Department of Psychology

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www.cmu.edu/dietrich/psychology

Can newborn infants perceive the world as we do, or is it just “a blooming buzzing confusion”? Do personality, beliefs and social factors influence health? How do scientists and young children make discoveries, and what abilities make these insights possible? How does brain activity reveal differences in thinking? Can computers think the way people do?

These are some of the questions that psychologists at Carnegie Mellon are trying to answer.

For the student who is majoring in Psychology, Cognitive Science or Neuroscience, studying with faculty who are on the leading edge of research on questions like the above can be a very exciting experience.

The Psychology Department at Carnegie Mellon has long been noted as one of the pioneering Psychology Departments in the world, particularly in such areas as cognitive psychology, cognitive science, social psychology, developmental psychology, cognitive neuroscience, and health psychology. The Psychology Department offers 5 majors: B.A. and B.S. degrees in Psychology, as well as a B.S. degree in Cognitive Science and together with the Department of Biological Sciences, a unified B.S. double major in Psychology and Biological Sciences, and an Intercollege major in Neuroscience.

The Major in Psychology

Psychology is a discipline that embraces both biological and social sciences. It is a science concerned with establishing principles and laws regarding the ways in which people think and behave through the scientific study of human behavior.

The orientation of the Carnegie Mellon Psychology curriculum is toward developing highly skilled and knowledgeable graduates. About half of our graduates go on to graduate or professional school. The remainder seek to expand their problem-oriented analytic skills to qualify themselves for job opportunities beyond those typically open to liberal arts students.

Majors in the department are expected not only to learn about findings already established by psychologists, but also to become proficient in the investigation and analysis of behavior. This includes observing behavior, formulating hypotheses, designing experiments to test these hypotheses, running experiments, performing statistical analysis, and writing reports.

The department has many resources for students to use in acquiring these skills. For instance, students interested in child development may be involved in the child development laboratory and observational facilities which are a part of the Carnegie Mellon Children’s School which operates under the department’s aegis. Students interested in health or clinical psychology might have opportunities to do internships in applied settings, and all psychology majors have access to extensive computer facilities for data analysis and simulation work. The department also has a state of the art set of undergraduate research laboratories and computer clusters, and through the Scientific Imaging & Brain Research Center, a magnet is in use for conducting brain imaging studies using fMRI.

In addition to formal class work, students are encouraged to participate in research projects where they may register and receive credit for freshmen research experience course 85-198 Research Training: Psychology, 85-506 Readings in Psychology, Fall research experience in 85-507 Research in Psychology or Spring research experience in 85-508 Research in Psychology. In the research in psychology course, the student may work on an ongoing research projects or develop and carry out a new research project with a faculty member. There is university and departmental funding available to help support student-initiated research projects and student travel to present research results at scientific meetings and conferences. In the Readings courses, the student reads extensively on a particular topic.

The faculty member and student meet to discuss the readings, and the student writes a paper on the topic selected. The Psychology Department Website (http://www.cmu.edu/dietrich/psychology), provides descriptions of faculty research interests (http://www.cmu.edu/dietrich/psychology/research-areas) that the student can use in determining who should be approached to supervise a particular research or reading project.

Students interested in gaining field work experience via a number of internship opportunities available to them can receive credit through 85-482 Internship in Psychology, 85-480 Internship in Clinical Psychology or 85-484 Practicum in Child Development. Clinical internships are available with a variety of clinical settings including the prestigious Western Psychiatric Institute and Clinic (the teaching hospital of the Department of Psychiatry at the University of Pittsburgh Medical School). During the internship, students get first-hand experience with different clinical populations. Developmental practicum experience is available in the department-run CMU Children’s School (http://www.cmu.edu/dietrich/psychology/centers-and-facilities).

Bachelor of Arts in Psychology

Mathematics 10-20 units
21-111-21-112 Differential Calculus - Integral Calculus 20
or 21-120 Differential and Integral Calculus * 10

*Students who place out of 21-120 with AP credit will have successfully completed the calculus requirement

Statistics Sequence 9 units
36-309 Experimental Design for Behavioral & Social Sciences 9
or 85-309 Experimental Design for Behavioral & Social Sciences - Psychology

Psychology Surveys 27 units
85-102 Introduction to Psychology * 9
85-211 Cognitive Psychology 9
85-213 Human Information Processing and Artificial Intelligence 9
85-219 Biological Foundations of Behavior 9
85-221 Principles of Child Development 9
85-241 Social Psychology 9
85-251 Personality 9

* Introduction to Psychology cannot be substituted; AP credit does not count towards this requirement

Research Methods 18 units
Complete two courses.
85-310 Research Methods in Cognitive Psychology 9
85-314 Cognitive Neuroscience Research Methods 9
85-320 Research Methods in Developmental Psychology 9
85-330 Analytic Research Methods 9
85-340 Research Methods in Social Psychology 9

Advanced Courses 18 units
Advanced psychology courses exist within four areas (cognitive, cognitive neuroscience, developmental, social and health psychology.) Any advanced content course or seminar in psychology or any psychology course higher than 85-349. Exceptions for the advanced course requirement are: 85-480, 85-482, 85-484, 85-506, 85-507, 85-508, 85-601, 85-602, 66-501, 66-502.

