease. It includes studies on autoimmune diseases, hypersensitivities, immune deficiency, immunotherapy, allograft and the like.
Pre-requisites: Bi 140, Ch 7, Ch 8, or consent of the adviser

Bi 128 FOOD MICROBIOLOGY, LECTURE (2 units) $^{MB, MBB}$
Food Microbiology (Bi 128) is a 2-unit lecture course which focuses on factors affecting the growth and survival of microorganisms in food systems. Physical, chemical and biological controls of microbial growth in food are discussed. Emphasis is given to beneficial uses of microorganisms in food production such as fermentation and preservation. In addition, mechanisms employed by food-borne spoilage and
pathogenic microorganisms are characterized according to their survival and elimination.

Pre-requisites: Bi 120, 120.1, or consent of the adviser
Co-requisite: Bi 128.1

Bi 128.1 FOOD MICROBIOLOGY, LABORATORY (1 unit) MB, MBB
Food Microbiology, Laboratory (Bi 128.1) is a 1-unit laboratory course that teaches the techniques in isolation, detection and cultivation of food-borne microorganisms. Procedures in qualitative and quantitative detection of specific microorganisms present in different types of food are given emphasis. In addition, effects of microbial growth on the physico-chemical characteristics of different foods are also investigated.
Pre-requisites: Bi 120, 120.1, or consent of the adviser
Co-requisite: Bi 122

Bi 129 INDUSTRIAL MICROBIOLOGY (3 units) MB, MBB
Industrial Microbiology (Bi 129) is a 3-unit lecture course that covers fundamental and applied aspects in industrial processes focusing on microorganisms of industrial importance; principles of screening and strain preservation; and fermentation processes for production of primary and secondary metabolites and other microbial products at laboratory, pilot, and industrial scales. Field studies are included.
Pre-requisites: Bi 120, 120.1, or consent of the adviser

Bi 131 MOLECULAR GENETICS (3 units) BM, MBB
Molecular Genetics (Bi 131) is a 3-unit lecture course that deals with the molecular basis of heredity. It deals with how biological molecules interact and function to give rise to cells and complex living organisms. How genetic material (nucleic acids) is reproduced and inherited from generation to generation and how the information from genetic material is interpreted to construct the structures that constitute living organisms, as well as details of chromosome structure and function is discussed. Prokaryotic (bacterial) and eukaryotic (yeast, plant, mammalian) model systems serve
as examples for evaluation. Special topics such as the genetic basis of development, immunity, cancer and evolution and population genetics are also taken up.

Pre-requisites: Bi 130, Bi 130.1, or consent of the adviser

**Bi 132 MICROBIAL GENETICS (3 units)**  
BM, MB, MBB

Microbial Genetics (Bi 132) is a 3-unit lecture course that emphasizes on microbes as major agents of gene transfer. Various patterns of gene transfer in microorganisms are discussed. It also deals with the principles of heredity based on the concepts of the central dogma of molecular biology and the underlying microbial gene action and regulation in microorganisms (i.e. bacteria). The course also deals with the usefulness of microorganisms in the advances of recombinant DNA technology and gene cloning (i.e. as cloning vectors).

Pre-requisites: Bi 120, 130, Bi 140, or consent of the adviser

**Bi 133 HUMAN GENETICS (3 units)**  
BM, MBB

Human Genetics (Bi 133) is a 3-unit lecture course that explores the foundations and frontiers of modern human genetics, with an emphasis on understanding the latest discoveries in this rapidly changing field of research. The course begins with an overview of cell structure and cellular processes. The principles of heredity will be examined, where simple Mendelian inheritance is contrasted with the effect of multiple genes and the environment that influence complex physical or behavioral traits. Descending to the molecular level, the process of how genetic information in DNA is read and how mutations affect gene function will be investigated. These molecular foundations are used to explore the science and social impact of modern genetic technology, including topics such as cloning, genetic testing and the new map of the human genome. The course concludes with an investigation of how genes vary in populations and how geneticists are contributing to our understanding of human evolution and diversity.

Pre-requisites: Bi 130, 130.1, or consent of the adviser

**Bi 134 MEDICAL GENETICS (3 units)**  
BM, MBB
Medical Genetics (Bi 134) is a 3-unit lecture course on the study of the principles of genetics and the patterns of inheritance as they apply to humans. Emphasis will be on common human genetic disorders, dysmorphic syndromes, inborn errors of metabolism, the diagnosis of certain disorders, and ethical dilemmas which arise from these conditions.
Pre-requisites: Bi 130, 130.1, or consent of the adviser

