

BIOLOGICAL SCIENCES

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The Department of Biological Sciences offers five distinct life sciences majors provided by a nationally recognized faculty that excels in teaching and research. Many faculty members have received University wide recognition for outstanding teaching. Research programs are funded by grants from agencies such as the National Institutes of Health and the National Science Foundation.

The innovative and highly integrated curriculum provides a sound foundation in molecular, cellular, developmental, organismal, ecological and environmental biology. The curriculum prepares students for futures in medicine, dentistry, veterinary medicine, graduate programs in the life sciences, graduate programs in health-related fields like physical therapy or physician assistant programs, ecology, environmental science, conservation biology and science education at the secondary school level.

Programs of Study from the department of Biological Sciences

The department offers majors in the following areas: biological sciences, molecular biology, physiology in health and disease, ecology and biodiversity, and integrated sciences. We also offer minors in biological sciences and human health science and systems.

Biological Sciences, BS & BA Majors

The biological sciences major provides a curriculum that encompasses the spectrum of disciplines in the life sciences.

Bachelor of Arts - Biological Sciences Major Requirements

(183 credits required for the degree (<http://bulletin.du.edu/undergraduate/undergraduateprograms/traditionalbachelorsprogram/bachelorofarts/>))

45 credits of biology. Requirements include:

| Code | Title | Credits |
|---|--|-----------|
| BIOL 1010 & BIOL 1020 | Physiological Systems and Physiological Systems Lab | 5 |
| BIOL 1011 & BIOL 1021 | Evolution, Heredity and Biodiversity and Evolution, Heredity and Biodiversity Lab | 5 |
| BIOL 2120 & BIOL 2121 | Cell Structure and Function and Cell Structure & Function Lab | 5 |
| BIOL 2510 & BIOL 2511 | General Genetics and General Genetics Lab | 5 |
| BIOL 2010 & BIOL 2011 | General Ecology and General Ecology Lab | 5 |
| Additional Biology electives at the 2000 or 3000 level ¹ | | 20 |
| Total Credits | | 45 |

Additional Requirements

| Code | Title | Credits |
|---|---|---------|
| The BA requires either one year of Chemistry or a minor in Chemistry. In addition, eight credits of Mathematics are required. | | |
| Chemistry | | |
| Chemistry coursework requirements include: | | 12-20 |
| CHEM 1010 & CHEM 1240 | General Chemistry I and General Chemistry I Laboratory | |
| CHEM 1020 & CHEM 1250 | General Chemistry II and General Chemistry II Laboratory | |
| CHEM 2000 or 3000 level course (at least 4 credits) | | |
| Mathematics | | |
| Select one of the following combinations: | | 8 |

| | |
|--------------------------|--|
| MATH 1951 & MATH 1952 | Calculus I and Calculus II |
| or | |
| MATH 1951 & BIOL 2090 | Calculus I and Biostatistics |
| or | |
| MATH 1951 & PSYC 2300 | Calculus I and Introduction to Statistics |
| Total Credits | |
| 20-28 | |

¹ Only five credits of BIOL 3995 Independent Research and/or BIOL 3991 Independent Study may be counted toward the credit requirement for the major.

Bachelor of Science - Biological Sciences Major Requirements

(183 credits required for the degree (<http://bulletin.du.edu/undergraduate/undergraduateprograms/traditionalbachelorsprogram/bachelorofscience/>))

45 credits of biology. Requirements include:

| Code | Title | Credits |
|---|--|-----------|
| BIOL 1010 & BIOL 1020 | Physiological Systems and Physiological Systems Lab | 5 |
| BIOL 1011 & BIOL 1021 | Evolution, Heredity and Biodiversity and Evolution, Heredity and Biodiversity Lab | 5 |
| BIOL 2120 & BIOL 2121 | Cell Structure and Function and Cell Structure & Function Lab | 5 |
| BIOL 2510 & BIOL 2511 | General Genetics and General Genetics Lab | 5 |
| BIOL 2010 & BIOL 2011 | General Ecology and General Ecology Lab | 5 |
| Additional Biology electives at the 2000 or 3000 level ¹ | | 20 |
| Total Credits | | 45 |

Additional Requirements

| Code | Title | Credits |
|--|---|---------|
| Two minors are required for the BS, one of which must be Chemistry. In addition, one year of Physics and one year of Mathematics are required. | | |
| Chemistry | | |
| A chemistry minor is required. Refer to the Department of Chemistry and Biochemistry | | 20 |
| Physics | | |
| One year of Physics with lab. Select one of the following: | | 15 |
| PHYS 1111 & PHYS 1112 & PHYS 1113 | General Physics I and General Physics II and General Physics III | |
| or | | |
| PHYS 1211 & PHYS 1212 & PHYS 1213 | University Physics I and University Physics II and University Physics III | |
| Mathematics | | |
| One year of Mathematics. Select one of the following: | | 12 |
| MATH 1951 & MATH 1952 & MATH 1953 | Calculus I and Calculus II and Calculus III | |
| or | | |
| MATH 1951 & MATH 1952 & BIOL 2090 | Calculus I and Calculus II and Biostatistics | |

| | | | |
|---|---|--|-----------|
| or | | | |
| MATH 1951 & MATH 1952 & PSYC 2300 | Calculus I and Calculus II and Introduction to Statistics | | |
| Total Credits | | | 47 |

¹ Only five credits of BIOL 3995 Independent Research and/or BIOL 3991 Independent Study may be counted toward the 45-credit requirement for the major.

Requirements for the Cognitive Neuroscience Concentration - Biological Sciences Majors

45 credits of biology. Required coursework includes those listed for the BA or BS major program in biological sciences. Students BIOL coursework must include:

| Code | Title | Credits |
|---|--|-----------|
| BA or BS Biological Sciences major required coursework | | 25 |
| BIOL 3646 | Seminar: Cognitive Neuroscience | 2 |
| Any three of the following: | | 12 |
| BIOL 3160 | Biophysics: Ion Channels & Disease | |
| BIOL 3640 | Introductory Neurobiology | |
| BIOL 3641 | Systems Neuroscience | |
| BIOL 3642 | Neuropharmacology | |
| BIOL 3644 | Neuromuscular Pathophysiology | |
| BIOL 3647 | Neuroscience of Movement | |
| BIOL 3648 | Molecular Mechanisms of Neurological Disease | |
| BIOL 3649 | Neurodegeneration and Neurotrauma: Mechanisms and Therapeutics | |
| BIOL 3650 | Endocrinology | |
| Additional Biology electives at the 2000 or 3000 level ¹ | | 6 |
| Total Credits | | 45 |

Additional Requirements: Bachelor of Arts with Cognitive Neuroscience Concentration

| Code | Title | Credits |
|--|---|--------------|
| The Psychology minor is required for the BA. In addition, one year of Chemistry and eight credits of Mathematics are required. | | |
| Psychology minor for Cognitive Neuroscience students | | 20 |
| See Psychology department for requirements. | | |
| Chemistry | | |
| Chemistry coursework requirements include: | | 12-20 |
| CHEM 1010 & CHEM 1240 | General Chemistry I and General Chemistry I Laboratory | |
| CHEM 1020 & CHEM 1250 | General Chemistry II and General Chemistry II Laboratory | |
| CHEM 2000 or 3000 level course (at least 4 credits) | | |
| Mathematics | | |
| Select one of the following combinations: | | 8 |
| MATH 1951 & MATH 1952 | Calculus I and Calculus II | |
| or | | |
| MATH 1951 & BIOL 2090 | Calculus I and Biostatistics | |
| or | | |
| MATH 1951 & PSYC 2300 | Calculus I and Introduction to Statistics | |
| Total Credits | | 40-48 |

Additional Requirements: Bachelor of Science with Cognitive Neuroscience Concentration

| Code | Title | Credits |
|--|---|-----------|
| Two minors are required for the BS, one of which must be Chemistry with the second minor in Psychology. In addition, one year of Physics and one year of Mathematics are required. | | |
| Psychology minor for Cognitive Neuroscience students | | 20 |
| See Psychology department for requirements | | |
| Chemistry | | |
| A chemistry minor is required. | | 20 |
| Physics | | |
| One year of Physics with lab. Select one of the following: | | 15 |
| PHYS 1111 & PHYS 1112 & PHYS 1113 | General Physics I and General Physics II and General Physics III | |
| or | | |
| PHYS 1211 & PHYS 1212 & PHYS 1213 | University Physics I and University Physics II and University Physics III | |
| Mathematics | | |
| One year of Calculus. Select one of the following: | | 12 |
| MATH 1951 & MATH 1952 & MATH 1953 | Calculus I and Calculus II and Calculus III | |
| or | | |
| MATH 1951 & MATH 1952 & BIOL 2090 | Calculus I and Calculus II and Biostatistics | |
| or | | |
| MATH 1951 & MATH 1952 & PSYC 2300 | Calculus I and Calculus II and Introduction to Statistics | |
| Total Credits | | 67 |

¹ Only five credits of BIOL 3995 Independent Research and/or BIOL 3991 Independent Study may be counted toward the credit requirement for the major.

Biological Sciences - Minor Requirements

20 credits of biology. Requirements include:

| Code | Title | Credits |
|--|--|-----------|
| BIOL 1010 & BIOL 1020 | Physiological Systems and Physiological Systems Lab | 5 |
| BIOL 1011 & BIOL 1021 | Evolution, Heredity and Biodiversity and Evolution, Heredity and Biodiversity Lab | 5 |
| 10 credits of courses at the 2000 level including one from the following courses: ¹ | | 10 |
| BIOL 2120 & BIOL 2121 | Cell Structure and Function and Cell Structure & Function Lab | |
| BIOL 2510 & BIOL 2511 | General Genetics and General Genetics Lab | |
| BIOL 2010 & BIOL 2011 | General Ecology and General Ecology Lab | |
| BIOL 3241 | Anatomy and Physiology of the Skeletal, Nervous and Muscular systems | |
| BIOL 3242 | Human Anatomy and Physiology - Systems of homeostasis | |
| Total Credits | | 20 |

¹ Only 4 credits of Undergraduate Research (BIOL 3995) and/or Independent Study (BIOL 3991) may be counted toward the credit requirement for the minor.

Cognitive Neuroscience

Cognitive Neuroscience Concentration with Biological Sciences Minor (with Psychology Major)

The minor requirements listed below apply only to students completing a Psychology major with a Cognitive Neuroscience concentration. Please see the Department of Psychology (<http://bulletin.du.edu/undergraduate/majorsminorscoursedescriptions/traditionalbachelorsprogrammajorsandminors/psychology/>) for Psychology minor requirements associated with this concentration.

Minimum of 20 credits as follows:

| Code | Title | Credits |
|--|--|---------|
| BIOL 1010 & BIOL 1020 | Physiological Systems and Physiological Systems Lab | 5 |
| BIOL 1011 & BIOL 1021 | Evolution, Heredity and Biodiversity and Evolution, Heredity and Biodiversity Lab | 5 |
| BIOL 2120 & BIOL 2121 | Cell Structure and Function and Cell Structure & Function Lab | 5 |
| BIOL 3646 | Seminar: Cognitive Neuroscience | 2 |
| At least two of the following courses: | | 8 |

| | |
|-----------|--|
| BIOL 3160 | Biophysics: Ion Channels & Disease |
| BIOL 3640 | Introductory Neurobiology |
| BIOL 3641 | Systems Neuroscience |
| BIOL 3642 | Neuropharmacology |
| BIOL 3644 | Neuromuscular Pathophysiology |
| BIOL 3647 | Neuroscience of Movement |
| BIOL 3648 | Molecular Mechanisms of Neurological Disease |
| BIOL 3649 | Neurodegeneration and Neurotrauma: Mechanisms and Therapeutics |
| BIOL 3650 | Endocrinology |

Total Credits **25**

Molecular Biology Major

The Molecular Biology major features upper-division courses that share the common theme of gene expression in biological systems and cellular function. This major is intended for students interested in professional postgraduate programs (medicine, dentistry, veterinary medicine), graduate programs in the life sciences and careers in the biotech industry.

