BIOLOGY

Department Website: Biology (https://www.gonzaga.edu/college-of-arts-sciences/departments/biology/)

Biology is the study of living organisms and the environment in which they live. To prepare students to pursue biology-oriented careers in fields such as medicine, dentistry, biotechnology, conservation science, environmental science, sustainability, research and teaching, we offer courses and experiences that help them understand the unity, diversity and complexity of life using evolutionary principles as the unifying theme. Through inquiry-based laboratory experiences and opportunities to participate in research projects, Biology majors also acquire problem solving and critical thinking skills and are therefore well prepared for their next step whether it be graduate or professional programs, specific training in health care fields, work in a lab or field station, or combining their scientific training with another interest such as business, law or even the arts.

Students earning a Biology degree at Gonzaga obtain:

- a broad, liberal arts education (through the university core curriculum)
- a common foundation of knowledge and experience across the breadth of biology (through the Biology common curriculum)
- foundational courses in the physical sciences that support biological research (chemistry and physics)
- the ability to investigate areas of interest in depth through a wide variety upper division courses

The Biology Department offers two degrees—the Bachelor of Science (B.S.) and the Bachelor of Arts (B.A.)—with one major: Biology. There are four subject-area concentrations within the Bachelor of Science degree, and a research concentration that can be combined with either the B.S. or the B.A. degree. Students are not required to choose a concentration. We also offer a Biology minor for students who want to combine a basic knowledge of Biology with a major in a different field.

The B.S. degree is designed for students preparing for careers in the life sciences, including continued training in graduate programs, as well as medical, dental and veterinary schools. The B.A. degree has fewer requirements and allows students more flexibility for combining the Biology major with other majors, minors, or certifications, such as teaching certification. The B.A. degree may also be suitable for graduate programs not requiring additional physics and chemistry.

Within the B.S. degree, students may choose a subject-area concentration aligned with one of the broad subfields of biology: Microbiology, Molecular, and Cell Biology (MMCB); Physiology; Ecology and Conservation Biology (ECB); or Evolution and Integrative Biology (EIB). These concentrations provide a focused and specific pathway through the major, while retaining the broad foundation and exposure to all of the major disciplinary areas in biology. Students may also choose a no-concentration option, which provides a broad overview of the field and prepares students for a wide range of career and education options.

The Research Concentration is designed for students who want to explore graduate level training in science, and can be combined with either the B.S. or the B.A. degree. Biology faculty members are committed to mentoring students in their research labs and also support Gonzaga students who are interested in doing summer research at other institutions. The Research Concentration may be combined with any of the subject-area concentrations.

Science impacts everyone in our society. To help promote an understanding of the nature of science and scientific issues that affect us all, the department offers courses that specifically fulfill the Scientific Inquiry requirement of the University Core curriculum: Scientific Inquiry (BIOL 104 Scientific Inquiry: and BIOL 104L Scientific Inquiry Lab), Biological Systems (BIOL 181 Biological Systems and BIOL 181L Biological Systems Lab), and Field Studies in Biodiversity (BIOL 159 Studies in Biodiversity and BIOL 159L Field Studies in Biodiversity).

Biology Common Curriculum

24 credits

All Biology students (B.S., B.A., and minor) take the Biology common curriculum, which includes the following courses:

Code	Title	Hours
Required lower division Biology courses		
BIOL 111	Biology Pathways [1]	1
BIOL 105 & 105L	Information Flow in Biological Systems and Information Flow in Biological Systems Lab	4
BIOL 106	Energy Flow in Biological Systems	3
BIOL 205 & 205L	Physiology and Biodiversity and Physiology and Biodiversity Lab	4
BIOL 206 & 206L	Ecology and Ecology Lab	4
BIOL 207 & 207L	Genetics and Genetics Lab	4
Required Chemistry courses		
CHEM 101 & 101L	General Chemistry I and General Chemistry I Lab [2]	4

[1] Not required for the Biology Minor

[2] Students pursuing the Biology minor may substitute ENVS 104 Environmental Chemistry and ENVS 104L Environmental Chemistry Lab, Environmental Chemistry.

Biology (BS) Major
B.S. Major in Biology With No Concentration

64 credits

In addition to the Biology common curriculum above, students pursuing the B.S. degree must also complete the following courses:

Code	Title	Hours
Lower Division		
CHEM 102 & 102L	General Chemistry II and General Chemistry II Lab	4
CHEM 230 & 230L	Organic Chemistry I and Organic Chemistry Lab I	4
CHEM 231 & 231L	Organic Chemistry II and Organic Chemistry Lab II	4
Select one of the following:		5

PHYS 111 & 111L	General Physics I and General Physics I Lab	
PHYS 121 & 121L	Physics I and Physics I Lab	
Select one of the following:		5
PHYS 112 & 112L	General Physics II and General Physics II Lab	
PHYS 122 & 122L	Physics II and Physics II Lab	
Upper Division		
BIOL 399	Advanced Topic:	2
BIOL Upper Division Electives [1]		15
BIOL 495	Senior Evaluation	0
BIOL 499	Senior Colloquium	1
Total Hours		**40**

[1] (Any BIOL course numbered 300 or above. BIOL 399 Advanced Topic:, BIOL 495 Senior Evaluation, BIOL 497 Biology Internship, and BIOL 499 Senior Colloquium do not qualify. CHEM 307 Biochemistry I/CHEM 307L Biochemistry I Lab may also be counted for meeting this requirement.)

Optional Concentrations: B.S. or B.A. in Biology with Research Concentration

The Research Concentration is designed to make research experiences available to more students, to show students the value of science education outreach through experiential learning, and to provide students with a more solid foundation in biological mathematics and science communication. It consists of a number of courses and experiences designed to prepare students to pursue research in some venue (graduate school, industry, government, medical school, or science education) after graduation. Students can enter the program at any time, although we anticipate most students will enter the program as sophomores or juniors.

To complete the Research Concentration, the following requirements are added to the requirements for the B.S. or B.A. degree in biology:

1. Participate in a significant research experience. This means working on an independent research project for the equivalent of 4 credits. Most students can fulfill this requirement in one summer of full-time research or four academic semesters of research while enrolled in other classes. Enrolling in the Research Concentration does not guarantee a research experience. It is the student's responsibility to secure a research position. This requirement can be fulfilled by working with a GU faculty member or, with prior permission, with a faculty member at a different institution.
2. Present the results from the independent research (in oral or poster format) to the scientific community at an event organized for that purpose.
3. Write up the research results under advisement with your research mentor. Final papers will be turned in to the Research Coordinator the last month of the final semester you are enrolled at Gonzaga. If you did research off campus, see the Research Coordinator to arrange a local writing mentor.
4. Participate in science education outreach for 16 hours one semester (BIOL 295 Science Outreach/CHEM 295 Science Outreach).
5. Take BIOL 484 Research Seminar Research Seminar (one credit) and attend a minimum of 12 biology-related seminars (including those in BIOL 484 Research Seminar), and write and submit a seminar reflection for each seminar.
6. Take a college calculus course, MATH 148 Survey of Calculus or MATH 157 Calculus and Analytic Geometry I.
7. Complete a statistics course (MATH 121 Introductory Statistics or MATH 321 Statistics for Experimentalist) or biological mathematics course, Biological Data Analysis (BIOL 305 Biological Data Analysis).

