# BIOLOGY, MASTER OF SCIENCE

The graduate program leading to the degree of Master of Science in Biology prepares students to apply basic scientific principles to the practical biological problems encountered in business, industry, government, and education. Graduates from the program will be able to apply the techniques of scientific research to real-world biological problems. Course work may include several important areas relevant to biology, including biotechnology, bio-fuels, statistics, environmental, molecular, and cellular biology.

A unique feature of the program is its 3+2 plan which is described in the Biology 3+2 Plan description. The 3+2 plan allows a student to simultaneously receive a BS and an MS degree in five years.

There are three options for MS degrees in Biology. Both the Thesis MS option and the Internship MS option must be completed on campus and only one course per year may be completed online.

### Thesis Option

For students interested in biological research, agency jobs, and professional schools where research experience is valued. The thesis option requires successful completion of the on campus core, six semester credits of thesis research (BIOL 599 THESIS RESEARCH (1.00 c.h.)) and an approved thesis, as well as 12 credits of elective coursework. Thesis option students are required to defend their research results before a thesis defense committee.

### Internship Option

Designed for students who already have or plan to complete an internship as part of the MS degree. The Internship MS option requires successful completion of the on campus core, four semester credits of Internship, and 16 credits of elective coursework. The program of study for each student must be approved by a graduate committee and the Program Director. A Intern MS option student must complete a comprehensive exam, submit a formal written report based on an internship, and defend their internship work before their graduate committee.

### Online Non-Thesis Option

Available for a broad range of career professionals including science teachers requiring graduate coursework and individuals with positions in which an MS in Biology will qualify them for promotion. The Online MS non-thesis option requires completion of the online core and 23 credits of elective coursework. The program of study for each student must be approved by a graduate committee and the Program Director. A online MS non-thesis option student must complete a comprehensive exam.

## Specific Admission Requirements

Students applying to the Biology MS Program must have a suggested 3.0 overall GPA and a bachelor's degree in Biology or a similar field.

The application file for admission:

1. A completed Biology MS online application;
2. Official college transcripts;
3. Two letters of recommendation;
4. A letter of support from a CSU-Pueblo Faculty mentor
5. A letter of intent;
6. GRE scores are optional and may be used to supplement the application

## Expected Student Learning Outcomes

Upon completion of the MS in Biology, students will have achieved the following goals:

**Mastery of the Scientific Method**
: Independent development and mastery of problem solving skills including experimental design, execution, critical analysis, and interpretation of the results of original scientific experimentation (thesis) or experiential learning (internship).

**Dissemination of Scientific Products**
: Persuasive communication and defense of significant results of original scientific investigation presented in both written and oral format at a graduate peer-professional level.

**Utilization of the Literature**
: Critical evaluation of an independently accessed comprehensive body of scientific literature which is project relevant and foundational in supporting and explaining research findings in both written and oral format.

**Development of a Relevant Knowledge Base**
: Development of intrinsically held fundamental field-specific knowledge which will be applied to explain and defend research findings at a level of mastery expected by peer-professionals.

**Professionalism & Self Responsibility**
: Maintain a consistent professional work ethic of independently taking the initiative and motivation to produce tangible products of a quality commensurate with peer-standards in graduate or professional schools or in the career field being pursued.

## Outcomes Assessment Activities

The faculty of the GPNS will use a variety of methods for evaluating student learning outcomes. Students completing this degree program will give a public research seminar (BIOL 593 Seminar (1 c.h.)) that will be evaluated by cognizant GPNS faculty members. A research thesis or internship project will be designed, conducted, and publically presented in writing and orally prior to defense and evaluation by the student's Graduate Advisory Committee.