Bachelor of Arts - Molecular Biology Major Requirements

(183 credits required for the degree (<http://bulletin.du.edu/undergraduate/undergraduateprograms/traditionalbachelorsprogram/bachelorofarts/>))

44 credits of biology. Requirements include:

| Code | Title | Credits |
|--------------------------|--|---------|
| BIOL 1010 & BIOL 1020 | Physiological Systems and Physiological Systems Lab | 5 |
| BIOL 1011 & BIOL 1021 | Evolution, Heredity and Biodiversity and Evolution, Heredity and Biodiversity Lab | 5 |
| BIOL 2120 & BIOL 2121 | Cell Structure and Function and Cell Structure & Function Lab | 5 |
| BIOL 2510 & BIOL 2511 | General Genetics and General Genetics Lab | 5 |
| BIOL 3800 | Human Molecular Biology | 4 |
| BIOL 3560 | Molecular Biology Laboratory | 4 |

| Category Elective Courses (minimum of three courses) | | 12 |
|---|--|-----------|
| BIOL 3145 | Cellular and Molecular Biology of Cancer | |
| BIOL 3150 | Intracellular Dynamics | |
| BIOL 3160 | Biophysics: Ion Channels & Disease | |
| BIOL 3570 | Proteins in Biological Systems | |
| BIOL 3610 | Developmental Biology | |
| BIOL 3615 | Blood Vessel Development and Disease | |
| BIOL 3630 | Cell Biology of Development | |
| BIOL 3640 | Introductory Neurobiology | |
| BIOL 3642 | Neuropharmacology | |
| BIOL 3644 | Neuromuscular Pathophysiology | |
| BIOL 3648 | Molecular Mechanisms of Neurological Disease | |
| BIOL 3650 | Endocrinology | |
| BIOL 3656 | Cellular Aspects of Diabetes and Obesity | |
| BIOL 3670 | Molecular Immunology | |
| BIOL 3675 | Virology | |
| BIOL 3690 | Cellular Microbiology | |
| BIOL 3701 | Topics in Genetics | |
| BIOL 3703 | Advanced Topics in Developmental Biology | |
| BIOL 3704 | Advanced Topics in Cell Biology | |
| BIOL 3705 | Advanced Topics in Molecular Biology | |
| BIOL 3850 | Genetic Engineering | |
| BIOL 3855 | Genetic Model Organisms in Health & Disease | |
| BIOL 3910 | Viruses & Infectious Human Diseases | |
| Any 3000-level BIOL course, may include category electives from above. ¹ | | 4 |
| Total Credits | | 44 |

Additional Requirements

| Code | Title | Credits |
|--|--|-----------|
| The BA in Molecular Biology requires a minor in Chemistry. In addition, eight credits of Mathematics are required. | | |
| Chemistry | | |
| A Chemistry minor is required, see Department of Chemistry and Biochemistry. | | 20 |
| Mathematics | | |
| Select one of the following combinations: | | 8 |
| MATH 1951 & MATH 1952 | Calculus I and Calculus II | |
| or | | |
| MATH 1951 & PSYC 2300 | Calculus I and Introduction to Statistics | |
| or | | |
| MATH 1951 & BIOL 2090 | Calculus I and Biostatistics | |
| Total Credits | | 28 |

¹ Only five credits of BIOL 3995 Independent Research and/or BIOL 3991 Independent Study may be counted toward the credit requirement for the major.

Bachelor of Science - Molecular Biology Major Requirements

(183 credits required for the degree (<http://bulletin.du.edu/undergraduate/undergraduateprograms/traditionalbachelorsprogram/bachelorofscience/>))

50 credits of biology. Requirements include:

| Code | Title | Credits |
|---|--|-----------|
| BIOL 1010 & BIOL 1020 | Physiological Systems and Physiological Systems Lab | 5 |
| BIOL 1011 & BIOL 1021 | Evolution, Heredity and Biodiversity and Evolution, Heredity and Biodiversity Lab | 5 |
| BIOL 2120 & BIOL 2121 | Cell Structure and Function and Cell Structure & Function Lab | 5 |
| BIOL 2510 & BIOL 2511 | General Genetics and General Genetics Lab | 5 |
| BIOL 3800 | Human Molecular Biology | 4 |
| BIOL 3560 | Molecular Biology Laboratory | 4 |
| Category Elective Courses (minimum of three courses) | | 12 |
| BIOL 3145 | Cellular and Molecular Biology of Cancer | |
| BIOL 3150 | Intracellular Dynamics | |
| BIOL 3160 | Biophysics: Ion Channels & Disease | |
| BIOL 3570 | Proteins in Biological Systems | |
| BIOL 3610 | Developmental Biology | |
| BIOL 3615 | Blood Vessel Development and Disease | |
| BIOL 3630 | Cell Biology of Development | |
| BIOL 3640 | Introductory Neurobiology | |
| BIOL 3642 | Neuropharmacology | |
| BIOL 3644 | Neuromuscular Pathophysiology | |
| BIOL 3648 | Molecular Mechanisms of Neurological Disease | |
| BIOL 3650 | Endocrinology | |
| BIOL 3656 | Cellular Aspects of Diabetes and Obesity | |
| BIOL 3670 | Molecular Immunology | |
| BIOL 3675 | Virology | |
| BIOL 3690 | Cellular Microbiology | |
| BIOL 3701 | Topics in Genetics | |
| BIOL 3703 | Advanced Topics in Developmental Biology | |
| BIOL 3704 | Advanced Topics in Cell Biology | |
| BIOL 3705 | Advanced Topics in Molecular Biology | |
| BIOL 3850 | Genetic Engineering | |
| BIOL 3855 | Genetic Model Organisms in Health & Disease | |
| BIOL 3910 | Viruses & Infectious Human Diseases | |
| Any 3000-level BIOL course, may include category electives from above. ¹ | | 10 |
| Total Credits | | 50 |

Additional Requirements

| Code | Title | Credits |
|---|---|---------|
| The BS in Molecular Biology requires two minors—one of which must be Chemistry. In addition, one year of Mathematics and one year of Physics are required | | |
| Chemistry | | |
| A chemistry minor is required, see Department of Chemistry and Biochemistry. | | 20 |
| Physics | | |
| One year of Physics with lab. Select one of the following combinations: | | 15 |
| PHYS 1111 & PHYS 1112 & PHYS 1113 | General Physics I and General Physics II and General Physics III | |
| or | | |
| PHYS 1211 & PHYS 1212 & PHYS 1213 | University Physics I and University Physics II and University Physics III | |

Mathematics

| | |
|---|----|
| Select one of the following combinations: | 12 |
|---|----|

| | |
|---|---|
| MATH 1951 & MATH 1952 & MATH 1953 | Calculus I and Calculus II and Calculus III |
|---|---|

or

| | |
|---|--|
| MATH 1951 & MATH 1952 & BIOL 2090 | Calculus I and Calculus II and Biostatistics |
|---|--|

or

| | |
|---|---|
| MATH 1951 & MATH 1952 & PSYC 2300 | Calculus I and Calculus II and Introduction to Statistics |
|---|---|

Total Credits**47**

¹ Only five credits of BIOL 3995 Independent Research and/or BIOL 3991 Independent Study may be counted toward the credit requirement for the major.

Cognitive Neuroscience Concentration - Molecular Biology Major

44 credits of biology (BA); 50 credits of biology (BS). Required coursework includes those listed for the BA or BS major program in molecular biology, including molecular biology category electives. In addition for the concentration in cognitive neuroscience, students must complete the following cognitive neuroscience requirements:

| Code | Title | Credits |
|--|---------------------------------|---------|
| BA or BS Molecular Biology major required coursework | | 28 |
| BIOL 3646 | Seminar: Cognitive Neuroscience | 2 |

Cognitive Neuroscience: Category Elective Courses

Note: A course can count both as a Molecular Biology Category elective and a Cognitive Neuroscience Category elective.

| | |
|-----------------------------|----|
| Any three of the following: | 12 |
|-----------------------------|----|

| | |
|-----------|--|
| BIOL 3160 | Biophysics: Ion Channels & Disease |
| BIOL 3640 | Introductory Neurobiology |
| BIOL 3641 | Systems Neuroscience |
| BIOL 3642 | Neuropharmacology |
| BIOL 3644 | Neuromuscular Pathophysiology |
| BIOL 3647 | Neuroscience of Movement |
| BIOL 3648 | Molecular Mechanisms of Neurological Disease |
| BIOL 3649 | Neurodegeneration and Neurotrauma: Mechanisms and Therapeutics |
| BIOL 3650 | Endocrinology |

| | |
|---|-----|
| Additional Biology courses at the 2000 or 3000 level for a total of at least 44 credits of biology (BA); 50 credits of biology (BS). ¹ | 2-8 |
|---|-----|

Total Credits**44-50**

Additional Requirements for the Bachelor of Arts Degree - Molecular Biology Major with Cognitive Neuroscience Concentration

| Code | Title | Credits |
|---|-------|---------|
| The BA requires a minor in Chemistry as well as the Psychology minor. In addition, eight credits of Mathematics are required. | | |

| | |
|-------------------|-----------|
| Psychology | 20 |
|-------------------|-----------|

Refer to Psychology for requirements.

Chemistry

| | |
|---|----|
| A chemistry minor is required. Refer to Department of Chemistry and Biochemistry. | 20 |
|---|----|

Mathematics

| | |
|---|---|
| Select one of the following combinations: | 8 |
|---|---|

| | |
|--------------------------|-------------------------------|
| MATH 1951 & MATH 1952 | Calculus I and Calculus II |
|--------------------------|-------------------------------|

or

| | |
|--------------------------|--|
| MATH 1951 & PSYC 2300 | Calculus I and Introduction to Statistics |
|--------------------------|--|

or

| | |
|--------------------------|---------------------------------|
| MATH 1951 & BIOL 2090 | Calculus I and Biostatistics |
|--------------------------|---------------------------------|

Total Credits **48**

Additional Requirements for the Bachelor of Science Degree - Molecular Biology Major with Cognitive Neuroscience Concentration

Code **Title** **Credits**

The BS requires two minors - which must include a minor in Chemistry and a minor in Psychology. In addition, one year of Mathematics and one year of Physics are required

Psychology **20**

Refer to Psychology for requirements.

Chemistry **20**

A chemistry minor is required. Refer to Department of Chemistry and Biochemistry.

Physics **15**

One year of Physics with lab. Select one of the following combinations:

| | |
|---|--|
| PHYS 1111 & PHYS 1112 & PHYS 1113 | General Physics I and General Physics II and General Physics III |
|---|--|

or

| | |
|---|---|
| PHYS 1211 & PHYS 1212 & PHYS 1213 | University Physics I and University Physics II and University Physics III |
|---|---|

Mathematics **12**

One year of Mathematics is required.

Select one of the following combinations

| | |
|---|---|
| MATH 1951 & MATH 1952 & MATH 1953 | Calculus I and Calculus II and Calculus III |
|---|---|

or

| | |
|---|--|
| MATH 1951 & MATH 1952 & BIOL 2090 | Calculus I and Calculus II and Biostatistics |
|---|--|

or

| | |
|---|---|
| MATH 1951 & MATH 1952 & PSYC 2300 | Calculus I and Calculus II and Introduction to Statistics |
|---|---|

Total Credits **67**

¹ Only five credits of BIOL 3995 Independent Research and/or BIOL 3991 Independent Study may be counted toward the credit requirement for the major.

Ecology and Biodiversity Major

The Ecology and Biodiversity major focuses on topics in the life sciences at the organismal, genomic and ecosystem levels. It is intended for students interested in graduate programs or careers in ecology, conservation biology, evolution or environmental sciences.