**Bi 135 POPULATION GENETICS (3 Units)** BM, ES, MB, MBB
Population Genetics (Bi 135) is a 3-unit lecture course that deals with the mathematical and experimental approaches to the genetics of natural populations, especially as they relate to evolution. Emphasis is also given to the interrelationship of genetics to natural selection, inbreeding, gene flow, spontaneous mutations and the bottleneck effects.
Pre-requisites: Bi 130, Bi 140, or consent of the adviser

**Bi 136 MOLECULAR MICROBIOLOGY (3 units)** MB, MBB
Molecular Microbiology (Bi 136) is a 3-unit lecture course that deals with the structures, properties, functions, and interactions of biomolecules in the cellular processes of microorganisms. The molecular bases of certain microbial phenomena are given emphasis. Current trends and/or recent breakthroughs in microbial cell biology and applications are also discussed.
Pre-requisites: Bi 120, Bi 120.1, Bi 140, Bi 140.1, Bi 121, or consent of the adviser

**Bi 141 BIOTECHNOLOGY Lecture (2 units)** BM, ES, MB, MBB
**Bi 141.1 BIOTECHNOLOGY Laboratory (1 unit)** BM, ES, MB, MBB
Biotechnology (Bi 141, Bi 141.1) is a 2-unit lecture and 1-unit laboratory course that focuses on the utilization of plant, animal, and microbial cells in producing beneficial products for the improvement of human life. The course covers molecular- and cellular-level manipulations to design and produce substances and/or organisms useful in solving crucial problems that humans are facing.
Pre-requisites: Bi 130, Bi 140, Bi 140.1, Ch 151, Ch 152, or consent of the adviser
**Bi 142 INTRODUCTORY BIOINFORMATICS Lecture (2 units)**

**Bi 142.1 INTRODUCTORY BIOINFORMATICS Laboratory (1 unit)**

Introductory Bioinformatics (Bi 142, Bi 142.1) is a 2-unit lecture and 1-unit laboratory course that would provide an overview on the inter-disciplinary methods of solving biological problems involving sequences, proteins, and genomes. As an introductory course, the focus would be the functional applications rather than the theoretical aspects of the computational approaches. Various existing methods will be critically described and the strengths and limitations of each will be discussed. The aim is to provide a practical description of the topics, tools, issues and current trends in these and related fields. While no computer experience or programming skills are required, prior exposure to personal computers, e-mail, and the Internet are essential. All homework and coursework must be submitted electronically.

Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser

**Bi 152.1 MICROSCOPY AND MICROTECHNIQUE Laboratory (3 units)**

Microscopy and Microtechnique (Bi 152.1) is a 3-unit laboratory course that covers general and specific methods on preparation of slides using different techniques. Cells are tiny, colorless, and translucent, and details of their structures depend on sectioning and processing using a variety of stains. Much of microscopy depends on microtechniques that provide sufficient contrast to make cellular features visible. Techniques suitable for classroom teaching and for research work are discussed, and scientific bases behind each step are emphasized. General and specific reagents for various techniques are differentiated. The basic/general steps for slide processing are also discussed. Topics to be covered include free-hand sectioning, sectioning using the sliding and rotary microtome, paraffin method, squash and smear technique, maceration, different clearing techniques, and epidermal peels.

Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser

**Bi 153.1 HISTOLOGY, Laboratory (3 units)**
Histology (153.1) is a 3-unit laboratory course that provides a comparative study of the structure and function of mammalian tissues and organs using histochemistry, electron and light microscopy and other imaging techniques.
Pre-requisites: Bi 100, Bi 100.1, Bi 101, Bi 101.1, or consent of the adviser

**Bi 154 INVERTEBRATE ZOOLOGY (3 units)**
Invertebrate Zoology (Bi 154) is a 3-unit lecture course that deals with the morphology, systematics, ecology, and physiology of representative invertebrates.
Pre-requisites: Bi 100, Bi 101, or consent of the adviser

**Bi 155 HUMAN ANATOMY AND PHYSIOLOGY (3 units)**
Human Anatomy and Physiology (Bi 155) is a 3-unit lecture course on the essential principles and concepts of the structure and function of the human body and the mechanisms for maintaining homeostasis. The course will include the study of cells and tissues, and the different organ systems. The course will also provide a clear understanding of how these organ systems function and interact with each other. Certain disease processes that affect the human body may also be discussed. This is intended as a beginner’s course/survey course for students who would like to pursue a medical or paramedical career, as well as a general natural science course.
Pre-requisites: Bi 100, Bi 101, Ch 7, or consent of the adviser

**Bi 172 MARINE BIOLOGY (3 units)**
Marine Biology (Bi 172) is a 3-unit lecture course that deals with the diversity and ecology of marine species across the biological Kingdoms. Marine organisms across habitats—from the intertidal mangroves and seagrass beds to the coral reefs and the open sea—and the various ecological processes that affect them are discussed. Current issues in human impacts on the marine environment are also covered.
Pre-requisites: Bi 170, Bi 170.1, or consent of the adviser