B.S. Degree with a Concentration in Ecology and Conservation Biology (ECB)

63-67 credits

In addition to the Biology common curriculum above, students pursuing the B.S. degree with the ECB concentration must also complete the following courses:

Code	Title	Hours
Required Chemistry and Physics Courses		
Select one of the following:		4
CHEM 102 & 102L	General Chemistry II and General Chemistry II Lab	
CHEM 230 & 230L	Organic Chemistry I and Organic Chemistry Lab I	
ENVS 202 & 202L	Applied Environmental Chemstry and Applied Environmental Chemistry Lab	
Select one of the following:		5
PHYS 111 & 111L	General Physics I and General Physics I Lab	
PHYS 121 & 121L	Physics I and Physics I Lab	
Select one of the following:		
MATH 148	Survey of Calculus	3
MATH 157	Calculus and Analytic Geometry I	4
Choose one of the following statistics courses		
MATH 221	Applied Statistics	3
BIOL 305	Biological Data Analysis	4
Required Upper Division Biology Courses		
BIOL 399	Advanced Topic:	2
BIOL 495	Senior Evaluation	0
BIOL 499	Senior Colloquium	1
BIOL Upper Division Electives:		
Select at least 12 credits of the following: [1]		12
BIOL 303	Population Ecology	
BIOL 313	Animal Behavior	
BIOL 323 & 323L	Conservation Biology and Conservation Biology Lab	
BIOL 331	Parasitology	
BIOL 333	Community Ecology	
BIOL 334	Advanced Evolution	
BIOL 340 & 340L	Field Botany and Field Botany Lab	

BIOL 342 & BIOL 323L	Plant Population Ecology and Conservation Biology Lab	
BIOL 344	Introduction to GIS in Biology	
BIOL 357 & 357L	Principles of Wildlife Management and Wildlife Management Lab	
BIOL 359 & 359L	Studies in Biodiversity and Field Studies in Biodiversity	
BIOL 360	Plant Biology	
BIOL 363 & 363L	Plant Propagation and Restoration and Plant Propagation and Restoration Lab	4
BIOL 367 & 367L	Entomology and Entomology Lab	
BIOL 380	Special Topics: (Approved ECB Study Abroad)	6
BIOL 403 & 403L	Marine Biology and Marine Biology Lab	
BIOL 404 & 404L	Freshwater Biology and Freshwater Biology Lab	4
BIOL 420	Physiological Ecology	
BIOL 425 & 425L	Ecotoxicology and Ecotoxicology Lab	4
BIOL 498	Undergraduate Research (Approved ECB Research)	
Select enough credits from the list of upper-division BIOL electives below to reach a minimum of 16 credits when combined with the upper-division BIOL electives above:		4
BIOL 301 - BIOL 498, including those listed above that were not used to meet any requirement above [2]		
Additional Science Electives		
Select a minimum of six credits of the following:		6-8
Any upper division BIOL courses that have not already been counted toward the concentration [3]		
Any CHEM course 102 or above that has not already been counted toward the concentration [4]		
CPSC 121	Computer Science I (and higher)	
Any MATH course above 148 that has not already been counted toward the concentration.		
Any PHYS course above 111		
Total Hours		**66-68**

[1] At least two courses must include labs; a significant research experience (BIOL 498 Undergraduate Research, 4 credits) can substitute for one laboratory course.

[2] BIOL 399 Advanced Topic:, BIOL 495 Senior Evaluation, and BIOL 497 Biology Internship do not qualify.

[3] BIOL 399 Advanced Topic:, BIOL 495 Senior Evaluation, BIOL 497 Biology Internship, and BIOL 499 Senior Colloquium do not qualify.

[4] CHEM 104 Scientific Inquiry does not qualify.

B.S. Degree with a Concentration in Evolution and Integrative Biology (EIB)

60 - 65 credits

In addition to the Biology common curriculum above, students pursuing the B.S. degree with the EIB concentration must also complete the following courses:

Code	Title	Hours
Required Chemistry, Physics, and Math Courses		
CHEM 230 & 230L	Organic Chemistry I and Organic Chemistry Lab I	4
Select one of the following:		5
PHYS 111 & 111L	General Physics I and General Physics I Lab	
PHYS 121 & 121L	Physics I and Physics I Lab	
Select one of the following:		3-4
MATH 147	Precalculus	
MATH 121	Introductory Statistics	
MATH 221	Applied Statistics [1]	
BIOL 305	Biological Data Analysis	
Required Upper Division Biology Courses		
One of the two following courses:		
BIOL 334	Advanced Evolution	
BIOL 323	Conservation Biology	
BIOL 399	Advanced Topic:	2
BIOL 495	Senior Evaluation	0
BIOL 499	Senior Colloquium	1
BIOL Upper Division Electives		
Select 12 credits of the following:		12
At least one course must include a lab; a significant research experience (BIOL 498, 4 credits) can substitute for one laboratory course. Course must be selected from 2 of the 3 Groups (A, B, C) [2]		
Group A		
BIOL 335	Advanced Genetics:	
BIOL 351 & 351L	Advanced Cell Biology and Advanced Cell Biology Lab	
BIOL 370 & 370L	Microbiology and Microbiology Lab	
BIOL 374	Immunology	
BIOL 375	Virology	
BIOL 441	Advanced Physiology	
BIOL 456 & 456L	Molecular Biology and Molecular Biology Lab	
Group B		
BIOL 313	Animal Behavior	
BIOL 331	Parasitology	
BIOL 334	Advanced Evolution	
BIOL 337	Developmental Biology	
BIOL 340 & 340L	Field Botany and Field Botany Lab	
BIOL 341 & 341L	Human Physiology and Human Physiology Lab	
BIOL 360	Plant Biology	
BIOL 367 & 367L	Entomology and Entomology Lab	
BIOL 371 & 371L	Vertebrate Biology and Anatomy and Vertebrate Biology and Anatomy Lab	
BIOL 441	Advanced Physiology	3
BIOL 451 & 451L	Comparative Endocrinology and Comparative Endocrinology Lab	4

Group C		
BIOL 303	Population Ecology	
BIOL 323 & 323L	Conservation Biology and Conservation Biology Lab	
BIOL 333	Community Ecology	
BIOL 342	Plant Population Ecology	
BIOL 343	Plant Community Ecology	
BIOL 344	Introduction to GIS in Biology	
BIOL 357 & 357L	Principles of Wildlife Management and Wildlife Management Lab	
BIOL 359 & 359L	Studies in Biodiversity and Field Studies in Biodiversity	
BIOL 363 & 363L	Plant Propagation and Restoration and Plant Propagation and Restoration Lab	
BIOL 403 & 403L	Marine Biology and Marine Biology Lab	
BIOL 404 & 404L	Freshwater Biology and Freshwater Biology Lab	
BIOL 420	Physiological Ecology	
BIOL 425 & 425L	Ecotoxicology and Ecotoxicology Lab	
Select two of the following:		
BIOL 305	Biological Data Analysis	
MATH 148	Survey of Calculus (and higher, if not used above)	
CHEM 102 & 102L	General Chemistry II and General Chemistry II Lab (and any CHEM course above 230)	
CPSC 121	Computer Science I (and higher)	
PHYS 112	General Physics II (and higher, if not used above)	
Total Hours		**34-35**

[1] MATH 221 Applied Statistics requires MATH 148 Survey of Calculus as a prerequisite.