Bachelor of Arts - Ecology and Biodiversity Major Requirements

(183 credits required for the degree (

44 credits of biology. Requirements include:

| Code | Title | Credits |
|---|--|-----------|
| BIOL 1010 & BIOL 1020 | Physiological Systems and Physiological Systems Lab | 5 |
| BIOL 1011 & BIOL 1021 | Evolution, Heredity and Biodiversity and Evolution, Heredity and Biodiversity Lab | 5 |
| BIOL 2010 & BIOL 2011 | General Ecology and General Ecology Lab | 5 |
| BIOL 2510 & BIOL 2511 | General Genetics and General Genetics Lab | 5 |
| Field course requirement | | |
| BIOL 3055 | Ecology of the Rockies | 4 |
| Category elective courses | | |
| Select four courses from the following | | 16 |
| BIOL 2320 | Andean Landscapes | |
| BIOL 2825 | Biogeographies of Conservation in Serengeti & Zanzibar | |
| BIOL 3010 | Evolution | |
| BIOL 3035 | Invasive Species Ecology | |
| BIOL 3044 | Coral Reef Ecology | |
| BIOL 3085 | Insect Ecology | |
| BIOL 3090 | Microbial Ecology | |
| BIOL 3095 | Global Change Ecology | |
| BIOL 3110 | Special Topics: Biology | |
| BIOL 3120 | General Microbiology | |
| BIOL 3253 | Environmental Physiology of Animals | |
| BIOL 3350 | Conservation Biology | |
| BIOL 3410 | Animal Behavior | |
| BIOL 3700 | Topics in Ecology | |
| Additional Biology electives at the 2000 or 3000 level ¹ | | 4 |
| Total Credits | | 44 |

Additional Requirements

| Code | Title | Credits |
|--|---|-----------|
| Chemistry | | |
| CHEM 1010 & CHEM 1240 | General Chemistry I and General Chemistry I Laboratory | 4 |
| Mathematics | | |
| 8 credits of Mathematics are required. Select one of the following combinations: | | 8 |
| MATH 1951 & BIOL 2090 | Calculus I and Biostatistics | |
| or | | |
| MATH 1951 & PSYC 2300 | Calculus I and Introduction to Statistics | |
| Total Credits | | 12 |

¹ Only 5 credits of Undergraduate Research (BIOL 3995) and/or Independent Study (BIOL 3991) may be counted toward the credit requirement for the major.

Bachelor of Science - Ecology and Biodiversity Major Requirements

(183 credits required for the degree (<http://bulletin.du.edu/undergraduate/undergraduateprograms/traditionalbachelorsprogram/bachelorofscience/>))

49 credits of biology. Requirements include:

| Code | Title | Credits |
|---|--|-----------|
| BIOL 1010 & BIOL 1020 | Physiological Systems and Physiological Systems Lab | 5 |
| BIOL 1011 & BIOL 1021 | Evolution, Heredity and Biodiversity and Evolution, Heredity and Biodiversity Lab | 5 |
| BIOL 2010 & BIOL 2011 | General Ecology and General Ecology Lab | 5 |
| BIOL 2510 & BIOL 2511 | General Genetics and General Genetics Lab | 5 |
| BIOL 2090 | Biostatistics | 4 |
| Field course requirement | | |
| BIOL 3055 | Ecology of the Rockies | 4 |
| Category elective courses ¹ | | |
| Minimum of four courses | | 16 |
| BIOL 2320 | Andean Landscapes | |
| BIOL 2825 | Biogeographies of Conservation in Serengeti & Zanzibar | |
| BIOL 3010 | Evolution | |
| BIOL 3035 | Invasive Species Ecology | |
| BIOL 3044 | Coral Reef Ecology | |
| BIOL 3085 | Insect Ecology | |
| BIOL 3090 | Microbial Ecology | |
| BIOL 3095 | Global Change Ecology | |
| BIOL 3110 | Special Topics: Biology | |
| BIOL 3120 | General Microbiology | |
| BIOL 3253 | Environmental Physiology of Animals | |
| BIOL 3350 | Conservation Biology | |
| BIOL 3410 | Animal Behavior | |
| BIOL 3700 | Topics in Ecology | |
| Additional Biology electives at the 2000 or 3000 level ¹ | | 5 |
| Total Credits | | 49 |

Additional Requirements

| Code | Title | Credits |
|--|---|---------|
| In addition, students must complete one year of Chemistry and one year of Physics. The BS degree in Ecology and Biodiversity requires two minors, one of which must be from the following list: Chemistry, Computer Science, Geography, Geographic Information Science, Geology, Mathematics, Medical Physics, or Physics. | | |
| Chemistry | | |
| One year of Chemistry with lab is required. | | 12 |
| CHEM 1010 & CHEM 1240 | General Chemistry I and General Chemistry I Laboratory | |
| CHEM 1020 & CHEM 1250 | General Chemistry II and General Chemistry II Laboratory | |
| CHEM 2000 or 3000 level course (at least 4 credits) | | |
| Physics | | |
| One year of Physics with lab is required. Select one of the following combinations: | | 15 |
| PHYS 1111 & PHYS 1112 & PHYS 1113 | General Physics I and General Physics II and General Physics III | |
| or | | |
| PHYS 1211 & PHYS 1212 & PHYS 1213 | University Physics I and University Physics II and University Physics III | |
| Mathematics | | |
| One year of Mathematics is required. Choose one of the following combinations: | | 12 |

| | |
|---|---|
| MATH 1951 & MATH 1952 & PSYC 2300 | Calculus I and Calculus II and Introduction to Statistics |
| MATH 1951 & MATH 1952 & BIOL 2090 | Calculus I and Calculus II and Biostatistics |
| or | |
| MATH 1951 & MATH 1952 & MATH 1953 | Calculus I and Calculus II and Calculus III |
| Total Credits | |
| 39 | |

¹ Only 5 credits of Undergraduate Research (BIOL 3995) and/or Independent Study (BIOL 3991) may be counted toward the credit requirement for the major.

Human Health Science & Systems

Minor Requirements

| Code | Title | Credits |
|---|--|-----------|
| Required Courses (10 Credit hours) | | 10 |
| HLTH 2000 | Science of Human Health | |
| HLTH 2010 | Health Systems Science | |
| HLTH 3000 | Seminar in Health Science | |
| Electives (10 Credit hours) ¹ | | 10 |
| HLTH 2200 | Medical Terminology: Fundamentals and Applications | |
| HLTH 2210 | Health Education and Promotion | |
| HLTH 3155 | Leadership in Health | |
| HLTH 3600 | Cultural Responsiveness in Health Care | |
| HLTH 3700 | Topics in Health | |
| HLTH 3870 | Medical Ethics | |
| HLTH 3991 | Independent Study in Human Health Science and Systems | |
| HLTH 3993 | Internship in Human Health Science & Systems | |
| HLTH 3995 | Independent Research in Human Health Science and Systems | |
| BIOL 2090 | Biostatistics | |
| BIOL 3025 | Science and the Law | |
| GEOG 3755 | Geography of Health | |
| Total Credits | | 20 |

¹ Only 4 credits of Undergraduate Research (BIOL 3995) and/or Independent Study (BIOL 3991) may be counted toward the credit requirement for the minor.

Physiology in Health & Disease

Bachelor of Science - Physiology in Health & Disease Major Requirements

(183 credits required for the degree (<http://bulletin.du.edu/undergraduate/undergraduateprograms/traditionalbachelorsprogram/bachelorofscience/>))

50 credits of biology. Requirements include:

| Code | Title | Credits |
|--------------------------|--|---------|
| BIOL 1010 & BIOL 1020 | Physiological Systems and Physiological Systems Lab | 5 |
| BIOL 1011 & BIOL 1021 | Evolution, Heredity and Biodiversity and Evolution, Heredity and Biodiversity Lab | 5 |

| | | |
|--------------------------|--|---|
| BIOL 2120 & BIOL 2121 | Cell Structure and Function and Cell Structure & Function Lab | 5 |
| BIOL 3241 | Anatomy and Physiology of the Skeletal, Nervous and Muscular systems | 5 |
| BIOL 3242 | Human Anatomy and Physiology - Systems of homeostasis | 5 |

Category Elective Courses: Physiological Electives & Cellular Electives. Four courses total, at least one from each group. 14-20

Physiological Electives: at least one course

| | |
|-----------|--|
| BIOL 3251 | Exercise Physiology |
| BIOL 3252 | High Altitude Physiology |
| BIOL 3254 | Advanced Cardiovascular and Pulmonary Physiology |
| BIOL 3256 | Advanced Human Anatomy & Physiology |
| BIOL 3258 | Research Techniques in Exercise Physiology |
| BIOL 3259 | Electrocardiogram Interpretation |
| BIOL 3260 | Nutritional Physiology |
| BIOL 3261 | Exercise Testing and Prescription |
| BIOL 3644 | Neuromuscular Pathophysiology |
| BIOL 3647 | Neuroscience of Movement |
| BIOL 3708 | Topics in Integrative Physiology |

Cellular Electives: at least one course.

| | |
|-----------|--|
| BIOL 3120 | General Microbiology |
| BIOL 3145 | Cellular and Molecular Biology of Cancer |
| BIOL 3150 | Intracellular Dynamics |
| BIOL 3160 | Biophysics: Ion Channels & Disease |
| BIOL 3610 | Developmental Biology |
| BIOL 3615 | Blood Vessel Development and Disease |
| BIOL 3641 | Systems Neuroscience |
| BIOL 3642 | Neuropharmacology |
| BIOL 3648 | Molecular Mechanisms of Neurological Disease |
| BIOL 3649 | Neurodegeneration and Neurotrauma: Mechanisms and Therapeutics |
| BIOL 3650 | Endocrinology |
| BIOL 3656 | Cellular Aspects of Diabetes and Obesity |
| BIOL 3670 | Molecular Immunology |
| BIOL 3675 | Virology |
| BIOL 3690 | Cellular Microbiology |
| BIOL 3910 | Viruses & Infectious Human Diseases |

Additional Biology electives at the 2000 or 3000 level ¹ 5

Total Credits 50

Code Title Credits

Additional Requirements

Two minors are required for the BS Physiology in Health & Disease, one of which must be Medical Physics.

In addition, one year of Chemistry and one year of Mathematics are required.

Medical Physics minor is required 21

| | |
|---|--|
| PHYS 1111 & PHYS 1112 & PHYS 1113 | General Physics I and General Physics II and General Physics III |
|---|--|

or

| | |
|---|---|
| PHYS 1211 & PHYS 1212 & PHYS 1213 | University Physics I and University Physics II and University Physics III |
| PHYS 2300 | Physics of the Body |
| PHYS 2340 | Medical Imaging Physics |

Chemistry

Chemistry coursework requirements include:

| | |
|---|---|
| CHEM 1010 & CHEM 1240 | General Chemistry I and General Chemistry I Laboratory |
| CHEM 1020 & CHEM 1250 | General Chemistry II and General Chemistry II Laboratory |
| CHEM 2000 or 3000 level course (at least 4 credits) | |
| Mathematics. Select one of the following sequences: | |
| MATH 1951 & MATH 1952 & MATH 1953 | Calculus I and Calculus II and Calculus III |
| or | |
| MATH 1951 & MATH 1952 & BIOL 2090 | Calculus I and Calculus II and Biostatistics |
| or | |
| MATH 1951 & MATH 1952 & PSYC 2300 | Calculus I and Calculus II and Introduction to Statistics |

¹ Only five (5) credits of BIOL 3995 Undergraduate Research and/or BIOL 3991 Independent Study may be counted toward the 50-credit requirement for the major.

Requirements for Distinction in the Major in Biological Science

- Minimum 3.5 cumulative GPA
- Completion of a thesis approved by the Department of Biological Sciences.

Requirements for Distinction in the Major in Molecular Biology

- Minimum 3.5 cumulative GPA
- Completion of a thesis approved by the Department of Biological Sciences.

Requirements for Distinction in the Major in Ecology and Biodiversity

- Minimum 3.5 cumulative GPA
- Completion of a thesis approved by the Department of Biological Sciences.

Requirements for Distinction in the Major in Physiology in Health and Disease

- Minimum 3.5 cumulative GPA
- Completion of a thesis approved by the Department of Biological Sciences.

Course Plans

The course plans below are intended to give students an example of how they might complete their degree requirements in the first two years. Please note that plans can vary greatly in year 2, and students should work with their Biology advisor to determine their academic path.

