

**The information below is provided as a guide to what you can expect during your Masters studies at the UCL Institute of Cognitive Neuroscience. Please note changes may still need to be made and the information is therefore not guaranteed.**

## **OUTLINE OF TAUGHT MODULES**

During your Masters year, you need to complete a number of taught modules and a research project. Information about the project is provided in section 3 and an outline of each taught module is given below. Please note the outlines are based on what was taught in the 2015-16 year. The exact content of each module will be updated each year to reflect changes in topics, lecturers and module convenors. The overview below should be taken as a guide to what will be taught.

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### **MSc Cognitive Neuroscience:**

As an MSc student, you complete all eight modules described below and a 60-credit research project. All modules are compulsory, and worth 15 credits each. You can also take an optional Matlab module and are expected to attend the “Key Information for Masters Students” sessions.

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### **MRes Cognitive Neuroscience:**

As an MRes student, you complete four taught modules and a 120-credit research project. You take two compulsory transferable skills modules (modules 1 and 2 below), and can choose one topics-oriented module (from modules 3-5), and one methods-oriented module (from modules 6-8). All modules are worth 15 credits each. You can also take an optional Matlab module and are expected to attend the “Key Information for Masters Students” sessions.

## 1. Research Skills: Statistics – TRANSFERABLE SKILLS MODULE

**UCL course code:** PSYCGR01

**Summary:** This module discusses various issues associated with experimental design and statistics. A wide range of statistical tests will be taught (e.g. t-tests, ANOVA, chi-square, regression, correlation). The module explores the methodology and selection of statistical tests, and will teach the use of software such as SPSS. You will learn how to summarise raw data effectively in graphs and tables and how to carry out statistical analyses of data. The module will train you how to critically evaluate the quantitative methodology of studies in the field of cognitive neuroscience.

**Assessment:** Three online one-hour unseen written exams (best two out of three count)

**Topics:** 1. Introduction; 2. Statistical inference; 3. Regression; 4. GLM assumptions and diagnostics; 5. Moderation and mediation; 6. Contrast coding (ANOVA); 7. Further topics in ANOVA and ANCOVA; 8. Repeated measures; 9. Introduction to mixed effects and multilevel models; 10. Logistic regression.

**Teacher:** Dr Maarten Speekenbrink (plus lab assistants)

## 2. Communication Skills in Cognitive Neuroscience – TRANSFERABLE SKILLS MODULE

**UCL course code:** PSYCGC13

**Summary:** This module introduces you to different approaches to communication for cognitive neuroscientists, and you will develop practical, communicative and public engagement skills in cognitive neuroscience. You will learn about modern ways to disseminate science and throughout the module, key transferable skills will be developed. You will learn how to think and express ideas logically and critically; disseminate knowledge; communicate effectively in oral and written form using a variety of methods and media; interact effectively with individuals and small groups; solve problems; organise, plan and manage projects; manage time; learn and communicate actively and independently; be creative; assess yourself; make decisions.

**Assessment:** A 1,000-1,500 word popular science article and a 3-4 minute film

**Topics:** 1. What is science communication? 2. Narratives and stories in science; 3. Giving talks; 4. Interviews; 5. Comedy for scientists; 6. Scientific writing; 7. Film making; 8. Writing from a poet and novelist's view; 9. Social media and CV development; 10. Troubleshooting and course overview.

### **3. Current Issues in Cognitive Neuroscience I: Fundamental Processes – TOPICS MODULE**

**UCL course code:** PSYCGC10

**Summary:** This is the first of three modules on the current state of knowledge in the field of cognitive neuroscience. This module focuses on our understanding of lower-level, fundamental cognitive processes. Examples include perception, attention, action, vision, audition, motor control, and object processing. Experts in each field will describe past and present findings on the topic, using their own research as a guideline and highlighting current controversies and debates. The module will explore findings from a range of neuroimaging techniques and lesion approaches.

**Assessment:** 3-4 minute narrated scientific poster

**Topics:** 1. Brain-body interface and the motor cortex; 2. Metacognition; 3. Somatosensation and nociception; 4. Speech; 5. Poster presentation skills training; 6. Visuomotor coordination; 7. The motor pathway for volition; 8. Replication, convergent evidence, meta-analysis and truth-seeking.

### **4. Current Issues in Cognitive Neuroscience II: Elaborative and Adaptive Processes – TOPICS MODULE**

**UCL course code:** PSYCGC08

**Summary:** This is the second of three modules on the current state of knowledge in the field of cognitive neuroscience. This module focuses on our understanding of elaborative and adaptive processes. Examples include memory, speech, language, number processing, social cognition, executive functions and

cognitive control. Experts in each field will describe past and present findings on the topic, using their own research as a guideline and highlighting current controversies and debates. The module will explore findings from a range of neuroimaging techniques and lesion approaches.