Psychology Breadth, Depth, and Application Electives 27 Units
Three courses from at least two of the Breadth, Depth and Application Categories. Please Consult the psychology department undergraduate website for approved Breadth Electives.

Depth

Any Psychology course between 85-300-85-499.


Application

85-198 Research Training: Psychology 9
85-241 Teaching Assistantship Var.
85-480 Internship in Clinical Psychology Var.
85-482 Internship in Psychology Var.
85-484 Practicum in Child Development Var.
85-507 Research in Psychology Var.
85-508 Research in Psychology Var.
85-601 Senior Thesis 9
85-602 Senior Thesis 9
66-501 H&SS Senior Honors Thesis I 9
66-502 H&SS Senior Honors Thesis II Must receive a B or higher; 9 units min 9

Breadth
Any 200 level Psychology survey course.
85-261 Abnormal Psychology 9
85-271 Animal Minds 9
or
Choose from a list of courses found outside of the department with departments including Biological Sciences, History, English, HCI, Philosophy, Social Decision Sciences and Statistics. The elective list may change and for the most up to date list please either contact Emilie O’Leary at emilier@andrew.cmu.edu or visit the psychology undergraduate website: www.cmu.edu/dietrich/psychology/undergraduate/current-students/academics.

Computer Science Requirement
15-110 Principles of Computing 10
or 88-300 Programming and Data Analysis for Social Scientists 10

Natural Science Requirement (B.A. 18 units of which include 9 units of Gen Ed Science)
The B.A. in psychology requires one course beyond the General Education requirement in natural science.
These courses can be selected from the following areas:
• 03-XXX Biology*
• 09-XXX Chemistry
• 33-XXX Physics
* Given the growing relevance of biology to psychology, it is strongly recommended to take a course in Biological Sciences

Bachelor of Science in Psychology
Mathematics 10-20 units
21-111-21-112 Differential Calculus - Integral Calculus 20
or
21-120 Differential and Integral Calculus * 10

*Students who place out of 21-120 with AP credit will have successfully completed the calculus requirement
Statistics Sequence 9 units
36-309 Experimental Design for Behavioral & Social Science 9
or 85-309 Experimental Design for Behavioral & Social Sciences - Psychology 9

Psychology Surveys 27 units
85-102 Introduction to Psychology * 9
Survey Courses - Complete Two Units
85-211 Cognitive Psychology 9
or 85-213 Human Information Processing and Artificial Intelligence 9
85-219 Biological Foundations of Behavior 9
85-221 Principles of Child Development 9
85-241 Social Psychology 9
85-251 Personality 9

* Introduction to Psychology cannot be substituted; AP credit does not count towards this requirement
Research Methods 18 units
Complete two courses.
85-310 Research Methods in Cognitive Psychology 9
85-314 Cognitive Neuroscience Research Methods 9
85-320 Research Methods in Developmental Psychology 9
85-330 Analytic Research Methods 9
85-340 Research Methods in Social Psychology 9

Advanced Courses
27 units
Advanced psychology courses exist within four areas (cognitive, cognitive neuroscience, developmental, social and health psychology.) Any advanced content course or seminar in psychology or any psychology course higher than 85-349. Exceptions for the advanced course requirement are: 85-480, 85-482, 85-484, 85-506, 85-507, 85-508, 85-601, 85-602, 66-501, 66-502.

Psychology Breadth, Depth, and Application Electives 27 Units
Three courses from at least two of the Breadth, Depth and Application Categories. Please Consult the psychology department undergraduate website for approved Breadth Electives.

Depth

Application
85-198 Research Training: Psychology 9
85-294 Teaching Assistantship Var.
85-480 Internship in Clinical Psychology Var.
85-482 Internship in Psychology Var.
85-484 Practicum in Child Development Var.
85-507 Research in Psychology Var.
85-508 Research in Psychology Var.
85-601 Senior Thesis 9
85-602 Senior Thesis 9
66-501 H&SS Senior Honors Thesis I 9
66-502 H&SS Senior Honors Thesis II Must receive a B or higher; 9 units min 9

Breadth
Any 200 level Psychology survey course.
85-261 Abnormal Psychology 9
85-271 Animal Minds 9
or
Choose from a list of courses found outside of the department with departments including Biological Sciences, History, English, HCI, Philosophy, Social Decision Sciences and Statistics. The elective list may change and for the most up to date list please either contact Emilie O’Leary at emilier@andrew.cmu.edu or visit the psychology undergraduate website: www.cmu.edu/dietrich/psychology/undergraduate/current-students/academics.

Computer Science Requirement
15-110 Principles of Computing 10
or 88-300 Programming and Data Analysis for Social Scientists 10

NATURAL SCIENCE REQUIREMENT (B.S. 27 UNITS OF WHICH INCLUDE 9 UNITS OF GEN ED SCIENCE)
The B.S. in psychology requires two courses beyond the General Education requirement in natural science.

• 03-xxx Biology*
• 09-xxx Chemistry
• 33-xxx Physics
* Given the growing relevance of biology to psychology, it is strongly recommended to take at least one course in Biological Sciences

Additional Major in Psychology
In order to complete an additional major in Psychology, a student must fulfill all of the Psychology major requirements within the department – in other words, the breadth requirement, computing requirement, three survey courses at the 200-level, two research methods courses, and two advanced courses. These courses must include at least 81 units, plus calculus prerequisites and the 36-200 statistics course or equivalent and 36-309. In addition, B.S. candidates must take the three-course science
requirement and B.A. candidates complete one science course beyond the General Education requirement.