BS in Biological Sciences

| First Year | | | |
|---|---------|-------------------|---------|
| Fall | Credits | Winter | Credits |
| FSEM 1111 | 4 | WRIT 1122 | 4 |
| CHEM 1010 | 3 | CHEM 1020 | 3 |
| CHEM 1240 | 1 | CHEM 1250 | 1 |
| MATH 1951 or BIOL 2090 | 4 | MATH 1951 or 1952 | 4 |
| Common Curriculum Requirement/Elective ¹ | 4 | BIOL 1011 | 4 |
| | | BIOL 1021 | 1 |
| | 16 | | 17 |

Second Year

| Fall | Credits | Winter | Credits | Spring | Credits |
|---|---------|---------------------------------|---------|---|---------|
| BIOL 2120 & BIOL 2121 (or BIOL 2010 & BIOL 2011) | | 5 BIOL 2510 & BIOL 2511 | | 5 BIOL upper level elective | 4 |
| CHEM 2451 | 3 | CHEM 2452 | 3 | BIOL upper level elective or general elective | 4 |
| CHEM 2461 | 1 | CHEM 2462 | 1 | Foreign Language | 4 |
| Foreign Language | 4 | Foreign Language | 4 | General Elective or PHYS 1113 | 4 |
| General Elective or PHYS 1111 | | 4 General Elective or PHYS 1112 | 4 | | |
| | 17 | | 17 | | 16 |

Total Credits: 100

¹ This "slot" will be needed for biology in Winter and Spring quarters, so do not start another full-year sequence during Fall quarter

BA in Biological Sciences

First Year

| Fall | Credits | Winter | Credits | Spring | Credits |
|---|---------|----------------------------|---------|---------------------------------|---------|
| FSEM 1111 | | 4 WRIT 1122 | | 4 WRIT 1133 | 4 |
| CHEM 1010 | 3 | CHEM 1020 | 3 | CHEM 2131 | 3 |
| CHEM 1240 | 1 | CHEM 1250 | 1 | CHEM 2141 | 1 |
| MATH 1951 or BIOL 2090 | 4 | MATH 1951 or 1952 | 4 | MATH 1952 (or general elective) | 4 |
| Common Curriculum Requirement/Elective ¹ | | 4 BIOL 1011 & BIOL 1021 | | 5 BIOL 1010 & BIOL 1020 | 5 |
| | 16 | | 17 | | 17 |

Second Year

| Fall | Credits | Winter | Credits | Spring | Credits |
|---|---------|--|---------|--|---------|
| BIOL 2120 & BIOL 2121 (or BIOL 2010 & BIOL 2011) | | 5 BIOL 2510 & BIOL 2511 | | 5 BIOL Upper Level Elective | 4 |
| Foreign Language | 4 | Foreign Language | 4 | Foreign Language | 4 |
| Common Curriculum Requirement/Elective | 4 | Common Curriculum Requirement/Elective | 4 | Common Curriculum Requirement/Elective | 4 |
| Common Curriculum Requirement/Elective | 4 | Common Curriculum Requirement/Elective | 4 | Common Curriculum Requirement/Elective | 4 |
| | 17 | | 17 | | 16 |

Total Credits: 100

¹ This "slot" will be needed for biology in Winter and Spring quarters, so do not start another full-year sequence during Fall quarter

BS in Molecular Biology

First Year

| Fall | Credits | Winter | Credits | Spring | Credits |
|---|---------|----------------------------|---------|----------------------------|---------|
| FSEM 1111 | | 4 WRIT 1122 | | 4 WRIT 1133 | 4 |
| CHEM 1010 | 3 | CHEM 1020 | 3 | CHEM 2131 | 3 |
| CHEM 1240 | 1 | CHEM 1250 | 1 | CHEM 2141 | 1 |
| MATH 1951 or BIOL 2090 | 4 | MATH 1951 or 1952 | 4 | MATH 1952 or 1953 | 4 |
| Common Curriculum Requirement/Elective ¹ | | 4 BIOL 1011 & BIOL 1021 | | 5 BIOL 1010 & BIOL 1020 | 5 |
| | 16 | | 17 | | 17 |

Second Year

| Fall | Credits | Winter | Credits | Spring | Credits |
|--------------------------|---------|----------------------------|---------|--|---------|
| BIOL 2120 & BIOL 2121 | | 5 BIOL 2510 & BIOL 2511 | | 5 BIOL 3560 | 4 |
| CHEM 2451 | 3 | CHEM 2452 | 3 | Foreign Language | 4 |
| CHEM 2461 | 1 | CHEM 2462 | 1 | Upper Level Biology Elective or General Elective | 4 |
| Foreign Language | 4 | Foreign Language | 4 | General Elective or PHYS 1113 | 4 |

| | | | |
|-------------------------------|---------------------------------|----|----|
| General Elective or PHYS 1111 | 4 General Elective or PHYS 1112 | 4 | |
| | 17 | 17 | 16 |
| Total Credits: 100 | | | |

¹ This "slot" will be needed for biology in Winter and Spring quarters, so do not start another full-year sequence during Fall quarter

BA in Molecular Biology

| First Year | | | | | |
|---|---------|--|---------|--|---------|
| Fall | Credits | Winter | Credits | Spring | Credits |
| FSEM 1111 | 4 | WRIT 1122 | 4 | WRIT 1133 | 4 |
| CHEM 1010 | 3 | CHEM 1020 | 3 | CHEM 2131 | 3 |
| CHEM 1240 | 1 | CHEM 1250 | 1 | CHEM 2141 | 1 |
| MATH 1951 or BIOL 2090 | 4 | MATH 1951 or 1952 | 4 | MATH 1952 (or general elective) | 4 |
| Common Curriculum Requirement/Elective ¹ | 4 | BIOL 1011 & BIOL 1021 | 5 | BIOL 1010 & BIOL 1020 | 5 |
| 16 | | 17 | | 17 | |
| Second Year | | | | | |
| Fall | Credits | Winter | Credits | Spring | Credits |
| BIOL 2120 & BIOL 2121 | 5 | BIOL 2510 & BIOL 2511 | 5 | BIOL 3560 | 4 |
| CHEM 2451 | 3 | CHEM 2452 | 3 | Foreign Language | 4 |
| CHEM 2461 | 1 | CHEM 2462 | 1 | Upper Level Biology Elective or General Elective | 4 |
| Foreign Language | 4 | Foreign Language | 4 | | |
| Common Curriculum Requirement/Elective | 4 | Common Curriculum Requirement/Elective | 4 | | |
| 17 | | 17 | | 12 | |
| Total Credits: 96 | | | | | |

¹ This "slot" will be needed for biology in Winter and Spring quarters, so do not start another full-year sequence during Fall quarter

BS in Ecology and Biodiversity

| First Year | | | | | |
|---|---------|--|---------|--|---------|
| Fall | Credits | Winter | Credits | Spring | Credits |
| FSEM 1111 | 4 | WRIT 1122 | 4 | WRIT 1133 | 4 |
| CHEM 1010 | 3 | CHEM 1020 | 3 | CHEM 2240 | 4 |
| CHEM 1240 | 1 | CHEM 1250 | 1 | MATH 1952 | 4 |
| MATH 1951 or BIOL 2090 | 4 | MATH 1951 or 1952 | 4 | BIOL 1010 & BIOL 1020 | 5 |
| Common Curriculum Requirement/Elective ¹ | 4 | BIOL 1011 & BIOL 1021 | 5 | | |
| | 16 | | 17 | | 17 |
| Second Year | | | | | |
| Fall | Credits | Winter | Credits | Spring | Credits |
| BIOL 2010 & BIOL 2011 | 5 | BIOL 2510 & BIOL 2511 | 5 | Biology Elective | 4 |
| Foreign Language | 4 | Foreign Language | 4 | Foreign Language | 4 |
| General Elective or PHYS 1111 | 4 | General Elective or PHYS 1112 | 4 | General Elective or PHYS 1113 | 4 |
| Common Curriculum Requirement/Elective | 4 | Common Curriculum Requirement/Elective | 4 | Common Curriculum Requirement/Elective | 4 |
| | 17 | | 17 | | 16 |
| Total Credits: 100 | | | | | |

¹ This "slot" will be needed for biology in Winter and Spring quarters, so do not start another full-year sequence during Fall quarter

BA in Ecology and Biodiversity

| First Year | | | | | |
|---|---------|--|---------|--|---------|
| Fall | Credits | Winter | Credits | Spring | Credits |
| FSEM 1111 | | 4 WRIT 1122 | | 4 WRIT 1133 | 4 |
| CHEM 1010 | 3 | MATH 1951 (or General Elective) | | 4 CHEM 2240 | 4 |
| CHEM 1240 | 1 | BIOL 1011 & BIOL 1021 | | 5 Common Curriculum Requirement/Elective | 4 |
| MATH 1951 or BIOL 2090 | 4 | | | BIOL 1010 & BIOL 1020 | 5 |
| Common Curriculum Requirement/Elective ¹ | 4 | | | | |
| | | 16 | | 13 | 17 |
| Second Year | | | | | |
| Fall | Credits | Winter | Credits | Spring | Credits |
| BIOL 2010 & BIOL 2011 | | 5 BIOL 2510 & BIOL 2511 | | 5 Biology Elective | 4 |
| Foreign Language | 4 | Foreign Language | | 4 Foreign Language | 4 |
| Common Curriculum Requirement/Elective | 4 | Common Curriculum Requirement/Elective | | 4 Common Curriculum Requirement/Elective | 4 |
| Common Curriculum Requirement/Elective | 4 | Common Curriculum Requirement/Elective | | 4 Common Curriculum Requirement/Elective | 4 |
| | | 17 | | 17 | 16 |
| Total Credits: 96 | | | | | |

¹ This "slot" will be needed for biology in Winter and Spring quarters, so do not start another full-year sequence during Fall quarter

BS in Physiology in Health and Disease

| First Year | | | | | |
|---|---------|--------------------------|---------|---|---------|
| Fall | Credits | Winter | Credits | Spring | Credits |
| FSEM 1111 | | 4 WRIT 1122 | | 4 WRIT 1133 | 4 |
| CHEM 1010 & CHEM 1240 | 4 | CHEM 1020 & CHEM 1250 | | 4 CHEM 2131 & CHEM 2141 | 4 |
| MATH 1951 or BIOL 2090 | 4 | MATH 1951 or 1952 | | 4 MATH 1952 or 1953 (or general elective) | 4 |
| Common Curriculum Requirement/Elective ¹ | 4 | BIOL 1011 & BIOL 1021 | | 5 BIOL 1010 & BIOL 1020 | 5 |
| | | 16 | | 17 | 17 |
| Second Year | | | | | |
| Fall | Credits | Winter | Credits | Spring | Credits |
| BIOL 2120 & BIOL 2121 (or BIOL 2010 & BIOL 2011) | | 5 BIOL 3241 | | 5 BIOL 3242 | 5 |
| Foreign Language | 4 | Foreign Language | | 4 Foreign Language | 4 |
| PHYS 1111 | 5 | PHYS 1112 | | 5 PHYS 1113 | 5 |
| | | | | BIOL upper level elective | 4 |
| | | 14 | | 14 | 18 |
| Total Credits: 96 | | | | | |

¹ This "slot" will be needed for biology in Winter and Spring quarters, so do not start another full-year sequence during Fall quarter

BIOL 1005 Perspectives-Veterinary Medicine (2 Credits)

Introduction to career areas in veterinary medicine through lectures, guest speakers and demonstrations. The credits for this course are general elective only. They do not apply to any major or minor in NSM or to SI-NPW of the common curriculum. Prerequisites: BIOL 1010 and BIOL 1020, or by departmental permission.

BIOL 1010 Physiological Systems (4 Credits)

The second required course in the introductory biology sequence required for students majoring in Biology or another science. Emphasis on physiology and development of plants and animals. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Co-requisite: BIOL 1020 lab section.

BIOL 1011 Evolution, Heredity and Biodiversity (4 Credits)

The first required courses in the introductory biology sequence required for students majoring in Biology or another science. Emphasis on evolution, basic genetics and inheritance, and biodiversity. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Co-requisite: BIOL 1021 lab section.

BIOL 1020 Physiological Systems Lab (1 Credit)

Exercises and experimentation to complement lecture material. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Co-requisite: BIOL 1010 lecture section.

BIOL 1021 Evolution, Heredity and Biodiversity Lab (1 Credit)

Exercises and experimentation to complement lecture material. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Co-requisite: BIOL 1011 lecture section.

BIOL 1220 Molecules to Humankind I (4 Credits)

First class in a three-quarter sequence for non-majors that examines the mechanisms that sustain life. Emphasis is placed on understanding the human body at the molecular, cellular and physiological levels. In the fall quarter our discussions start with the atom and basic chemistry. We next consider the properties of complex molecules, including DNA, proteins, carbohydrates and lipids, in order to see how such molecules are used and organized by living organisms. Our discussions of large and complex molecules lead naturally to the basic unit of life, the cell. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

BIOL 1221 Molecules to Humankind II (4 Credits)

Second class in a three-quarter sequence for non-majors begins with an introduction to the general vertebrate body plan; we emphasize the human body plan but also compare it with other vertebrates. Discussions progress through the major organ and physiological systems of the body, including circulatory, respiratory, excretory, endocrine, nervous, skin, immune, reproductive, gastrointestinal, and skeletal and muscle systems. Discussions concentrate on the organization and function of these systems. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

BIOL 1222 Molecules to Humankind III (4 Credits)

Third class in a three-quarter sequence focuses for non-majors on cell biology, genetics, and human reproduction and development. After a review of cell structure and function, focusing on how cells are capable of replication with modification, the mechanisms by which information is passed on from one cell to another and from one generation to the next are considered. The second half of the quarter concerns sexual reproduction and early development. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisites: BIOL 1221.