**Assessment:**

2,000-3,000 word written essay

**Topics:**

1. The imitating brain; 2. The influential adolescent brain; 3. The socially rewarded brain; 4. The interacting and cooperating brain; 5. The laughing brain; 6. The conscious brain; 7. The self-aware brain; 8. The remembering brain; 9. The happy brain; 10. The optimistic brain.

**5. Current Issues in Cognitive Neuroscience III: Translational Research – TOPICS  
MODULE**

**UCL course code:**

PSYCGC09

**Summary:**

This is the third and final module on the current state of knowledge in the field of cognitive neuroscience. This module focuses on our understanding of translational research. Examples include cognitive neuropsychiatry, recovery and rehabilitation after neurological damage, cognition across the life span, genetic underpinnings of cognition, and language in the deaf. Experts in each field will describe past and present findings on the topic, using their own research as a guideline and highlighting current controversies and debates. The module will explore findings from a range of neuroimaging techniques and lesion approaches.

**Assessment:**

2,000-3,000 word written essay

**Topics:**

1. Schizophrenia; 2. Frontal lobes, executive functions, and memory for intentions; 3. Language processing in people who are born deaf; 4. Developmental cognitive neuroscience; 5. Depression and other affective disorders; 6. Typical and atypical visual development; 7. Restoring awareness following stroke; 8. Cognitive psychosocial interventions for people with dementia; 9. Web-based therapy and cognitive training; 10. Autism.

## 6. Methods in Cognitive Neuroscience I: Lesion Approaches – METHODS MODULE

**UCL course code:** PSYCGC15

**Summary:** This module teaches how lesion approaches can be used to advance the field of cognitive neuroscience. The module includes a series of case demonstrations, each of a patient with a circumscribed brain lesion and associated functional deficit. Theoretical issues surrounding neuropsychological data, and how to use magnetic resonance imaging to characterise structural and functional aspects of brain lesions, will be discussed. The module may also consider 'virtual lesions', brought about by transcranial magnetic and direct current stimulation. Lesion techniques in humans will be discussed alongside work using animal models.

**Assessment:** 2,000-3,000 word lab report based on the design of a new psychometric task

**Topics:** Five case demonstrations at the National Hospital for Neurology and Neurosurgery plus 1. Introduction to human neuropsychology; 2. TMS methodology; 3. Creating cognitive tests for group comparisons; 4. Lesion models in non-humans; 5. Establishing brain-behaviour relationships using the human lesion method.

## 7. Methods in Cognitive Neuroscience II: Neuroimaging – METHODS MODULE

**UCL course code:** PSYCGC11

**Summary:** This module focuses on modern techniques for imaging the human brain. Students will be taught the key principles of a range of neuroimaging techniques, including magnetic resonance imaging (MRI), positron emission tomography (PET), electroencephalography (EEG), and magnetoencephalography (MEG). The methodological limitations of these techniques will be discussed and there may be an opportunity to observe some of the techniques in action. The module explores how

each technique can be used to understand mind-brain relations in patients and healthy individuals, emphasizing their relative advantages and disadvantages. You will learn to critically evaluate neuroimaging research. Students will practice the analysis and interpretation of neuroimaging data and will learn how to disseminate findings.

**Assessment:** 1,000-1,500 word critical analysis of a published neuroimaging paper and a 1,000-1,500 word report

**Topics:** 1. Introduction to neuroimaging; 2. The pros and cons of different neuroimaging techniques; 3. Designing neuroimaging experiments; 4. MRI: recording; 5. MRI: analysis and interpretation; 6. EEG/MEG: recording; 7. EEG/MEG: analysis and interpretation; 8. fMRI: hands-on data analysis; 9. EEG/MEG: hands-on data analysis; 10. Integration of techniques and disseminating neuroimaging findings.

## 8. Structure and Function of the Brain – METHODS MODULE

**UCL course code:** PSYCGC14

**Summary:** This module outlines basic neuroanatomy and measurement of

the brain. You will learn the physiological and structural principles underlying the anatomical organization of the brain and the functional segregation of higher cognitive functions, starting from the cellular level (synapses, action potentials) and working up to a more detailed consideration of the major anatomical divisions. Major functional circuits will be outlined, with an emphasis on their anatomical organization and connectivity.

**Assessment:** Two-hour unseen written short answer exam

**Topics:** 1. Neurons and development; 2. Visual system; 3. Somatosensory system; 4. Auditory system; 5. Motor system; 6. Limbic system; 7. MRI and MEG/EEG physics.