Department of Biological and Physical Sciences

MAJORS

Biology (BS)
Biology for Secondary Education (BS)
Medical Laboratory Science, offered cooperatively with NAACLS-accredited partner institutions (BS)

MINORS

Biology
Chemistry
Environmental Studies

CERTIFICATES

One Health

DEGREE PROGRAM AFFILIATIONS OFFERED

Nursing with the Goldfarb School of Nursing in St. Louis (2/2)
Occupational Therapy with Washington University in St. Louis (3/2)
Dual Degree Program in Engineering with University of Missouri-Kansas City and with Washington University in St. Louis
Chiropractic with Logan University of Chiropractic in St. Louis (3/3)

MISSION

The mission of the Department of Biological and Physical Sciences is to inspire students to embrace a lifetime appreciation and understanding of the biological sciences by providing essential, rigorous, and authentic science experiences. The department offers a variety of program and curriculum choices that prepare students to enter the scientific community.

FACULTY

Main Campus

Elizabeth Rayhel, associate professor and department chairperson
Julie Hamdi, assistant professor
Kelly Lane-deGraaf, assistant professor
Stephenie Paine-Saunders, associate professor
Minh Truong, associate professor

Mercy Hospital

Beverly B. Kraemer, M.D.-Medical Director for the MLS programs.

Terry Taff, MA, MT (ASCP) SM -Laboratory Manager and Program Director

BACCALAUREATE DEGREE AND RESIDENCY REQUIREMENTS

All requirements for an undergraduate degree are listed under academic policies and regulations in the introductory section for undergraduate programs in this catalog. These requirements include general education requirements and a graduation requirement of at least one course in religion or theology. In addition to the degree and residency requirements of the university and the department, all students must take a nationally normalized science exit exam.

MAJOR APPROVAL FOR BIOLOGY AND MEDICAL LABORATORY SCIENCE PROGRAMS

Major approval is required during the second semester of the sophomore year, or after the completion of 45 credit hours at Fontbonne. For transfer students, major approval is required after completing the equivalent of one full semester (a minimum of 12 credit hours) at Fontbonne. Students seeking major approval must have a minimum cumulative grade point average (GPA) of 2.5 on a 4.0 scale as well as a GPA of 2.5 in the courses specified below. All courses for the major must be passed with a C- or better.

- Three courses in biology (including one introductory biology course)
- Two courses in chemistry

MAJOR APPROVAL FOR BIOLOGY FOR SECONDARY EDUCATION

In addition to satisfying major approval for the biology degree, students seeking certification for secondary education must apply for acceptance to the teacher certification program. Said application should be made at least one semester prior to the planned semester for student teaching/field experience. Acceptance into the teacher certification program is based upon final validation of professional (3.00) and cumulative (2.75) GPA; final validation of a 3.00 GPA in relevant content areas for middle/secondary candidates; and approval by the Teacher Education Unit. Without approval by the Teacher Education Unit, students cannot enroll for student teaching/field experience.

GENERAL EDUCATION REQUIREMENTS

The general education requirements are presented in the undergraduate academic information section in this catalog. A course that meets a general education requirement may also meet a course requirement for the major or a course requirement in another discipline. For the majors within the biological and physical sciences, the general education coursework will require 44-45 credits, depending upon the math and life-science courses taken.

THE BIOLOGY CORE

The Biology core of courses gives students a foundation in Biology, while allowing the opportunity for students to focus their upper-division coursework in areas of interest. The subcategories include coursework in Organismal Biology, Cell and Molecular Biology, Environment and Ecology, and Professional Skills.

MAJOR IN BIOLOGY

The major in Biology provides a background in the Biological Sciences. Students majoring in Biology will be equipped to pursue employment in the field, post-graduate study in Biology or Human or Animal Medicine, as well as programs in Dentistry, Physician Assistant, or other life-science or health-related fields of study.

General Education Requirements in Biology

The following specific general education courses meet the requirements for the biology major. All other general education courses are unspecified.

MTH 150 Calculus and Analytic Geometry I (4 credits)
BIO 112 General Biology I with Lab (4 credits)*
CHM 106 General Chemistry I with Lab (4 credits)

*BIO 108 (3 credits), with recommendation of instructor and approval of department chair, may substitute for BIO 112. This substitution would not transfer to other institutions, would not satisfy some medical- or graduate-program requirements, and the student must adjust total credit hours accordingly.