**Bi 174 ECOLOGY OF ANIMAL BEHAVIOR (3 units)**
Ecology of Animal Behavior (Bi 174) is a 3-unit lecture course dealing with the integration of the principles of ecology, evolution and animal behavior. The behavioral patterns of animals are discussed in the context of the evolution of traits in response to such ecological processes as competition, predation, mating, and parental care.
Pre-requisites: Bi 170, Bi 170.1, or consent of the adviser

**Bi 175 BIODIVERSITY (3 units)**
Biodiversity (Bi 175) is a 3-unit lecture course that is designed to help students understand the processes involved in the development of the tremendous variety and variation of life; appreciate the nature and importance of genetic, species, ecosystem and cultural diversity; learn essential methods used in proper documentation of biological resources; and become aware of the issues on loss of global and local biodiversity.
Pre-requisites: Bi 170, Bi 170.1, Bi 171, Bi 171.1, or consent of the adviser

**Bi 176 EVOLUTION (3 units)**
Evolution (Bi 176) is a 3-unit lecture course that focuses on evidences and principles involved in the evolution of plants and animals including man. It also emphasizes the concepts and theories of modern evolutionary biology including the mechanism of genetic change in populations, speciation pattern and geologic change through time.
Pre-requisites: Bi 130, Bi 130.1, Bi 150, Bi 150.1, or consent of the adviser

**Bi 177 PRINCIPLES OF CONSERVATION BIOLOGY (3 units)**
Principles of Conservation Biology (Bi 177) is a 3-unit lecture course that deals with the maintenance, loss, and preservation of global and local biodiversity. Biodiversity and allied fields—among them population genetics, population and community ecology, behavioral ecology, and systematics—are discussed alongside economics and resource management, stressing the multidisciplinarity and rapid development in the search for solutions to problems in conservation biology. Special emphasis is on conservation biology and sustainable development of biological resources in the Philippines, one of the major global biodiversity hotspots.
Pre-requisites: Bi 175 or consent of the adviser

**BI 178 BIOGEOGRAPHY (3 units)**

Biogeography (Bi 178) is a 3-unit lecture course that deals with the geographical distribution patterns of species and the various factors that determine them. The focus is on ecological and evolutionary factors, such as dispersal and vicariance, and anthropological sources of pattern changes over time. Being an interdisciplinary course, pertinent concepts not only in biology but also in geography and geology are discussed.

Pre-requisites: Bi 176 or consent of the adviser

**BI 179 MOLECULAR ECOLOGY (3 units)**

Molecular Ecology (Bi 179) is a 3-unit lecture course that deals with the increasing use of molecular techniques in approaching problems in ecology, evolution, biodiversity, and conservation. Concepts and issues from a wide range of topics including genes and their products, behavior, population structure, microbial diversity, genetically modified organisms (GMOs) are discussed. The course also covers molecular ecology techniques such as molecular marker development, molecular diagnostics, and barcoding.

Pre-requisites: Bi 130, Bi 130.1, Bi 140, Bi 140.1, Bi 170, Bi 170.1, Bi 176, or consent of the adviser

**BI 180 PHYSIOLOGICAL ECOLOGY (3 units)**

Physiological Ecology (Bi 180) is a 3-unit lecture course that deals with the interplay between the physiological mechanisms of organisms and their environment. It delves into how organisms adjust their behavior and physiology in response to environmental changes in order to survive and reproduce successfully. Among the physico-chemical factors affecting the activities of organisms and thus will be focused on in the course are temperature, light availability, water availability, salinity, and pH. This course is particularly significant due to the environmental fluctuations brought about by changing global climate.

Pre-requisites: Bi 170, Bi 170.1, or consent of the adviser
Bi 181 MICROBIAL PHYSIOLOGY Lecture (2 units) \textsuperscript{BM, ES, MB, MBB}

Bi 181.1 MICROBIAL PHYSIOLOGY Laboratory (1 unit) \textsuperscript{BM, ES, MB, MBB}

Microbial Physiology (Bi 181, Bi 181.1) is a 2-unit lecture and 1-unit laboratory course that deals on the study of microbial cell structure and function. Various processes undergone by microorganisms to obtain energy and grow even in unusual environments are discussed.

Pre-requisites: Bi 120, 120.1, Ch 151, Ch 152, or consent of the adviser

BI 184.1 BIOMEDICAL INSTRUMENTATION (3 units) \textsuperscript{BM}

Biomedical Instrumentation (Bi 184.1) is a 3-unit laboratory course that discusses the methods and instrumentation used for measuring physiologic variables of the human body. It provides a perspective on the principles of design, applications, operation, calibration, maintenance, and troubleshooting of biomedical equipment. Topics include biomedical instruments like sensors for bio-potentials (fluid flow, pressure, temperature, respiratory pressure and flow, blood-gas, heart sounds, cell, nerve and muscle potentials, etc.), bioelectric amplifiers and signal processing, surface electrodes, electrocardiographs, cardiac assist devices, intensive care unit instrumentation (e.g. incubator, respirator, anaesthesia machine, dialysis machine), medical imaging, and electrical safety in the medical environment.

