

# BIOLOGY WITH ECOLOGY EMPHASIS (BS)

The growing significance of environmental issues to the overall health of our world in the new century requires more individuals who are scientifically trained to contribute to solving environmental problems.

The BS in Biology with Ecology emphasis is designed to provide in-depth training for students planning to do research in various areas of environmental sciences as either graduate students or employees of environmental agencies and companies. The curriculum includes the same foundational lecture and laboratory courses in the areas of cell biology, genetics, and ecology taken by general biology majors. Additional coursework focuses specifically on topics related to ecology and evolution.

## Related Programs

### Major

- Biology (BS) (<https://catalog.luc.edu/undergraduate/arts-sciences/biology/biology-bs/>)
- Biology with Molecular Biology Emphasis (BS) (<https://catalog.luc.edu/undergraduate/arts-sciences/biology/biology-molecular-biology-emphasis-bs/>)

## Curriculum

This specialized Biology major requires 37 credit hours, including 9 required Biology courses (21 credit hours) and Biology elective courses (16 credit hours) plus cognate courses in Calculus, Chemistry and Physics. This track allows students to receive the strong background in fundamental biology required of all Biology majors, while also specializing in the areas of ecology and evolution. Students will follow the program outlined below:

| Code  | Title  | Hours     |
|---|--|-----------|
| <b>Biology Courses: Required</b>  |  |           |
| BIOL 101  | General Biology I                            | 3         |
| BIOL 111  | General Biology I Lab                        | 1         |
| BIOL 102  | General Biology II                           | 3         |
| BIOL 112  | General Biology II Lab                       | 1         |
| BIOL 251  | Cell Biology                                 | 3         |
| BIOL 265  | Ecology                                      | 3         |
| BIOL 266  | Ecology Laboratory                           | 1         |
| BIOL 282  | Genetics                                     | 3         |
| BIOL 319  | Evolution                                    | 3         |
| <b>Biology Courses: Electives (p. 1)</b>  |  | <b>16</b> |
| At least six (6) credits must be at 300-level and at least two (2) elective courses must include a laboratory component. (p. 2) |  |           |
| At least two (2) electives must be designated as Ecology Electives. (p. 3)  |  |           |
| <b>Chemistry</b>  |  |           |
| CHEM 160  | Chemical Structure and Properties            | 3         |
| or CHEM 101   | General Chemistry A Lecture/Discussion       |           |
| or CHEM 105   | Chemical Principles                          |           |
| CHEM 161  | Chemical Structure and Properties Laboratory | 1         |
| or CHEM 105   | Chemical Principles                          |           |

|             |  |   |
|-------------|--|---|
| or CHEM 111 | General Chemistry Lab A                      |   |
| CHEM 180    | Chemical Reactivity I                        | 3 |
| or CHEM 221 | Organic Chemistry I Lec/Disc                 |   |
| or CHEM 223 | Organic Chemistry A Lec/Disc                 |   |
| CHEM 181    | Chemical Reactivity I Lab                    | 1 |
| or CHEM 221 | Organic Chemistry I Lec/Disc                 |   |
| or CHEM 225 | Organic Chemistry Lab A                      |   |
| CHEM 240    | Chemical Reactivity II                       | 3 |
| or CHEM 222 | Organic Chemistry II Lec/Disc                |   |
| or CHEM 224 | Organic Chemistry B Lec/Disc                 |   |
| CHEM 241    | Chemical Reactivity II Laboratory            | 1 |
| or CHEM 222 | Organic Chemistry II Lec/Disc                |   |
| or CHEM 226 | Organic Chemistry Lab B                      |   |
| CHEM 260    | Quantitative Methods in Chemistry            | 3 |
| or CHEM 102 | General Chemistry B Lecture/Discussion       |   |
| or CHEM 106 | Basic Inorganic Chemistry                    |   |
| CHEM 261    | Quantitative Methods in Chemistry Laboratory | 1 |
| or CHEM 106 | Basic Inorganic Chemistry                    |   |
| or CHEM 112 | General Chemistry Lab B                      |   |