Courses Required in Biology

THE BIOLOGY CORE (17-18 CREDITS)

BIO 112 General Biology I (counted as GER)
BIO 114 General Biology II with Lab (4 credits)
BIO 196 Biology Seminar I (2 credits)
BIO 212 Genetics (3 credits)
BIO 318 Cell and Molecular Biology (3 credits)
BIO 496 Biology seminar II (2 credits)

Plus any one of the following:
BIO 204 Mathematical Modeling and Experimental Design (3)
BIO 214 Molecular Genetics of Development (3)
BIO 306 Kinesiology and Biomechanics (4)

BIOLOGY SUBCATEGORIES

Organismal Biology minimum of two courses required (7-8 credits)
BIO 250 Microbiology with Laboratory (4 credits)
BIO 207 Plant Biology with Laboratory (4 credits)
BIO 220 Anatomy and Physiology I with Lab (4 credits)
BIO 222 Anatomy and Physiology II with Lab (4 credits)
BIO 260 Comparative Anatomy (3 credits)
BIO 306 Kinesiology/Biomechanics with Lab (4 credits)

Cell and Molecular Biology minimum of two courses required (6 credits)
BIO 324 Techniques in Tissue Culture (3 credits)
BIO 326 Molecular Techniques Laboratory (3 credits)
CHM318 Biochemistry (3 credits)
BIO 322 Immunology (3 credits)
BIO 325 Emerging Infectious Disease (3 credits)

Ecology/Evolution one course required
(3-4 credits)
BIO 160 Animal Behavior (3 credits)
BIO 271 Field Ecology (4 credits)
BIO 320 Evolutionary Biology (3 credits)
BIO 321 Conservation Biology (3 credits)
BIO 421 Conservation Medicine (3 credits)

Professional Skills minimum of 2 credits, maximum of 10 credits.
BIO 295 / 495 Department Research (2-4 credits); may be taken multiple times
BIO 497 Biology Internship (1-4 credits)
BIO 203 Science and Society (3 credits)

Additional Courses Required in Chemistry (12 credits)

CHM 106 General Chemistry I with Lab (counted as GER)
CHM 108 General Chemistry II with Lab (4 credits)
CHM 210 Organic Chemistry I (3 credits)
CHM 211 Organic Chemistry I Laboratory (2 credits)
CHM 212 Organic Chemistry II (3 credits)

Optional Chemistry courses*

(required for chemistry minor)
CHM 213 Organic Chemistry II Laboratory (2 credits)
CHM 318 Biochemistry (3 credits)

* recommended for many postgraduate programs.

Additional Courses Required in Mathematics and Computer Science (6-7 credits)

MTH 125 Biostatistics (3)**
MTH 150 Calculus with Analytic Geometry I (counted as GER) (Note: this course has prerequisite of MTH 110 OR MTH105 and MTH108)
MTH 315 Advanced Statistics (3 credits) OR
MTH 151 Calculus with Analytic Geometry II (4)

**MTH 115 can be substituted for MTH 125

Additional Courses Required in Physics (8 credits)

PHY 208 College Physics I with Lab (4 credits)
PHY 210 College Physics II with Lab (4 credits)
OR
PHY 218 Engineering Physics I with Lab (4 credits)
PHY 220 Engineering Physics II with Lab (4 credits)

Additional Graduation Requirements

BIO 413 Exit Exams (0 credits);
Any religion or theology course;
Completion of all General Education Requirements, including a Bridge course and two courses that are designated writing intensive, at least one of which is at the 300 level.

MAJOR IN BIOLOGY FOR SECONDARY EDUCATION

Teacher Certification Requirements

Full information for teacher certification policies, procedures, and requirements are found in the section titled Teacher Certification at Fontbonne University following the graduate programs' section in this catalog. Those interested in combining a major in biology with secondary certification must review this section in its entirety.

General Education Requirements

The following specific general education courses meet the requirements for the biology major with secondary certification

CIS 103 Computer Technology: Applications for Teachers (3 credits)
COM 102 Public Speaking (3 credits)
EDU 234 Philosophical Foundations of Education (3 credits)
GOV 101 US and MO Constitutions (1 credit)
MTH 150 Calculus with Analytical Geometry I (4 credits)
PSY 200 Developmental Psychology (3 credits)
BIO 112 General Biology I with Lab (4 credits)*
CHM 106 General Chemistry I with Lab (4 credits)
OR
CHM 128 General, Organic and Biological Chemistry I with Lab (4 credits)

*BIO 108 (3 credits), with recommendation of instructor and approval of department chair, may substitute for BIO 112. This substitution would not transfer to other institutions, and the student must adjust total credit hours accordingly.

Courses Required in Education

EDU 201 Introduction to Classroom Teaching–Middle/Secondary (3)
EDU 203 Survey of learners with exceptionalities (3 credits)
EDU 234 Philosophical Foundations of Education (3 credits)
EDU 350 Methods of Teaching Reading in the Content Area (2 credits)
EDU 401 Classroom/Behavior Management Techniques (3 credits)
EDU 447 Planning for Instruction and Assessment—Middle and Secondary (3 credits)
EDU 451 Student Teaching at the Secondary Level (12-16 credits)

Additional Courses Required in Biology

THE BIOLOGY FOR EDUCATION CORE

(14 credits)
BIO 112 General Biology I with Lab (counted as GER)
BIO 114 General Biology II with Lab (4 credits)
BIO 196 Biology Seminar I (2 credits)
BIO 212 Genetics (3 credits)
BIO 318 Cell and Molecular Biology (3 credits)
BIO 371 Methods of Teaching Biology in Secondary (2 credits)

BIOLOGY SUBCATEGORIES

Organismal one course required (minimum of 3 credits)