Pre/co-requisites: Bi 183, Bi 183.1, or consent of the adviser

Bi 185 INTRODUCTION TO MOLECULAR MEDICINE \textsuperscript{BM, MBB}

Introduction to Molecular Medicine (Bi 185) is a 3-unit lecture course that discusses human diseases and their diagnoses and treatments from a molecular biology perspective. Concepts revolving around the human genome, gene expression, and genetic engineering are tackled to be able to provide a wide perspective on this recent trend and how it makes us understand diseases on a deeper level and anticipate novel therapies to address them.

Pre-requisites: Bi 130, Bi 130.1, Bi 140, Bi 140.1, Ch 151, Ch 152, or consent of the adviser
Bi 186 PHARMACOLOGY AND TOXICOLOGY Lecture (2 units)  
Bi 186.1 PHARMACOLOGY AND TOXICOLOGY Laboratory (1 unit)  
Pharmacology and Toxicology, Lecture and Laboratory (Bi 186/186.1) is a 2-unit lecture and 1-unit laboratory course that offers an introduction to pharmacology and toxicology by providing a background on different naturally occurring and synthetic drugs, including their chemical structures and nomenclatures. It also deals with the effects of these drugs on toxicity and the functions of the different organ systems of the mammalian body. In addition, the following properties of drugs will be dealt with: interactions, toxic effects, and medical applications and antipathogenic capabilities. Emphasis will also be given to the two main areas of pharmacology: pharmacodynamics and pharmacokinetics. The laboratory component demonstrates and investigates the effects of the drugs on toxicity and the functions of different organ systems of the mammalian body using rodents and small non-rodent species as model animals.  
Pre-requisites: Bi 110, Bi 140, Bi 140.1, Ch 151, Ch 152, Bi 155 or Bi 183/183.1, or consent of the adviser

Bi 187 ENDOCRINOLOGY (3 units)  
Endocrinology (Bi 187) is a 3-unit lecture course about the endocrine system, its normal function in human growth and development, and some disorders that affect it. It deals with the biochemistry of hormones, how it affects its target cells and the body as a whole, as well as the different endocrine organs and their regulation. Common disorders of the endocrine system like gigantism, hyperthyroidism and others will also be discussed to better highlight normal endocrine function.  
Pre-requisite: Bi 155 or consent of the adviser

Bi 188 CARDIO-RESPIRATORY BIOLOGY (3 units)  
Cardio-respiratory Biology (Bi 188) is a 3-unit lecture course that deals with the normal anatomy and function of the cardiovascular and respiratory systems, as well as derangements in their normal functioning. Topics included are the normal anatomy and physiology of the heart, blood vessels, and the respiratory system. These include heart
gross anatomy, cardiac conduction, as well as the normal functioning and mechanics of arteries, veins, capillaries and their impact on circulation. The gross anatomy of the respiratory tract, the normal mechanisms for external and internal respiration and its control will be tackled. Common diseases in both systems will be discussed and used to further emphasize cardio-respiratory biology. Common clinical instruments like the stethoscope, ECG, and the like, will also be discussed to give a more practical and complete overview of both systems.

Pre-requisite: Bi 155 or consent of the adviser

**Bi 189 NEUROBIOLOGY (3 units)**

Neurobiology (Bi 189) is a 3-unit lecture course that deals with the normal anatomy and physiology of the central and peripheral nervous system, its effects on human function and behaviour, as well as common diseases that affect it. The course begins with nerve cell biology, impulse transmission, the use of neurotransmitters, eventually leading to the gross anatomy and physiology of the brain, the spinal cord, and the peripheral nerves. Specific nervous functions such as stimulus sensing, motor action, and memory formation among others will also be discussed. Diseases of the nervous system such as stroke, Alzheimer’s, Parkinson’s and others will be used to emphasize the normal structure and function of the nervous system.

Pre-requisite: Bi 155 or consent of the adviser

**Bi 196 CURRENT TRENDS IN BIOLOGY (3 units)**

Current Trends in Biology (Bi 196) is a 3-unit lecture course that discusses recent development in the application of biology in the industry and research.