### Mathematics

|             |                     |     |
|-------------|---------------------|-----|
| MATH 131    | Applied Calculus I  | 3-4 |
| or MATH 161 | Calculus I          |     |
| MATH 132    | Applied Calculus II | 3-4 |
| or MATH 162 | Calculus II         |     |

### Physics

|             |   |     |
|-------------|---|-----|
| PHYS 111    | College Physics I Lec / Dis                         | 3-4 |
| or PHYS 121 | College Physics I with Calculus Lecture/Discussion  |     |
| or PHYS 125 | General Physics I Lec/Disc                          |     |
| PHYS 111L   | College Physics Laboratory I                        | 1   |
| PHYS 112    | College Physics II Lec/Disc                         | 3   |
| or PHYS 122 | College Physics II with Calculus Lecture/Discussion |     |
| or PHYS 126 | General Physics II Lec/Disc                         |     |
| PHYS 112L   | College Physics Lab II                              | 1   |

**Total Hours** **67**

<sup>1</sup> Special topics courses (BIOL 377, BIOL 394, BIOL 394E, BIOL 394M, BIOL 395, BIOL 395E, BIOL 395M, BIOL 397, BIOL 397E, BIOL 397M) can be taken multiple times for credit as long as the course topic is different.

## Biology Electives

| Code                                     | Title                             | Hours |
|--|-----------------------------------|-------|
| <b>Biology</b>                           |                                   |       |
| Any BIOL 200-Level Course <sup>1,2</sup> |                                   |       |
| Any BIOL 300-Level Course <sup>1,3</sup> |                                   |       |
| BIOL 2TRN Biology 200-Level Transfer     |                                   |       |
| BIOL 3TRN Biology 300-Level Transfer     |                                   |       |
| <b>Anthropology</b>                      |                                   |       |
| ANTH 246 /<br>BIOL 246                   | Ancient Human-Animal Interactions | 3     |
| ANTH 280 /<br>BIOL 280                   | Evolution of Human Disease        | 3     |

|                              |   |   |
|------------------------------|---|---|
| ANTH 281 /<br>BIOL 281       | Evolution of the Human Diet                               | 3 |
| ANTH 325 /<br>BIOL 325       | Primatology-Behavior & Ecology                            | 3 |
| ANTH 326 /<br>BIOL 326       | Human Osteology Lec/Lab                                   | 4 |
| ANTH 327 /<br>BIOL 378       | Dental Anthropology                                       | 3 |
| ANTH 346 /<br>BIOL 346       | Biology of Women  | 3 |
| ANTH 359 /<br>BIOL 359       | Paleopathology  | 3 |
| <b>Chemistry</b>             |   |   |
| CHEM 361 /<br>BIOL 366       | Principles of Biochemistry                                | 3 |
| <b>Environmental Science</b> |   |   |
| ENVS 215 /<br>BIOL 215       | Ornithology   | 3 |
| ENVS 267 /<br>BIOL 347       | Bird Conservation and Ecology                             | 3 |
| ENVS 340 /<br>BIOL 340       | Natural History of Belize                                 | 3 |
| ENVS 345 /<br>BIOL 349       | Conservation and Sustainability of Neotropical Ecosystems | 3 |
| ENVS 367                     | Mammalogy   | 3 |
| ENVS 369 /<br>BIOL 348       | Field Ornithology   | 3 |
| <b>Neuroscience</b>          |   |   |
| NEUR 101                     | Introduction to Neuroscience <sup>4</sup>                 | 3 |
| NEUR 300 /<br>BIOL 303       | Seminar in Neuroscience                                   | 1 |
| NEUR 301 /<br>BIOL 373       | Laboratory in Neuroscience I                              | 4 |
| NEUR 302                     | Laboratory in Neuroscience II                             | 3 |
| <b>Physics</b>               |   |   |
| PHYS 371                     | Biophysics  | 3 |
| <b>Psychology</b>            |   |   |
| PSYC 240 /<br>BIOL 240       | Psychology-Biology of Perception <sup>4</sup>             | 3 |
| PSYC 311 /<br>BIOL 313       | Lab in Psychobiology                                      | 3 |
| PSYC 382 /<br>BIOL 284       | Behavioral and Cognitive Neuroscience                     | 3 |
| PSYC 388 /<br>BIOL 373       | Laboratory in Neuroscience I                              | 4 |
| <b>Statistics</b>            |   |   |
| STAT 310 /<br>BIOL 310       | Categorical Data Analysis                                 | 3 |
| STAT 335 /<br>BIOL 335       | Introduction to Biostatistics                             | 3 |
| STAT 336 /<br>BIOL 336       | Advanced Biostatistics                                    | 3 |
| STAT 337 /<br>BIOL 337       | Quantitative Methods in Bioinformatics                    | 3 |