## Specific Program Requirements

### Program Overviews

#### Thesis Option

| Course | Title | Credits |
|---|---|---|
| Core Requirements | | 4 |
| Option Requirements | | 30 |
| Electives | | 12 |
| **Total Credits** | | **46** |

#### Non-Thesis Option

### Specific Core Requirements

**On campus students will take one of the following courses:**

| Course | Title | Credits |
|---|---|---|
| BIOL 512 & 512L | Advanced Cellular Biology and Advanced Cellular Biology Lab | 4 |

| | | |
|---|---|---|
| BIOL 514 & 514L | Vertebrate Physiology and Vertebrate Physiology Lab | 4 |
| BIOL 540 & 540L | Advanced Biotechniques and Advanced Biotechniques Lab | 4 |
| BIOL 543 & 543L | Limnology and Limnology Lab | 4 |
| BIOL 553 & 553L | Ecology and Ecology Field Studies | 4 |

## Thesis Option

| Course | Title | Credits |
|---|---|---|
| **Core Requirements** | | |
| Core Courses | | 4 |
| **Concentration Core Requirements** | | |
| BIOL 510 | Foundations in Graduate Studies | 3 |
| MATH 550 | Statistical Methods | 3 |
| BIOL 599 | Thesis Research | 6 |
| BIOL 593 | Seminar | 1 |
| BIOL 589 | Thesis Defense | 1 |
| **Elective Courses** | | |
| Select 12 credits | | 12 |
| **Total Credits** | | **30** |

## Internship Option

| Course | Title | Credits |
|---|---|---|
| **Core Requirements** | | |
| Core Courses | | 4 |
| **Concentration Core Requirements** | | |
| BIOL 510 | Foundations in Graduate Studies | 3 |
| MATH 550 | Statistical Methods | 3 |
| BIOL 593 | Seminar | 1 |
| BIOL 598 | Internship | 4 |
| BIOL 588 | Internship Seminar | 1 |
| **Elective Courses** | | |
| Select 16 credits | | 16 |
| **Total Credits** | | **32** |

## Online Non-Thesis Option

| Course | Title | Credits |
|---|---|---|
| **Online Core Courses** | | |
| BIOL 505 | Foundations in Graduate Studies | 3 |
| BIOL 548 | Biological Statistics | 3 |
| BIOL 559 | Comprehensive Exam | 1 |
| BIOL 568 | Evolution | 3 |
| BIOL 577 | Current Issues in Biology (students must take 1cr BIOL 577 three different semesters) | 3 |
| **Online Elective Courses** | | |
| Select 23 credits | | 23 |
| **Total Credits** | | **36** |

### Elective Courses

Elective courses are selected from courses listed below: (others may be added, with permission as new courses are added, or from other areas of study, for example biochemistry or wildlife and natural resources).

| Course | Title | Credits |
|---|---|---|
| BIOL 502 | Immunology | 3 |
| BIOL 503 & 503L | Virology and Virology Lab | 4 |
| BIOL 512 & 512L | Advanced Cellular Biology and Advanced Cellular Biology Lab | 4 |
| BIOL 513 & 513L | Plant Physiology and Plant Physiology Lab | 4 |
| BIOL 514 & 514L | Vertebrate Physiology and Vertebrate Physiology Lab | 4 |
| BIOL 521 & 521L | Histology and Histology Lab | 4 |
| BIOL 532 & 532L | Developmental Biology and Developmental Biology Lab | 4 |
| BIOL 540 & 540L | Advanced Biotechniques and Advanced Biotechniques Lab | 4 |
| BIOL 541 & 541L | Freshwater Invertebrate Zoology and Freshwater Invertebrate Zoology Lab | 4 |
| BIOL 543 & 543L | Limnology and Limnology Lab | 4 |
| BIOL 552 & 552L | Advanced Microscopy and Advanced Microscopy Lab | 4 |
| BIOL 553 & 553L | Ecology and Ecology Field Studies | 4 |
| BIOL 554 | Behavioral Ecology | 3 |
| BIOL 561 | Applied Geospatial Technology (GIS/GPS) | 3 |
| BIOL 562 | Environmental Policy & Management | 3 |
| BIOL 565 | Environmental Toxicology | 3 |
| BIOL 579 & 579L | Ichthyology and Ichthyology Laboratory | 3 |
| BIOL 581 & 581L | Entomology and Entomology Lab | 3 |
| BIOL 582 & 582L | Herpetology and Herpetology Lab | 3 |
| BIOL 583 & 583L | Mammalogy and Mammalogy Lab | 3 |
| BIOL 584 & 584L | Ornithology and Ornithology Lab | 3 |
| BIOL 585 & 585L | Plant Taxonomy and Plant Taxonomy Lab | 4 |
| BIOL 586 | Field Botany | 3 |
| BIOL 591 | Special Topics | 1-4 |
| BIOL 595 | Independent Study | 1-4 |