BIO 250 Microbiology (4 credits)
BIO 207 Plant Biology (4 credits)
BIO 220 Anatomy and Physiology I (4 credits)
BIO 222 Anatomy and Physiology II (4 credits)
BIO 260 Comparative Anatomy (3 credits)
BIO 306 Kinesiology/Biomechanics (3 credits)

Cell and Molecular one course required (3 credits)

BIO 324 Techniques in Tissue Culture (3 credits)
BIO 326 Molecular Techniques Laboratory (3 credits)
CHM 318 Biochemistry (3 credits)
BIO 322 Immunology (3 credits)
BIO 321 Conservation Biology (3 credits)
BIO 421 Conservation Medicine (3 credits)

Ecology/Evolution both courses required (7 credits)

BIO 271 Field Ecology (4 credits)
BIO 320 Evolutionary Biology (3 credits)

Professional Skills (one course required)

BIO 203 Science and Society (3 credits)

Courses Required in Chemistry (7 or 12 credits)

Either chemistry sequence will satisfy the major.
CHM 128 General, Organic and Biological Chemistry I with Lab (counted with GER)
CHM 228 General, Organic and Biological Chemistry II with Lab (4 credits)
CHM 328 General, Organic and Biological Chemistry III (3 credits)
OR
CHM 106 General Chemistry I with Lab (counted with GER)
CHM 108 General Chemistry II with Lab (4 credits)
CHM 210 Organic Chemistry I (3 credits)

CHM 211 Organic Chemistry I Laboratory (2 credits)
CHM 212 Organic Chemistry II (3 credits)

Optional Chemistry Courses (Required for chemistry minor)

CHM 213 Organic Chemistry II Laboratory (2 credits)
CHM 318 Biochemistry (3 credits)

Courses Required in Mathematics and Computer Science (6-7 credits)

MTH 125 Biostatistics (3 credits)**
MTH 150 Calculus with Analytic Geometry I (counted with GER) (This course has prerequisite of MTH 110 or both of MTH 105 and MTH 108)
MTH 315 Advanced Statistics OR
MTH 151 Calculus with Analytic Geometry II

**MTH 115 can be substituted for MTH 125

Courses Required in Physics (4 credits)

PHY 208 College Physics I with Laboratory (4 credits)
OR
PHY 218 Engineering Physics I with Laboratory (4 credits)

Additional Graduation Requirements

- BIO 413 Exit Exams (0 credits);
- Any religion or theology course;
- Completion of all General Education Requirements, including a Bridge course and two courses that are designated writing intensive.

MAJOR IN MEDICAL LABORATORY SERVICES (FOUR-YEAR CURRICULUM)

The program in MLS is offered in cooperation with NAALCS-accredited clinical teaching labs at various partnering institutions. Fontbonne University offers two options for students interested in pursuing certification in MLS. The single-major curriculum can be completed in four years, leading to the B.S. in MLS; the double-major option requires five years; leading to double majors in Biology and MLS. Clinical internship placements, which are required for the MLS major, are awarded on a competitive basis and cannot be guaranteed by the university. After successful completion of a NAACLS accredited MLS program and receipt of the BS degree, students are eligible to sit for the American Society for Clinical Pathology (ASCP) MLS certification examination. A list of current partnering institutions can be obtained by contacting the department.

General Education Requirements

The following specific general education course must be chosen to meet the requirements for the biology major:

MTH 150Calculus with Analytic Geometry I (4 credits)
BIO 112 General Biology I with Lab (4 credits)*
CHM 106 General Chemistry I with Lab (4 credits)

*BIO 108, with recommendation of instructor and approval of department chair, may substitute for BIO 112. This substitution would not transfer to other institutions, and the student must adjust total credit hours accordingly.

Biology Courses Required (minimum credits)

THE BIOLOGY CORE (15 CREDITS)

BIO 112 General Biology I with Lab (counted as GER)*
BIO 114 General Biology II with Lab (4 credits)
BIO 196 Biology Seminar I (2 credits)
BIO 212 Genetics (3 credits)
BIO 214 Molecular Genetics of Development (3 credits)
OR
BIO 224 Introduction to MLS (3 credits; taken at Mercy Hospital**)
BIO 318 Cell and Molecular Biology (3 credits)

**Only two students/year will be enrolled in this course, chosen on a competitive basis

BIOLOGY SUBCATEGORIES

Organismal Biology 3 courses required (12 credits)
BIO 250 Microbiology with Lab (4 credits)
BIO 220 Anatomy and Physiology I with Lab (4 credits)
BIO 222 Anatomy and Physiology II with Lab (4 credits)

Cell and Molecular Biology 2 courses required
CHM 318 Biochemistry (3 credits)
BIO 322 Immunology (3 credits)

Courses Required in Chemistry

CHM 106 General Chemistry I with Lab (counted as GER)
CHM 108 General Chemistry II with Lab (4 credits)

CHM 210 Organic Chemistry I (3 credits)
CHM 211 Organic Chemistry I Laboratory (2 credits)
CHM 318 Biochemistry (counted above as a cell and Molecular elective)

Optional Chemistry Courses (required for chemistry minor)

CHM 212 Organic Chemistry (3 credits)
CHM 213 Organic Chemistry II Laboratory (2 credits)

Courses Required in Mathematics and Computer Science (3 credits)