<sup>2</sup> BIOL 296 Introduction to Research can be taken multiple times, but only a maximum of 2 credit hours count as Biology Electives.

<sup>3</sup> A maximum of 3 total credits of BIOL 396, BIOL 396E, BIOL 396M, BIOL 398, BIOL 398E, and BIOL 398M can count as Biology Electives.

<sup>4</sup> Either BIOL 240/PSYC 240 Psychology-Biology of Perception OR NEUR 101 Introduction to Neuroscience (but NOT both) count as Biology Electives.

## Lab Requirements

| Code  | Title   | Hours |
|---|---|-------|
| <b>100-Level Labs</b>                         |   |       |
| Both of the following courses are required:   |   |       |
| BIOL 111                                      | General Biology I Lab                                     | 1     |
| BIOL 112                                      | General Biology II Lab                                    | 1     |
| <b>200-Level Labs</b>                         |   |       |
| The following course is required:             |   |       |
| BIOL 266                                      | Ecology Laboratory  | 1     |
| <b>Biology Elective Labs</b>                  |   |       |
| Choose at least two of the following courses: |   |       |
| BIOL 205                                      | Plant Biology Lec/Lab                                     | 4     |
| BIOL 210                                      | Laboratory Techniques                                     | 2     |
| BIOL 242                                      | Anatomy and Physiology I                                  | 4     |
| BIOL 243                                      | Anatomy and Physiology II                                 | 4     |
| BIOL 252                                      | Cell Biology Laboratory                                   | 1     |
| BIOL 283                                      | Genetics Laboratory                                       | 1     |
| BIOL 302                                      | General Microbiology Lec/Lab                              | 4     |
| BIOL 313 /<br>PSYC 311                        | Lab in Psychobiology                                      | 3     |
| BIOL 315                                      | Introductory Immunology Lec/Lab                           | 4     |
| BIOL 316                                      | Limnology Lec/Lab   | 4     |
| BIOL 323                                      | Comparative Anatomy Lec/Lab                               | 4     |
| BIOL 326 /<br>ANTH 326                        | Human Osteology Lec/Lab                                   | 4     |
| BIOL 327                                      | Wetland Ecology   | 4     |
| BIOL 340 /<br>ENVS 340                        | Natural History of Belize                                 | 3     |
| BIOL 341                                      | Histology Lec/Lab   | 4     |
| BIOL 342                                      | Human Anatomy   | 4     |
| BIOL 347 /<br>ENVS 267                        | Bird Conservation and Ecology                             | 3     |
| BIOL 348 /<br>ENVS 369                        | Field Ornithology   | 3     |
| BIOL 349 /<br>ENVS 345                        | Conservation and Sustainability of Neotropical Ecosystems | 3     |
| BIOL 353                                      | Natural History of Vertebrates                            | 4     |
| BIOL 355                                      | Parasitology Lec/Lab                                      | 4     |
| BIOL 360                                      | Field Biology   | 3     |
| BIOL 363                                      | Entomology Lec/Lab  | 4     |
| BIOL 366L                                     | Cell Physiology & Biochemistry Lab                        | 3     |
| BIOL 367                                      | Bioimaging  | 4     |
| BIOL 368                                      | Plant Ecology Lec/Lab                                     | 4     |
| BIOL 370                                      | Ichthyology Lec/Lab                                       | 4     |