Pre-requisites: Bi 130, Bi 120, Bi 120.1, or consent of the adviser

*The Junior Term Abroad (JTA) Program*

BS Biology and BS Life Sciences majors can now, in their junior year, take the Junior Term Abroad (JTA) Program, under which they take a semester’s worth of Biology subjects at any one of several partner institutions of the School of Science and Engineering in Asia, Australia, and the USA. The universities currently in roster of
affiliates are: Osaka University in Japan; Hong Kong University of Science and Technology in Hong Kong; Chung-ang University and University of Incheon in Korea; Nanyang Technology University in Singapore; La Trobe University and New Castle University in Australia; and Fordham University and University of San Francisco in the USA. One BS Biology major finished his program at the Hong Kong University of Science and Technology and one BS Life Sciences major finished his at the University of San Francisco. As of this writing, two BS Biology and eight BS Life Sciences majors are on their way to JTA stints in Korea, the United States, and France.

For more information, go to http://sites.google.com/site/sosejta/.
III. FACILITIES

The Science Education Complex (SEC) A houses the Biology Department. The Department has six teaching laboratories that are located in SEC B: Botany Laboratory; Zoology Laboratory; Ecology, Histology, and Developmental Biology Laboratory; Genetics Laboratory; Microbiology Laboratory; and Comparative Anatomy Laboratory.

Also located in SEC B are the research laboratories, wherein faculty members and undergraduate and graduate students conduct their research and thesis. These research laboratories include the Bioassay and Tissue Culture, Genetics and Molecular Biology, Microbiology, and Microtechnique rooms. Among the equipment routinely used by the faculty and students are the inverted microscope; 96-well microplate reader; CO₂ incubator; Biosafety Level (BSL) 2 cabinet; rotary evaporator; PCR Thermocyclers; agarose and PAGE electrophoresis set-ups; gel documentation system; UV-VIS spectrophotometer; deionizer; ultralow freezer; refrigerated centrifuge; autoclaves, orbital shaker incubator; distilling apparatus; and microtome. The Department also has a PowerLab system for teaching and research applications in physiology, biomedical sciences, and sports/exercise studies. The Laboratories are adequately stocked with chemicals and reagents, and the ratio of microscope to student is 1:1 in regular Biology classes.

Located on a separate lot between Alingal Hall and the College Covered Courts is the Biological Research House, where many students stock animal specimens for their theses.

Figure 2 shows several of these facilities.
Figure 2. Biology Facilities. (Top Row, L-R) Specimen collection; Tissue Culture Research Laboratory; Biological Research House; (Middle Row, L-R) Botany Teaching Laboratory; Stockroom; Genetics and Molecular Biology Research Laboratory; (Bottom Row, L-R) Comparative Anatomy Teaching Laboratory; Microbiology Research Laboratory; Zoology Teaching Laboratory.
IV. RESEARCH

The Departmental Research Thrust is BioME: Biodiversity for Medicine and the Environment.

The Department of Biology offers research opportunities that reflect the breadth of the discipline today. This is a direct result of the multidisciplinary nature of modern biology—where applications of common principles, concepts, and methods from mathematics, physics, chemistry, and computer science provide fresh perspectives into biological problems such as how an organism replicates itself; the function of microorganisms in the gut of mammals; and how organisms and communities respond to environmental pressures like infection, nutrient depletion, and climate change. Because of this, our students are exposed to a wide range of research techniques that encompass all levels of biological organization—from molecular and cellular to populations and ecosystems.

To provide organization, and to reflect the research interests of our current faculty, we cluster our research activities into six fields: Bio-education Research; Biosystematics and Species Discovery; Health Research; Microbial Biotechnology; Molecular Biology and Genetics; and Morpho-anatomy and Physiology. Many projects in the department show an overlap among these fields. Examples are the molecular fingerprinting studies in Moringa oleifera (molecular biology, ecology and systematics); characterization of the virgin coconut oil fermentation process (molecular biology and biotechnology, microbiology); and screening of plant natural products for medicinal purposes (biomedical science, microbiology, molecular biology and biotechnology).

We actively apply for grants to fund our research activities from both internal and external funding sources. Current research activities are funded by the Department of Science and Technology, Department of Agriculture, University Research Council, and the Loyola Schools Scholarly Work Faculty Grant. The faculty have had their researches published in local and international journals, including those indexed in SCOPUS and Thomson Reuters-ISI.
Existing Projects

Mobile Diagnostics for Tropical and Lifestyle Diseases
Project Leader: Merab A. Chan, Ph.D.

Geometric Morphometrics as a Tool for Conservation Biology and Biomedicine
Project Leader: Ronald Allan L. Cruz, M.Sc.

Aquatic Biodiversity and Conservation of Philippine Streams; Evolutionary Biology and Taxonomy of Stream-Dwelling Beetles and Decapods
Project Leader: Hendrik Freitag, Ph.D.

Novel Molecules from Novel Microorganisms
Project Leader: Ronie J. Calugay, Ph.D.

