A major revolution is occurring in the field of biological sciences. Biology is undergoing unprecedented technological advances in biochemistry, biophysics, cell biology, genetics, molecular biology, developmental biology, neuroscience and computational biology. Carnegie Mellon’s Department of Biological Sciences is nationally recognized as one of the outstanding departments in these areas. Advances in basic research are already being used to solve problems, not only in medicine and public health, but also in areas such as agriculture, forestry, mining, energy, and in industrial and pharmaceutical manufacturing processes. The department provides its students with an education that has both intellectual breadth and depth of exposure to modern research biology. This education can be used to gain employment immediately after graduation in government, industry or academic research laboratories, or to pursue graduate studies in a variety of areas such as science, medicine, public health, law, or business. A degree in biological sciences provides excellent preparation for medical school or other graduate programs in the health professions. These students are aided by the Carnegie Mellon Health Professions Program (HPP), an advisory and resource service for all Carnegie Mellon students who are considering careers in the health care field. (See the HPP (http://courcecatalog.web.cmu.edu/services/healthprofessionsprogram/ #healthprofessionsprogram) section in this catalog or www.cmu.edu/hpp for more information.)

The department offers a Bachelor of Science (B.S.) degree in Biological Sciences. This program has a distinctive core curriculum that provides a foundation in biology, chemistry, computer science, mathematics, and physics. In addition to the core courses, the program includes six biology electives, free electives as well as humanities, social science and fine arts electives. With these electives, students can shape a degree program according to their own interests and career goals. For students who have an interest in a particular field of biology and wish to have a specialized focus, the department offers options in biochemistry, biophysics, cell biology, computational biology, developmental biology, genetics, molecular biology and neuroscience that provide the relevant training in each area. The options are especially recommended for students who are considering graduate school in one of these areas. The B.S. degrees in Biological Sciences/Neuroscience Track and Neuroscience are available to those students who wish to pursue an in-depth study of neuroscience.

In this exciting era that includes the influence of biology and the life sciences on many fields from medicine to law, the in-depth exposure to multiple disciplines provides opportunities for students to prepare for involvement at the forefront of emerging new fields, markets, and policy changes. The Department of Biological Sciences at Carnegie Mellon is working at these new interfaces through interdisciplinary research and educational programs. Innovative interdisciplinary degrees which are offered by the department include the inter-college B.S. degrees in Computation Biology and Neuroscience as well as the unified B.S. degree in Biological Sciences and Psychology. Students also explore interdisciplinary studies through the Science and Humanities Scholars program, or pursue interests at the interface between the arts and sciences through the Bachelor of Science and Arts (B.S.A.) degree program combining biological sciences with a discipline in the College of Fine Arts.

A stand-alone Bachelor of Arts (B.A.) degree is available for students who wish to expand their educational training into other fields. Many students choose to broaden their education by pursuing minors and additional majors in disciplines throughout the university, not just within the Mellon College of Science.

One of the most important features of the Department of Biological Sciences is the opportunity for undergraduate students to interact with faculty. Providing a solid foundation to scientific practice is critical; therefore, the department offers first-year students a variety of inquiry-based, hands-on courses that incorporate a wide range of topics and interests within Biological Sciences. These courses kick-start the transformation of science students to scientists. We encourage our students to get to know their faculty through one of these courses, or through mentorship, independent research projects in the faculty laboratories. Our faculty members are prominent research scientists who also teach beginning and advanced courses. The upper level teaching laboratories are located in the same building as the faculty research laboratories and share scientific equipment. We encourage students to make themselves aware of the research areas of the faculty and to develop research projects with faculty. While such research is usually most important in the senior year, it may begin earlier in a student’s undergraduate training. The department has an Honors Program in Research Biology to facilitate a more intensive involvement in research for eligible students. During the past four years, more than 80 percent of the undergraduate biology majors have worked with faculty on their research and, in some cases, have been co-authors of research papers and have given presentations at national meetings.

