### Areas of Specialization

- The Department of Cognitive Science offers optional "areas of specialization" within the Cognitive Science major for the BS degree only.
- The areas of specialization are intended to provide majors with guidance in choosing elective courses and to make the specific interests and training of a major clear to prospective employers and graduate schools. Specifying an area of specialization is optional; however, students should take into consideration that approved courses are not necessarily offered every year, when planning for their specialization.
- To major in Cognitive Science with an area of specialization, student must fulfill the requirements for the BS degree and must choose 4 of the required 6 electives from their specialization.
- At least 3 of your 6 total electives must be taken within the Cognitive Science Department (COGS courses).
- A COGS 199 may be allowed for elective credit within the specialization if the research project was clearly in one of the specialization areas. The specialization area will be listed on the transcript.

#### Neuroscience Specialization
**Major Code: CG29**

This area of specialization is intended for majors interested in neuroscience research or medicine. Allowed electives include courses in cognitive neuroscience, organic chemistry, biochemistry, and physiology.

- **Cognitive Science**
  - COGS 119: Programming/Experimental Res.
  - COGS 143: Animal Cognition
  - COGS 154: Comm. Disorders Child/Adults
  - COGS 160: Sem Special Topics (if topic applies)
  - COGS 163: Metabolic Disorders of the Brain
  - COGS 164: Neurobiology of Motivation
  - COGS 169: Genetic Information for Behavior
  - COGS 170: Brain Waves Across Scales
  - COGS 171: Mirror neuron System
  - COGS 172: Brain Disorders and Cognition
  - COGS 174: Drugs: Brain, Mind, and Culture
  - COGS 175: Neuropsychological/States of Consciousness
  - COGS 176: From Sleep to Attention
  - COGS 177: Space and Time in the Brain
  - COGS 178: Genes, Brains, and Behavior
  - COGS 179: Electrophysiology of Cognition
  - COGS 180: Decision Making in the Brain
  - COGS 184: Modeling the Evolution of Cognition

*Plus any COGS 107 not used for core sequence*

**Biochemistry**
- BIBC 100: Structural Biochemistry
- BIBC 102: Metabolic Biochemistry

**Biology-Animal Physiology and Neuroscience**
- BIPN 100: Human Physiology I
- BIPN 105: Animal Physiology Lab
- BIPN 144: Developmental Neurobiology
- BIPN 146: Computational Neurobiology
- BIPN 148: Cellular Basis of Learning and Memory

**Chemistry**
- CHEM 143B: Organic Chemistry Laboratory
- CHEM 143C: Organic Chemistry Laboratory

**Linguistics**
- LIGN 160: Language Representation in the Brain
- LIGN 161: Language Processing in the Brain

**Psychology**
- PSYC 123: Cognitive Control and Frontal Lobe Function
- PSYC 132: Hormones and Behavior
- PSYC 133: Circadian Rhythms – Biological Clock
- PSYC 150: Cognitive Neuroscience of Vision
- PSYC 168: Psych. Disorders of Childhood
- PSYC 169: Brain Damag and Ment. Func.
- PSYC 174: Visual Cognition
- PSYC 179: Drugs, Addts., & Ment. Disord.
- PSYC 181: Drugs and Behavior
- PSYC 182: Illusions and the Brain

**Neuroscience Specialization**

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>PSYC 115</td>
<td>Neuro. Dev. and Cog. Change</td>
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<td>PLUS any COGS 107 not used for core sequence</td>
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</tbody>
</table>

#### Machine Learning and Neural Computation Specialization
**Major Code: CG35**

This area of specialization is intended for majors interested in computational and mathematical approaches to modeling cognition or building cognitive systems, theoretical neuroscience, as well as software engineering and data science. Allowed electives include advanced courses in neural networks, artificial intelligence, and computer science.

- **Cognitive Science**
  - COGS 109: Modeling and Data Analysis
  - COGS 118B: Intro to Machine Learning II

- **Biochemistry**
  - BIPN 146: Computational Neurobiology

- **Computing Science and Engineering**

  - CSE 100: Advanced Data Structures
  - CSE 101: Design and Analysis of Algorithms
  - CSE 102: Storage System Architectures
  - CSE 105: Theory of Computability
  - CSE 130: Program Lang: Prin. and Paradigms
  - CSE 131: Compiler Construction
  - CSE 150A: Intro to AI: Prob. Reasoning & Decision-Making
  - CSE 150B: Intro to AI: Search & Reasoning
  - CSE 151A: Intro to Machine Learning
  - CSE 151B: Deep Learning
  - CSE 160: Intro to Parallel Computation