DNA Fingerprinting and DNA Sequence Based Genetic Diversity Analyses of Selected Valuable Crops in the Philippines (Molecular Biology, Plants)
Project Leader: Vivian A. Panes, Ph.D.
V. STUDENT ORGANIZATION

Biology and Life Sciences majors have always been active members of the Ateneo community, primarily through the various student organizations that they join. Serving as their home organization in particular is the Ateneo Biological Organization eXplore eXperience eXcel (BOx). It was formed in October 2004 to address the need of the Biology majors for a holistic, immersive experience in the biological sciences. Its main goal at its inception was to provide its members with an avenue to explore and experience various sub-disciplines of biology and to excel in their chosen endeavors. Now an accredited student organization of the Loyola Schools, BOx has gone beyond academic and research-oriented formation to become, quite simply, one of the most formative, indispensable, and life-changing experiences that a Biology or Life Sciences major could have. By promoting the unity of the entire biology community through its “AdMU One Bio” thrust and helping its members explore, experience, and excel in diverse biological interests, BOx has become a family that knows that the best way to study life is to live it.

The “AdMU One Bio” theme is not merely a catch-phrase; it has embodied BOx’s success at unifying the batches of Biology and Life Sciences. That, perhaps, counts as BOx’s greatest achievement. Other milestones for the organization are its being a founding member of the Biology Majors Alliance of the Philippines (BMAP); seven-time basketball champions in the Intramurals Athletics Council (IAC); organizers of the annual Biology Night and Biolympics sportsfest; and premier advocate of animal welfare and biodiversity within the campus. In the school year 2011-2012, BOx was one of three finalists for Most Outstanding Student Group in the Loyola Schools Awards for Leadership and Service. BOx was also a finalist for Best Executive Board and Best New Project (Haynayan: BioCamp 2012) in the Council of Organizations of Ateneo (COA) Awards.
Over 400 Biology and Life Sciences majors are currently members of BOx. Many majors also join the Pre-Med Society of Ateneo (PMSA), which was founded in 1975 by a Biology major.
VI. ALUMNI

The Department of Biology is proud of its over 1000 alumni, many of whom have excelled in and become leaders in their chosen careers. A significant majority are in the medical fields, with most others in research, the academe, industry, and business. Among the Metro Manila-based medical school options, the five most popular in the last ten years (2001 to 2011) have been 1) Ateneo School of Medicine and Public Health (ASMPH); 2) University of Santo Tomas (UST) Faculty of Medicine and Surgery; 3) University of the East Ramon Magsaysay Memorial Medical Center (UERMMMC); 4) University of the Philippines-Manila College of Medicine; and 5) St. Luke's-William H. Quasha College of Medicine. Many alumni have also gone to other medical schools outside Metro Manila, graduate studies in biology, and direct employment. These data are summarized in Figure 3.

Figure 3. Where the BS Biology alumni have gone after graduation.
Our alumni perform very well in the Physician Board Examinations, with a number having made it into the Top 10. The following alumni have placed:

Elizabeth Ann M. Fajardo (BS Biology '77)  
- Eighth, June 1982 Exams

Edmundo G. Gonzalez (BS Biology '77)  
- First, December 1982 Exams

Jose Godofredo P. Diaz (BS Biology '79)  
- Fourth, December 1985 Exams

Jose Adriano Mateo M. Santiago (BS Biology '82)  
- Fifth, August 1987 Exams

Benjamin S. Bernandino, Jr. (BS Biology '90)  
- Seventh, February 1996 Exams

Carmencita R. Esquivel (BS Biology '95)  
- Sixth, February 2005 Exams

Carlo Rodrigo S. Carreon (BS Biology '96)  
- Second, February 2002 Exams

Kristine T. Lo (BS Biology '96)  
- Ninth, February 2002 Exams

Maria Czarina M. Acelajado-Onoya (BS Biology '98)  
- Ninth, August 2003 Exams

Mia Isadora L. Loyola-Fronteras (BS Biology '99)
- Fifth, February 2005 Exams

Patrick Leonard G. Co (BS Biology '00)
- First, August 2006 Exams

Tamara Louise J. Razon (BS Biology '01)
- Second, February 2007 Exams

Jeffrey P. Mendoza (BS Biology '02)
- Seventh, August 2007 Exams

Abigail R. Arana (BS Biology '02)
- Second, February 2008 Exams

Arik Paolo Isaiah C. de la Cruz (BS Biology '02)
- Third, February 2008 Exams

Gentry George T. King (BS Biology '03)
- Third, August 2008 Exams

Gwenalyn Gail C. Garcia (BS Biology '05)
- Fourth, August 2010 Exams

The following are just a few of the outstanding alumni of the Department:

Raul K. Suarez, Ph.D. (BS Biology '73)
- Professor, University of California-Santa Barbara

Alfred H. Belmonte, M.D. (BS Biology '74)
- Student Affairs Coordinator, University of Santo Tomas (UST) Faculty of Medicine and Surgery
- Associate Professor, UST Faculty of Medicine and Surgery
- President, Philippine College of Surgery

Telesforo E. Gana, Jr., M.D. (BS Biology '74)
- Chief, Urology Division, Philippine General Hospital
- Board of Governors, Philippine College of Surgeons
- Board of Trustees, PGH Medical Foundation, Inc.