Concentrations within the Psychology Major

Students who wish to focus their Psychology program on a specific area can do so either by the careful selection of Psychology elective courses focusing on their area of interest or by pursuing one of the following concentrations. Students must obtain a concentration form from the Undergraduate Program Coordinator, Emilie O'Leary, receive approval from their psychology faculty advisor, then returning the signed copy to Emile in Baker Hall 339. The completion of a concentration will be recognized in the Psychology Graduation Program.

Health-Psychology Concentration

For Psychology majors who wish to have a focus of their study be on Health Psychology, the following courses should be selected as part of their Psychology Major in conjunction with their Psychology advisor's approval.

As part of the natural science requirement, choose two of the following:
- 03-121 Modern Biology 9
- 03-132 Basic Science to Modern Medicine 9
- 03-133 Neurobiology of Disease 9

As part of the psychology breadth requirement:
- 85-219 Biological Foundations of Behavior 9
- 85-241 Social Psychology 9

As part of the psychology Research Methods requirements:

As part of the advanced coursework in psychology requirement, at least two of the following:
- 85-442 Health Psychology 9
- 85-443 Social Factors and Well-Being 9
- 85-446 Psychology of Gender 9
- 85-501 Stress, Coping and Well-Being 9
- 85-362 Seminar on Addiction 9

As part of the Breadth, Depth and Application requirement, at least one of the following:
- 85-480 Internship in Clinical Psychology 9
- 85-507 Research in Psychology 9
- 85-482 Internship in Psychology 9

or an additional advanced psychology seminar from the list above

Cognitive-Neuroscience Concentration

For Psychology majors who wish to have a focus of their study be on Cognitive Neuroscience, the following courses should be selected as part of their Psychology Major in conjunction with their Psychology advisor's approval.

As part of the natural science requirement, choose two of the following:
- 03-121 Modern Biology 9
- 03-363 Systems Neuroscience 9
- 03-366 Biochemistry of the Brain 9

As part of the psychology Breadth requirement:
- 85-211 Cognitive Psychology 9
- 85-219 Biological Foundations of Behavior 9

As part of the Research Methods requirement:
- 85-310 Research Methods in Cognitive Psychology 9
- 85-314 Cognitive Neuroscience Research Methods 9

As part of the advanced coursework in psychology requirement, at least two of the following:
- 85-359 Introduction to Music Cognition Research 9
- 85-370 Perception 9

Behavior and Developmental Psychology Concentration

For Psychology majors who wish to have a focus of their study be on Behavior and Developmental Psychology, the following courses should be selected as part of their Psychology Major in conjunction with their Psychology advisor's approval.

As part of the B.S. science requirement, choose one of the following:
- 03-121 Modern Biology 9
- 03-364 Developmental Neuroscience 9
- 03-365 Neural Correlates of Learning and Memory 9

As part of the psychology Breadth requirement:
- 85-211 Cognitive Psychology 9
- 85-221 Principles of Child Development 9

As part of the psychology Research Methods Requirement:
- 85-310 Research Methods in Cognitive Psychology 9
- 85-320 Research Methods in Developmental Psychology 9

As part of the advanced coursework in psychology requirement, at least two of the following:
- 85-350 Psychology of Prejudice 9
- 85-352 Evolutionary Psychology 9
- 85-354 Infant Language Development 9
- 85-363 Attention, Its Development and Disorders 9
- 85-390 Human Memory 9
- 85-408 Visual Cognition 9
- 85-406 Autism: Psychological and Neuroscience Perspectives 9
- 85-438 Educational Goals, Instruction, and Assessment 9

As part of the Breadth, Depth and Application requirement, at least two of the following:
- 85-294 Teaching Assistantship Var.
- 85-484 Practicum in Child Development Var.
- 85-507 Research in Psychology Var.
- 85-508 Research in Psychology Var.
- 76-420 The Cognition of Reading and Writing: Introduction to a Social/Cognitive Process 9
- 05-418 Design Educational Games 12
- 57-331 Principles of Education 9

Or an additional advanced psychology seminar from the list above

Cognitive Psychology Concentration

For Psychology majors who wish to have a focus of their study be on Cognitive Psychology and/or Cognitive Modeling, the following courses should be selected as part of their Psychology Major in conjunction with their Psychology advisor's approval.

As part of the B.S. science requirement:
- 03-121 Modern Biology 9
As part of the psychology Breadth requirement:
85-211 Cognitive Psychology 9

As part of the psychology Research Methods requirement:
85-310 Research Methods in Cognitive Psychology 9

As part of the advanced coursework in psychology requirement, at least two of the following:
85-356 Music and Mind: The Cognitive Neuroscience of Sound 9
85-359 Introduction to Music Cognition Research 9
85-370 Perception 9
85-385 Auditory Perception: Sense of Sound 9
85-390 Human Memory 9
85-395 Applications of Cognitive Science 9
85-406 Autism: Psychological and Neuroscience Perspectives 9
85-407 Neuroscience of Concepts 9
85-412 Cognitive Modeling 9
85-414 Cognitive Neuropsychology 9
85-419 Introduction to Parallel Distributed Processing 9
85-421 Language and Thought 9
85-429 Cognitive Brain Imaging 9
85-435 Neural and Cognitive Models of Adaptive Decisions 9

As part of the Breadth, Depth and Application requirement, at least one of the following:
85-507 Research in Psychology Var.
85-508 Research in Psychology Var.
76-420 The Cognition of Reading and Writing: Introduction to a Social/Cognitive Process 9
05-391 Designing Human Centered Software 12
05-413 Human Factors 9
80-305 Choices, Decisions, and Games 9
80-380 Philosophy of Language 9
80-484 Language and Thought 9

Or an additional advanced psychology seminar

Social-Personality Psychology Concentration

For Psychology majors who wish to have a focus of their study be on Social and/or Personality Psychology, the following courses should be selected as part of their Psychology Major in conjunction with their Psychology advisor’s approval.