As of the fall of 2011, the Department of Biological Sciences offers B.S. degrees in Biological Sciences as well as Computational Biology at Carnegie Mellon University in Doha, Qatar. Students enrolled in either of these degree programs will also complete the requirements outlined below. Unfortunately, a limited number of required courses for the CMU-Qatar program are offered through a collaboration with the Weil Cornell Medical College in Qatar. For a listing of how the degree requirements are fulfilled for students enrolled in Doha, please consult the CMU-Qatar website (https://www.qatar.cmu.edu/curriculum-bs).
Department of Biological Sciences

or 09-221 Laboratory I: Introduction to Chemical Analysis
09-208 Techniques for Organic Synthesis and Analysis 9
or 09-222 Laboratory II: Organic Synthesis and Analysis

Total Chemistry units 56

Students who complete 09-107 with an A grade will be exempted from the requirement to take 09-106 Modern Chemistry II.

Elective Units Units
Free Electives 48
MCS Nontechnical Breadth Requirements 72
Total Elective units 120

360 Minimum number of units required for degree:

MCS Technical Breadth Requirements

Majors entering CMU and majoring in Biological Sciences (or affiliated majors) in the Fall of 2015 or beyond will fulfill the MCS Technical Breadth Requirements as follows:

• At least 18 units must be at the 03-3xx level or above, exclusive of 03-445 and 03-370.
• Up to three interdisciplinary electives may count as biology electives.
• Up to 18 units of 03-445 Undergraduate Research may count as general biology electives; a maximum of 36 units can count for the minimum units required for graduation.

Biological Sciences Electives

The following specifications apply to Biological Sciences electives:

• At least 18 units must be at the 03-3xx level or above, exclusive of 03-445 and 03-370.
• Up to three interdisciplinary electives may count as biology electives.
• Up to 18 units of 03-445 Undergraduate Research may count as general biology electives; a maximum of 36 units can count for the minimum units required for graduation.
• Courses in biology taken through cross-registration or study abroad at another university may count as electives if prior permission is obtained from the Carnegie Mellon Department of Biological Sciences advisor.

Departmental Electives Group

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-115/116 Phage Genomics Research</td>
<td>6</td>
</tr>
<tr>
<td>03-124 Modern Biology Laboratory</td>
<td>9</td>
</tr>
<tr>
<td>03-125 Evolution</td>
<td>9</td>
</tr>
<tr>
<td>03-126 Cellular Response to the Environment</td>
<td>4</td>
</tr>
<tr>
<td>03-127 How Biological Experiments Work - A Project Course</td>
<td>9</td>
</tr>
<tr>
<td>03-161 Molecules to Mind</td>
<td>9</td>
</tr>
<tr>
<td>03-230 Intro to Mammalian Physiology</td>
<td>9</td>
</tr>
<tr>
<td>03-326 Evolution of Regulatory Genomics</td>
<td>4.5</td>
</tr>
<tr>
<td>03-327 Phylogenetics</td>
<td>9</td>
</tr>
<tr>
<td>03-350 Developmental Biology</td>
<td>9</td>
</tr>
<tr>
<td>03-362 Cellular Neuroscience</td>
<td>9</td>
</tr>
<tr>
<td>03-363 Systems Neuroscience</td>
<td>9</td>
</tr>
<tr>
<td>03-364 Developmental Neuroscience</td>
<td>9</td>
</tr>
<tr>
<td>03-365 Neural Correlates of Learning and Memory</td>
<td>9</td>
</tr>
<tr>
<td>03-366 Biochemistry of the Brain</td>
<td>9</td>
</tr>
<tr>
<td>03-370 Principles of Biotechnology</td>
<td>9</td>
</tr>
<tr>
<td>03-390 Molecular and Cellular Immunology</td>
<td>9</td>
</tr>
<tr>
<td>03-391 Microbiology</td>
<td>9</td>
</tr>
<tr>
<td>03-392 Microbiology Laboratory</td>
<td>6</td>
</tr>
<tr>
<td>03-439 Introduction to Biophysics</td>
<td>9</td>
</tr>
<tr>
<td>03-442 Molecular Biology</td>
<td>9</td>
</tr>
<tr>
<td>03-445 Undergraduate Research</td>
<td>Var.</td>
</tr>
<tr>
<td>03-511 Computational Molecular Biology and Genomics</td>
<td>9</td>
</tr>
<tr>
<td>03-512 Computational Methods for Biological Modeling and Simulation</td>
<td>9</td>
</tr>
<tr>
<td>03-534 Biological Imaging and Fluorescence Spectroscopy</td>
<td>9</td>
</tr>
<tr>
<td>03-545 Honors Research</td>
<td>9</td>
</tr>
<tr>
<td>03-620 Techniques in Electron Microscopy</td>
<td>9</td>
</tr>
<tr>
<td>03-709 Applied Cell and Molecular Biology</td>
<td>12</td>
</tr>
<tr>
<td>03-711 Computational Molecular Biology and Genomics</td>
<td>12</td>
</tr>
<tr>
<td>03-712 Computational Methods for Biological Modeling and Simulation</td>
<td>12</td>
</tr>
<tr>
<td>03-713 Bioinformatics Data Integration Practicum</td>
<td>6</td>
</tr>
<tr>
<td>03-726 Evolution of Regulatory Genomics</td>
<td>6</td>
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<tr>
<td>03-727 Phylogenetics</td>
<td>12</td>
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<tr>
<td>03-730 Advanced Genetics</td>
<td>12</td>
</tr>
<tr>
<td>03-740 Advanced Biochemistry</td>
<td>12</td>
</tr>
<tr>
<td>03-741 Advanced Cell Biology</td>
<td>12</td>
</tr>
<tr>
<td>03-742 Molecular Biology</td>
<td>12</td>
</tr>
<tr>
<td>03-744 Membrane Trafficking</td>
<td>9</td>
</tr>
<tr>
<td>03-751 Advanced Developmental Biology and Human Health</td>
<td>12</td>
</tr>
<tr>
<td>03-762 Advanced Cellular Neuroscience</td>
<td>12</td>
</tr>
<tr>
<td>03-763 Advanced Systems Neuroscience</td>
<td>12</td>
</tr>
<tr>
<td>03-765 Advanced Neural Correlates of Learning and Memory</td>
<td>12</td>
</tr>
<tr>
<td>03-770 Principles of Biotechnology</td>
<td>12</td>
</tr>
<tr>
<td>03-791 Advanced Microbiology</td>
<td>12</td>
</tr>
<tr>
<td>03-871 Structural Biophysics</td>
<td>12</td>
</tr>
</tbody>
</table>