[2] At least **one** course must include a lab or BIOL 498 Undergraduate Research. Can substitute for the laboratory course.

B.S. Major in Biology With a Concentration in Microbiology, Molecular, and Cellular Biology (MMCB)

66-67 credits

In addition to the Biology common curriculum above, students pursuing the B.S. degree with the MMCB concentration must also complete the following courses:

Code	Title	Hours
Required Chemistry, Physics, and Math Courses		
CHEM 102 & 102L	General Chemistry II and General Chemistry II Lab	4
CHEM 230 & 230L	Organic Chemistry I and Organic Chemistry Lab I	4
CHEM 231 & 231L	Organic Chemistry II and Organic Chemistry Lab II	4
CHEM 307 & 307L	Biochemistry I and Biochemistry I Lab	4
Select one of the following:		5
PHYS 111 & 111L	General Physics I and General Physics I Lab	
PHYS 121 & 121L	Physics I and Physics I Lab	
Select one of the following:		3-4
MATH 148	Survey of Calculus	
MATH 157	Calculus and Analytic Geometry I	
MATH 221	Applied Statistics	
BIOL 305	Biological Data Analysis	
Required Upper Division Biology Courses		
BIOL 399	Advanced Topic:	2
BIOL 495	Senior Evaluation	0
BIOL 499	Senior Colloquium	1
BIOL Upper Division and Other Science Electives:		
Group A		
Select one of the following:		4
BIOL 351 & 351L	Advanced Cell Biology and Advanced Cell Biology Lab	
BIOL 370 & 370L	Microbiology and Microbiology Lab	
BIOL 456 & 456L	Molecular Biology and Molecular Biology Lab	
Group B		
Select one of the following:		3-4
BIOL 335	Advanced Genetics:	
BIOL 337	Developmental Biology	
BIOL 351 & 351L	Advanced Cell Biology and Advanced Cell Biology Lab	
BIOL 380	Special Topics: (Group B approved study abroad)	
BIOL 451 & 451L	Comparative Endocrinology and Comparative Endocrinology Lab	
BIOL 456 & 456L	Molecular Biology and Molecular Biology Lab	
Group C		
Select one of the following:		3-4
BIOL 331	Parasitology	
BIOL 370 & 370L	Microbiology and Microbiology Lab	
BIOL 374	Immunology	
BIOL 375	Virology	
BIOL 380	Special Topics: (Group C approved study abroad)	
Select enough credits from the list of courses below to reach a minimum of 15 credits when combined with the upper-division BIOL electives above:		3-5
BIOL 301 - BIOL 498, including those listed above that were not used to meet any requirement above [1]		
CHEM 300 and higher		
CPSC 121	Computer Science I (and higher)	
MATH 148	Survey of Calculus (and higher, if not used above)	
PHYS 112	General Physics II (and higher)	
Total Hours		**40-45**

[1] (BIOL 399 Advanced Topic:, BIOL 495 Senior Evaluation, and BIOL 497 Biology Internship do not qualify)

B.S. Degree with a Concentration in Physiology

63-64 Credits

In addition to the Biology common curriculum above, students pursuing the B.S. degree with the Physiology concentration must also complete the following courses:

Code	Title	Hours
Required Chemistry, Physics, and Math Courses		
CHEM 230 & 230L	Organic Chemistry I and Organic Chemistry Lab I	4
Select one of the following:		5
PHYS 111 & 111L	General Physics I and General Physics I Lab	
PHYS 121 & 121L	Physics I and Physics I Lab	
Select one of the following:		3-4
MATH 321	Statistics for Experimentalist	
MATH 221	Applied Statistics	
BIOL 305	Biological Data Analysis	
Required Upper Division Biology Courses		
BIOL 399	Advanced Topic:	2
BIOL 495	Senior Evaluation	0
BIOL 499	Senior Colloquium	1
BIOL Upper Division Electives:		15
Physiology Courses		
Choose three (3) courses from ths Physiology list; at least one course must include a lab. (A significant research experience related to physiology (BIOL 498, 4 credits) can be substituted for a laboratory course.)		
BIOL 313	Animal Behavior	
BIOL 341 & 341L	Human Physiology and Human Physiology Lab	
BIOL 351 & 351L	Advanced Cell Biology and Advanced Cell Biology Lab	
BIOL 371 & 371L	Vertebrate Biology and Anatomy and Vertebrate Biology and Anatomy Lab	
BIOL 376	Cellular Neurophysiology	3
BIOL 420	Physiological Ecology	
BIOL 451 & 451L	Comparative Endocrinology and Comparative Endocrinology Lab	
BIOL 441	Advanced Physiology	
BIOL 498	Undergraduate Research (Approved Physiology Research)	
Biology Courses		
Choose enough credits from BIOL 301-498 to reach a minimum of 15 credits when combined with the Physiology courses above.		
Any of those in the Physiology list that were not used may be counted here. (BIOL 399, 495, and 497 do not qualify.)		
Additional Science Electives:		9
Any upper division BIOL courses that have not already been counted toward the concentration [2]		
CHEM 102 & 102L	General Chemistry II and General Chemistry II Lab	
CHEM 231	Organic Chemistry II (and higher)	
CPSC 121	Computer Science I (and higher)	
ANY MATH course 148 or higher		
Any PHYS course above 111		
Total Hours		**42-43**

[1] (BIOL 399 Advanced Topic:, BIOL 495 Senior Evaluation, and BIOL 497 Biology Internship do not qualify.)

[2] (BIOL 399 Advanced Topic:, BIOL 495 Senior Evaluation, BIOL 497 Biology Internship, and BIOL 499 Senior Colloquium do not qualify)

Biology (BA) Major Program Requirements

In addition to the Biology common curriculum above, students pursuing the B.A. degree must also complete the following courses:

Code	Title	Hours
Select one of the following:		4
CHEM 102 & 102L	General Chemistry II and General Chemistry II Lab	
CHEM 230 & 230L	Organic Chemistry I and Organic Chemistry Lab I	
ENVS 202 & 202L	Applied Environmental Chemstry and Applied Environmental Chemistry Lab	
BIOL Upper Division Electives [1]		9
BIOL 399	Advanced Topic:	2
BIOL 495	Senior Evaluation	0
BIOL 499	Senior Colloquium	1
Total Hours		**16**

[1] Any BIOL course numbered 300 or above. BIOL 399 Advanced Topic:, BIOL 495 Senior Evaluation, BIOL 497 Biology Internship, and BIOL 499 Senior Colloquium do not qualify. CHEM 307 Biochemistry I/CHEM 307L Biochemistry I Lab may also be counted for meeting this requirement.