As part of the Psychology Breadth requirement: 85-241 Social Psychology 9
85-251 Personality 9

As part of the Psychology Research Methods requirement: 85-340 Research Methods in Social Psychology 9

As part of the advanced coursework in psychology requirement, at least two of the following:
85-350 Psychology of Prejudice 9
85-357 Navigating Race and Identity in America: The Role of Psychology in Racial Interga
85-358 Pro-Social Behavior 9
85-375 Crosscultural Psychology 9
85-377 Attitudes and Persuasion 9
85-443 Social Factors and Well-Being 9
85-444 Relationships 9
85-446 Psychology of Gender 9
85-501 Stress, Coping and Well-Being 9

As part of the Breadth, Depth and Application requirement, at least one of the following:
85-507 Research in Psychology Var.
85-508 Research in Psychology Var.
85-482 Internship in Psychology Var.
05-320 Social Web 12

Clinical/Counseling Psychology Concentration

For Psychology majors who wish to have a focus of their study be on Clinical/Counseling Psychology, the following courses should be selected as part of their Psychology Major in conjunction with their Psychology advisor’s approval.

As part of the Psychology Breadth requirement at least one of the following:
85-241 Social Psychology 9
85-251 Personality 9

Required additional coursework:
85-261 Abnormal Psychology 9
85-422 Clinical Psychology: Science and Practice 9
85-480 Internship in Clinical Psychology Var.

As part of the Psychology Research Methods requirements:
85-340 Research Methods in Social Psychology 9

As part of the advanced coursework in psychology requirement, at least two of the following:
85-375 Crosscultural Psychology 9
85-377 Attitudes and Persuasion 9
85-406 Autism: Psychological and Neuroscience Perspectives 9
85-414 Cognitive Neuropsychology 9
85-442 Health Psychology 9
85-443 Social Factors and Well-Being 9
85-444 Relationships 9
85-446 Psychology of Gender 9
85-501 Stress, Coping and Well-Being 9

Neuroscience Major

The Psychology Department at Carnegie Mellon University has a major focus on the role of the brain and nervous system in cognition and behavior, including biological approaches involving the health impact that arises from the interaction of behavior with the nervous, endocrine, and immune systems. These interests are manifested in faculty research (http://www.cmu.edu/dietrich/psychology/research-areas), departmental and university centers that operate from or heavily involve the department (e.g., the Center for Cognitive Brain Imaging (http://www.ccbi.cmu.edu), and the Center for the Neural Basis of Cognition (http://www.cnbc.cmu.edu)) as well as undergraduate coursework (http://www.cmu.edu/dietrich/psychology/undergraduate) and graduate coursework.

For undergraduates, there are a number of ways in which students with an interest in these approaches can pursue that interest in an organized fashion. Major requirements for the Bachelor of Science in Neuroscience can be found under Intercollege Programs (http://coursescatalog.web.cmu.edu/servicesandoptions/intercollegeprograms/#bachelorsofscienceinneurosciencetext).

Carnegie Mellon University recently launched BrainHub – an initiative designed to leverage its core strengths in cognitive science, engineering, and computer science, and our emerging excellence in biological sciences, to harness the technology that helps the world explore brain and behavior. Students will be able to take advantage of exciting opportunities such as lectures hosted on various topics, newly funded CMU campus research projects trying to answer pressing questions in brain science and the many global partnerships with other institutions all with the same motivating goal to enhance and increase research in brain sciences.

Finally, for any interested student, there is a Minor in Cognitive Neuroscience (http://coursescatalog.web.cmu.edu/dietrichcollegeofhumanitiesandsocialsciences/departmentspsychology/minortext) available through the Psychology department.

The Major in Cognitive Science

The Psychology Department offers a B.S. degree in Cognitive Science. The field of cognitive science has grown out of increasingly active interaction among psychology, linguistics, artificial intelligence, philosophy, and neuroscience. All of these fields share the goal of understanding intelligence. By combining these diverse perspectives, students of cognitive science are able to understand cognition at a deep level. Because this major is administered by the Psychology Department, it focuses on human
cognition and the experimental study of the human mind as illuminated by the techniques of the above disciplines.

**Cognitive Science Curriculum**

The Cognitive Science major is only offered as a B.S. degree. Candidates should complete before the junior year the two-semester calculus sequence 21-120/21-256 (or alternatively 21-120/21-127)* and a statistics sequence (36-200 or equivalent and if possible, 36-309). In addition, candidates complete 15-112 Fundamentals of Programming and Computer Science, as their departmental computing course.