Interdisciplinary Electives Group

Up to three of the following courses may count as biology electives:

• 09-518 Bioorganic Chemistry: Nucleic Acids and Carbohydrates | 9 |
• 09-519 Bioorganic Chemistry: Peptides, Proteins and Combinatorial Chemistry | 9 |
• 09-521 Metals in Biology: Function and Reactivity | 9 |
• 09-535 Applied topics in Macromolecular and Biophysical Techniques | 9 |
• 21-127 Concepts of Mathematics | 10 |
• 21-259 Calculus in Three Dimensions | 9 |
• 21-260 Differential Equations | 9 |
• 36-201 Statistical Reasoning and Practice | 9 |
• 36-247 Statistics for Lab Sciences | 9 |
• 42-202 Physiology | 9 |
• 85-219 Biological Foundations of Behavior | 9 |

Options for the B.S. in Biological Sciences

Students who wish to specialize in a particular area of biology can do so through a set of departmentally defined options. A student who completes the required biology electives for any option can have up to two noted on his or her transcript. Options need not be declared. The elective courses required for each of the options are listed below.

Biochemistry Option

Required Biology Electives:

• 03-740 Advanced Biochemistry | 12 |
• 21-259 Calculus in Three Dimensions | 9 |
• or 21-260 Differential Equations |

Any ONE of the following courses:

• 09-518 Bioorganic Chemistry: Nucleic Acids and Carbohydrates | 9 |
• 09-519 Bioorganic Chemistry: Peptides, Proteins and Combinatorial Chemistry | 9 |
• 09-521 Metals in Biology: Function and Reactivity | 9 |

Recommended Biology Electives:

• 03-442 Molecular Biology | 9 |
• 03-534 Biological Imaging and Fluorescence Spectroscopy | 9 |
• 03-439 Introduction to Biophysics | 9 |
• 03-871 Structural Biophysics | 12 |

Biophysics Option

Required Biology Electives:

• 03-740 Advanced Biochemistry | 12 |
Neuroscience Option
Required Biology Electives:
03-362 Cellular Neuroscience 7 9
03-363 Systems Neuroscience 7 9
Any ONE of the following courses:
42-202 Physiology 9
03-350 Developmental Biology 9
03-364 Developmental Neuroscience 9
03-365 Neural Correlates of Learning and Memory 9
03-366 Biochemistry of the Brain 9
03-534 Biological Imaging and Fluorescence Spectroscopy 9
85-219 Biological Foundations of Behavior 9
7 One of these courses must be completed at the Graduate Level (Complete either 03-762 or 03-763).