BIOL 1260 Sustaining Life I (4 Credits)

A three-quarter sequence for non-majors examining some important biological mechanisms that sustain life -- and "life" in general! Emphasis is placed on the understanding the critical connections between the student's health and the health of the surrounding world. The first quarter begins with a discussion of the defining characteristics of "life" and the basic mechanisms required to sustain it. The course continues with an overview of biological diversity and ends with a focus on the many important connections between food, human health, and environmental health. The second quarter begins by building a basic understanding of how ecosystems function -- including the interactions among living organisms (including humans) and between these living organisms and their environment. The course continues with focused discussions of issues related to the impact of biological diversity on infectious disease and medicine. The third quarter begins with a focus on the importance of biodiversity to biomedical research, especially related to model systems. It then reviews some of the current threats to biodiversity and concludes by exploring some possible solutions that can give hope for sustaining "life" in the future. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

BIOL 1261 Sustaining Life II (4 Credits)

A three-quarter sequence for non-majors examining some important biological mechanisms that sustain life -- and "life" in general! Emphasis is placed on the understanding the critical connections between the student's health and the health of the surrounding world. The first quarter begins with a discussion of the defining characteristics of "life" and the basic mechanisms required to sustain it. The course continues with an overview of biological diversity and ends with a focus on the many important connections between food, human health, and environmental health. The second quarter begins by building a basic understanding of how ecosystems function -- including the interactions among living organisms (including humans) and between these living organisms and their environment. The course continues with focused discussions of issues related to the impact of biological diversity on infectious disease and medicine. The third quarter begins with a focus on the importance of biodiversity to biomedical research, especially related to model systems. It then reviews some of the current threats to biodiversity and concludes by exploring some possible solutions that can give hope for sustaining "life" in the future. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: BIOL 1260.

BIOL 1262 Sustaining Life III (4 Credits)

A three-quarter sequence for non-majors examining some important biological mechanisms that sustain life – and "life" in general! Emphasis is placed on the understanding the critical connections between the student's health and the health of the surrounding world. The first quarter begins with a discussion of the defining characteristics of "life" and the basic mechanisms required to sustain it. The course continues with an overview of biological diversity and ends with a focus on the many important connections between food, human health, and environmental health. The second quarter begins by building a basic understanding of how ecosystems function – including the interactions among living organisms (including humans) and between these living organisms and their environment. The course continues with focused discussions of issues related to the impact of biological diversity on infectious disease and medicine. The third quarter begins with a focus on the importance of biodiversity to biomedical research, especially related to model systems. It then reviews some of the current threats to biodiversity and concludes by exploring some possible solutions that can give hope for sustaining "life" in the future. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: BIOL 1261.

BIOL 1270 Living in the Microbial World I (4 Credits)

Students receive an introduction to the world of microbiology, the good, the bad and the ugly. With the help of the press and movie industry, most "human hosts" believe that microorganisms are to be feared, sterilized and/or destroyed. While this is true for a very small number of microbes, the majority is composed of essential and beneficial microorganisms that help the existence of all life on Earth. This first course in the sequence for non-majors is dedicated to raising the awareness of students to the value and need of our unseen partners. Laboratory included. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

BIOL 1271 Living in the Microbial World II (4 Credits)

For such a small size, microorganisms can have a large impact on our human world. This second course in the sequence for non-majors brings a new perspective to students on the role microorganisms, and their associated diseases, have played in turning the tide of war victories, immigration of a country, world politics and more. We tend to believe that humans alone can control their world but sometimes the mightiest of all are our unseen partners. Laboratory included. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: BIOL 1270.

BIOL 1272 Living in the Microbial World III (4 Credits)

In this last course in the sequence for non-majors, students are given an opportunity to challenge their beliefs and understandings of how life came to exist on Earth and the perspective of how humans are the most evolutionarily advanced. Students are guided through time on Earth and examine the development of life and the constant contribution of their unseen partners. Laboratory included. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: BIOL 1271.

BIOL 1988 Study Abroad Resident Credit (0-18 Credits)**BIOL 1990 Independent Study (1-5 Credits)****BIOL 2010 General Ecology (4 Credits)**

Topics in ecosystems, population and community ecology, as well as behavioral ecology. Prerequisite: BIOL 1011 and BIOL 1010. Co-requisite: BIOL 2011.

BIOL 2011 General Ecology Lab (1 Credit)

Exercise and experimentation to complement the lecture. Co-requisite: BIOL 2010, and Prerequisite: BIOL 1021 with a minimum grade of D-.

BIOL 2055 Ways of Seeing and Sensing in Biological Systems at Kennedy Mountain Campus (4 Credits)

Ways of Seeing and Sensing represents a new collaboration between the departments of Biological Sciences, Physics & Astronomy, and Media, Film & Journalism Studies at DU's Kennedy Mountain Campus (KMC). As part of this course, students will collaborate as part of multidisciplinary teams; to compile and apply new content knowledge in biology/ecology, film-making, science communication and story-telling in a project-based curriculum unique to the KMC. The class is a place-based exercise revolving around the idea that what we know about our surroundings depends on how we "see" or "sense." We will examine various aspects of natural systems specific to the Kennedy Mountain Campus (KMC) using both micro and macro approaches to "seeing" through a variety of technologies, including microscopes, trail cameras, photo and video cameras, night vision glasses, and telescopes. To further develop the concept of "sensing," we will explore the soundscapes of the KMC as well as the ways plants and animals in this ecosystem sense their surroundings. We will also explore the KMC using human senses other than sight to navigate the nighttime environment. Students will work in teams of 3–4 to develop and produce documentary stories unique to the ecology and astronomy of the KMC. Students choosing to participate for credit in Biological Sciences will complete additional reading and assignments focusing on the various ways that biological systems (from cells, to organisms, to communities) sense and respond to changes in their environment, including light, heat, sound, chemical cues, and physical forces such as electricity and gravity. This course will meet together with PHYS 2050 and MFJS 2050 courses, which each have different prerequisites and discipline-specific assignments. Prerequisites: BIOL 1010 and BIOL 1011.

BIOL 2090 Biostatistics (4 Credits)

Statistics in biological research. Computer-aided statistical analysis and hypothesis testing focusing on experiments and data unique to the biological sciences. Cross listed with BIOL 4090.

BIOL 2120 Cell Structure and Function (4 Credits)

Chemical composition of cells; structure and function of cell organelles; interrelationship of cellular unit with its environment; mechanisms of energy conversion within cells; functions of excitability, contractility and cell growth. Prerequisite: BIOL 1011. Corequisites: BIOL 2121 lab section and CHEM 1010.

BIOL 2121 Cell Structure & Function Lab (1 Credit)

Exercises and experimentation to complement lecture material. Lab fee associated with this course. Co-requisite: BIOL 2120.

BIOL 2320 Andean Landscapes (4 Credits)

This course introduces students to the landscapes, biodiversity, societies, and human-environment interactions in the Andes of Peru through an intensive and immersive field study and travel experience. This field intensive class equals 4 academic credits and occurs during winter interterm. Over a period of 11 days we will visit the cities and surroundings of Lima, Arequipa, and Cusco, Peru where we will examine and compare geography, cultures, history, archaeology, ecology, biodiversity, and sustainability issues. The Andean environment offers unique challenges for environment and societies and by understanding the locations and patterns of human activity in the Andes, students can better appreciate the circumstances affecting individuals and countries other than our own. Through observations, lectures, discussions, readings, assignments and immersion, the course will stress the development of in situ critical thinking skills and the promotion of cultural diversity and global awareness. This course counts toward the sustainability minor and the intercultural global studies minor. This course counts as a category elective for the Ecology and Biodiversity major. Prerequisite: BIOL 1011.

BIOL 2510 General Genetics (4 Credits)

Mechanisms of heredity with application to all forms of life. Topics include classical genetics (mendelian inheritance, meiosis, epistasis, recombination gene mapping, chromosomal mutations) and an introduction to modern molecular genetics (DNA structure and function, gene expression and regulation). Prerequisites: BIOL 1010, BIOL 1011. Recommended prerequisite: BIOL 2120. Corequisite: BIOL 2511.

BIOL 2511 General Genetics Lab (1 Credit)

The laboratory component of BIOL 2510. COREQUISITES: BIOL 2510 PREREQUISITES: BIOL 1020 AND BIOL 1021 RECOMMENDED PREREQUISITES: BIOL 2121.

BIOL 2825 Biogeographies of Conservation in Serengeti & Zanzibar (4 Credits)

This course introduces students to the landscapes, biodiversity, societies, and human-environment interactions in mainland Tanzania and the island of Zanzibar through an intensive and immersive field study and travel experience. This field intensive class equals 4 academic credits. Over a period of 9 days we will visit the greater Serengeti ecosystem and Tanzania where we will examine and compare geography, cultures, history, archaeology, ecology, biodiversity, and sustainability issues. The environment in this part of East Africa offers unique challenges for wildlife and societies. By understanding the locations and patterns of human and animal activity there, students can better appreciate the circumstances affecting individuals and countries other than our own. Through observations, lectures, discussions, readings, assignments and immersion, the course will stress the development of in-situ critical thinking skills and the promotion of environmental sustainability, cultural diversity and global awareness. Fulfills biology, geography, environmental science, sustainability minor, and intercultural global studies minor requirements. This course counts as a category elective for the Ecology and Biodiversity major. Prerequisite: BIOL 1011.

BIOL 2988 Study Abroad Resident Credit (0-18 Credits)**BIOL 3005 Science Communication (4 Credits)**

Science communication has shaped, and continues to shape, the world in which we live (e.g., why you wash your hands, why we don't feed bears in U.S. national parks anymore, and why some students imagine themselves becoming scientists or not). Sharing how science is conducted and how new knowledge is generated through the scientific method also plays a critical role in our future: creating engaged citizens, shaping the next generation of scientists, increasing diversity and diverse perspectives in the sciences, informing policy-makers and lawyers, combatting misconceptions, increasing trust of scientists, and guiding our own individual behaviors. But, like any other complex skillset, science communication takes practice. This course provides students with a range of resources and skills for effective, ethical, and evidence-based communication of complex socio-scientific issues. It provides a supportive environment in which students will practice and refine their science communication through peer feedback and engagement with real audiences. The focus is on cultivating practical communication skills, with emphasis on effective speaking, writing and exhibition of scientific topics with the variety of audiences students will encounter in their future careers. Course readings, activities, and final projects also examine how identity shapes both the science we do and the lenses we and other stakeholders bring to communication tasks. The course is hybrid, highly interactive, and writing-intensive. This course is restricted to Junior or Senior Standing UG majoring in the College of Natural Sciences and Mathematics.

BIOL 3010 Evolution (4 Credits)

Evolution is the central concept in biology. This course examines the foundations of evolutionary theory. We will cover the history of life on earth, the genetic basis for evolution, evolutionary processes (natural and sexual selection), the origin of species, and medical applications of evolutionary theory. This course counts as a category elective for the Ecology and Biodiversity major. Prerequisite: BIOL 2510.

BIOL 3025 Science and the Law (2,4 Credits)

This course will focus on the intersection of science and US law. Four major areas of focus that will be covered are the admissibility of expert witnesses / scientific evidence in court; how advances in forensic genetics and national DNA databases raise legal issues pertaining to expectations of privacy and the standards for reaching a verdict; the impact of US Supreme Court opinions on the patenting of genes used as diagnostic markers for human disease and the legal landscape surrounding issues of evolution and creationism/intelligent design. Students will then explore how the law impacts their own areas of scientific interest. The goal of this course is to increase our understanding as scientists of how advances in science impact and are impacted by the US judicial system. PREREQUISITES: BIOL 1010 AND BIOL 1011.