MTH 125 Biostatistics (3 credits)**
MTH 150 Calculus with Analytic Geometry I (counted with GER) (note: this course has prerequisites of MTH 110 or both of MTH105 and MTH108)

**MTH 115 can be substituted for MTH 125

Courses Required in Physics (8 credits)

PHY 208 College Physics I with Lab (4 credits)
AND
PHY 210 College Physics II with Lab (4 credits)

OR
PHY 218 Engineering Physics I with Lab (4 credits)
AND
PHY 220 Engineering Physics II with Lab (4 credits)

Courses Required in Medical Laboratory Sciences (2 semesters or 24 credits)

The Medical Laboratory Internship includes lectures and experiential training in the laboratory techniques and procedures utilized in a hospital setting. Fontbonne University is a partner with NAACLS-accredited teaching clinical laboratories to provide these opportunities, however acceptance into an internship is highly competitive and not guaranteed by the university. In the absence of an internship, students would complete the degree in Biology and have the option of pursuing the double major with MLS (see below).

ADDITIONAL GRADUATION REQUIREMENTS:

- BIO 413 Exit Exams (0 credits);
- Any religion or theology course;
- Completion of all General Education Requirements, including a Bridge course and two courses that are designated writing intensive.

THE DOUBLE MAJOR IN BIOLOGY AND MEDICAL LABORATORY SCIENCES (FIVE-YEAR CURRICULUM)

For students wishing to double major by combining all of the requirements for the Biology major and the MLS major, the 32 credits of the senior year will include the following:

BIO 496 Biology seminar II (2 credits)
BIO 370 or BIO 271 Evolutionary Biology **OR** Field Ecology (3-4 credits)
BIO/CHM 495 Department Research (3-4 credits)
BIO 324 or BIO 326 Tissue Culture or Molecular techniques laboratory (3)
MTH 151 or MTH 315 Calculus with Analytic Geometry II or Advanced Statistics (3-4)
BIO, CHM or General Elective Hours (credits required will vary)

CERTIFICATES

CERTIFICATE IN ONE HEALTH

Fontbonne University's Department of Biological and Physical Sciences partners with the Institute for Conservation Medicine at the St. Louis Zoo to offer the Certificate in One Health. One Health is a growing field that integrates the disciplines of animal health, human health and conservation into a unified approach to health. Human health and animal health are increasingly linked, so the student interested in any of these fields will benefit from the background provided by the One Health curriculum. Professionals in the field address such problems as emerging infectious diseases, colony collapse in bees, natural-disaster management, nature-deficit disorder, antibiotic resistance in bacteria and much more. After completion of the prerequisite courses, students must apply for acceptance into the certificate program.

Prerequisites:

BIO 112 General Biology I (4 credits)
BIO 114 General Biology II (4 credits)
BIO 204 Modeling and Experimental Design (3 credits)
BIO 212 Genetics (3 credits)
BIO 250 Microbiology (4 credits)
BIO 271 Field Ecology (4 credits)
MTH 125 Biostatistics (3 credits)

Courses for the certificate (19-22 credits total):

BIO 321 Conservation Biology (3 credits)
BIO 322 Immunology (3 credits)
BIO 325 Emerging Infectious Disease (3 credits)
BIO 421 Conservation Medicine (3 credits)
BIO 497 One Health Internship (1-4 credits)*

One Health Electives (6 credits total to be chosen from the following):

BIO 320 Evolutionary Biology (3 credits)
HCM 330 Public Health Administration (3 credits)
HCM350 Legal Issues in Healthcare (3 credits)
PHL 228 Environmental Ethics (3 credits)
PSY 350 Environmental Psychology (3 credits; prerequisite: Introductory Psychology)

MINORS

CHEMISTRY

The minor in Chemistry requires the following 21 credits of Chemistry coursework
CHM 106 General Chemistry I with Lab (4 credits-meets physical science GER)
CHM 108 General Chemistry II with Lab (4 credits)
CHM 210 Organic Chemistry I (3 credits)
CHM 211 Organic Chemistry I Laboratory (2 credits)
CHM 212 Organic Chemistry II (3 credits)
CHM 213 Organic Chemistry II Laboratory (2 credits)
CHM 318 Biochemistry (3 credits)

BIOLOGY

The Biology Minor requires the following 22 credit hours of Biology coursework; and includes an introductory chemistry course as prerequisite to some of the classes.