<sup>1</sup> If not already taken as a 200-level or 300-level required course.

|                                      |  |     |
|--------------------------------------|--|-----|
| BIOL 373 /<br>NEUR 301 /<br>PSYC 388 | Laboratory in Neuroscience I   | 4   |
| BIOL 375                             | Aquatic Insects Lecture & Laboratory   | 4   |
| BIOL 385                             | Prin Electron Microscopy Lec/Lab   | 4   |
| BIOL 390                             | Molecular Biology Laboratory   | 4   |
| BIOL 394                             | Special Topics in Biology Laboratory   | 1-4 |
| BIOL 394E                            | Special Topics in Biology Laboratory (Ecology Emph)                            | 1-4 |
| BIOL 394M                            | Special Topics in Biology Laboratory (Molecular Emph)                          | 1-4 |
| BIOL 395L                            | Special Topics Laboratory  | 1-4 |
| BIOL 396                             | Research <sup>1</sup>  | 3   |
| BIOL 396E                            | Research (Ecology Emph) <sup>1</sup>   | 3   |
| BIOL 396M                            | Research (Molecular Emph) <sup>1</sup>   | 3   |
| BIOL 397                             | Course-Based Undergraduate Research Experience 1-4 in Biology                  | 1-4 |
| BIOL 397E                            | Course-based Undergraduate Research Experience 1-4 in Biology (Ecology Emph)   | 1-4 |
| BIOL 397M                            | Course-based Undergraduate Research Experience 1-4 in Biology (Molecular Emph) | 1-4 |
| BIOL 398                             | Internship in Biology <sup>1</sup>   | 1-3 |
| BIOL 398E                            | Internship in Biology (Ecology Emph) <sup>1</sup>                              | 1-3 |
| BIOL 398M                            | Internship in Biology (Molecular Emph) <sup>1</sup>                            | 1-3 |
| NEUR 302                             | Laboratory in Neuroscience II  | 3   |

<sup>1</sup> A maximum of one course of BIOL 396, BIOL 396E, BIOL 396M, BIOL 398, BIOL 398E, and BIOL 398M can count toward the 2 minimum courses of Biology Labs.

## Ecology Electives

| Code           | Title   | Hours |
|----------------|---|-------|
| <b>Biology</b> |   |       |
| BIOL 205       | Plant Biology Lec/Lab                               | 4     |
| BIOL 316       | Limnology Lec/Lab                                   | 4     |
| BIOL 320       | Animal Behavior                                     | 3     |
| BIOL 321       | Great Transitions in Vertebrate History             | 3     |
| BIOL 327       | Wetland Ecology                                     | 4     |
| BIOL 328       | Conservation Biology                                | 3     |
| BIOL 330       | Global Change Biology                               | 3     |
| BIOL 344       | Microbial Evolution and Human Well-being            | 3     |
| BIOL 353       | Natural History of Vertebrates                      | 4     |
| BIOL 355       | Parasitology Lec/Lab                                | 4     |
| BIOL 360       | Field Biology                                       | 3     |
| BIOL 363       | Entomology Lec/Lab                                  | 4     |
| BIOL 368       | Plant Ecology Lec/Lab                               | 4     |
| BIOL 369       | Invertebrate Biology                                | 3     |
| BIOL 370       | Ichthyology Lec/Lab                                 | 4     |
| BIOL 375       | Aquatic Insects Lecture & Laboratory                | 4     |
| BIOL 394E      | Special Topics in Biology Laboratory (Ecology Emph) | 1-4   |
| BIOL 395E      | Special Topics in Biology (Ecology Emph)            | 3     |
| BIOL 396E      | Research (Ecology Emph) <sup>1</sup>                | 3     |