Because of the number and sequential nature of required courses, prospective Cognitive Science majors are encouraged to begin course work for the major prior to junior year. In particular, completion of calculus, 36-200, and 85-211 or 85-213 before the junior year will enable students to complete 85-310 and 85-309 and by the fall semester of their sophomore or junior year and, if interested, to then take advantage of research opportunities in the department.

*The 3-Semester sequence 21-111/21-112/21-256 may be substituted by students who have already taken 21-111 before deciding on the major.

### Computing Prerequisite

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<tr>
<th>Units</th>
<th>Course</th>
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<tbody>
<tr>
<td>12</td>
<td>Fundamentals of Programming and Computer Science</td>
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</table>

### Mathematics

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<tr>
<th>Units</th>
<th>Course</th>
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<tbody>
<tr>
<td>29-30</td>
<td>Differential Calculus - Integral Calculus</td>
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<tr>
<td>20</td>
<td>Differential and Integral Calculus</td>
</tr>
<tr>
<td>10</td>
<td>Concepts of Mathematics</td>
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*Students who place out of 21-120 will have fulfilled the calculus requirement.

### Statistics Sequence

<table>
<thead>
<tr>
<th>Units</th>
<th>Course</th>
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<tbody>
<tr>
<td>9</td>
<td>Reasoning with Data</td>
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<tr>
<td>9</td>
<td>Experimental Design for Behavioral &amp; Social Sciences</td>
</tr>
<tr>
<td>9</td>
<td>Experimental Design for Behavioral &amp; Social Sciences - Psychology</td>
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</table>

### Computational/Cognitive Modeling Core

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<tr>
<th>Units</th>
<th>Course</th>
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<tbody>
<tr>
<td>10</td>
<td>Principles of Imperative Computation</td>
</tr>
<tr>
<td>10</td>
<td>Principles of Functional Programming</td>
</tr>
<tr>
<td>12</td>
<td>Great Ideas in Theoretical Computer Science</td>
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</table>

### Cognitive Psychology Core

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<tr>
<th>Units</th>
<th>Course</th>
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<tbody>
<tr>
<td>9</td>
<td>Cognitive Psychology</td>
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<tr>
<td>9</td>
<td>Human Information Processing and Artificial Intelligence</td>
</tr>
<tr>
<td>9</td>
<td>Research Methods in Cognitive Psychology</td>
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<tr>
<td>9</td>
<td>Cognitive Neuroscience Research Methods</td>
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</table>

### Cognitive Science Concentration

(3 courses, concentration approval required)

These three courses are chosen in conjunction with your advisor to form a coherent area of concentration from the course list under "Cognitive Science Concentration* in the current Undergraduate Catalog. Before proceeding with the choice of courses, students must fill out the concentration form, obtained from Emilie O'Leary in Baker Hall 339, with a description of the concentration area and the planned set of three courses. Courses not represented on the list may, with pre-approval of advisor and department, be used to satisfy part of this requirement. The three courses are not required to be within any single category below but be coherent within the major and the focus may vary across disciplinary boundaries. Courses taken for the major requirements can not be double counted in the concentration.

### Computer Science

<table>
<thead>
<tr>
<th>Units</th>
<th>Course</th>
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<tbody>
<tr>
<td>12</td>
<td>Computer Vision</td>
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<td>9</td>
<td>Formal Languages, Automata, and Computability</td>
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<td>12</td>
<td>Introduction to Machine Learning (Master's)</td>
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<td>12</td>
<td>User-Centered Research and Evaluation</td>
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<td>12</td>
<td>Personalized Online Learning</td>
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### Psychology

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<th>Units</th>
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<tr>
<td>9</td>
<td>Biological Foundations of Behavior</td>
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<td>9</td>
<td>Evolutionary Psychology</td>
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<td>9</td>
<td>Infant Language Development</td>
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<td>9</td>
<td>Perception</td>
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<td>9</td>
<td>Crosscultural Psychology</td>
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<td>9</td>
<td>In Search of Mind: The History of Psychology</td>
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<td>9</td>
<td>Human Memory</td>
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<td>9</td>
<td>Human Expertise</td>
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<td>9</td>
<td>Applications of Cognitive Science</td>
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<td>Autism: Psychological and Neuroscience Perspectives</td>
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<td>Cognitive Modeling</td>
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<td>Cognitive Neuropsychology</td>
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<td>Introduction to Parallel Distributed Processing</td>
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<td>Language and Thought</td>
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<td>9</td>
<td>Cognitive Development</td>
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<td>9</td>
<td>Learning in Humans and Machines</td>
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<td>9</td>
<td>Cognitive Brain Imaging</td>
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### Philosophy

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<tr>
<td>9</td>
<td>Logic and Proofs</td>
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<td>Logic and Mathematical Inquiry</td>
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<td>Philosophy of Science</td>
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<td>Analytic Philosophy</td>
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<td>9</td>
<td>Pragmatism</td>
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<td>Philosophy of Mind</td>
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<td>Formal Logic</td>
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<td>9</td>
<td>Undecidability and Incompleteness</td>
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<td>9</td>
<td>Causal Discovery, Statistics, and Machine Learning</td>
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### Linguistics

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<th>Units</th>
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<tr>
<td>9</td>
<td>Nature of Language</td>
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<td>9</td>
<td>Linguistic Analysis</td>
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<td>9</td>
<td>Language and Thought</td>
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<td>9</td>
<td>Modal Logic</td>
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<td>9</td>
<td>Introduction to Discourse Analysis</td>
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</tbody>
</table>
Decision Sciences

88-302 Behavioral Decision Making 9
88-380 Dynamic Decisions 9
88-388 Psychological Models of Decision Making 9
88-402 Modeling Complex Social Systems 9

Neurosciences

03-362 Cellular Neuroscience 9
03-363 Systems Neuroscience 9
42-202 Physiology 9
15-386 Neural Computation 9
15-883 Computational Models of Neural Systems 12

Science Requirement

The Cognitive Science program requires two additional science courses beyond the college’s one course Science General Education Requirement.