CHM 106 or 128 should be chosen to meet the Pillar in Physical Sciences

BIO 112 General Biology I with Lab (4 credits-meets Life Science GER)
BIO 114 General Biology II with Lab (4 credits)
BIO 212 Genetics (3)
BIO 207 Plant Biology with Lab (4 credits)
BIO 250 Microbiology with Lab (4 credits)
BIO 318 Cell and Molecular Biology (3 credits)

ENVIRONMENTAL STUDIES

The environmental studies minor requires 21-22 credits of coursework including
BIO 108 Introduction to Life Science (3 credits-meets Life Science GER)
OR
BIO 112 General Biology I
(4 credits-meets Life Science GER)

BIO 207 Plant Biology with Lab (4 credits)
BIO 271 Field Ecology (4 credits)
PHL 228 Environmental Ethics (3 credits)
PSY 350 Environmental Psychology (3 credits)
PSY/BIO 490 or 495 or 496 or 497 Independent Study, Research, Seminar, or Internship (4 credits)

GENERAL STUDIES: HEALTH
GENERAL STUDIES: SCIENCE

As part of the University General Studies program, the Department of Biological and Physical Sciences offers two areas of emphasis; Health and Science. The general studies majors offer students a path to graduation that combines generalized study with disciplinary focus, leading to a Bachelor of Arts degree. General Studies Major requirements include:

- All Residency, Major, General Education, and Graduation Requirements as described in the Fontbonne University Catalog.
- A minimum GPA of 2.0 in the major is required for graduation.
- A minimum of 18 hours of course work in an area of emphasis, 15 hours of electives, as defined by departments, and a capstone experience; listed below.

THE GENERAL STUDIES: HEALTH

General Education Courses

MTH 105 or MTH 110 College Algebra **OR** Precalculus
MTH 115 Introduction to Statistics*
PSY 100 Introduction to Psychology
SOC 100 Introduction to Sociology
PHL 221 or PHL 260 Business Ethics **OR** Contemporary Moral Issues
BIO 108 or BIO 112 Introduction to Life Science **OR** General Biology I
CHM 106 or CHM 128 General Chemistry I **OR** General, Organic and Biological Chemistry I

Required Courses in Health

BIO 220 Anatomy and Physiology I
BIO 222 Anatomy and Physiology II
BIO 250 Microbiology
FCS 214 or FCS 216 Nutrition and wellness **OR** Principles of Nutrition
PSY 200 Developmental Psychology
BIO 205 Medical Terminology
BIO 395 Topics in Healthcare (capstone)

THE GENERAL STUDIES: SCIENCE

General Education Courses

MTH 105 or MTH 110College Algebra OR Precalculus
MTH 115 Introduction to Statistics*
BIO 112 General Biology I
CHM 106General Chemistry I

Required Courses in Life and Physical Sciences

BIO 114 General Biology II
CHM 108 General Chemistry II
BIO 212 Genetics
BIO 204 or BIO 214 Molecular Genetics of Development **OR** Modeling and Experimental Design
BIO 250 Microbiology
Bio 318 Cell and Molecular Biology (capstone)

* MTH 125 can substitute for MTH 115; however MTH 125 cannot be used to meet the Mathematics general education requirement.

DUAL DEGREE PROGRAM IN ENGINEERING WITH THE UNIVERSITY OF MISSOURI–KANSAS CITY OR WITH WASHINGTON UNIVERSITY IN ST. LOUIS

Fontbonne University students may choose a dual degree program of study in collaboration with either the School of Computing and Engineering at the University of Missouri-Kansas City or the School of Engineering and Applied Science at Washington University in St. Louis. This program may be combined with any major, but is most easily achieved in conjunction with a major in applied mathematics or in biology. Because of the many engineering avenues, students must work closely with the dual degree advisor to map out a curriculum plan. A minimum cumulative grade point average (GPA) of B+ (3.25 on a 4.0 scale) or better, both overall and in science and mathematics courses, is required for admission to the engineering schools. Applicants with lower GPAs are considered on a case-by-case basis. Upon satisfactory completion of both programs, the student will be awarded Bachelor of Science degrees from both Fontbonne University and University of Missouri-Kansas City or from both Fontbonne University and Washington University in St. Louis.

DUAL DEGREE PROGRAM IN OCCUPATIONAL THERAPY WITH WASHINGTON UNIVERSITY IN ST. LOUIS (3/2)

Fontbonne University students may elect to pursue a 3/2 program of study in connection with the Occupational Therapy (OT) program in the Washington University School of Medicine. Students who have completed the first three years of coursework for either a biology or a psychology degree at Fontbonne and who have a minimum cumulative grade point average of 3.0 in required prerequisite courses may apply for admission to the OT program at Washington University during their junior year at Fontbonne. Upon satisfactory completion of the first year of coursework at Washington University, the student will be awarded a Bachelor of Science degree in biology or a bachelor of arts degree in psychology from Fontbonne University. It is the student's responsibility to apply for the bachelor's degree from Fontbonne during the fall semester of the student's first year at Washington University. At the end of the second year of study at Washington University, the student would qualify for a master of occupational therapy degree from the Washington University School of Medicine.

NURSING WITH THE GOLDFARB SCHOOL OF NURSING AT BARNES HOSPITAL IN ST. LOUIS (TRANSFER AGREEMENT)

Fontbonne University students may elect to pursue a program of study in connection with the Goldfarb School of Nursing (GSON), located at the Barnes-Jewish Hospital complex. Students who have completed a minimum of one semester with a minimum cumulative grade point average of 3.0 may apply for admission to GSON. If accepted, the student must complete the remainder of the general education and prerequisite coursework, maintaining a 3.0 cumulative grade point average, before transferring to GSON for training in clinical techniques and procedures. Qualified students should be aware that there can be a waiting period before matriculation at GSON. After completion of 5 terms at GSON the student would qualify for the Bachelor of Science degree in Nursing (BSN) from the Goldfarb School of Nursing. Each school retains its own tuition rates and separate financial aid packages, and GSON students must be available a minimum of 30-40 hours per week, for course work and simulation labs during the day or evenings and for clinical experiences during days, evenings and/or weekends. Students complete their

clinical experiences at Barnes-Jewish Hospital, St. Louis Children's Hospital, Missouri Baptist Medical Center and other BJC HealthCare hospitals and St. Louis area health care facilities.
For certification as an RN, eligible graduates must also pass the National Council Licensure Exam (NCLEX).