|                              |  |     |
|------------------------------|--|-----|
| BIOL 397E                    | Course-based Undergraduate Research Experience 1-4 in Biology (Ecology Emph) | 1-4 |
| BIOL 398E                    | Internship in Biology (Ecology Emph) <sup>1</sup>                            | 1-3 |
| BIOL 399E                    | Individual Study (Ecology Emph)  | 1-3 |
| <b>Anthropology</b>          |  |     |
| ANTH 246 /<br>BIOL 246       | Ancient Human-Animal Interactions  | 3   |
| ANTH 281 /<br>BIOL 281       | Evolution of the Human Diet  | 3   |
| ANTH 325 /<br>BIOL 325       | Primatology-Behavior & Ecology   | 3   |
| <b>Environmental Science</b> |  |     |
| ENVS 215 /<br>BIOL 215       | Ornithology  | 3   |
| ENVS 267 /<br>BIOL 347       | Bird Conservation and Ecology  | 3   |
| ENVS 340 /<br>BIOL 340       | Natural History of Belize  | 3   |
| ENVS 345 /<br>BIOL 348       | Conservation and Sustainability of Neotropical Ecosystems                    | 3   |
| ENVS 367                     | Mammalogy  | 3   |
| ENVS 369 /<br>BIOL 349       | Field Ornithology  | 3   |
| <b>Statistics</b>            |  |     |
| STAT 335 /<br>BIOL 335       | Introduction to Biostatistics  | 3   |

<sup>1</sup> A maximum of 3 total credits of either BIOL 396E Research (Ecology Emph) OR BIOL 398E Internship in Biology (Ecology Emph) (but NOT both) can count toward the BIOE-BS degree.

## Suggested Sequence of Courses

The below sequence of courses is meant to be used as a suggested path for completing coursework. An individual student's completion of requirements depends on course offerings in a given term as well as the start term for a major or graduate study. Students should consult their advisor for assistance with course selection.

The biology department recommends that students pursuing the BS in Biology with Ecology Emphasis complete their required classes in the following sequence. Requirements include courses in Biology (BIOL), Chemistry (CHEM), Mathematics (MATH) and Physics (PHYS):

| Course                 | Title  | Hours     |
|------------------------|--|-----------|
| <b>First Semester</b>  |  |           |
| BIOL 101               | General Biology I                            | 3         |
| BIOL 111               | General Biology I Lab                        | 1         |
| CHEM 160               | Chemical Structure and Properties            | 3         |
| CHEM 161               | Chemical Structure and Properties Laboratory | 1         |
| MATH 131               | Applied Calculus I                           | 3         |
| <b>Hours</b>           |  | <b>11</b> |
| <b>Second Semester</b> |  |           |
| BIOL 102               | General Biology II                           | 3         |
| BIOL 112               | General Biology II Lab                       | 1         |
| CHEM 180               | Chemical Reactivity I                        | 3         |