Rey Gerardo E. Bacarro (BS Biology '77)
- Former President and General Manager, Pfizer, Inc.
- President, Board of Trustees, Kythe

Manuel M. Mariano, M.D. (BS Biology '78)
- CEO, Manuel M. Mariano Hospital and Medical Center
- Board of Trustees, St. Luke's College of Medicine

Gina S. Itchon, M.D. (BS Biology '80)
- Head, Department of Preventive and Community Medicine, College of Medicine, Xavier University

Teofilo L. Lee Chiong, Jr., M.D. (BS Biology ’82)
- Medical Director, Sleep Center, National Jewish Medical and Research Center, Denver CO
Dominic Paul T. Piamonte, M.D., Ph.D. (BS Biology '83)
- Group Manager, Area Manager, Interaction Design, Volvo Technology Corporation, Sweden

Maria Eufemia C. Yap, M.D., M.Sc. (BS Biology '83)
- Director, Health Unit, Ateneo Graduate School of Business
- Associate Dean, Ateneo School of Medicine and Public Health

Angela Nina Ann R. Ingle, Ph.D. (BS Bio '85)
- Conservation ecologist, Wildlife biologist and educator

Norman Dennis E. Marquez, M.D. (BS Biology '87)
- Director, Health Sciences Program, School of Science and Engineering, Ateneo de Manila University

Caroline Joan S. Picart, Ph.D. (BS Biology '87)
- Internationally recognized scientist, author, and radio show host (“The Dr. Caroline ‘Kay’ Picart Show”)

Ian Mark Garret M. Gampon, M.D. (BS Biology '92)
- Assistant Professor, Department of Pediatrics, Mount Sinai School of Medicine, New York NY

Jo Marie V. Acebes, D.V.M., Ph.D. (cand.) (BS Bio '94)
- Former Humpback Whale Research and Conservation Project (HWRCP) consultant, World Wide Fund for Nature
- Cetacean expert
Jan Denton A. Chua, M.D., M.B.A. (BS Biology ‘99)
- CEO, iScan Electronics, Inc.
- Managing Director, HB Calleja National Heart Institutes

Catherine Denise R. Jayme (BS Biology ’00)
- Senior Manager, Executive Education and Development, Lee Kuan Yew School of Public Policy, National University of Singapore
VII. LOCATION AND CONTACT INFORMATION

The Biology Department office, classrooms, and laboratories are all located at the Science Education Complex (SEC), particular SEC A and SEC B. The Biology Department is at SEC A105 and the laboratories are at SEC B. Figure 3 shows the location of these.

![Figure 4. Location of the Biology Department offices and laboratories in the Loyola Schools campus. Figure taken from the Ateneo de Manila University website (http://ateneo.edu/map/ls-map.htm).](image)

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**Fax**
+63 (2) 426-1034
E-mail
biology@ateneo.edu

Web
VIII. HOW TO APPLY

Note: The following information is taken from the official Ateneo de Manila University website (http://ateneo.edu), to which all interested applicants are referred for further information.

All freshman applicants must secure an application form from the Office of Admission and Aid, G/F Kostka Hall within a designated period from June to August. The application and testing fee for applicants from local high schools is PhP500.00. The application fee for applicants from high schools abroad is US$50.00 or PhP2,800.00.

Freshman applicants must then fill out and submit the completed application form and exam permit, together with all other requirements, at the Office of Admission and Aid on or before the designated date in August. **Incomplete Application Forms will not be processed.**

Registration for the Ateneo College Entrance Test (ACET) for freshmen (local and foreign) who will be taking the exam is until a designated date in August. The ACET will be administered on two designated Saturdays in September at the Loyola Heights campus from 7:30 AM to 12:30 PM, and 1:30 PM to 6:30 PM. This exam covers the areas of Mathematics, English, and General Intelligence.

Applicants presently residing abroad may submit the result of their Scholastic Aptitude Test I (SAT I) taken this year or two years ago in lieu of the ACET.
IX. FREQUENTLY ASKED QUESTIONS

1. Are BS Biology and BS Life Sciences honors programs?
   Yes, only those that have made it to the Top 15% of ACET takers can be admitted to these programs.