- **Linguistics**

- **Math**
  - MATH 170A: Intro to Numerical Analysis: Linear Algebra
  - MATH 170B: Intro to Numerical Analysis: Numerical Linear Algebra
  - MATH 170C: Intro to Numerical Analysis: Ordinary, Diff. Eq.
  - MATH 180A: Introduction to Probability
  - MATH 180B: Intro. to Stochastic Processes I
  - MATH 180C: Intro. to Stochastic Processes II
  - MATH 189: Exploratory Data Analysis and Inference

- **Cross-Campus Online**
  - CMN 150V: Computational Social Science (UC Davis)
  - CMPE 107: Prob/Stats for Engineers (UC Santa Cruz)

*Students specializing in Machine Learning and Neural Computation must choose 2 electives from:
COGS 118A-B-C-D. These courses require MATH 20C-E, 18, 180A, and CSE 18 or CSE 11 as prerequisites.**

#### Language and Culture Specialization
**Major Code: CG34**

This area of specialization is intended for majors whose primary interests include human psychology and applications of cognitive science in design and engineering. Allowed electives include courses in cognitive development, language, laboratory research of cognition, anthropology and sociology.

- **Cognitive Science**
  - COGS 110: The Developing Mind
  - COGS 112: Humor
  - COGS 119: Programming/Experimental Research
  - COGS 143: Animal Cognition
  - COGS 144: Social Cognition
  - COGS 151: Analogy and Conceptual Systems
  - COGS 152: Cognitive Foundations of Math
  - COGS 153: Language Comprehension
  - COGS 154: Comm. Disorders Child/Adults
  - COGS 155: Gesture and Cognition
  - COGS 156: Language Development
  - COGS 157: Music and the Mind
  - COGS 160: Sem Special Topics (if topic applies)
  - COGS 171: Mirror Neuron System

*Plus COGS 101C when not used for core sequence*

- **Linguistics**
  - LIGN 148: Psycholinguistics of Sign Language
  - LIGN 155: Evolution of Language
  - LIGN 170: Psycholinguistics
  - LIGN 171: Child Lang Acquisition
  - LIGN 174: Gender and Language in Society
  - LIGN 175: Sociolinguistics
  - LIGN 180: Language Representation in the Brain
  - LIGN 181: Language Processing in the Brain

- **Psychology**
  - PSYC 115A: Lab in Cognitive Psychology I
  - PSYC 115B: Lab in Cognitive Psychology II
  - PSYC 128: Psychology of Reading
  - PSYC 145: Psychology of Language
  - PSYC 156: Cognitive Development in Infancy

- **Sociology**
  - SOCI 116: Gender and Language in Society
  - SOCI 117: Language, Culture, and Education
  - SOCI 118E: Sociology of Language

*Students can take either LIGN 174 or SOCI 116 but not both*
CLINICAL ASPECTS of COGNITION SPECIALIZATION
Major Code: CG31

This area of specialization is intended for majors interested in cognitive neuropsychology, psychiatry, cognitive disorders, and the effects of drugs and brain damage on cognitive functions. Allowed electives include courses in those topics, as well as organic chemistry, biochemistry and physiology.

Cognitive Science
CGS 154: Communication Disorders in Children + Adults
CGS 163: Metabolic Disorders of the Brain
CGS 171: Minor neuron System
CGS 172: Brain Disorders and Cognition
CGS 174: Drugs: Brain, Mind and Culture
CGS 175: The Neuropsychological Basis of Alternate States of Consciousness
CGS 176: From Sleep to Attention

Biochemistry
BIBC 100: Structural Biochemistry
BIBC 102: Metabolic Biochemistry

Biology-Animal Physiology and Neuroscience
BIPN 100: Human Physiology I
BIPN 105: Animal Physiology Lab

Psychology
PSYC 100: Clinical Psychology
PSYC 116: Lab in Clinical Psychology Research
PSYC 120: Learning and Motivation
PSYC 124: Clinical Assessment and Treatment
PSYC 125: Clinical Neuropsychology
PSYC 134: Eating Disorders
PSYC 140: Human Behavior Lab.
PSYC 154: Behavior Modification
PSYC 155: Social Psychology and Medicine
PSYC 168: Brain Damage and Mental Functions
PSYC 170: Cognitive Neuropsychology
PSYC 179: Drugs, Addiction, Mental Disorders
PSYC 181: Drugs and Behavior
PSYC 188: Impulse Control Disorders