Optional Concentration: B.S. or B.A. in Biology with Research Concentration

The Research Concentration is designed to make research experiences available to more students, to show students the value of science education outreach through experiential learning, and to provide students with a more solid foundation in biological mathematics and science communication. It consists of a number of courses and experiences designed to prepare students to pursue research in some venue (graduate school, industry, government, medical school, or science education) after graduation. Students can enter the program at any time, although we anticipate most students will enter the program as sophomores or juniors.

To complete the Research Concentration, the following requirements are added to the requirements for the B.S. or B.A. degree in biology:

1. Participate in a significant research experience. This means working on an independent research project for the equivalent of 4 credits. Most students can fulfill this requirement in one summer of full-time research or four academic semesters of research while enrolled in other classes. Enrolling in the Research Concentration does not guarantee a research experience. It is the student's responsibility to secure a research position. This requirement can be fulfilled by working with a GU faculty member or, with prior permission, with a faculty member at a different institution.
2. Present the results from the independent research (in oral or poster format) to the scientific community at an event organized for that purpose.
3. Write up the research results under advisement with your research mentor. Final papers will be turned in to the Research Coordinator the last month of the final semester you are enrolled at Gonzaga. If you did research off campus, see the Research Coordinator to arrange a local writing mentor.
4. Participate in science education outreach for 16 hours one semester (BIOL 295 Science Outreach/CHEM 295 Science Outreach).
5. Take BIOL 484 Research Seminar Research Seminar (1 credit) and attend a minimum of 12 biology-related seminars (including those in BIOL 484 Research Seminar), and write and submit a seminar reflection for each seminar.
6. Take a college calculus course, Survey of Calculus (MATH 148 Survey of Calculus) or Calculus and Analytic Geometry I (MATH 157 Calculus and Analytic Geometry I).
7. Complete a statistics course (MATH 121 Introductory Statistics or MATH 321 Statistics for Experimentalist) or biological mathematics course, Biological Data Analysis (BIOL 305 Biological Data Analysis).

Biology Minor Program Requirements

In addition to the Biology common curriculum above, students pursuing a minor in Biology must also complete at least five credits of upper-division Biology electives (300- or 400-level).

Students must earn a C- grade or better in BIOL 105 Information Flow in Biological Systems/BIOL 105L Information Flow in Biological Systems Lab and CHEM 101 General Chemistry I/CHEM 101L General Chemistry I Lab in order to take BIOL 106 Energy Flow in Biological Systems. A C- grade or better in BIOL 106 Energy Flow in Biological Systems is required in order to take BIOL 205 Physiology and Biodiversity, BIOL 206 Ecology, or BIOL 207 Genetics. Students must also earn a C- grade or better in BIOL 205 Physiology and Biodiversity/BIOL 205L Physiology and Biodiversity Lab, BIOL 206 Ecology/BIOL 206L Ecology Lab, BIOL 207 Genetics/BIOL 207L Genetics Lab and BIOL 399 Advanced Topic: in order to take BIOL 499 Senior Colloquium. For upper division biology electives, a minimum of 10 credits (B.S.), 6 credits (B.A.), or 4 credits (Minor) must be biology courses taken from Gonzaga faculty; students participating in study abroad programs should make note. Credits from BIOL 497 Biology Internship do not satisfy any requirements for the Biology Major or Minor.

All courses should be chosen in consultation with a faculty advisor.

Courses

BIOL 104. Scientific Inquiry:. (2 Credits)
This lecture and laboratory course content will be determined by the instructor to meet the learning objectives of the Scientific Inquiry requirement of the University Core. Fall and Spring.
Corequisites: BIOL 104L

BIOL 104L. Scientific Inquiry Lab. (1 Credit)
Taken concurrently with BIOL 104.
Corequisites: BIOL 104
Course Fee: 140

BIOL 105. Information Flow in Biological Systems. (3 Credits)
This course provides a foundation in the principles of biology by examining the fundamental role of information in generating the properties of life. The course explores the molecular basis of biological information (codes, signals, structures) and its role in growth, development, communication, regulation, reproduction and evolution of living things. Fall and Spring.
Corequisites: BIOL 105L
Enrollment is limited to students with a program in Biochemistry, Biology, Biology, Biomedical Engineering, Comp Sci Computation Think, Computer Science, Human Physiology, Neuroscience, Nursing, App Math - Biology, Medical Physics or Biology.

BIOL 105L. Information Flow in Biological Systems Lab. (1 Credit)
Designed to provide students with an authentic scientific discovery experience, this laboratory involves the isolation, identification, and characterization of novel bacteriophages from local soil samples. Students learn how to approach scientific questions, make observations, record, analyze and report data. Taken concurrently with BIOL 105.
Prerequisites: BIOL 105 (may be taken concurrently) with a minimum grade of C-
Course Fee: 150
Enrollment is limited to students with a program in Biochemistry, Biology, Biology, Biomedical Engineering, Comp Sci Computation Think, Computer Science, Human Physiology, Neuroscience, Nursing, App Math - Biology, Medical Physics or Biology.

BIOL 106. Energy Flow in Biological Systems. (3 Credits)
This course focuses on the biological processes of energy acquisition, how energy is used in biological systems, and how energy is transferred between organisms and through ecosystems. Human impacts to energy transfer will be covered and topics will integrate energy concepts from cells to organisms to ecosystems. There is no laboratory associated with this course. Fall and Spring. Prerequisite(s): BIOL 105, minimum grade: C- and BIOL 105L, minimum grade: C- (or concurrent) and CHEM 101, minimum grade: C- and CHEM 101L, minimum grade: C-
Prerequisites: BIOL 105 with a minimum grade of C- and BIOL 105L (may be taken concurrently) with a minimum grade of C- and CHEM 101 with a minimum grade of C-
Enrollment is limited to students with a program in Biochemistry, Biology, Biology, Biomedical Engineering, Comp Sci Computation Think, Computer Science, Human Physiology, Neuroscience, App Math - Biology, Medical Physics or Biology.

BIOL 111. Biology Pathways. (1 Credit)
This course is designed to help biology students increase their awareness of biology as a discipline and discover their role within the broader biological community. Students are introduced to a range of possible careers in biology, degree pathways within biology, and various tools to assist students during their time at Gonzaga. Fall.

BIOL 159. Studies in Biodiversity. (1 Credit)
May be repeated for credit.
This course is an optional continuation of BIOL 159L Field Studies in Biodiversity. Research projects initiated in the field in BIOL 159L will be concluded with further library research, completion of a technical or popular press article, drafting and editing a poster, and a presentation at a local or regional event. Fall.
Prerequisites: BIOL 159L with a minimum grade of D
Equivalent: BIOL 359

BIOL 159L. Field Studies in Biodiversity. (3 Credits)
May be repeated for credit.
This course uses a field experience as a backdrop to learn about evolutionary, ecological and biogeographical processes that determine the ranges and biodiversity of organisms. The course begins with class work on the Gonzaga campus and is followed by 3-4 weeks in the field, where Gonzaga faculty and local experts will mentor students. Field locations vary by year and include Ecuador, Zambia, or domestic locations. This course is designed for non-science majors. The class meets together with the students enrolled in BIOL 359L for Biology majors. Summer.
Equivalent: BIOL 359L

BIOL 170. Introduction to Microbiology. (3 Credits)
An introduction to microbiology for students in Nursing or other allied health professions who will not be majoring in Biology. The course includes basic cellular chemistry and genetics, as well as a survey of topics of clinical importance. Fall and Spring.
Prerequisites: (BIOL 105 with a minimum grade of C- or TRAN GBIO with a minimum grade of T) and BIOL 105L with a minimum grade of C- and (CHEM 101 with a minimum grade of C- or TRAN GCHM with a minimum grade of T)
Corequisites: BIOL 170L
Students cannot enroll who have a program in Biology or Biology.