B.S. Biological Sciences/Neuroscience Track
The Bachelor of Science in Biological Sciences/Neuroscience Track provides an option for those Biological Sciences majors who are interested in an intensive curricular focus in neuroscience. The requirements of the Track are the same as those listed for the B.S. in Biological Sciences with the following changes to the biological sciences elective requirements:

Degree Requirements:
03-362 Cellular Neuroscience 9
03-363 Systems Neuroscience 9
03-765 Advanced Neural Correlates of Learning and Memory 12
Plus three of the following electives:
03-350 Developmental Biology 9
03-364 Developmental Neuroscience 9
03-366 Biochemistry of the Brain 9
03-534 Biological Imaging and Fluorescence Spectroscopy 9
15-385 Introduction to Computer Vision 6
15-386 Neural Computation 9
42-202 Physiology 9
85-211 Cognitive Psychology 9
85-213 Human Information Processing and Artificial Intelligence 9
85-219 Biological Foundations of Behavior 9

B.S. Computational Biology
The Bachelor of Science in Computational Biology is listed in the Intercollege (http://www.cmu.edu/servicesandoptions/intercollegeprograms/#bachelorofsciencecomputationalbiology) section of this catalog. It is a joint degree program offered between the Mellon College of Science and the School of Computer Science. Current MCS students interested in pursuing this degree should contact Dr. Becki Campanaro (DH 1320). More information can also be found on the CMU Computational Biology website (http://www.cbd.cmu.edu/education/bachelorofscienceincomputationalbiology.html).

B.S. Neuroscience
The Bachelor of Science in Neuroscience is listed in the Intercollege (http://www.cmu.edu/servicesandoptions/intercollegeprograms/#bachelorofscienceinneuroscience) section of this catalog. It is a joint degree program offered between the Mellon College of Science and the Dietrich College of Humanities and Social Sciences. Current MCS students interested in pursuing this degree should contact Dr. Becki Campanaro (DH 1320). More information can also be found on the CMU Neuroscience website (http://www.cmu.edu/neuro).
B.S. Biological Sciences and Psychology

This major is intended to reflect the interdisciplinary nature of current research in the fields of biology and psychology, as well as the national trend in some professions to seek individuals broadly trained in both the social and natural sciences.

**Note:** Students entering from the Dietrich College of Humanities and Social Sciences will earn a Bachelor of Science in Psychology and Biological Sciences. Students in the Mellon College of Science will earn a Bachelor of Science in Biological Sciences and Psychology. Students in the joint Science and Humanities Scholars (SHS) program can complete the SHS educational core and choose either departmental order for their diploma.

Depending on a student’s home college (DC or MCS), General Education core and choose either departmental order for their diploma.

**Degree Requirements:**

- **Biological Sciences**
  - 03-121 Modern Biology 9 units
  - or 03-151 Honors Modern Biology
  - 03-220 Genetics 9 units
  - 03-231/232 Biochemistry I 9 units
  - 03-320 Cell Biology 9 units
  - 03-343 Experimental Techniques in Molecular Biology 12 units
  - 03-411 Topics in Research 1 unit
  - 03-412 Topics in Research 1 unit
  - 03-xxx General Biology Elective 9 units
  - 03-3xx Advanced Biology Elective 18 units

**Total Biology units** 77 units

1 Please see description and requirements for electives under the B.S. in Biological Sciences section of this Catalog.

- **Mathematics, Statistics, Physics and Computer Science**
  - 21-120 Differential and Integral Calculus 10 units
  - 21-122 Integration and Approximation 10 units
  - or 21-124 Calculus II for Biologists and Chemists
  - 36-247 Statistics for Lab Sciences 9 units
  - or 36-201 Statistical Reasoning and Practice
  - 36-207 Experimental Design for Behavioral and Social Sciences 9 units
  - 33-121 Physics I for Science Students 12 units
  - or 33-122 Honors Modern Biology