|                         |  |           |
|-------------------------|--|-----------|
| CHEM 181                | Chemical Reactivity I Lab                    | 1         |
| MATH 132                | Applied Calculus II                          | 3         |
| <b>Hours</b>            |  | <b>11</b> |
| <b>Third Semester</b>   |  |           |
| BIOL 265                | Ecology                                      | 3         |
| BIOL 266                | Ecology Laboratory                           | 1         |
| CHEM 240                | Chemical Reactivity II                       | 3         |
| CHEM 241                | Chemical Reactivity II Laboratory            | 1         |
| <b>Hours</b>            |  | <b>8</b>  |
| <b>Fourth Semester</b>  |  |           |
| BIOL 282<br>or BIOL 251 | Genetics<br>or Cell Biology                  | 3         |
| CHEM 260                | Quantitative Methods in Chemistry            | 3         |
| CHEM 261                | Quantitative Methods in Chemistry Laboratory | 1         |
| <b>Hours</b>            |  | <b>7</b>  |
| <b>Fifth Semester</b>   |  |           |
| BIOL 251<br>or BIOL 282 | Cell Biology<br>or Genetics                  | 3         |
| PHYS 111                | College Physics I Lec / Dis                  | 3         |
| PHYS 111L               | College Physics Laboratory I                 | 1         |
| <b>Hours</b>            |  | <b>7</b>  |
| <b>Sixth Semester</b>   |  |           |
| BIOL 319                | Evolution                                    | 3         |
| PHYS 112                | College Physics II Lec/Disc                  | 3         |
| PHYS 112L               | College Physics Lab II                       | 1         |
| BIOL Elective (Ecology) |  | 3         |
| <b>Hours</b>            |  | <b>10</b> |
| <b>Seventh Semester</b> |  |           |
| BIOL Elective (Ecology) |  | 3         |
| BIOL Electives          |  | 5         |
| <b>Hours</b>            |  | <b>8</b>  |
| <b>Eighth Semester</b>  |  |           |
| BIOL Electives          |  | 5         |
| <b>Hours</b>            |  | <b>5</b>  |
| <b>Total Hours</b>      |  | <b>67</b> |

## Transferring Credit

Transfer students seeking the BS in Biology with Ecology Emphasis degree must take a minimum of 20 credit hours in Biology courses at Loyola. No more than 18 credit hours from another institution may be applied to the BS in Biology with Ecology Emphasis degree program.

## Course Repeat Rule

Effective with the spring 2009 semester, students are allowed only TWO attempts to pass Biology courses with a C- or better grade. The two attempts includes withdrawals (W).

The procedure for securing approval for a repeat: Students must come to the Biology Department, fill out a permission to register form, and obtain signatures of both the faculty instructor, and the Biology Chairperson or Assistant-Chairperson. A copy of this form is then submitted to the student's academic advisor to secure final permission for the repeat. After a second attempt to pass a Biology course, it is at the discretion of

the Biology Chairperson or Assistant-Chairperson whether the student may repeat the course.

## College of Arts and Sciences Graduation Requirements

All Undergraduate students in the College of Arts and Sciences are required to take two Writing Intensive courses (6 credit hours) as well as complete a foreign language requirement at 102-level or higher (3 credit hours) or a language competency test. More information can be found here (<https://www.luc.edu/cas/college-requirements/>).

## Additional Undergraduate Graduation Requirements

All Undergraduate students are required to complete the University Core, at least one Engaged Learning course, and UNIV 101. SCPS students are not required to take UNIV 101. Nursing students in the Accelerated BSN program are not required to take core or UNIV 101. You can find more information in the University Requirements (<https://catalog.luc.edu/undergraduate/university-requirements/>) area.

## Learning Outcomes

At the completion of the Undergraduate Biology with Ecology Emphasis Major:

- Students will demonstrate developing mastery of the following Vision and Change core concepts and their related principals as they relate to population ecology, community ecology, and ecosystem-level concepts: evolution (the diversity of life-forms that have evolved over time through mutations, selection and genetic change; structure and function (the basic units of biological structures that define the functions of all living things); information flow, exchange and storage (the influence of genetics on the control of the growth and behavior of organisms); pathways and transformations of energy and matter (the ways in which chemical transformation pathways and the laws of thermodynamics govern the growth and change of biological systems); and systems (the ways in which living things are interconnected and interact with one another).
- Students will be able to retrieve, synthesize, and critically evaluate scientific literature.
- Students will be able to communicate (orally and in writing) results and interpretation of scientific research.
- Students will be able to design and implement experiments that test predictive hypotheses, analyze data, report results, and interpret the significance of these experiments to enhance their understanding of ecological systems.