Programme Specification

A statement of the knowledge, understanding and skills that underpin a taught programme of study leading to an award from The University of Sheffield

1	**Programme Title**	Cognitive and Computational Neuroscience (CCN)
2	**Programme Code**	PSYT12
3	**JACS Code**	C861
4	**Level of Study**	Postgraduate
5a	**Final Qualification**	MSc
5b	**Position in the QAA Framework for Higher Education Qualifications**	Masters level
6a	**Intermediate Qualification(s)**	PG Cert
6b	**Position in the QAA Framework for Higher Education Qualifications**	Not applicable
7	**Teaching Institution** (if not Sheffield)	Not applicable
8	**Faculty**	Science
9	**Department**	Psychology
10	**Other Department(s) involved in teaching the programme**	None
11	**Mode(s) of Attendance**	Full-time
12	**Duration of the Programme**	1 year
13	**Accrediting Professional or Statutory Body**	None
14	**Date of revision**	November 2023

15. Background to the programme and subject area

Cognitive and computational neuroscience provides the foundation for a deep understanding of the relationship between brain and behaviour. Cognitive neuroscience focuses on the neurobiological processes underpinning cognition, with . computational techniques serving to construct mathematical models that can simulate, predict, and estimate brain circuits and neurobiological and cognitive functions.

The Department of Psychology at Sheffield University has a strong research track-record in computational neuroscience, cognitive neuroscience, and systems neuroscience.

During this course, students will gain an in-depth understanding of the core problems in cognitive and computational neuroscience and will develop an understanding of the disciplines and techniques used to address these problems such as: experimental cognitive psychology, computational and mathematical modelling, and neuroscience and brain imaging. The extensive course project will provide an opportunity to combine these skills and knowledge to investigate a specific issue related to the subject.

16. Programme aims

The aims of the programme are to provide each student with:

A1 a broad and critical understanding of leading-edge cognitive and computational neuroscience.

A2 an appreciation of different approaches to understanding brain structure and function.

A3 the ability to design, run and analyse experiments in order to test specific experimental hypotheses which incorporate constraints derived from cognitive psychology, psychophysics, neuroscience, and behavioural studies.

A4 a general research training, thus providing a sound base for graduates to pursue a research degree or a career in research.

A5 an appreciation of an academic scientific environment that rewards innovation, fosters a sense of community, and encourages students to direct their own learning.

17. Programme learning outcomes

Knowledge and understanding: Students completing the MSc programme will have:	
K1	a sound knowledge and critical understanding of several key research areas in cognitive and computational neuroscience.
K2	a comprehensive knowledge of the key problems in cognitive and computational neuroscience, and an understanding of the standard techniques required to solve such problems.
K3	extensive knowledge of one chosen research area, which forms the basis of the course project.
K4	the ability to deal with quantitative aspects of mechanistic explanation in cognitive and computational neuroscience.
K5	an appreciation of the techniques used to record the relevant experimental data.

Skills and other attributes: Students completing the MSc programme will be able to:	
S1	Formulate research problems in cognitive neuroscience as well-defined, testable hypotheses.
S2	Demonstrate a fundamental working knowledge of brain structure (anatomy) and function (neurophysiology) at the level of individual cells, small networks, and neural systems.
S3	Demonstrate broad knowledge of the research methods and techniques used in cognitive and computational neuroscience.
S4	demonstrate programming skills in simulation and data analysis relevant to cognitive and computational neuroscience.
S5	Build and test computational models of neural and cognitive systems in the context of neural computation and cognitive science.
S6	Demonstrate initiative and self-motivation, fostered through the completion of an individual project.
S7	Demonstrate an understanding of fundamental issues in cognition (PSY6305) OR demonstrate an in-depth knowledge of the physical foundations of modern neuroimaging techniques underlying magnetic resonance imaging (PSY6424).
S8	**Articulate the relationships between brain structure and behavioural function in the context of neuroanatomical and computational descriptions of neural systems (PSY6315)** OR design experimental protocols for the generation of neuroimaging datasets that can be analysed to address specific hypotheses in cognitive neuroscience (PSY6414).
S9	Gain experience working in partnership with others to translate and adapt knowledge.
S10	Apply lateral thinking in problem solving.

18. Teaching, learning and assessment

Development of the learning outcomes is promoted through the following teaching and learning methods:

The Department fosters an environment with many opportunities for individual and group learning. However, the primary responsibility for learning lies with the student, who must be organised and self-motivated to make the most of the programme. Teaching is offered through formal lectures, seminars, laboratories, problem-solving classes, and project supervision. Projects will be undertaken in areas close to active research within the Department, thereby providing ample opportunity for students to learn and to explore ideas at the cutting-edge of cognitive neuroscience.

Lectures. The purpose of a lecture is to motivate interest in a subject, to convey the core concepts, and to provide pointers to further sources of information. Lecture handouts will be provided in advance in online formats. The smaller group nature of the CCN course allows student interaction during the lectures to ensure that key material is conveyed effectively. Learning outcomes K1-3 are supported through this.

Seminars. These enable the discussion of a particular topic in some detail and may take the form of reviewing specific research papers. The seminars support and provide constructive feedback for the student's independent learning. Through participation a student develops relevant knowledge, learns to apply conceptual

tools, and improves cognitive, communicative and transferable skills, including the capacity to present reasoned arguments in oral form, to give presentations, to pursue independent learning and show critical judgement. Learning outcomes K1-3 are supported through this.