**Total Science units** 63-65 units

- **Chemistry**
  - 09-105 Introduction to Modern Chemistry I 10 units
  - 09-106 Modern Chemistry II 10 units
  - or 09-197 Organic Chemistry I 9 units
  - or 09-198 Modern Organic Chemistry
  - or 09-217 Organic Chemistry II 9 units
  - or 09-220 Modern Organic Chemistry II
  - 09-207 Techniques in Quantitative Analysis 9-12 units
  - or 09-221 Laboratory I: Introduction to Chemical Analysis
  - 09-208 Techniques for Organic Synthesis and Analysis 9-12 units
  - or 09-222 Laboratory II: Organic Synthesis and Analysis

**Total Chemistry units** 56-62 units

- **Psychology Courses**
  - 85-102 Introduction to Psychology 9 units
  - 85-219 Biological Foundations of Behavior 9 units
  - 85-2xx Survey Psychology Courses 18 units
  - 85-310 Research Methods in Cognitive Psychology 9 units
  - or 85-340 Research Methods in Social Psychology
  - or 85-320 Research Methods in Developmental Psychology
  - or 85-314 Cognitive Neuroscience Research Methods
  - or 85-330 Analytic Research Methods
  - 85-xxx Advanced Psychology Electives 18 units

**Total Psychology units** 63 units

* Excluding 85-261 Abnormal Psychology

**Additional Advanced Elective**

9 units (Choose one of the following)

- 85-3xx Advanced Psychology Elective 9 units
  - or 03-xxx Advanced Biology Elective 9 units

**Additional Laboratory or Research Methods**

9-12 units (Choose one of the following)

- 03-344 Experimental Biochemistry 12 units
  - 03-345 Experimental Cell and Developmental Biology 12 units
  - 85-310 Research Methods in Cognitive Psychology 9 units
  - 85-314 Cognitive Neuroscience Research Methods 9 units
  - 85-320 Research Methods in Developmental Psychology 9 units
  - 85-340 Research Methods in Social Psychology 9 units

**Elective Units**

Free Electives 33-36 units

MCS Nontategorical Breadth or DC General Education 36-48 units

**Total Elective units** 69-84 units

**Minimum number of units required for degree:**

360 units

**B.A. Biological Sciences**

The Department of Biological Sciences offers a Bachelor of Arts (B.A.) degree that is intended for students who wish to combine their interest in science with their interest(s) in other discipline(s) across campus. The requirements for the B.A. degree are distributed as follows:

**Degree Requirements:**

- **Biological Sciences**
  - 03-121 Modern Biology 9 units
  - or 03-151 Honors Modern Biology
  - 03-220 Genetics 9 units
  - 03-231/232 Biochemistry I 9 units
  - 03-320 Cell Biology 9 units
  - 03-343 Experimental Techniques in Molecular Biology 12 units
  - 03-411 Topics in Research 1 unit
  - 03-412 Topics in Research 1 unit
  - 03-xxx General Biology Elective 18 units
  - 03-3xx Advanced Biology Elective 18 units

**Total Biology units** 85-88 units

* Please see description and requirements for electives under the B.S. in Biological Sciences section of this Catalog.

- **Chemistry**
  - 09-105 Introduction to Modern Chemistry I 10 units
  - or 09-106 Modern Chemistry II 10 units
  - or 09-197 Organic Chemistry I 9 units
  - or 09-198 Modern Organic Chemistry
  - or 09-217 Organic Chemistry II 9 units
  - or 09-220 Modern Organic Chemistry II
  - 09-207 Techniques in Quantitative Analysis 9-12 units
  - or 09-221 Laboratory I: Introduction to Chemical Analysis
  - 09-208 Techniques for Organic Synthesis and Analysis 9-12 units
  - or 09-222 Laboratory II: Organic Synthesis and Analysis

**Total Chemistry units** 56-62 units

- **Psychology Courses**
  - 85-102 Introduction to Psychology 9 units
  - 85-219 Biological Foundations of Behavior 9 units
  - 85-2xx Survey Psychology Courses 18 units
  - 85-310 Research Methods in Cognitive Psychology 9 units
  - or 85-340 Research Methods in Social Psychology
  - or 85-320 Research Methods in Developmental Psychology
  - or 85-314 Cognitive Neuroscience Research Methods
  - or 85-330 Analytic Research Methods
  - 85-xxx Advanced Psychology Electives 18 units