These can be selected from any one of the following areas.

03-xxx Biology *
09-xxx Chemistry
33-xxx Physics

* Those interested in a cognitive neuroscience focus are recommended to take biology courses, including if possible, 03-362, or 03-363.

Additional Major in Cognitive Science

In order to complete a double major in Cognitive Science, a student must fulfill the major requirements as listed under the Cognitive Science major. These include the programming requirement (15-112), the Mathematics and Statistics prerequisites, Computational/Cognitive Modeling Core, the Cognitive Psychology Core, the Cognitive Science Concentration Requirement, and the Supplementary Science Requirement. Students will be assigned a department advisor to help plan their program of studies in Cognitive Science.

Unified Double Major in Psychology & Biological Sciences

Veronica Hinman, Department Head, Biological Sciences

Michael Tarr, Department Head, 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.

Depending on a student's home college (DC or MCS), General Education (GenEd) requirements will be different. GenEd requirements for DC [http://coursecatalog.web.cmu.edu/dietrichcollegeofhumanitiesandsocialsciences/ #hampssgeneraleducationprogram160] and MCS [http://coursecatalog.web.cmu.edu/melloncollegeofscience] are found on their respective Catalog pages.

Degree Requirements:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-151</td>
<td>Honors Modern Biology</td>
<td>10</td>
</tr>
<tr>
<td>or 03-121</td>
<td>Modern Biology</td>
<td></td>
</tr>
<tr>
<td>03-220</td>
<td>Genetics</td>
<td>9</td>
</tr>
<tr>
<td>or 03-221</td>
<td>Genomes, Evolution, and Disease: Introduction to Quantitative Genetic Analysis</td>
<td></td>
</tr>
<tr>
<td>03-231</td>
<td>Honors Biochemistry</td>
<td>9</td>
</tr>
<tr>
<td>03-320</td>
<td>Cell Biology</td>
<td>9</td>
</tr>
<tr>
<td>03-343</td>
<td>Experimental Techniques in Molecular Biology</td>
<td>12</td>
</tr>
<tr>
<td>03-411</td>
<td>Topics in Research</td>
<td>1</td>
</tr>
<tr>
<td>03-412</td>
<td>Topics in Research</td>
<td>1</td>
</tr>
<tr>
<td>03-xxx</td>
<td>General Biology Elective</td>
<td>9</td>
</tr>
<tr>
<td>03-3xx</td>
<td>Advanced Biology Elective</td>
<td>18</td>
</tr>
</tbody>
</table>

03-3xx Advanced Biology Elective

Total Biology units 78

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-120</td>
<td>Differential and Integral Calculus</td>
<td>10</td>
</tr>
<tr>
<td>21-124</td>
<td>Calculus II for Biologists and Chemists</td>
<td>10</td>
</tr>
<tr>
<td>or 21-122</td>
<td>Integration and Approximation</td>
<td></td>
</tr>
<tr>
<td>36-247</td>
<td>Statistics for Lab Sciences</td>
<td>9</td>
</tr>
<tr>
<td>or 36-200</td>
<td>Reasoning with Data</td>
<td></td>
</tr>
<tr>
<td>36-309</td>
<td>Experimental Design for Behavioral &amp; Social Sciences</td>
<td>9</td>
</tr>
<tr>
<td>or 85-309</td>
<td>Experimental Design for Behavioral &amp; Social Sciences - Psychology</td>
<td></td>
</tr>
<tr>
<td>33-121</td>
<td>Physics I for Science Students 2</td>
<td>12</td>
</tr>
<tr>
<td>or 33-141</td>
<td>Physics I for Engineering Students</td>
<td></td>
</tr>
<tr>
<td>15-110</td>
<td>Principles of Computing</td>
<td>10-12</td>
</tr>
<tr>
<td>or 15-112</td>
<td>Fundamentals of Programming and Computer Science</td>
<td></td>
</tr>
<tr>
<td>or 02-201</td>
<td>Programming for Scientists</td>
<td></td>
</tr>
</tbody>
</table>