BIOL 170L. Introduction to Microbiology Lab. (1 Credit)
An introduction to methods of microbial analysis including the culture, safe handling, and genetic analysis of microbes. Taken concurrently with BIOL 170.
Corequisites: BIOL 170
Course Fee: 150

BIOL 181. Biological Systems. (2 Credits)
This course provides an exploration of the basic systems in biology from plants to animals and from cells to ecosystems for non-science majors. Additionally, this course provides elementary teacher candidates with the basic content knowledge needed to teach life science at the elementary school level. Lab is required. Fall.
Prerequisites: EDTE 221E (may be taken concurrently) with a minimum grade of D
Corequisites: BIOL 181L
Students cannot enroll who have a major in Biology or Biology.

BIOL 181L. Biological Systems Lab. (1 Credit)
Taken concurrently with BIOL 181.
Corequisites: BIOL 181
Course Fee: 140
Students cannot enroll who have a major in Biology or Biology.

BIOL 190. Special Topics. (0-3 Credits)
May be repeated for credit.
Topic to be determined by instructor.

BIOL 193. FYS:. (3 Credits)
The First-Year Seminar (FYS) introduces new Gonzaga students to the University, the Core Curriculum, and Gonzaga's Jesuit mission and heritage. While the seminars will be taught by faculty with expertise in particular disciplines, topics will be addressed in a way that illustrates approaches and methods of different academic disciplines. The seminar format of the course highlights the participatory character of university life, emphasizing that learning is an active, collegial process.

BIOL 199. Investigations in Biology. (2 Credits)
May be repeated for credit.
Designed for non-science majors; this fulfills the core Scientific Inquiry requirement. Lectures and laboratory sessions emphasize science as an inquiry based process. Laboratory is required when offered.
Corequisites: BIOL 199L
Students cannot enroll who have a major in Biochemistry, Biology, Biology, Chemistry or Chemistry.

BIOL 199L. Investigations in Biology Lab. (1 Credit)
Taken concurrently with BIOL 199.
Corequisites: BIOL 199
Course Fee: 150
Students cannot enroll who have a major in Biochemistry, Biology, Biology, Chemistry or Chemistry.

BIOL 205. Physiology and Biodiversity. (3 Credits)
This course focuses on understanding the diversity of life on earth and the physiological mechanisms that allow organisms to live in a wide array of environments. A framework of physiology is used to compare and contrast clades of organisms. A prerequisite for most upper division biology elective courses, and a pre-requisite for BIOL 499. Fall.
Prerequisites: BIOL 105 with a minimum grade of C- and BIOL 105L with a minimum grade of C- and BIOL 106 with a minimum grade of C-
Corequisites: BIOL 205L
Enrollment is limited to students with a program in Biology, Biology, Comp Sci Computation Think, App Math - Biology or Biology.

BIOL 205L. Physiology and Biodiversity Lab. (1 Credit)
Students are introduced to the diversity of organisms and physiological processes that allow organisms to live in a wide array of environments.
Corequisites: BIOL 205
Course Fee: 140

BIOL 206. Ecology. (3 Credits)
This course examines the ecological and evolutionary mechanisms that determine the distribution and abundance of species. Students will explore interactions between organisms and their environments at levels from individuals through ecosystems. A pre-requisite for most upper division biology elective courses, and a pre-requisite for BIOL 499. Must be taken Sophomore or Junior year, and cannot be taken Senior year. Spring.
Prerequisites: BIOL 105 with a minimum grade of C- and BIOL 105L with a minimum grade of C- and BIOL 106 with a minimum grade of C-
Corequisites: BIOL 206L
Enrollment is limited to students with a program in Biology, Biology, Comp Sci Computation Think, App Math - Biology or Biology.

BIOL 206L. Ecology Lab. (1 Credit)
Field and laboratory experiments are used to investigate ecological mechanisms that determine the distribution and abundance of species. Taken concurrently with BIOL 206.
Corequisites: BIOL 206
Course Fee: 140
Enrollment is limited to students with a program in Biology, Biology, Comp Sci Computation Think, App Math - Biology or Biology.

BIOL 207. Genetics. (3 Credits)
This course promotes an understanding of genes and genomes – their molecular properties, how they are expressed and regulated, how they contribute to inheritance, and how they are shaped by evolutionary forces. A pre-requisite for most upper division biology elective courses and a pre-requisite for BIOL 499. Fall and Spring.
Prerequisites: BIOL 105 with a minimum grade of C- and BIOL 105L with a minimum grade of C- and BIOL 106 with a minimum grade of C-
Corequisites: BIOL 207L
Enrollment is limited to students with a program in Biochemistry, Biology, Biology, Biomedical Engineering, Comp Sci Computation Think, Neuroscience, App Math - Biology or Biology.

BIOL 207L. Genetics Lab. (1 Credit)
This course provides students with hands-on experimental investigations of molecular mechanisms in genetics. Taken concurrently with BIOL 207.
Course Fee: 150

BIOL 290. Directed Readings. (1-3 Credits)
May be repeated for credit.
Topic to be determined by faculty.

BIOL 295. Science Outreach. (0 Credits)
May be repeated for credit.
The Biology and Chemistry/Biochemistry departments run a variety of outreach programs that include class visits, field trip tours, special summer programs and more. All of our programs strive to engage participants with opportunities for hands-on scientific discovery and inspiration. Fall and Spring.
Equivalent: CHEM 295

BIOL 303. Population Ecology. (3 Credits)
An in-depth look at the interactions that control the distribution and abundance of organisms at the population level. Topics such as life-history strategies, population dynamics, competition, predation, parasitism, and mutualism will be explored through the research literature, and quantitative approaches. Fall, even years.
Prerequisites: BIOL 106 with a minimum grade of C- and BIOL 206 with a minimum grade of C-
Equivalent: ENVS 401
Enrollment is limited to students with a program in Biology, Biology, App Math - Biology or Biology.

BIOL 304. Practice in Laboratory Teaching. (1-2 Credits)
May be repeated for credit.
Students gain teaching experience by assisting laboratory instructors as a teaching assistant (TA) in a laboratory course. Duties may include laboratory set-up, in-class mentoring, grading, and quiz preparation. May be repeated. A maximum of two credits may be applied to Biology electives. Usually limited to students who have earned an A or B in the lecture portion of the course for which the student is a candidate to TA the laboratory. By permission only. Fall and Spring.
Prerequisites: BIOL 106 with a minimum grade of C-

BIOL 305. Biological Data Analysis. (4 Credits)
An applied study of statistical methods used to investigate biological questions. Emphasis will be on applications using software to investigate biological data sets generated by student and instructor research. The course will survey descriptive statistics, sampling, experimental design, estimation, hypothesis testing, and model building (e.g. analysis of variance, regression, multivariate). This course does not fulfill the University Core Math requirement. Spring, even years. Pre-requisite: BIOL 106, minimum grade: C- and (BIOL 205, minimum grade: C- or BIOL 206, minimum grade: C- or BIOL 207, minimum grade: C-)
Prerequisites: Prerequisites exist. Refer to Zagweb.
Course Fee: 150

BIOL 313. Animal Behavior. (3 Credits)
This course explores how behavioral processes affect ecological patterns. The behavioral adaptations of animals to their environment including the evolution of behavior, foraging, competition for resources, reproductive ecology, mating systems, parental care, and cooperative behavior. Fall, even years.
Prerequisites: Prerequisites exist. Refer to Zagweb.