**Total Psychology units** 63 units

* Excluding 85-261 Abnormal Psychology

**Additional Advanced Elective**

9 units (Choose one of the following)

- 85-3xx Advanced Psychology Elective 9 units
  - or 03-xxx Advanced Biology Elective 9 units

**Additional Laboratory or Research Methods**

9-12 units (Choose one of the following)

- 03-344 Experimental Biochemistry 12 units
  - 03-345 Experimental Cell and Developmental Biology 12 units
  - 85-310 Research Methods in Cognitive Psychology 9 units
  - 85-314 Cognitive Neuroscience Research Methods 9 units
  - 85-320 Research Methods in Developmental Psychology 9 units
  - 85-340 Research Methods in Social Psychology 9 units

**Elective Units**

Free Electives 33-36 units

MCS Nontategorical Breadth or DC General Education 36-48 units

**Total Elective units** 69-84 units

360 units
Minor in Biological Sciences

The curriculum within the Neuroscience minor will allow students from various disciplines to gain fundamental knowledge of neuroscience concepts. The interdisciplinary nature of the coursework echoes the nature of the field itself; students will select courses from the natural, social, and computer sciences. Neuroscientists not only require foundational knowledge of molecular, cellular, and systems neuroscience, but they should also understand the behavioral significance and appreciate how computational work and imaging techniques can aid in clarifying normal and abnormal functioning of these fundamental processes.

Students pursuing the minor in Neuroscience will:

- Acquire foundational knowledge of the basic biological foundations of the nervous system, from the cellular through systems levels.
- Understand the effects of basic neurological function on behavior, including cognition.
- Gain an appreciation of the interdisciplinary nature of the field of neuroscience.

NOTE: Because the curriculum within this minor may overlap with some degree requirements, no more than 2 courses fulfilling Neuroscience Minor requirements may count towards the requirements of a student’s major or other minor.

Courses required for the Neuroscience minor

Required courses (4):

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-121 Modern Biology</td>
<td>9</td>
</tr>
<tr>
<td>or 03-115 Honors Modern Biology</td>
<td>9</td>
</tr>
<tr>
<td>03-362 Cellular Neuroscience</td>
<td>9</td>
</tr>
<tr>
<td>03-363 Systems Neuroscience</td>
<td>9</td>
</tr>
<tr>
<td>85-219 Biological Foundations of Behavior</td>
<td>9</td>
</tr>
<tr>
<td>or 03-161 Molecules to Mind</td>
<td>9</td>
</tr>
</tbody>
</table>

Distribution Requirements: Three courses, including at least 1 from each of the following categories:

<table>
<thead>
<tr>
<th>Category</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approaches to Neuroscience Category</td>
<td></td>
</tr>
<tr>
<td>15-386 Neural Computation</td>
<td>9</td>
</tr>
<tr>
<td>15-883 Computational Models of Neural Systems</td>
<td>12</td>
</tr>
<tr>
<td>85-412 Cognitive Modeling</td>
<td>9</td>
</tr>
<tr>
<td>85-414 Cognitive Neuropsychology</td>
<td>9</td>
</tr>
<tr>
<td>85-419 Introduction to Parallel Distributed Processing</td>
<td>9</td>
</tr>
<tr>
<td>85-429 Cognitive Brain Imaging</td>
<td>9</td>
</tr>
<tr>
<td>Cognitive Neuroscience Category</td>
<td></td>
</tr>
<tr>
<td>03-364 Developmental Neuroscience</td>
<td>9</td>
</tr>
<tr>
<td>85-211 Cognitive Psychology</td>
<td>9</td>
</tr>
<tr>
<td>85-356 Music and Mind: The Cognitive Neuroscience of Sound</td>
<td>9</td>
</tr>
<tr>
<td>85-370 Perception</td>
<td>9</td>
</tr>
<tr>
<td>85-390 Human Memory</td>
<td>9</td>
</tr>
<tr>
<td>85-406 Autism: Psychological and Neuroscience Perspectives</td>
<td>9</td>
</tr>
</tbody>
</table>

*NOTE: 85-213 may be used instead of 85-211 when offered

Minimum number of units required for the Neuroscience Minor: 63
Eukaryotes; DNA replication; DNA mutation and repair; Meiosis; Mitosis; and Regulation of Gene Expression.