Cross-Campus Online
PSY BEH 102C: Abnormal Psychology (UC Irvine)
Visit crossenroll.universityofcalifornia.edu to enroll

DESIGN AND INTERACTION SPECIALIZATION
Major Code: CG33

This area of specialization is intended for majors interested in human computer interaction, web, visualization, and applications of cognitive science in design and engineering. Additional electives may be petitioned from communication, computer science, computer engineering and visual arts. Please note: We cannot guarantee enrollment in non-COGS courses (i.e., CSE, ECE, ICAM) for HCI students since many of these majors are very impacted and priority is given to students in those majors.

Cognitive Science
CGS 102A: Cognitive Perspectives
CGS 102B: Cognitive Ethnography
CGS 102C: Cognitive Design
CGS 119: Programming/Experimental Res.
CGS 120: Interaction Design
CGS 121: HCI Programming Studio
CGS 122: Interaction Design Startup
CGS 123: Social Computing
CGS 124: HCI Technical Systems Research
CGS 125: Advanced Interaction Design
CGS 126: Human-Computer Interaction
CGS 127: Designing Human-Data Interactions
CGS 128: Information Visualization
CGS 160: Sem Special Topics (if topic applies)
CGS 187A: Usability & Info. Architecture
CGS 187B: Practicum in Pro Web Design
CGS 188: Artificial Intelligence Algorithm
CGS 189: Brain Computer Interfaces

Communication
COMM 101E: Media Production Lab: Ethnographic Methods for Media Production
COMM 101M: Media Production Lab: Communicating and Computers
COMM 102C: Practicum in New Media & Community Life
COMM 105G: Computer Games Studies
COMM 106: Internet Industry
COMM 110T: LLC: Language, Thought & Media
COMM 120N: Advanced Media Production: News Media Workshop
COMM 124A: Critical Design: Advanced Studio
COMM 124B: Critical Design: Topic Studio
COMM 151: The Information Age: Fact and Fiction
COMM 172: Adv. Studies in Mediation and Interaction
COMM 173: Interaction with Technology

Computing and the Arts
VIS 143: Virtual Environments

Computer Science
CSE 100: Advanced Data Structures
CSE 101: Design and Analysis of Algorithms
CSE 110: Software Engineering
CSE 118: Ubiquitous Computing
CSE 130: Programming Lang: Principles and Paradigms
CSE 132A: Database System Principles
CSE 132B: Database Systems Applications
CSE 134B: Web Client Languages
CSE 135: Online Database Analytics Applications
CSE 150: Introduction to Artificial Intelligence: Search and Reasoning
CSE 151: Introduction to Artificial Intelligence: Statistical Approaches
CSE 152: Intro Computer Vision
CSE 165: 3D User Interaction
CSE 167: Computer Graphics
CSE 176A: Maker Topics: Health Care Robotics

Design
DSGN 100: Prototyping
DSGN 160: Special Topics in Design

Electrical and Computer Engineering
ECE 161A: Introduction to Digital Signal Processing
ECE 161B: Digital Signal Processing I
ECE 161C: Applications of Digital Signal Processing
ECE 172A: Introduction to Intelligent Systems: Robotics and Machine Intelligence
ECE 187: Introduction to Biomedical Imaging And Sensing

Education Studies
EDS 124AR: Teaching Comp. in a Digital World
EDS 124BR: Teaching Comp. Thinking for Everyone

Engineering
ENG 100D: Design for Development

Philosophy
PHIL 164: Technology and Human values

Psychology
PSYC 161: Engineering Psychology

Visual Arts
VIS 135: Design Research Methods
VIS 145A: Time- and Process-Based Digital Media I
VIS 145B: Time- and Process-Based Digital Media II
VIS 147A: Electronic Technologies for Art I
VIS 147B: Electronic Technologies for Art II
VIS 149: Seminar in Contemporary Computer Topics
VIS 161: Systems and Networks at Scale
VIS 162: Speculative Science and Design Invention
VIS 163: Design Research and Criticism
VIS 176: 16mm Filmmaking
VIS 177: Scripting Strategies
VIS 180A: Documentary Evidence and the Construction of Authenticity in Current Media Practices
VIS 180B: Fiction and Allegory in Current Media Practices
VIS 182: Advanced Editing

Cross-Campus Online
CMN 170: The Digital Revolution and Social Change (UC Davis)
Visit crossenroll.universityofcalifornia.edu to enroll