BIOL 323. Conservation Biology. (3 Credits)
This course covers the biological concepts important for the conservation of natural populations, communities, and ecosystems. Both theoretical and empirical studies will be applied to such topics as: the genetics and ecology of small populations, consequences of habitat fragmentation, the impact of introduced species, and the ecological value of biological diversity. Spring.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 323L

BIOL 323L. Conservation Biology Lab. (1 Credit)
This laboratory includes field trips. Taken concurrently with BIOL 323.
Corequisites: BIOL 323
Course Fee: 150

BIOL 331. Parasitology. (3 Credits)
Explores the medical, physiological, ecological, and historical effects of parasites. The course concentrates on human parasites and ranges from viruses and bacteria through helminths and arthropods. Fall. Pre-requisite: BIOL 106, minimum grade: C- and BIOL 205, minimum grade: C- and BIOL 206, minimum grade: C-.
Prerequisites: Prerequisites exist. Refer to Zagweb.

BIOL 333. Community Ecology. (3 Credits)
Community ecology seeks to explain the underlying mechanisms that create, maintain, and determine the fate of biological communities. Typically, patterns are documented by observation, and used to generate hypotheses about processes, which are tested. Integrating theory with real world observations is fundamental to community ecology and will be a focus of this class. Fall, odd years.
Prerequisites: BIOL 106 with a minimum grade of C- and BIOL 206 with a minimum grade of C-
Equivalent: ENVS 407

BIOL 334. Advanced Evolution. (3 Credits)
May be repeated for credit.
An in-depth study of the mechanisms responsible for the diversity of life on earth. Topics covered include speciation, adaptation, systematics, extinction, natural selection, genetic drift, mutation, and gene flow. Examples are chosen from all types of organisms. This course may be repeated once as long as the content is different than the first occurrence of enrollment. Fall, even years.
Prerequisites: Prerequisites exist. Refer to Zagweb.

BIOL 335. Advanced Genetics:. (3 Credits)
May be repeated for credit.
An advanced study of genetics within the context of a selected topic in biology. Past topics have included an examination of human race and racism and the study of genomes. This course may be repeated once as long as the content is different than the first occurrence of enrollment. Spring, even years. Pre-requisite: BIOL 106, minimum grade: C- and BIOL 207, minimum grade: C-.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Equivalent: HONS 407
Enrollment is limited to students with a program in Biology, Biology, App Math - Biology or Biology.

BIOL 337. Developmental Biology. (3 Credits)
A study of the principles and mechanisms that underlie the development of plants and animals, using approaches that integrate cell biology, genetics, molecular biology, and evolution. Spring, odd years.
Prerequisites: Prerequisites exist. Refer to Zagweb.

BIOL 340. Field Botany. (3 Credits)
Course includes systematics of flowering plants, plant communities of the Inland Northwest, sight identification of major plant families and selected topics in plant ecology. A plant collection is required as well as a field project in the area of plant systematics or plant ecology. This course counts towards the required 9 plant-related credits for Wildlife Biology positions with federal agencies, such as U.S. Fish and Wildlife Service and U.S. Forest Service that utilize Wildlife Biology Series GS-0486.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 340L
Equivalent: ENVS 410
Enrollment is limited to students with a program in Biology, Biology, Comp Sci Computation Think or App Math - Biology.

BIOL 340L. Field Botany Lab. (1 Credit)
Taken concurrently with BIOL 340.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 340
Equivalent: ENVS 410L
Course Fee: 150

BIOL 341. Human Physiology. (3 Credits)
Examines the function of human physiological systems including: metabolic, nervous, cardiovascular, respiratory, renal, muscular, and immunological. Systems are examined through case studies focused on human disease and human performance. Spring.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 341L

BIOL 341L. Human Physiology Lab. (1 Credit)
Taken concurrently with BIOL 341. May require weekend field trips.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 341
Course Fee: 150

BIOL 342. Plant Population Ecology. (3 Credits)
This class meets with and covers the same topics as BIOL 303 (Population Ecology) but takes a more plant-focused approach. Through class illustrations and independent projects, students will investigate the theories and empirical evidence in population ecology that directly influence plant populations. This course counts towards the required 9 plant-related credits for Wildlife Biology positions with federal agencies, such as U.S. Fish and Wildlife Service and U.S. Forest Service that utilize Wildlife Biology Series GS-0486. Fall, even years.
Prerequisites: BIOL 206 with a minimum grade of C- or ENVS 103 with a minimum grade of C-
Corequisites: BIOL 303L
Equivalent: ENVS 411

BIOL 343. Plant Community Ecology. (3 Credits)
This class meets with and covers the same topics as BIOL 333 (Community Ecology), but takes a more plant-focused approach. Students will explore the theories and experimental evidence of community ecology and conduct ecology projects with a specific focus on plant processes. This course counts towards the required 9 plant-related credits for Wildlife Biology positions with federal agencies, such as U.S. Fish and Wildlife Service and U.S. Forest Service that utilize Wildlife Biology Series GS-0486. Fall, odd years.
Prerequisites: BIOL 206 with a minimum grade of C- or ENVS 103 with a minimum grade of B
Equivalent: BIOL 333, ENVS 412

BIOL 344. Introduction to GIS in Biology. (3 Credits)
Many aspects of biology involve understanding organisms across the landscape. From simple field navigation to complex analysis in conservation genomics, spatial ecology, or disease spread, the use of geographic information systems (GIS) are a key tool in modern biology. This course will introduce students to the use of GIS as a biological tool. Students will learn mapping and introductory spatial analysis in leading GIS software packages to answer biological questions and communicate biological data with an emphasis on hands-on learning, real data, and community involved research.
Prerequisites: BIOL 106 with a minimum grade of C- and BIOL 206 with a minimum grade of C-
Equivalent: ENVS 384

BIOL 351. Advanced Cell Biology. (3 Credits)
An advanced study of cell structure and function with an emphasis on selected topics in cell biology. Topics vary with instructor, but may include cell signaling, cell cycle, plant cells, and the cell biology of cancer. Fall.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 351L

BIOL 351L. Advanced Cell Biology Lab. (1 Credit)
Taken concurrently with BIOL 351 when laboratory is offered.
Corequisites: BIOL 351
Course Fee: 150

BIOL 357. Principles of Wildlife Management. (3 Credits)
The ecology, theory, methods, and philosophy of wildlife management emphasizing game, nongame, and endangered species. Students gain an understanding of the roles and responsibilities of various government agencies and non-governmental organizations. Fall, even years.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 357L
Equivalent: ENVS 387

BIOL 357L. Wildlife Management Lab. (1 Credit)
This laboratory includes field trips. Taken concurrently with BIOL 357.
Corequisites: BIOL 357
Equivalent: ENVS 387L
Course Fee: 150

BIOL 359. Studies in Biodiversity. (1 Credit)
May be repeated for credit.
This course is a continuation of BIOL 359L Field Studies in Biodiversity. Research projects initiated in the field in BIOL 359L will be concluded with further library research, completion of a scientific article, and presentation of the research at a local or regional meeting. Fall.
Prerequisites: BIOL 359L with a minimum grade of D
Equivalent: BIOL 159
Enrollment is limited to students with a major in Biology, Biology or App Math - Biology.