99-101 Computing @ Carnegie Mellon 3

Total Science units 63-65

2 MCS students must also complete 33-122 Physics II for Biological Sciences and Chemistry Students.

Chemistry

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>09-105</td>
<td>Introduction to Modern Chemistry I</td>
<td>10</td>
</tr>
<tr>
<td>09-106</td>
<td>Modern Chemistry II</td>
<td>10</td>
</tr>
<tr>
<td>09-217</td>
<td>Organic Chemistry I</td>
<td>9</td>
</tr>
<tr>
<td>or 09-219</td>
<td>Modern Organic Chemistry</td>
<td></td>
</tr>
<tr>
<td>09-218</td>
<td>Organic Chemistry II</td>
<td>9</td>
</tr>
<tr>
<td>or 09-220</td>
<td>Modern Organic Chemistry II</td>
<td></td>
</tr>
<tr>
<td>09-207</td>
<td>Techniques in Quantitative Analysis</td>
<td>9-12</td>
</tr>
<tr>
<td>or 09-221</td>
<td>Laboratory I: Introduction to Chemical Analysis</td>
<td></td>
</tr>
<tr>
<td>09-208</td>
<td>Techniques for Organic Synthesis and Analysis</td>
<td>9-12</td>
</tr>
<tr>
<td>or 09-222</td>
<td>Laboratory II: Organic Synthesis and Analysis</td>
<td></td>
</tr>
</tbody>
</table>

Total Chemistry units 56-62

Psychology Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>85-102</td>
<td>Introduction to Psychology</td>
<td>9</td>
</tr>
<tr>
<td>85-219</td>
<td>Biological Foundations of Behavior</td>
<td>9</td>
</tr>
<tr>
<td>85-2xx</td>
<td>Survey Psychology Courses</td>
<td>18</td>
</tr>
<tr>
<td>85-310</td>
<td>Research Methods in Cognitive Psychology</td>
<td>9</td>
</tr>
<tr>
<td>or 85-340</td>
<td>Research Methods in Social Psychology</td>
<td></td>
</tr>
<tr>
<td>or 85-320</td>
<td>Research Methods in Developmental Psychology</td>
<td></td>
</tr>
<tr>
<td>or 85-314</td>
<td>Cognitive Neuroscience Research Methods</td>
<td></td>
</tr>
<tr>
<td>or 85-330</td>
<td>Analytic Research Methods</td>
<td></td>
</tr>
<tr>
<td>85-3xx</td>
<td>Advanced Psychology Electives</td>
<td>16</td>
</tr>
</tbody>
</table>

Total Psychology units 63

* Excluding 85-261 Abnormal Psychology

Additional Advanced Elective 9 units

(Choose one of the following courses)

85-3xx Advanced Psychology Elective 9

or

03-3xx Advanced Biology Elective 9

Additional Laboratory or Research Methods 9-12 units

(Choose one of the following courses)

03-344 Experimental Biochemistry 12

03-345 Experimental Cell and Developmental Biology 12

03-346 Experimental Neuroscience 12

85-310 Research Methods in Cognitive Psychology 9

85-314 Cognitive Neuroscience Research Methods 9

85-320 Research Methods in Developmental Psychology 9

85-340 Research Methods in Social Psychology 9
Elective Units | Units
--- | ---
Free Electives | 33-36
MCS Nontech Breadth or DC General Education requirements | 36-48
Total Elective units | 69-84

**Minimum number of units required for degree:** 360

**Minors in Psychology and Cognitive Neuroscience**

### Minor in Psychology 72 units

**I. Introductory course**
- 85-102 Introduction to Psychology * 9

*A survey course can be taken in place of 85-102.

**II. Area Survey courses**
- Complete two courses.
- 85-211 Cognitive Psychology 9
- or 85-213 Human Information Processing and Artificial Intelligence 9
- 85-219 Biological Foundations of Behavior 9
- 85-221 Principles of Child Development 9
- 85-241 Social Psychology 9
- 85-251 Personality 9

**III. Statistics**
- 36-200 Reasoning with Data 9
- 36-309 Experimental Design for Behavioral & Social Sciences 9
- or 85-309 Experimental Design for Behavioral & Social Sciences - Psychology 9

27 units

**Upper Level Courses**
- Complete three courses from categories IV and V, with at least one course from each.

**IV. Research Methods Courses * (minimum 9 units)**
- 85-310 Research Methods in Cognitive Psychology 9
- 85-314 Cognitive Neuroscience Research Methods 9
- 85-320 Research Methods in Developmental Psychology 9
- 85-330 Analytic Research Methods 9

*Prerequisites for all Research Methods courses: 36-309 and the appropriate survey course.

**V. Advanced courses (minimum 9 units)**

Advanced psychology courses exist within four areas (cognitive, cognitive neuroscience, developmental, social and health psychology.) Any advanced content course or seminar in psychology or any psychology course higher than 85-350. Exceptions for the advanced course requirement are: 85-480, 85-482, 85-484, 85-488, 85-506, 85-507, 85-508, 85-601, 85-602, 66-501.

### Minor in Cognitive Neuroscience 63 units

The minor in Cognitive Neuroscience offered by the Department of Psychology is similar to the Neuroscience Minor offered by the Department of Biological Sciences. The differences between the two forms of the minor are determined by one required course, and additionally, by the students' choice of distribution electives. The requirements for the Cognitive Neuroscience Minor include 7 courses: four required courses, and three distribution and elective courses.