2. What are the retention requirements for BS Biology and BS Life Sciences majors?
   For a major of the BS Biology or BS Life Sciences program to stay in his/her program in the succeeding school year, he/she must have:
   - Had a yearly cumulative QPI of 2.50 in the previous school year;
   - Passed Bi 100/100.1 General Biology I and Bi 101/101.1 General Biology II in his/her first full year in the program;
   - Not had more than three (3) D’s and F’s in science subjects (chemistry, mathematics, physics) for the duration of his/her program;
   - Not had more than three (3) D’s in Biology subjects for the duration of his/her program;
   - Not failed any Biology subject; and
   - Been recommended for retention by at least two (2) members of the Department of Biology faculty and undergone an interview with the Department Chairperson and/or Undergraduate Student Coordinator.

3. Are BS Biology and BS Life Sciences difficult courses?
   They are certainly challenging courses, with some semesters having two to three science courses with laboratories, but with the right attitude toward learning and diligent studying, students will reap all the benefits of the rigorous biological education provided by the Department.

4. Will BS Biology and BS Life Sciences majors have the opportunity to engage in non-academic activities?
Certainly. There are over 50 student organizations to choose from, not including the varsity athletics teams. Among these, most important is the Ateneo Biological Organization eXplore eXperience eXcel (BOx), recognized as the home organization of BS Biology and BS Life Sciences majors. It allows its members to bond with fellow majors, showcase their talents, develop their knowledge and skills in biology, serve the community and environment through outreach projects, and engage in sports (through the various BOx sports teams) and arts (through BeatBOx, the organization’s dance group, and Voice BOx, the organization's singing group). Many majors are also members of the Pre-Med Society of Ateneo (PMSA).

5. Is a medical career the only option for graduates of BS Biology and BS Life Sciences?
   No. While a significant majority of our majors have gone on to pursue medical careers, many have also found success in careers in the academe, research, industry, government, and business. Several of our alumni have gone on to take graduate studies in diverse biological fields and even in non-scientific endeavours such as law and business (see Figure 3). With the wide diversity of microbiology-related courses offered, our majors may also not be eligible for becoming registered microbiologists.

6. Can graduates of BS Biology and BS Life Sciences get into any medical school of their choice?
   Nearly one hundred percent of our majors who took the National Medical Admissions Test (NMAT) have been able to get into at least one of the top medical schools in the country, including Ateneo School of Medicine and Public Health (ASMPH). Among the Metro Manila-based medical school options, the five most popular in the last ten years (2001 to 2011) have been 1) ASMPH; 2) University of Santo Tomas (UST) Faculty of Medicine and Surgery; 3) University of the East Ramon Magsaysay Memorial Medical Center (UERMMMC); 4) University of the Philippines-Manila College of Medicine; and 5) St. Luke's-
William H. Quasha College of Medicine (refer to Figure 3). Some have been accepted in medical schools abroad.

To ease the transition from BS Biology or BS Life Sciences to the medical program of the ASMPH, the three required cognates (HSC 55 Introduction to Epidemiology, DS 175.80 Political Economy of Health and Development, LS 13 Principles of Management for the Service Sector) are considered Biology Specialization Courses for BS Life Sciences majors under the Biomedical Sciences Specialization.

7. **What is/are the difference/s between BS Biology and BS Life Sciences?**

The following table shows the basic differences between the two courses:

<table>
<thead>
<tr>
<th>BS Biology</th>
<th>BS Life Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-year curriculum (180-181 units)</td>
<td>4-year curriculum (162 units)</td>
</tr>
<tr>
<td>Comprehensive and holistic approach</td>
<td>Specialized approach</td>
</tr>
<tr>
<td>8 Biology Electives, taken from any Area of Specialization</td>
<td>6 Specialization Electives, taken from one Area of Specialization</td>
</tr>
<tr>
<td>Summer classes only during junior and senior year</td>
<td>Summer classes during sophomore, junior and senior years</td>
</tr>
<tr>
<td>Thesis and Practicum options</td>
<td>Thesis option only</td>
</tr>
</tbody>
</table>

8. **What are the differences among these courses and BS Health Sciences or other pre-med courses in Ateneo?**

BS Biology and BS Life Sciences provide rigorous and comprehensive education in the pertinent biological sciences, such as genetics, anatomy, physiology, and microbiology. BS Health Sciences, whose approach toward pre-medical training is non-traditional like the curriculum of the Ateneo School of Medicine and Public Health (ASMPH), emphasizes more on chemistry and subjects in management and the social sciences. Health Sciences majors are required to take only eight units of preparatory biology subjects (General Biology, Cell and Molecular Biology). BS Psychology is also recognized as a pre-med program; their majors take courses in botany, zoology, and another biology subject (usually comparative anatomy or cell and molecular biology).