CHIROPRACTIC WITH LOGAN UNIVERSITY COLLEGE OF CHIROPRACTIC IN ST. LOUIS (3/3)

Fontbonne University students may elect to pursue a 3/3 program of study in connection with the Logan University College of Chiropractic in St. Louis. Students who have completed the first three years of coursework toward a biology degree at Fontbonne, have a minimum cumulative grade point average of 2.75 can apply to Logan University College of Chiropractic. Upon satisfactory completion of the first year of coursework in chiropractic, the student will be awarded a Bachelor of Science degree in biology from Fontbonne University. It is the student's responsibility to apply for the bachelor's degree from Fontbonne during the fall semester of the student's first year at Logan University. Upon satisfactory completion of the third year of study at Logan College of Chiropractic the student would be awarded a doctorate in chiropractic.

BIOLOGY COURSES REQUIRED FOR HONORS BIOLOGY

Members of the Honors Program majoring in Biology who are candidates for University Scholar must complete the following upper division courses with honors criteria:

- BIO 496 Biology Seminar (2 credits) to include a research proposal
- BIO 495 Department Research (1-4 cred) to include a presentation proposal to a local undergraduate research conference
- PHY 218 Engineering Physics I (4 credits)

COURSES

All prerequisites must be passed with a minimum grade of C- or better within the last five (5) years. Any prerequisite prior to five (5) years or with a grade of less than C- must be approved by the department chair.

BIOLOGICAL SCIENCES COURSES

BIO 106 Topics in Environmental Science with Lab (3 credits)

An introduction as to how nature works, how the environment has been and is being modified and abused by human activities, and what can be done to protect and improve it for future generations of humans and other living things. SP

BIO 108 Introduction to Life Science with Lab (3 credits)

Introductory course covering the basic principles of life with an emphasis on the scientific method, characterization of life, organization of living things, energetics, and evolution.
FA, SP, SU

BIO 112 General Biology I with Lab (4 credits)

Selected principles and problems in general biology with emphasis on those principles most applicable to all living organisms: cellular organization, energy exchange, and inheritance. FA

BIO 114 General Biology II with Lab (4 credits)

A general course in organismal biology covering diversity of living things from the prokaryote to higher plants and animals. Prerequisite: Introductory biology course. SP

BIO/PSY 160 Animal Behavior (3 credits)

An introductory course covering general behavioral principles from the psychological and biological perspectives. Basic topics covered include learning, biological mechanisms of behavior, foraging, defense, aggression, sensory systems and communication, reproductive behavior, and parental care behavior. This class includes a two hour lab each week. FA (odd years).

BIO 196 Biology Seminar I (2 credits)

This course will provide first-year biology students with an overview of opportunities in biology careers as well as exposure to current research areas of the department. This seminar will familiarize students with scientific presentation and writing formats. SP

BIO 203 Science and Society (3 credits)

An introductory course examining the history of science and technology, with an emphasis on modern science, as well as the philosophy of scientific and technological thought. This course will also explore the reciprocal effects of science on society and society on science. This course has been approved to meet the Mission Core II and Writing Intensive General Education Requirements. FA (online)

BIO 204 Modeling and Experimental Design (3 credits)

An introductory course in the application of mathematics, statistics and computer science in the Biological Sciences taught from the science perspective. Emphasis will be placed on modeling in the areas of genomics, epidemiology, phylogeny and evolution, and design in the areas of ecology, gene expression and related areas. Prerequisites: BIO 114; BIO 212; MTH 105 or MTH 110 (or equivalent); MTH 115 or MTH 125. SP

BIO 207 Plant Biology with Lab (4 credits)

Introduction to morphology, physiology, and evolution of vascular plants; integrating form and function to understand diversity. Prerequisite: Introductory biology course. FA

BIO 212 Genetics (3 credits)

Study of the fundamental laws of inheritance in biological systems. Prerequisites: Introductory biology course and MTH 115 or MTH 125 (may be taken concurrently). FA

BIO 214 Molecular Genetics of Development (3 credits)

A molecular approach to genetic interactions in a variety of organisms during development from gametogenesis to more complex forms. Prerequisites: BIO 212. SP of even years

BIO 220 Anatomy and Physiology I with Lab (4 credits)

A course designed to introduce students to those aspects related to the study of the human body. Particular attention is given to cells, tissues, integumentary, skeletal, muscular, nervous, and endocrine systems. FA, SP, SU

BIO 222 Anatomy and Physiology II with Lab (4 credits)

Continuation of Anatomy and Physiology I. Particular attention is given to the digestive, cardiovascular, respiratory, urinary, and reproductive systems. Prerequisite: BIO 220. SP, SU

BIO 250 Microbiology with Lab (4 credits)

A general course with emphasis on classification, physiology, and pathology of microorganisms. Prerequisites: CHM 106 or CHM 128 (may be taken concurrently). SP

BIO 260 Comparative Anatomy (3 credits)

A study of vertebrate structure in relation to phylogeny, ontogeny, and function, emphasizing morphological adaptation for function. The laboratory investigation compares the detailed anatomy of representatives of various vertebrate groups including fish, amphibians, reptiles, birds and mammals. Prerequisites: BIO 114, BIO 220. Fall (even years).