BIOL 359L. Field Studies in Biodiversity. (3 Credits)
May be repeated for credit.
This course uses a field experience as a backdrop to learn about evolutionary, ecological and biogeographical processes that determine the ranges and biodiversity of organisms. The course begins with class work on the Gonzaga campus and is followed by 3-4 weeks in the field, where Gonzaga faculty and local experts will mentor students. Field locations vary by year and include Ecuador, Zambia, or domestic locations. This course is designed for students majoring or minoring in biology. The class meets together with students enrolled in BIOL 159L for non-science majors. Students are required to enroll in BIOL 359, Studies in Biodiversity, the semester after enrolling in BIOL 359L.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Equivalent: BIOL 159L

BIOL 360. Plant Biology. (3 Credits)
This course acquaints students with the evolution, structure, development and functions of plant cells, tissues and organs. Plant identification and classification are emphasized, along with the importance of environment and ethical considerations of the applied plant sciences. This course counts towards the required 9 plant-related credits for Wildlife Biology positions with federal agencies, such as U.S. Fish and Wildlife Service and U.S. Forest Service that utilize Wildlife Biology Series GS-0486. Fall, odd years.
Prerequisites: (BIOL 205 with a minimum grade of C- and BIOL 206 with a minimum grade of C-) or ENVS 413 with a minimum grade of B-
Equivalent: ENVS 413

BIOL 363. Plant Propagation and Restoration. (3 Credits)
This course covers the ecological theories and plant strategies that inform ecological restoration, aiming to repair damaged ecosystems and create habitats for wildlife. The practical skills of restoration project planning, monitoring, regulatory reporting, and traditional ecological knowledge will be covered. This course counts towards the required 9 plant-related credits for Wildlife Biology positions with federal agencies, such as U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Bureau of Land Management, etc.; Wildlife Biology Series GS-0486. Spring, odd years.
Prerequisites: BIOL 206 with a minimum grade of C- or ENVS 103 with a minimum grade of B-
Corequisites: BIOL 363L
Equivalent: ENVS 414

BIOL 363L. Plant Propagation and Restoration Lab. (1 Credit)
This course will address plant propagation, plant identification, and general plant care that are foundational skills for restoration projects. Field trips are included. This course counts towards the required 9 plant-related credits for Wildlife Biology positions with federal agencies, such as U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Bureau of Land Management, etc.; Wildlife Biology Series GS-0486.
Prerequisites: BIOL 206 with a minimum grade of C- or ENVS 103 with a minimum grade of B-
Corequisites: BIOL 363
Equivalent: ENVS 414L
Course Fee: 150

BIOL 367. Entomology. (3 Credits)
This course introduces students to the scientific study of insects. Topics will include insect identification, diversity, behavior, anatomy, ecology, and applied entomology. Fall, odd years.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 367L
Equivalent: ENVS 406

BIOL 367L. Entomology Lab. (1 Credit)
This laboratory includes field trips. Taken concurrently with BIOL 367.
Corequisites: BIOL 367
Equivalent: ENVS 406L
Course Fee: 150

BIOL 370. Microbiology. (3 Credits)
A study of the fundamental factors involved in microbiology including basic microbial morphology, taxonomy, biochemistry, genetics, and culture techniques. Fall and Spring
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 370L

BIOL 370L. Microbiology Lab. (1 Credit)
Taken concurrently with BIOL 370.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 370
Course Fee: 150

BIOL 371. Vertebrate Biology and Anatomy. (3 Credits)
Vertebrate diversity, structure and function from an evolutionary perspective. Topics covered will include development, physiology, ecology, behavior and conservation. Spring, odd years.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 371L
Enrollment is limited to students with a major in Biology, Biology or App Math - Biology.

BIOL 371L. Vertebrate Biology and Anatomy Lab. (1 Credit)
Taken concurrently with BIOL 371.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 371
Course Fee: 150

BIOL 374. Immunology. (3 Credits)
An introduction to the cellular and molecular basis of the immune response. Topics will include structures and interactions of molecules in the immune system, generation of diversity in immune specificity, cellular immunology, and the basis of immunity and autoimmune diseases. Fall.
Prerequisites: Prerequisites exist. Refer to Zagweb.

BIOL 375. Virology. (3 Credits)
Viral evolution, replication, virus-host interactions, epidemiology, and lateral gene transfer are covered. Spring.
Prerequisites: Prerequisites exist. Refer to Zagweb.

BIOL 376. Cellular Neurophysiology. (3 Credits)
This course provides an in-depth exploration of the cellular mechanisms underlying the functions of the nervous system. Topics covered include the electrical and chemical signaling properties of neurons, synaptic transmission, and neural plasticity. Students will also examine current research in the field of neurophysiology and develop an understanding of the relationship between cellular processes and behavior. Spring.
Prerequisites: Prerequisites exist. Refer to Zagweb.

BIOL 380. Special Topics:. (0-6 Credits)
May be repeated for credit.
This course may be repeated as long as the content is different than other occurrences of enrollment. If course is not taught by a Gonzaga faculty member, a limited number of credits can be applied to Biology electives: 5 for BS, 3 for BA, 1 for minor. Study abroad and School for Field Studies courses are examples.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Enrollment is limited to students with a program in Biology, Biology or Biology.

BIOL 380L. Special Topics:. (0-6 Credits)
May be repeated for credit.
Prerequisites: Prerequisites exist. Refer to Zagweb.

BIOL 390. Directed Reading. (1-4 Credits)
May be repeated for credit.
Topic to be determined by instructor.

BIOL 395. Research Assistantship. (0 Credits)
May be repeated for credit.
Undergraduate research assistantships are opportunities for student to earn a stipend while performing independent research in the laboratory of a Biology or Chemistry & Biochemistry faculty member. By Department Chair permission only.

BIOL 399. Advanced Topic:. (2 Credits)
May be repeated for credit.
An introduction to primary research literature on specific biological topics. Students will write a paper that has as its foundation primary literature. Students will utilize their oral communication skills to explain the background of a given biology topic and lead discussions of the primary literature. Topics will vary. Course should be taken Junior year and must be completed with a C- grade or better prior to taking BIOL 499. Pre-requisites vary depending on topic. Course can only be repeated with permission from the Biology Department Chair.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Enrollment is limited to students with a program in Biology, Biology, App Math - Biology or Biology.

Students with the Biology 399 previously taken attribute may **not** enroll.