This information is sometimes available in the course description, but more detail is often found in a course syllabus.


3. Introductory level courses that focus on other biology areas (i.e., anatomy, physiology, ecology, evolution, and/or development) will not be accepted for 03-121 credit. These courses may receive credit for a general biology elective.

4. Students should contact their departmental academic advisor for the transfer credit approval process in their college.

Faculty

ALISON L. BARTH, Professor – Ph.D., University of California, Berkeley; Carnegie Mellon, 2002–.

MOHAMED BOUAOUINA, Assistant Teaching Professor, Carnegie Mellon-Qatar – Ph.D., Carnegie Mellon, 2013–.

DANIEL BRASIER, Assistant Teaching Professor – Ph.D., University of California, San Diego; Carnegie Mellon, 2012–.

MAGGIE BRAUN, Associate Teaching Professor and Associate Dean of Undergraduate Affairs for MCS – Ph.D., University of Pittsburgh; Carnegie Mellon, 2008–.

MARCEL BRUCEZ, Associate Professor in Biological Sciences and Chemistry, Associate Director of MBIC – Ph.D., University of California, Berkeley; Carnegie Mellon, 2006–.

AMY L. BURKERT, Teaching Professor and Vice Provost for Education – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1997–.

BECKI M. CAMPANARO, Assistant Teaching Professor and Assistant Department Head for Undergraduate Affairs – Ph.D., Arizona State University; Carnegie Mellon, 2015–.

CLAIRE CHEETHAM, Assistant Research Professor – Ph.D., King’s College London; Carnegie Mellon, 2015–.

JASON M. D’ANTONIO, Assistant Teaching Professor and Director of the Health Professions Program – Ph.D., University of Pittsburgh School of Medicine; Carnegie Mellon, 2013–.

CARRIE B. DOONAN, Teaching Professor and Director of Undergraduate Laboratories – Ph.D., University of Connecticut; Carnegie Mellon, 1993–.

CHARLES A. ETTENSOHN, Professor – Ph.D., Yale University; Carnegie Mellon, 1987–.

ARYN GITIS, Assistant Professor – Ph.D., University of California, San Diego; Carnegie Mellon, 2017–.

DAVID D. HACKNEY, Professor – Ph.D., University of California, Berkeley; Carnegie Mellon, 1978–.

N. LUISA HILLER, Assistant Professor – Ph.D., Northwestern University Medical School; Carnegie Mellon, 2012–.

VERONICA F. HINMAN, Associate Professor – Ph.D., University of Queensland; Carnegie Mellon, 2006–.

CHIEN HO, Professor and Director of NMR Center of Pittsburgh – Ph.D., Yale University; Carnegie Mellon, 1979–.

JEFFREY O. HOLLINGER, Professor of Biological Sciences and Biomedical Engineering – Ph.D., D.D.S., University of California; Carnegie Mellon, 2002–.

KENNETH HOVIS, Assistant Teaching Professor, Carnegie Mellon-Qatar – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2011–.

VALENTIN ILYIN, Associate Teaching Professor of Computational Biology at CMU-Qatar – Ph.D., Carnegie Mellon, 2012–.

JONATHAN W. JARVIK, Associate Professor – Ph.D., Massachusetts Institute of Technology; Carnegie Mellon, 1979–.

SANDRA KUHLMAN, Assistant Professor – Ph.D., University of Kentucky; Carnegie Mellon, 2012–.

FREDERICK LANNI, Associate Professor – Ph.D., Harvard University; Carnegie Mellon, 1982–.

CHRISTINA H. LEE, Associate Professor – Ph.D., University of California, San Francisco; Carnegie Mellon, 2000–.

ADAM D. LINSTEDT, Professor – Ph.D., University of California, San Francisco; Carnegie Mellon, 1993–.

A. JAVIER LOPEZ, Associate Professor – Ph.D., Duke University; Carnegie Mellon, 1989–.

BROOKE M. MCCARTNEY, Associate Professor – Ph.D., Duke University; Carnegie Mellon, 2003–.

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