BIO 271 Field Ecology (4 credits)
Introduction to field research techniques; Exploration of interactions among living and nonliving things within local natural resources; Identification of local flora and fauna; One hour of lecture and three hours of fieldwork at specified locations offsite weekly. Prerequisites: BIO114 and MTH 150 with C or better, or approval of department chair. SP (even years)

BIO 295 Department Research (1-4 credits)
This course is designed to provide the student with a non-classroom, non-structured, individualized experience in experimental research in the biological and physical sciences, utilizing the knowledge and skills obtained in other science courses. Offered with the approval of the department chair.

BIO 306 Kinesiology and Biomechanics with Lab (4 credits)
An introduction to the mechanical principles of movement with emphasis placed on the anatomical and biomechanical aspects of movement.
Prerequisites: Bio 220; an introductory physics course. SP (even years).

BIO 318 Cell and Molecular Biology (3 credits)
Study of fine structures, metabolism, physical, and chemical activities of cells and subcellular structures. Prerequisites: Introductory biology course; BIO 114. FA (odd years)

BIO 320 Evolutionary Biology (3 credits)
This course examines the basic processes and patterns of evolution: natural selection, evolutionary genetics, the analysis of adaptation, the phylogeny of life, the fossil record, molecular evolution, macroevolution and speciation; as well as an evaluation of current evolutionary issues. Prerequisites: BIO 114; BIO 212. FA (even years)

BIO 321 Conservation Biology (3 credits)
A course exploring the conservation of biodiversity based on principles of ecology, evolution and population genetics. The course will focus on current threats to biodiversity as well as population dynamics and stability, endangered species approaches, habitat fragmentation, population management and the complexities of science-based conservation strategies. This course will use lecture, discussion and readings of case studies. Prerequisites: BIO 114; BIO 212; BIO 204; BIO 271. SP (odd years)

BIO 322 Immunology (3 credits)
Introductory course which covers the basic concepts of antibody-mediated and cell-mediated immunity. Recent advances in the field will be emphasized from basic scientific and clinical perspectives. Prerequisites: Introductory biology course; BIO 114; BIO 250; CHM 108. FA (odd years)

BIO 324 Tissue Culture Techniques (3 credits)
A laboratory course focused on mastering the techniques required to maintain cells in culture in a sterile environment. Students will culture of different cell types, prepare media and understand the fundamentals of microscopy, cell-growth analysis and cell counting. Prerequisite: Bio 318 or approval by the department chair. FA (even years).

BIO 325 Emerging Infectious Disease (3 credits)
This is an introductory course in the area of infectious diseases. It will introduce principles of disease transmission, zoonotic disease, and basic epidemiological strategies and principles employed in the area of public health. Prerequisites: BIO 114; BIO 204; BIO 250; BIO 322, and MTH 125 or MTH 115. Offered as needed.

BIO 326 Molecular Techniques Laboratory (3 credits)
This course will give the student lecture and laboratory experience in bioinformatics, DNA manipulations including restriction digests and cloning and Polymerase Chain Reaction, in addition to other related molecular biology techniques Prerequisites: BIO 214, CHM 318. FA (odd years)

BIO 370 Teaching of Science in Early Childhood and Elementary (2 credits)
Application of principles of teaching science on the early childhood and elementary school level; examination of various approaches to presenting hands-on activities. Prerequisites: BIO 108; PHY 108. FA, SP

BIO 371 Teaching of Science in Middle and Secondary School (2 credits)
Application of principles of teaching science on the middle and secondary school level; examination of various approaches to presenting hands-on activities. Prerequisites; BIO 108 or BIO 112 FA

BIO 413 Department Assessment II (0 credits)
This course is required for graduation for all designated majors in biology. The course consists of a nationally-normalized test in biology and chemistry designed to assess progress in the major field of study. FA, SP

BIO 421 Conservation Medicine (3 credits)
A culminating course in the area of One Health integrating the concepts of ecology, conservation biology, emerging infectious disease, and human health and well-being. This course should immediately precede, or be concurrent with, the biology internship required for the certificate in One Health. Prerequisites: BIO 320; BIO 321; BIO 322; BIO 325. SP (even years)

BIO 490 Independent Study (1-4 credits)
Course in which students may pursue a library, curriculum development, or experimental research project in some aspect of science. Students with 60 or more semester credit hours may register for an independent study course. Offered as needed with the approval of the department chair.