BIOL 3035 Invasive Species Ecology (4 Credits)

This course investigates those plants and animal species that have dramatically expanded their ranges and cause ecological harm. Topics covered include the mechanisms of ecological impacts across the globe, how invasive species are used to test basic ecological theory, the application of this research for managing real species, and related issues such as the debate within the scientific community about the term "invasive." We use a case-study approach, and students have the opportunity to go into the field as a class to observe the real invasions and learn sampling methods.

BIOL 3044 Coral Reef Ecology (3 Credits)

Ecology of coral reefs; organization and distribution of reefs; review of reef organisms and their interactions with each other and their physical environment; threats to coral reef conservation. This course counts as a category elective for Ecology and Biodiversity majors. Prerequisite: (BIOL 2010 or BIOL 2050) OR (GEOG 1201, GEOG 1202, and GEOG 1203).

BIOL 3045 Coral Reef Ecology Lab (1 Credit)

Ecology of coral reefs laboratory to supplement lecture material; travel to the Caribbean over spring break to observe coral reefs firsthand; introduction to research methods. SCUBA certification and permission of instructor required. A travel and dive fee is associated with this course.

BIOL 3055 Ecology of the Rockies (4 Credits)

A week in residence at the Mt. Evans Field Station prior to the start of fall quarter includes field projects dealing with ecology and environmental issues. On campus classes involve data analysis and interpretation and formal scientific communication. Themes include terrestrial and aquatic ecosystems, taxonomic groups ranging from conifer stands to aquatic insects and mountain goats. Lab fee associated with this course. Prerequisite: BIOL 2010 or permission of instructor.

BIOL 3070 Ecological Field Methods (4 Credits)

Series of field exercises for students to learn principles and procedures of field methodology, data analysis and technical writing in ecology; problems drawn from population, community and ecosystem ecology. Lab fee associated with this course. Prerequisite: BIOL 2010.

BIOL 3085 Insect Ecology (4 Credits)

A general introduction to insect biology and the science of entomology. Arthropods are the most diverse group of animals on Earth and insects account for more than half of all known living organisms. This course explores the biodiversity of insects on Earth, insect morphology and physiology. The evolutionary history and taxonomy of key orders of insects is emphasized as well as the importance of insects to our everyday lives. This course counts as a category elective for Ecology and Biodiversity majors. Prerequisites: BIOL 1010, BIOL 1011, and BIOL 2010.

BIOL 3090 Microbial Ecology (4 Credits)

Interactions among microorganisms and their environment. Impact of ecological principles on microbial diseases, pollutant degradation, nutrient cycles and global change. Prerequisites: BIOL 1010, BIOL 1020, AND BIOL 2510.

BIOL 3095 Global Change Ecology (4 Credits)

Over the past century, the mean surface temperature of our planet has increased slightly less than 1°C. While this may seem like a small increment, this change is already profoundly affecting Earth's organisms and ecological communities, and predictions for the impacts of continued change range from severe to catastrophic. Humans are also changing the environment through alteration of nutrient and water regimes. Topics include cause of climate change, comparison to past climatic change, human contribution to change and effect on organisms, communities and ecosystems. Prerequisites: BIOL 1010, BIOL 1011, AND BIOL 2010. RECOMMENDED PREREQUISITES/COREQUISITES: BIOL 2090.

BIOL 3110 Special Topics: Biology (1-5 Credits)

Topics of special interest to teaching/research faculty of department presented as needed to complement and expand existing curriculum. May be repeated for credit. PREREQUISITES: BIOL 1010.

BIOL 3120 General Microbiology (4 Credits)

Fundamental principles of microorganisms in the world and in disease; role of bacteria in biological phenomena. Includes laboratory. Lab fee associated with this course. Counts as a category elective for Ecology and Biodiversity majors. Prerequisite: BIOL 2120.

BIOL 3145 Cellular and Molecular Biology of Cancer (4 Credits)

This course examines the mechanisms that underlie the development and progression of cancer. The cellular and molecular events that drive uncontrolled cell proliferation and eventual metastasis of tumors are discussed. This course counts as a category elective for the Molecular Biology major. Prerequisite: BIOL 2120.

BIOL 3150 Intracellular Dynamics (4 Credits)

Focuses on spatial and temporal control of intracellular processes with an emphasis on neuronal and endocrine cells. Topics include vesicular traffic, protein targeting, dynamics and spatial organization of signaling complexes. Emphasis on modern techniques of cell and molecular biology with examples from primary literature. This course counts as a category elective for the Molecular Biology major. Prerequisite: BIOL 2120.

BIOL 3160 Biophysics: Ion Channels & Disease (4 Credits)

Examines ion channel structure and function and the ways in which this information provides insight into human disease. The focus is on the use of biophysical techniques in combination with molecular and genetic analysis of channel genes. General Physics recommended. This course counts as a category elective for the Molecular Biology major and Cognitive Neuroscience concentration. Prerequisite: BIOL 2120.

BIOL 3230 Nutrition (3 Credits)

Investigation of metabolism, all nutrients and various applications of nutrition to sports and healthy living. Prerequisite: BIOL 3250.

BIOL 3241 Anatomy and Physiology of the Skeletal, Nervous and Muscular systems (5 Credits)

This course is designed to introduce students to the fundamental concepts, content and scientific bases of Skeletal, Muscular, and Nervous system anatomy and physiology at both macroscopic and microscopic levels. The course consists of both lecture and laboratory sessions each week and requires attendance and participation in both. The course will utilize diverse resources, exercises, and activities to engage you in the learning process, including, text, video, animations, models, dissections, inquiry-based learning, and a variety of assessments. Please note that the lab portion of this course does require dissection. Prerequisites: BIOL 2120.

BIOL 3242 Human Anatomy and Physiology - Systems of homeostasis (5 Credits)

This course is designed to introduce students to the fundamental concepts, content and scientific bases of Cardiovascular, Respiratory, Urinary, Digestive, Immune and Reproductive system anatomy and physiology at both macroscopic and microscopic levels. The course consists of both lecture and laboratory sessions each week and requires attendance and participation in both. The course will utilize diverse resources, exercises, and activities to engage you in the learning process, including, text, video, animations, models, dissections, inquiry-based learning, and a variety of assessments. Please note that the lab portion of this course does require dissection. Prerequisites: BIOL 2120.

BIOL 3245 Human Anatomy (5 Credits)

This course is designed to introduce you to the fundamental concepts, content and scientific bases of human anatomy. Specific content covered in the course includes: the Language of Anatomy, Body Organization, Histology, and Integument, Skeletal, Muscular, Nervous, Cardiovascular, Respiratory, Urinary, Digestive and Reproductive anatomy at both macroscopic and microscopic levels. The course consists of both lecture and laboratory sessions each week and requires attendance and participation in both. The course will utilize diverse resources, exercises, and activities to engage you in the learning process, including, text, video, animations, models, dissections, inquiry-based learning, and a variety of assessments. Please note that the lab portion of this course does require dissection. Prerequisite: BIOL 2120 Cell Structure and Function.

BIOL 3250 Human Physiology (5 Credits)

Functional relationships of human organ systems with coordinated laboratory activities and experiments that demonstrate and test physiological principles. Lab fee associated with this course. Prerequisites: BIOL 1010.

BIOL 3251 Exercise Physiology (4 Credits)

This course will cover exercise physiology topics included but not limited to: energy systems, physiological response to exercise/training, and exercise programming. A strong background in human physiology is recommended. This course counts as a category elective for the Physiology in Health and Disease major. Prerequisite: BIOL 1010.

BIOL 3252 High Altitude Physiology (4 Credits)

This course is an advanced course in physiology for those interested in both the impacts of altitude exposure on health and athletic performance. We live at altitude in Denver, and in fact there are many factors affecting our bodies (which we may or may not realize) that impact our daily lives. This course aims to provide insight on the acute and chronic physiological responses of altitude as well as to provide a deeper understanding into the use of hypoxic environments for improving health and benefiting athletic performance. We will explore the physiological mechanisms related to these reduced oxygen environments as well as develop projects that contribute to the understanding of using this environment as a stimulus. This course counts as a category elective for the Physiology in Health and Disease major. Prerequisite: BIOL 3242.

BIOL 3253 Environmental Physiology of Animals (4 Credits)

By studying species across the animal kingdom, we will learn about the vast array of physiological strategies that have evolved to help animals maintain homeostasis in the face of varied environmental challenges. We will cover foundational principals of animal physiological ecology and evolution, as well as new and exciting discoveries through weekly discussions of primary literature. We will focus primary literature discussions on "extreme environments," as Earth's harshest landscapes provide exciting and powerful examples of adaptations of physiological systems. This course will be delivered through a combination of lectures, active learning assignments, readings from the scientific literature, and group discussions. By the end of this course, you will develop a new perspective on the ecological and evolutionary factors that shape physiological similarities and differences among the animals of our planet (including humans). This course counts as a category elective for the Ecology and Biodiversity major and Physiology in Health and Disease major. Prerequisites: BIOL 1010 and BIOL 1011.

BIOL 3254 Advanced Cardiovascular and Pulmonary Physiology (4 Credits)

This course provides a deeper level of physiological knowledge of the cardiac, vascular, circulatory, and pulmonary systems and their functions. With both lecture materials as well as in-class discussion of concepts and research articles, we will go deep into the basic levels of composition and function and facilitate the understanding of mechanisms that limit disease populations, elderly, etc. How can we adapt our lifestyles to improve our cardiovascular health? Prerequisite: BIOL 2120 or BIOL 3242.

BIOL 3256 Advanced Human Anatomy & Physiology (5 Credits)

This one quarter course is intended for advanced biology and physiology majors with an interest in the anatomical structure and physiological functioning of body systems. This course builds upon the Human Anatomy and Human Physiology courses that are prerequisites. This advanced course will explore in greater depth understanding mechanisms of action of major body systems and elaborate on the relationship between structure and function. In addition to didactic content, students will complete evaluation of primary literature and design laboratory experiments to test hypotheses of interest. The course will utilize diverse resources, exercises, and activities in the learning process including text, video, animations, models, dissections, inquiry-based learning, experimentation and a variety of assessments. The course consists of both lecture and laboratory sessions each week and requires attendance and participation in both. Please note that the lab portion of this course requires dissection. This course counts as a category elective for the Physiology in Health and Disease major. Prerequisites: BIOL 3241 and BIOL 3242.

BIOL 3257 Clinical Exercise Physiology (5 Credits)

This is an upper-level course in clinical physiology for those interested in understanding fundamental practices and assessments within clinical settings. We will work to combine knowledge from various backgrounds in physiology and tie theoretical and practical concepts together for assessing body function and developing methods for improving health and performance. We will relate daily experiences with class content to deepen our knowledge and retain this information for future reference. We will connect the physiological concepts related to the cardiovascular, respiratory, muscle systems as well as develop projects that require combining knowledge of the assessment skills and evaluation for clear communication and exercise prescription to special populations. Prerequisite: BIOL2120 or BIOL 3242.

BIOL 3258 Research Techniques in Exercise Physiology (4 Credits)

This upper-level course is designed to give you exposure to several methods of research within the area of exercise physiology. This is a hands-on course that combines theory and literature with practical research experiences in physiology. For those interested in understanding more about research, this is the course for you as we will perform data collection and analysis of differing topics. These may include the following topics: pulse and tissue oxygenation, signaling (heart rate variability, oxygen kinetics), respiratory loops, Doppler ultrasound (blood flow and tissue structure), etc. Our aims will focus on understanding how and why the method works, how to collect data, as well as the analysis and reporting of variables for proper interpretation.

BIOL 3259 Electrocardiogram Interpretation (2 Credits)

This course is an advanced course in cardiac physiology for those interested in understanding principles associated with cardiac function, electrical physiology of the heart, and interpretation of the electrocardiogram. This is applicable for several pre-med career paths especially within clinical settings. As the functions related to our heart drive our cardiovascular system, we will find ways to relate our experiences of daily life to the concepts and principles learned throughout this course to deepen our knowledge and retain this information. We will explore the physiological mechanisms related to the cardiac system as well as develop projects that require combining knowledge of the electrical pathways and of use of electrocardiography for proper interpretation. Prerequisite: BIOL 2120, BIOL 3241, BIOL 3242, or equivalent.

BIOL 3260 Nutritional Physiology (4 Credits)

This course is designed to introduce the fundamental concepts, content and scientific bases of nutritional physiology at the levels. This course will examine the scientific structure and properties of carbohydrates, proteins and lipids as the major macronutrients required for human health. In addition, it includes exploration of the digestion, absorption and metabolism of both macronutrients and micronutrients. The course will utilize diverse resources, exercises, and activities in the learning process including text, video, animations, inquiry-based learning, experimentation and a variety of assessments. Prerequisite: BIOL 2120.