BIOL 403. Marine Biology. (3 Credits)
Students will explore the biology of marine systems. Topics will include atmospheric and climate modeling, fluid dynamics, physiology, evolution of diversity, ecology, molecular biology, economics, and environmental science. Offered upon sufficient demand.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 403L
Equivalent: ENVS 403

BIOL 403L. Marine Biology Lab. (1 Credit)
Taken concurrently with BIOL 403 when laboratory is offered.
Corequisites: BIOL 403
Course Fee: 150

BIOL 404. Freshwater Biology. (3 Credits)
An introduction the physical, chemical, geological, and human factors which influence freshwater organisms and their communities. After completion of the course students will be competent in application of ecological concepts to freshwater systems and to understand the impacts of human activities on freshwater ecosystems. Spring, even years.
Prerequisites: BIOL 206 with a minimum grade of C- and BIOL 206L with a minimum grade of C-
Corequisites: BIOL 404L
Equivalent: ENVS 408
Enrollment is limited to students with a program in Biology, Biology or Biology.

BIOL 404L. Freshwater Biology Lab. (1 Credit)
Taken concurrently with BIOL 404. Lab will emphasize field techniques, sample identification, and scientific inquiry. Equivalent: ENVS 408L Co-requisite: BIOL 404
Prerequisites: BIOL 206 with a minimum grade of C- and BIOL 206L with a minimum grade of C-
Corequisites: BIOL 404
Equivalent: ENVS 408L
Course Fee: 150
Enrollment is limited to students with a program in Biology, Biology or Biology.

BIOL 420. Physiological Ecology. (3 Credits)
This course will examine the interactions between organismal function and the physical environment. Topics include: physiological and evolutionary adaptations to extreme environments (high altitudes, deep oceans, and deserts), physiological determinants of patterns of diversity, limits to performance and environmental tolerance, and physiological responses to climate change. Fall, odd years.
Prerequisites: Prerequisites exist. Refer to Zagweb.

BIOL 425. Ecotoxicology. (3 Credits)
This course provides an overview of pollutants in different environments, their movement through these environments, and the effects these pollutants have on organisms at the molecular, cellular, individual, population, and ecosystem levels. Numerous case studies on specific aspects of environmental toxicology in the US will be examined throughout the course. Students will also be introduced to how toxicology is linked to environmental policies, climate change, and environmental justice. Fall, odd years.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 425L
Equivalent: ENVS 409
Enrollment is limited to students with a program in Biology, Biology or Biology.

BIOL 425L. Ecotoxicology Lab. (1 Credit)
Taken concurrently with BIOL 425L. Labs will focus on methodology, instrumentation, data analyses, and writing scientific reports.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 425
Equivalent: ENVS 409L
Course Fee: 150
Enrollment is limited to students with a program in Biology, Biology or Biology.

BIOL 432. CIS:. (3 Credits)
The Core Integration Seminar (CIS) engages the Year Four Question: "Imagining the possible: What is our role in the world?" by offering students a culminating seminar experience in which students integrate the principles of Jesuit education, prior components of the Core, and their disciplinary expertise. Each section of the course will focus on a problem or issue raised by the contemporary world that encourages integration, collaboration, and problem solving. The topic for each section of the course will be proposed and developed by each faculty member in a way that clearly connects to the Jesuit Mission, to multiple disciplinary perspectives, and to our students' future role in the world.
Prerequisites: Prerequisites exist. Refer to Zagweb.

BIOL 441. Advanced Physiology. (3 Credits)
May be repeated for credit.
Physiological mechanisms, processes and responses of animals. Physical, chemical and biochemical principles common to physiological systems, such as respiration, excretion, and metabolism, will be covered. Goals of the course are to reveal the mechanisms, adaptive significance, and evolution of physiological systems using a comparative approach. This course may be repeated once as long as the content is different than the first occurrence of enrollment.
Prerequisites: Prerequisites exist. Refer to Zagweb.

BIOL 451. Comparative Endocrinology. (3 Credits)
A comparative study of the structure and function of hormones across a wide variety of taxa (emphasizing vertebrates), including secretion and regulation of hormones, mechanisms of action, and integration of hormones into biological processes. Fall, even years.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 451L

BIOL 451L. Comparative Endocrinology Lab. (1 Credit)
Taken concurrently with BIOL 451 when laboratory is offered.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 451
Course Fee: 150

BIOL 456. Molecular Biology. (3 Credits)
This course explores experimental strategies and techniques for discovering how genes function at the molecular level. The course integrates genetics and biochemistry focusing especially on the relationship between DNA, RNA and protein. Spring.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 456L

BIOL 456L. Molecular Biology Lab. (1 Credit)
Labs focus on the construction, manipulation, and analysis of recombinant DNA molecules. Taken concurrently with BIOL 456.
Corequisites: BIOL 456
Course Fee: 150

BIOL 484. Research Seminar. (1 Credit)
This class is designed to expose students to various areas of biology research and to the different communication forms of that research. Graduate school is a fundamental part of the biology research pathway and therefore this course will help students to become familiar with the graduate school process. The format of the class will include seminars and class meetings. Fall and Spring.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Enrollment limited to students with a semester level of Fourth Year (96+ credits) or Third Year (60-95.99 credits).

BIOL 490. Directed Reading. (1-4 Credits)
May be repeated for credit.
Reading material will be selected by the student after consultation with a faculty member in the department. A maximum of six credits of any combination of BIOL 390, BIOL 490, BIOL 496, and BIOL 498 can be applied to Biology electives. By permission only.
Prerequisites: Prerequisites exist. Refer to Zagweb.

BIOL 495. Senior Evaluation. (0 Credits)
May be repeated for credit.
Required of all majors. Students will take the Major Field Test in Biology in their senior year. Students must score at or above the 20th percentile to pass the course. Fall and Spring.
Corequisites: BIOL 499
Enrollment limited to students with a semester level of Fourth Year (96+ credits).

Enrollment is limited to students with a program in Biology or Biology.

BIOL 497. Biology Internship. (0-6 Credits)
May be repeated for credit.
Professional work experience in a biology-related field. Students are responsible for arranging placement opportunities, and gaining approval from a supervising faculty member in the Biology department. This course does not satisfy any requirements for the Biology major or minor. Satisfactory /Unsatisfactory grading only.
Enrollment limited to students with a semester level of Fourth Year (96+ credits) or Third Year (60-95.99 credits).

Enrollment is limited to students with a program in Biology, Biology or Biology.

BIOL 498. Undergraduate Research. (0-6 Credits)
May be repeated for credit.
This course provides the motivated student with the opportunity to conduct an independent research project under the direction of a Biology Department faculty member. A maximum of six credits of any combination of BIOL 390, BIOL 490, BIOL 496, and BIOL 498 can be applied to Biology electives.
Prerequisites: Prerequisites exist. Refer to Zagweb.

BIOL 499. Senior Colloquium. (1 Credit)
Required of all majors. This course meets once per week to discuss biological issues relevant to society. Students must complete all 200-level major requirements and BIOL 399 with C- grades or better to take this senior level course. Taken concurrently with BIOL 495. Fall and Spring.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: BIOL 495
Enrollment limited to students with a semester level of Fourth Year (96+ credits).