BIO 495 Biology Research (1-4 credits)
This course is designed to provide the student with a non-classroom, non-structured, individualized experience in experimental research in the biological sciences, utilizing the knowledge and skills obtained in other science courses. Offered with the approval of the department chair.

BIO 496 Biology Senior Seminar (2 credits)
A capstone course designed to equip students with the skills of reading and evaluating primary scientific literature, while exploring current topics in science. An oral presentation will be required. Prerequisites: BIO 114; BIO 318; and at least junior status. FA

BIO 497 Biology Internship (1-4 credits)
A supervised, off-campus field-based experience at an approved site specifically related to students' career goals; integrates and applies academic knowledge and skills; emphasizes professional development.
Prerequisites: At least junior status with a science GPA of 3.0 or consent of instructor.

PHYSICAL SCIENCES COURSES

CHM 106 General Chemistry I with Lab (4 credits)
An introductory course in chemistry for science majors. Includes stoichiometry, atomic structure, chemical reactions, and solutions. Prerequisite: college algebra or precalculus. FA

CHM 108 General Chemistry II with Lab (4 credits)
A continuation of CHM 106; includes kinetics, equilibrium, thermodynamics, acids and bases, and electrochemistry. Prerequisite: CHM 106. SP

CHM 128 General, Organic, and Biological Chemistry I (4 credits)
An introductory course exploring inorganic principles of basic human functioning. Includes lecture and lab. Prerequisite: MTH 105 with minimum grade of C- within last five years or permission of department chair. SP

CHM 210 Organic Chemistry I (3 credits)
A study of the compounds of carbon with emphasis on functional groups, structure nomenclature, and reactions. Prerequisites: CHM 106; CHM 108. FA

CHM 211 Organic Chemistry I Lab (2 credits)
Laboratory experience to accompany CHM 210. Must be taken concurrently with CHM 210 or by consent of the department chair. Prerequisites: CHM 106; CHM 108. FA

CHM 212 Organic Chemistry II (3 credits)
A study of the mechanisms of reactions of organic compounds.
Prerequisite: CHM 210. SP

CHM 213 Organic Chemistry II Lab (2 credits)
Laboratory experience to accompany CHM 212. Must be taken concurrently with CHM 212 or by consent of the department chair. Prerequisites: CHM210, CHM211. SP

CHM 228 General, Organic, and Biological Chemistry II (4 credits)
An overview course exploring organic chemistry principles of basic human functioning. Emphasis will be given to biologically active organic molecule chemistry such as proteins, nucleic acids, fats, and carbohydrates. Includes lecture and lab. Prerequisites: CHM 106 and CHM 108, or CHM 128; all with minimum grade of C- within last five years or permission of department chair. FA

CHM 318 Biochemistry (3 credits)
Study of chemical properties and metabolism of compounds of biological interest: carbohydrates, lipids, proteins, and nucleic acids. Prerequisites: BIO 112, 220 or 250; CHM 210. SP

CHM 328 General, Organic, and Biological Chemistry III (3 credits)
A course in biochemistry with a focus on human health and function. Prerequisites: CHM 228 or CHM 210; and BIO 250 with minimum grade of C- within last five years or permission of department chair. SP

CHM 495 Chemistry Research (1-4 credits)
This course is designed to provide the student with a non-classroom, non-structured, individualized experience in experimental research in chemistry, utilizing the knowledge and skills obtained in other science courses. Offered with the approval of the department chair.

CHM 497 Chemistry Internship (1-4 credits)
A supervised, off-campus field-based experience at an approved site specifically related to students' career goals; integrates and applies academic knowledge and skills; emphasizes professional development.
Prerequisites: At least junior status with a science GPA of 3.0 or consent of instructor.

PHY 108 Introduction to Physical Science with Lab (3 credits)
Introductory course in physical science covering the scientific method, basic principles of physics, chemistry, earth science and astronomy. FA, SP, SU

PHY 208 College Physics I with Lab (4 credits)
An algebra-based course intended for science majors. Includes principles of mechanics, heat, wave motion, and sound with examples and problems taken from biological contexts. Prerequisite: MTH 150. FA

PHY 210 College Physics II with Lab (4 credits)
A continuation of PHY 208; includes light, electricity, magnetism, and quantum physics. Prerequisite: PHY 208 or equivalent. SP

PHY 218 Engineering Physics I with Lab (4 credits)
A calculus-based course intended for engineering, science and math majors. Includes principles of mechanics, heat, wave motion, and sound. Prerequisite: MTH 150. FA

PHY 220 Engineering Physics II with Lab (4 credits)
A continuation of PHY 218; includes light, electricity, magnetism, and quantum physics.
Prerequisite: PHY 218 or equivalent; MTH 151. SP

PHY 495 Physics Research (1-4 credits)
This course is designed to provide the student with a non-classroom, non-structured, individualized experience in experimental research in physics, utilizing the knowledge and skills obtained in other science courses. Offered with the approval of the department chair.

PHY 497 Physics Internship (1-4 credits)
A supervised, off-campus field-based experience at an approved site specifically related to students' career goals; integrates and applies academic knowledge and skills; emphasizes professional development.
Prerequisites: At least junior status with a science GPA of 3.0 or consent of instructor.