BIOL 3261 Exercise Testing and Prescription (4 Credits)

The purpose of this upper-level course is to develop knowledge combined with hands-on skills for integration of exercise testing and prescription concepts. Material in this course will be applicable for performance as well as clinical considerations. This is an active course which will require your participation as both the subject and technician, giving perspective and understanding of methods and protocols along with their justification for various purposes. Recommended prerequisite course: Clinical Exercise Physiology.

BIOL 3280 Intro to Pathophysiology (4 Credits)

This course is designed as an introduction of the mechanisms and consequences of disease based on physiological dysfunction in the major organ systems. The course will focus on the fundamental concepts and processes of human pathophysiology through exploration of the unique physiological roles of several body systems, how these systems have important integrative relationships that underlie the overall physiological functioning of healthy humans, and how system function is altered in disease and the clinical manifestations of these changes. This course counts as a category elective for the Physiology in Health and Disease major. Prerequisite: BIOL 2120. A course in human physiology is recommended.

BIOL 3350 Conservation Biology (5 Credits)

Conservation Biology is the study of documenting the earth's biodiversity, its threats, and how it may be protected. It is a multidisciplinary science within ecology with contributions from environmental chemistry, geography, sociology, and political science, among other fields. In this class students learn the language of conservation biology, the methods used by conservation biologists, and the nuances of current issues. In class, material is learned through both lecture and interactive exercises in the classroom portion, with hands-on practice in techniques and applications during the lab. This course counts as a category elective for the Ecology and Biodiversity major. Prerequisite: BIOL 2010.

BIOL 3410 Animal Behavior (4 Credits)

This class examines animal behavior from an evolutionary and ecological perspective. The course provides the background needed to understand behavioral evolution, including a focus on the inheritance of behavior, natural selection, sexual selection, and kin selection. This class studies the evolution of a variety of behaviors, including communication and displays, mate choice, parental care, cooperation, mating systems, social behavior, habitat selection, foraging, and anti-predator behavior. The emphasis is on theoretical principles, design of experiments, and interpretation of data. This course counts as a category elective for the Ecology and Biodiversity major. Prerequisites: BIOL 1010 and BIOL 1011, and BIOL 2010. Recommended Prerequisite: BIOL 2090.

BIOL 3560 Molecular Biology Laboratory (4 Credits)

Laboratory based course that covers techniques in gene excision, cloning and reinsertion and gene sequencing. Lab fee associated with this course. Prerequisite: BIOL 2510, or permission of instructor.

BIOL 3570 Proteins in Biological Systems (4 Credits)

Proteins considered in their biological setting; protein synthesis and degradation; survey of protein functions in vivo; introduction to protein biotechnology. This course counts as a category elective for the Molecular Biology major. Prerequisites: BIOL 2120.

BIOL 3610 Developmental Biology (4 Credits)

Processes and mechanisms of development, exemplified by higher animal embryogenesis, with consideration of microbial model systems. This course counts as a category elective for the Molecular Biology major. Prerequisite: BIOL 2120 and 2510.

BIOL 3615 Blood Vessel Development and Disease (4 Credits)

This course details the underlying biological programs during blood vessel development and mechanisms that lead to vascular pathologies. The class will incorporate aspects embryology, signaling transduction, and genetics as well as current techniques in developmental biology to comprehensively cover how blood vessels are formed embryonically. Additionally, we will discuss in detail how defects in blood vessel-related signaling programs later manifest into disease. Prerequisite for this course is Cell Structure and Function (BIOL2120/2121).

BIOL 3630 Cell Biology of Development (4 Credits)

Every organism has a stereotypical shape, but how does this shape arise? This course examines the cellular and molecular mechanisms that direct the forming of body and tissue shape. This course counts as a category elective for the Molecular Biology major. Prerequisite: BIOL 2120.

BIOL 3640 Introductory Neurobiology (4 Credits)

Organization and function of vertebrate central nervous system; nature of action potential, biochemistry of neurotransmitters, neuropeptides, functional anatomy of nervous system, phylogeny of nervous system. This course counts as a category elective for the Molecular Biology major and Cognitive Neuroscience concentration. Prerequisite: BIOL 2120.

BIOL 3641 Systems Neuroscience (4 Credits)

Structure and function of the brain and spinal cord, emphasis on functional systems including sensory perception, motor control and consciousness. This course counts as a category elective for the Cognitive Neuroscience concentration. Prerequisite: BIOL 3640.

BIOL 3642 Neuropharmacology (4 Credits)

How psychoactive drugs exert their effects on the nervous system; drugs of abuse and drugs used in the treatment of psychotic and neurodegenerative disorders. This course counts as a category elective for the Molecular Biology major and Cognitive Neuroscience concentration. Prerequisite: BIOL 2120. Recommended prerequisites: BIOL 3640.

BIOL 3644 Neuromuscular Pathophysiology (4 Credits)

Cellular and molecular basis for normal nerve and muscle functions and the alteration of these functions by toxins, trauma and diseases of the brain, nerves and muscles; how specific insults produce clinical symptoms and pathology. Prerequisite: BIOL 2120.

BIOL 3646 Seminar: Cognitive Neuroscience (2 Credits)

This seminar is the capstone course for the neuroscience portion of the cognitive neuroscience program. Seminar topics include but are not limited to neurological disorders, model systems in neuroscience and sensory systems.

BIOL 3647 Neuroscience of Movement (4 Credits)

Producing the vast array of movements that humans (and many animals) use everyday represents one of the body's greatest challenges and greatest successes. These various movements require that the nervous, muscular, and skeletal systems work in concert to achieve a common goal. This course will explore the scientific basis of movement production, with particular emphasis on the neuroscience of motor control. We will explore how the nervous system drives the development of movement strategies at an early age, modifies movement strategies to adapt to changing demands throughout life, and how injury, dysfunction, and/or aging can lead to movement challenges. This course counts as a category elective for the Physiology in Health and Disease major and Cognitive Neuroscience concentration. Required prerequisite: Cell Structure & Function (BIOL 2120); Recommended prerequisite (1 or more of the following): Introduction to Neuroscience (BIOL 3640) or permission of instructor.

BIOL 3648 Molecular Mechanisms of Neurological Disease (4 Credits)

This course will be an in-depth study into some of the key molecular mechanisms involved in the pathogenesis of human neurological disease. A particular emphasis will be placed on the role of RNA regulation and metabolism. The primary focus will be on five devastating diseases: 1. Spinal Muscular Atrophy (SMA) 2. Fragile X Syndrome (FXS) and Fragile X Tremor Ataxia Syndrome (FXTAS) 3. Myotonic Dystrophy type 1 and 2 (DM1 and DM2) 4. Spinocerebellar Ataxia type 2 (SCA2) 5. Amyotrophic Lateral Sclerosis (ALS) and Frontotemporal Dementia (FTD) This course will cover a variety of topics including disease pathophysiology and pathogenesis. However, readings will be assigned from the recent primary literature discussing cellular and molecular mechanisms. This course counts as a category elective for the Molecular Biology major and Cognitive Neuroscience concentration. Prerequisite: BIOL 2510 Genetics.

BIOL 3649 Neurodegeneration and Neurotrauma: Mechanisms and Therapeutics (4 Credits)

Neurodegeneration and Neurotrauma: Mechanisms and Therapeutics covers the following disorders: Alzheimer's disease, Parkinson's disease, amyotrophic lateral sclerosis, Huntington's disease, spinocerebellar ataxia, Creutzfeldt-Jakob disease, multiple sclerosis, traumatic brain injury and spinal cord injury. Course literature includes primary journal articles and review papers describing the etiology and pathophysiological mechanisms of these disorders. Potential therapeutic approaches to treatment are also investigated. The course format typically includes a lecture reviewing the basic biology, symptoms, and current treatments for each disorder, followed by a thorough analysis of primary research papers focused on novel molecular mechanisms and new targets for therapeutic development. Grading is based on 3 exams throughout the academic quarter and participation in discussing journal articles in class. This course counts as a category elective for the Cognitive Neuroscience concentration. Prerequisite: BIOL 2120 Cell Structure and Function. Recommended: BIOL 3640 Introductory Neurobiology. For Graduate Students: an additional term paper is required with the exact topic to be agreed upon by the student and instructor.

BIOL 3650 Endocrinology (4 Credits)

Mechanisms of hormone action, evolution of vertebrate endocrine systems, analysis of function integration of hormonal responses in maintenance of homeostasis. This course counts as a category elective for the Molecular Biology major and Cognitive Neuroscience concentration. Prerequisite: BIOL 2120.

BIOL 3651 Comparative Endocrinology (4 Credits)

Intercellular communication systems are essential for the proper coordination of trillions of cells in multi-cellular animals. This course will evaluate the evolution of neuroendocrine networks in both invertebrates and vertebrates with a focus on how these neuroendocrine networks influence, growth, reproduction, osmoregulation, and metabolism. Prerequisite: BIOL 3650.

BIOL 3656 Cellular Aspects of Diabetes and Obesity (4 Credits)

This course focuses on specific cellular and molecular events key to the understanding of the pathological conditions of diabetes and obesity. Topics include the endocrine pancreas, adipose tissue and neuroendocrine control energy expenditure and feeding behavior. This course counts as a category elective for the Molecular Biology major. Prerequisite: BIOL 2120.

BIOL 3670 Molecular Immunology (4 Credits)

The ability to distinguish self from non-self is crucial to all organisms. In humans Organs, cells and other higher animals, this task fall to the immune system. Suppression of this system is key to numerous pathogenic viruses including Ebola and human immunodeficiency virus. The failure to adequately regulate immune response underlies allergic reactions, arthritis and diabetes. This course will introduce students to the organs, cells and molecules that underlie mammalian immune response; immunogenetics and the fundamental mechanisms of cell mediated and humoral immune response; and the relationship of immune system to human disease. This course counts as a category elective for the Molecular Biology major. Prerequisite: BIOL 2510.

BIOL 3675 Virology (4 Credits)

Viruses are the ultimate cell biologists. They usurp essential cellular components to create new virus progeny leading to pathological cellular physiology. This course will delve into the genetic and cellular principles that govern virus entry, replication, and assembly and cover a broad range of DNA and RNA-based virus families. This course counts as a category elective for the Molecular Biology major. Prerequisites: BIOL 2120 and BIOL 2510.

BIOL 3690 Cellular Microbiology (4 Credits)

The field of cellular microbiology broadly defines the interface between commensal or pathogenic microbes, prokaryotes or lower eukaryotes, and their host. The burgeoning field of cellular microbiology has seen an explosion of new knowledge related to the feedback regulation between commensal microbes and their hosts. Furthermore, our knowledge of virulence factors that promote host and pathogenic microbe niches has continued to expand. This topics course will build a medically relevant and coherent picture of the host-microbe interface on genetic, molecular, cellular, and organismal scales by surveying relevant literature that has uncovered interspecies communication and control pathways. This course counts as a category elective for the Molecular Biology major. Prerequisites: BIOL 2120 and BIOL 2510.

BIOL 3700 Topics in Ecology (1-4 Credits)

Topics vary; may include plant, animal, biochemical, alpine or aquatic; one topic per quarter. May be repeated for credit. Taught from original literature. Prerequisite: one quarter of undergraduate ecology and/or instructor's permission.

BIOL 3701 Topics in Genetics (1-4 Credits)

Topics vary; may include genetic methods, molecular genetics, human genetics, chromosomes or population genetics; one topic per quarter. May be repeated for credit. Taught from original literature. This course counts as a category elective for the Molecular Biology major. Prerequisite: BIOL 2510 and/or instructor's permission.

BIOL 3702 Advanced Topics in Regulatory Biology (1-4 Credits)

Topics vary; may include endocrinology, physiology or immunology; one topic per quarter. May be repeated for credit. Taught from original literature. Prerequisite: varies with topic and instructor; instructor's permission usually required.

BIOL 3703 Advanced Topics in Developmental Biology (1-4 Credits)

Topics vary; may include gene expression in development, developmental immunogenetics, developmental biochemistry or aging; one topic per quarter. May be repeated for credit. Taught from original literature. This course counts as a category elective for the Molecular Biology major. Prerequisite: instructor's permission.