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

### Cognitive Neuroscience Curriculum

**Required Coursework**

- 03-121 Modern Biology 9
- 03-363 Systems Neuroscience 9
- 85-219 Biological Foundations of Behavior 9
- 85-211 Cognitive Psychology 9
- or 85-213 Human Information Processing and Artificial Intelligence 9

**Distribution Requirements**

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

- Approaches to Cognitive Neuroscience
  - 85-314 Cognitive Neuroscience Research Methods 9
- 85-412 Cognitive Modeling 9
- 85-414 Cognitive Neuropsychology 9
- 85-419 Introduction to Parallel Distributed Processing 9
- 85-429 Cognitive Brain Imaging 9
- 15-386 Neural Computation 9
- 15-883 Computational Models of Neural Systems 12
- 36-746 Statistical Methods for Neuroscience and Psychology 12

**Cognitive Neuroscience Electives**

- 03-133 Neurobiology of Disease 9
- 03-362 Cellular Neuroscience 9
- 03-364 Developmental Neuroscience 9
- 03-365 Neural Correlates of Learning and Memory 9
- 85-370 Perception 9
- 85-385 Auditory Perception: Sense of Sound 9
- 85-390 Human Memory 9
- 85-406 Autism: Psychological and Neuroscience Perspectives 9

### The Honors Program

The Honors Program provides recognition of outstanding performance by students in the Psychology department. Participation enables students to pursue their own research ideas through completion of an honors thesis. The honors thesis is completed during the senior year. By completing a thesis, the student earns 18 units of credit and qualifies for graduation with “College Honors.” To qualify for the Honors Program, the student must maintain a quality point average of at least 3.50 in the major and 3.25 overall. More information on the Honor program can be found here (http://www.cmu.edu/dietrich/undergraduate/programs/shp)

A year long departmental senior thesis course exists (66-501 and 66-502) for students interested in pursuing a sizable research project who do not qualify for the honors program. More information can be obtained by contacting Emile O’Leary at emilier@andrew.cmu.edu.

### Faculty

J. ANDERSON, Richard King Mellon University Professor of Psychology and Computer Science - Ph.D., Stanford University; Carnegie Mellon, 1978–

J. A. BEHRMANN, Thomas S. Baker Univ Professor of Psychology and Cognitive Neuroscience – Ph.D., University of Toronto; Carnegie Mellon, 1993–

J. CANTLON, Ronald J. and Mary Ann Zdrojkowski Associate Professor of Developmental Neuroscience - PhD, Duke University; Carnegie Mellon, 2007–

J. CARVER, Teaching Professor, Psychology; Associate Dean of Student Affairs, Dietrich College - Ph.D., Carnegie Mellon University; Carnegie Mellon, 1993–

S. COHEN, Robert E. Doherty University Professor of Psychology – Ph.D., New York University; Carnegie Mellon, 1982–

C. COX-BOYD, Associate Teaching Professor – Ph.D., University of North Carolina at Chapel Hill; Carnegie Mellon, 1999–

D. CRESWELL, Associate Professor – Ph.D., University of California, Los Angeles; Carnegie Mellon, 2008–

K. CRESWELL, Associate Professor – Ph.D., University of Pittsburgh; Carnegie Mellon, 2012–

B. C. FEENEY, Professor of Psychology – Ph.D., State University of New York at Buffalo; Carnegie Mellon, 2001–
ANNA FISHER, Associate Professor – Ph.D., The Ohio State University; Carnegie Mellon, 2006–

VICKI S. HELGESON, Professor of Psychology – Ph.D., University of Denver; Carnegie Mellon, 1990–

LAURIE HELLER, Teaching Professor – Ph.D., University of Pennsylvania; Carnegie Mellon, 2009–

LORI L. HOLT, Professor of Psychology – Ph.D., University of Wisconsin; Carnegie Mellon, 1999–

MARCEL A. JUST, D. O. Hebb University Professor of Psychology – Ph.D., Stanford University; Carnegie Mellon, 1972–

ROBERTA KLATZKY, Charles J. Queenan Jr., Professor of Psychology – Ph.D., Stanford University; Carnegie Mellon, 1993–

KENNETH R. KOEDINGER, Professor of HCII – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2001–

MARSHA C. LOVETT, Teaching Professor – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2000–

BRIAN MACWHINNEY, MacWhinney, Brian Teresa Heinz Professor of Cognitive Psych – Ph.D., University of California, Berkeley; Carnegie Mellon, 1981–

BRADFORD MAHON, Associate Professor – PhD, Harvard University; Carnegie Mellon, 2009–

KODY MANKE, Assistant Teaching Professor – Ph.D, Stanford University; Carnegie Mellon, 2016–

BONNIE NOZARI, Associate Professor – PhD, University of Illinois at Urbana-Champaign; Carnegie Mellon, 2011–

DAVID PLAUT, Professor of Psychology – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1994–

DAVID RAKISON, Associate Professor – D.Phil., University of Sussex; Carnegie Mellon, 2000–

LYNNE M. REDER, Professor of Psychology – Ph.D., University of Michigan; Carnegie Mellon, 1978–

MICHAEL F. SCHEIER, Scheier, Mike Walter van Dyke Bingham Professor of Personality and Health Psychology – Ph.D., University of Texas; Carnegie Mellon, 1975–

MICHAEL TARR, Professor & Dept Head and Kavčič-Moura Professor of Cognitive and Brain Science - Ph.D., Massachusetts Institute of Technology; Carnegie Mellon, 2009–

ERIK D. THIESSEN, Associate Professor, Director of Undergraduate Education in Psychology - Ph.D., University of Wisconsin, Madison; Carnegie Mellon, 2004–

TIMOTHY VERSTYNEN, Associate Professor – Ph.D., University of California, Berkeley; Carnegie Mellon, 2006–

DAN YUROVSKY, Assistant Professor – PhD, Indiana University; Carnegie Mellon, 2012–