BIOL 3704 Advanced Topics in Cell Biology (1-4 Credits)

Topics vary; may include supramolecular structure, microscopy, membranes and techniques. May be repeated for credit. Taught from original literature. This course counts as a category elective for the Molecular Biology major. Prerequisites: BIOL 2120.

BIOL 3705 Advanced Topics in Molecular Biology (1-4 Credits)

Topics vary, but may include biochemistry, supramolecular structure and function, molecular genetics, membrane biology. May be taken more than once for credit. Taught from original literature. This course counts as a category elective for the Molecular Biology major. Prerequisite: varies with course and instructor; instructor's permission usually required.

BIOL 3706 Topics in Evolution (1-4 Credits)

Topics vary, but may include molecular evolution, plant evolution and animal evolution. Prerequisite: BIOL 2120 and BIOL 2510.

BIOL 3707 Advanced Topics in Conservation Biology (1-4 Credits)**BIOL 3708 Topics in Integrative Physiology (2-4 Credits)**

Topics for this course include, but are not limited to, human physiology and disease, integrative physiology, environmental or social impacts on human physiology and health, and comparative physiology. Students will gain knowledge of a specific topic in physiology and/or pathophysiology through discussion of current literature and research. May be repeated for credit. Prerequisite: BIOL 2120.

BIOL 3800 Human Molecular Biology (4 Credits)

Medical Genetics is the 24th member of the American Board of Medical Specialties. This course will introduce students to the fundamentals of molecular biology with an emphasis on understanding of how the field is applied in the context of medical diagnostics, personalized/precision medicine and other commercial applications. Students will be introduced to published research reports and provided with opportunities to critically examine the application of molecular biology to central questions in such areas as oncology, inherited diseases and genetically engineered organisms. Prerequisite: BIOL 2510.

BIOL 3850 Genetic Engineering (4 Credits)

This course will cover principles in gene manipulation and its application in research, medicine and industry. More specifically, this course will explain emerging technologies in genetic engineering and its practical and ethical implications. Topics will incorporate historical and emerging aspects of developmental biology, chemistry, and genetics as well as current techniques in genetic manipulation that are related to genomic editing. Additionally, students will be trained to interface with genomic databases and employ DNA sequence editing software to manipulate DNA sequences to achieve novel cloned products. This course counts as a category elective for the Molecular Biology major. Prerequisite for this course is Genetics BIOL 2510.

BIOL 3855 Genetic Model Organisms in Health & Disease (4 Credits)

This course is focused on how basic science studies using genetic model organisms have had a major impact on human health and disease in addition to helping us understand fundamental aspects of biology. We will cover clinically relevant recent advances from bacterial studies (i.e. CRISPR/Cas9-mediated genome editing) to how studies in fruit flies revealed insights into immune disease. Students will gain a better appreciation for why researchers using model organisms were awarded Nobel prizes as well as why major medical funding organizations like the National Institutes of Health, American Cancer Society, and American Heart Association support research using non-human systems. This course will prepare students to understand health-relevant research from varied model systems. Students will learn practical aspects for determining which model systems are best suited to answer which types of questions. They will also practice designing experiments and defending their importance in grant abstract-style essays. Prerequisites: BIOL 2120 and BIOL 2510.

BIOL 3910 Viruses & Infectious Human Diseases (4 Credits)

From sexually transmitted viruses to bacterial pneumonia, infectious pathogens are the number one threat to human health. This course will introduce students to prions, viruses and bacterial pathogens with an emphasis on those commonly encountered in clinical medical practice. Through the use of technical/scientific research journals students will be encouraged to investigate the etiology, pathogenesis and treatment of human infectious disease with an emphasis on the clinical, molecular diagnostic and therapeutic aspects of the disease. This course counts as a category elective for the Molecular Biology major. Prerequisite: BIOL 2510. Recommended prerequisite: BIOL 3800.

BIOL 3920 Forensic Pathology (2-4 Credits)

In its broadest definition, forensic science represents a fusion of the natural sciences, criminology and jurisprudence. The field of forensic pathology in particular focuses on the investigation of sudden, unnatural, unexplained or violent deaths. Using the most authoritative books available and a multimedia lecture format, students in this course gain an introductory understanding of the pathophysiology of wounding and death as well as the clinical antemortem symptomology of physical abuse, neglect and extrajudicial wounding. Students also learn about the processes responsible for the decomposition of corpses as well as the use of molecular and geometric tools for the reconstruction of crime scenes from bloodstain evidence. Finally, students learn how to integrate a variety of forensic tools in investigations of sexual assault, serial killers, traffic fatalities and mass deaths. Prerequisite: BIOL 2120 or permission of instructor.

BIOL 3950 Undergraduate Research (1-10 Credits)

Participation in faculty research programs by agreement between student and faculty member. Maximum of 5 quarter hours of BIOL 3950 and/or BIOL 3991 may be applied to the 45-quarter-hour requirement for a major in biological sciences.

BIOL 3988 Study Abroad Resident Credit (0-18 Credits)**BIOL 3991 Independent Study (1-10 Credits)**

Topic in biology studied under faculty supervision. Student's responsibility to identify faculty supervisor before registering for class. Maximum of 5 quarter hours of BIOL 3991 and/or BIOL 3950 may be applied toward the 45-quarter-hour requirement for a major in biological sciences.

BIOL 3995 Independent Research (1-10 Credits)**HLTH 2000 Science of Human Health (4 Credits)**

This keystone course focuses on individual, community and population health. Students will be introduced to topics including health & wellness through the lifespan, population and public health, health promotion and education, and social determinants of health and health equity. This course will provide students not only the insight about the scientific basis, but also the social and cultural contexts of human health and health care. Students will gain an understanding about how behavioral health and social factors affect human biology and health. In addition, students will learn to effectively employ the critical skills and competencies necessary for understanding and evaluating human health and health care, as well as to effectively identify and learn to contribute to evidence-based health care.

HLTH 2010 Health Systems Science (4 Credits)

This keystone course will provide knowledge about how education, policy and healthcare delivery function within health care systems. Students will be introduced to topics including healthcare delivery systems and management, health policy and economics, and health informatics and technology. Students will gain an understanding about the healthcare delivery organizations and systems in the United States, contributions of government and public policy to health care, and the economics that drive healthcare systems. These content areas will be presented within the themes of the 3 pillars of health equity: access to health care, quality of care, and health outcomes. Students will gain an appreciation of a perspective from the patient experience in the healthcare system. Furthermore, this course will challenge students to effectively identify and critically consider the interactions and conflicts between these entities.

HLTH 2200 Medical Terminology: Fundamentals and Applications (4 Credits)

This course presents fundamentals and applications of medical terminology. This review and application of human anatomy and physiology is suitable for students who have completed some introductory biology and who are working toward a career in medicine or for whom communication with healthcare providers is essential. Students study basic anatomy and physiology at a level that is intermediate between introductory and advanced courses, discover the medical history behind medical terminology, analyze medical case studies, and work to develop skills for clear and concise articulation of the basic concepts of anatomy and physiology behind medical diagnosis and treatment. This mastery of medical terminology helps to build a strong foundation for advanced coursework in anatomy and physiology. Prerequisites: BIOL 1010 and 1011, or BIOL 1222, or BIOL 1262.

HLTH 2210 Health Education and Promotion (4 Credits)

This course will provide students foundational knowledge about how to deliver health education and promote healthy behaviors to community. Students will focus on integrating evidence-based research into instructional strategies including preparing culturally sensitive presentations, leading difficult conversations, and activities to reinforce healthy behaviors. This course includes a weekly service-learning activity, where students will present approved workshops to youth on topics such as: mental health, sexual health, healthy behaviors and harm prevention, and accessing health care. The content delivered to youth aligns with the National Health Education Standards. Prerequisites: HLTH 2000 or HLTH 2010.

HLTH 3000 Seminar in Health Science (1-2 Credits)

This seminar is the capstone course for the Human Health Science & Systems program. This class will focus on the current understanding of several topics in human health. Emphasis will be on critical reading and discussion of current scientific literature related to human health and health care. Students will learn to recognize and appreciate different approaches and methods of health-related research. Students will utilize and integrate knowledge from previous courses to understand to present effective discussions on current topics in health. For students' continued development of strong oral communication skills, student presentations of primary literature will generate the basis of discussion. Prerequisites: HLTH 2000 and 2010.

HLTH 3155 Leadership in Health (1 Credit)

This course addresses the basic leadership skills necessary to succeed in the dynamic professional environment of health science and healthcare. Topics covered include individual and team leadership strategies and professional skills related to communication, management, strategic planning, implementation of change, negotiation, conflict resolution, and team building. Students will determine leadership strengths and weaknesses and learn to adapt their leadership approach to meet specific situations and challenges. Students will strengthen their leadership practices through a series of lectures, case studies, guided interactions and group exercises. Prerequisites: HLTH 2000 and 2010.

HLTH 3600 Cultural Responsiveness in Health Care (2 Credits)

To contribute to reducing health inequities and improving health outcomes, this course will promote an improved understanding and responsiveness to the realities of social and structural impacts that influence the health of an individual or community. Topics will include health care delivery and access, political economy of health care, implicit biases, professionalism, relational leadership, dealing with patients in difficult situations, and health equity. The course will help students learn to provide more informed and effective care and promote a more culturally sensitive and responsive future workforce in healthcare, while also serving community needs. Prerequisite: HLTH 2000 or equivalent.

HLTH 3700 Topics in Health (1-4 Credits)

Topics in the area of, but are not limited to, human health and disease, environmental or social impacts on health, healthcare delivery, evidence-based medicine. Students will gain knowledge of a specific topic in human health and/or health care through discussion of current literature and research. May be repeated for credit. Prerequisites: HLTH 2000 or 2010.

HLTH 3870 Medical Ethics (4 Credits)

This course will present knowledge and discussion of ethical issues that arise from advances in the biomedical sciences and medicine. Several specific ethical issues and policies related to methodologies and procedures, emerging medical technologies, treatment decisions, doctor-patient relationship, informed consent, medical experimentation/clinical research, and health care reform. The overall objective of this course is to enhance awareness and critical thinking skills for future science professionals who are able to express their views in a culturally-responsive manner and listen to and appreciate others' perspectives. This course will focus on discussions, case studies, and projects. Prerequisites: BIOL 2120, or HLTH 2000.

HLTH 3991 Independent Study in Human Health Science and Systems (1-4 Credits)

In this course, students can engage in independent study focused on a topic in human health science and/or human health system science under faculty supervision. The independent study in Human Health Science and Systems provides individualized opportunities to gain knowledge on a specific health topic of interest to the student. This course complements the student's didactic coursework in established health topics and provides an opportunity for students to delve deeper into a specific health-related topic. The student is responsible for identifying a faculty supervisor before registering for class. Maximum of 5 quarter hours of HLTH 3991 and/or HLTH 3993 and/or HLTH 3995 may be applied toward the 20-quarter-hour requirement for a minor in Human Health Science & Systems. Prerequisites: HLTH 2000 or HLTH 2010.

HLTH 3993 Internship in Human Health Science & Systems (0-4 Credits)

An internship is the opportunity to engage in a unique educational experience outside of the didactic setting of the classroom. This course includes a structured practical and productive internship experience that allows for the integration and application of coursework in a professional setting. The internship can be administrative, clinical, programmatic, or research focused. The internship must be a new experience for the student. If the proposed internship is within same setting as previous experience, the internship activities must be clearly different from past experiences. The course credit is variable (1-5 credits) depending on the rigor and time commitment required to complete the internship. Prerequisites: HLTH 2000 or 2010.

HLTH 3995 Independent Research in Human Health Science and Systems (1-4 Credits)

Independent research is an opportunity for students to be engaged in research within the fields of human health science or health systems studied under the guidance of a faculty member. This course complements the student's didactic coursework in established health topics and provides an opportunity for students to engage in focused research on health-related question. research. Students will effectively employ the critical research skills and competencies necessary critique and understand current literature, identify gaps in current knowledge, and understand and employ appropriate research approaches and methods for addressing the health-related research question. The student is responsible for identifying a faculty supervisor before registering for class. Maximum of 5 quarter hours of HLTH 3991 and/or HLTH 3993 and/or HLTH 3995 may be applied toward the 20-quarter-hour requirement for a minor in Human Health Science & Systems. Prerequisites: HLTH 2000 or 2010.

Faculty

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