Computer Laboratories. Computer laboratory space will be available to students on postgraduate courses in cognitive neuroscience, complete with relevant modelling and analysis software. This enables hands-on exploration of analysis and computational modelling tools. Learning outcome K5 is supported by this.

Biology Laboratories. Enable students to witness demonstrations of experimental neuroscientific procedures and to analyse resultant data sets. Learning outcome K5 is supported through this.

Problem-Solving Classes. Facilitate the practice of applying theoretical ideas to concrete situations and supports learning outcome K4**.**

Mathematical and Research Methods Tutorials. These classes are taught in a workshop style and support students in applying their knowledge and developing their problem-solving skills. Some tutorials cover mathematics and programming and provide general help to solve specific problems. This feature is provided in recognition of the varied mathematical and programming skills of the students. Other tutorials introduce cognitive neuroscience research methods (e.g., EEG), providing students with hands-on exposure to cutting-edge equipment. Additionally, depending on their optional module choice, students write a literature review on a selected topic relevant to the course (PSY6305) or a lab diary (PSY6424). This is provided in recognition of the varied student experience in regard to their exposure to scientific literature and writing. Learning outcomes K4-5 and S3-5 are supported by these different tutorials.

Research **Project.** Depending on the nature of the project chosen, the project will support a variety of learning outcomes including K3-5 and S1, S6, and S9-10. This is a major piece of work that students begin with in Semester 2 and then focus exclusively on during the summer period. Students will work closely with one of the Masters teaching staff upon a topic of their choice, usually related closely to the current research questions being investigated by staff with appropriate research expertise at The University of Sheffield. This will provide valuable experience of the research process for students seeking a research career in cognitive neuroscience within or outside of academia.

Private Study. In preparation for lectures, seminars and assessment, students develop their understanding of theoretical and empirical issues and increase their knowledge about the discipline. The amount of independent study varies from module to module, but reading lists provided for each module will guide the students in the amount of work expected.

Opportunities to demonstrate achievement of the learning outcomes are provided through the following assessment methods:

Assessment consists of formal examinations and coursework. The examination papers consist of short-answers, numerical examples, and essay questions, depending upon the nature of the material covered by each module. The coursework consists of essays, a research dissertation (up to 10,000 words), a poster or oral presentation to test knowledge, understanding and presentation skills.

19. Reference points

The learning outcomes have been developed to reflect the following points of reference:

Subject Benchmark Statements
https://www.qaa.ac.uk/quality-code/subject-benchmark-statements

Framework for Higher Education Qualifications (2024)
https://www.qaa.ac.uk/the-quality-code/qualifications-frameworks#

University Vision and Strategic Plan
https://www.sheffield.ac.uk/vision

Learning and Teaching Strategy, using the LETs toolkit for learning and teaching
https://www.sheffield.ac.uk/lets/home

The Sheffield Masters Graduate
https://www.sheffield.ac.uk/polopoly_fs/1.694997!/file/TSMG.pdf

The Sheffield graduate attributes:
https://www.sheffield.ac.uk/sheffieldgraduate/studentattributes

The research interests of neuroscience staff and the research strategy of the Department of Psychology.

20. Programme structure and regulations

In Semester 1, students take three foundation modules, consolidated in Semester 2 by two advanced modules. In addition, students have a choice between two modules for each semester to tailor the programme to their interests. Each module constitutes 15 credits to a total of 105 credits (60 Semester 1, 45 Semester 2). In the last part of the year, students conduct a research project worth 75 credits.

A candidate who has been awarded sixty credits of taught modules shall be eligible for the award of the Postgraduate Certificate in Cognitive and Computational Neuroscience.

Detailed information about the structure of programmes, regulations concerning assessment and progression and descriptions of individual modules are published in the University Calendar available online at http://www.sheffield.ac.uk/calendar/regs.

21. Student development over the course of study

The programme is designed so that students progressively achieve more advanced levels of learning and practice. In Semester 1, students take three modules designed to ensure that all students, irrespective of their background, have a thorough knowledge of the fundamentals of neuroscience (PSY6306), computational neuroscience with a focus on biological models (PSY6307), and mathematical modelling (PSY6309). In Semester 2, students receive advanced training in research methods of cognitive neuroscience (PSYTBD) and theoretical computational models (PSY6308). The project begins after the examination period of Semester 1 (February) and is completed by the end of August. Students are supported by close supervision.

22. Criteria for admission to the programme

The course recruit's students from psychological, biological and mathematical/physical science or engineering backgrounds. Criteria are therefore, a 2.1 or 1st in a psychology or life sciences degree with some neuroscience component, or 2.1 or 1st in a mathematical/physical sciences or engineering degree. In the case of applicants from psychology or the life sciences, we require that they can demonstrate some measure of mathematical ability. For example, this may take the form of a pre-University qualification equivalent to A-level maths, or some experience of mathematics on their degree course. At the very least we would expect a commitment to take on mathematical material. In the case of applicants from a mathematical/physical sciences or engineering background, we require that they can demonstrate some acquaintance with biological material, or at the very least, show a commitment to learning cognitive neuroscience and using experimental biological data.

Students who are non-native speakers of English must also demonstrate that their language ability is sufficient before starting the course. Our standard English requirement is a minimum IELTS 6.5 (with no less than 6.0 in any component).

23. Additional information

Prospective applicants might also benefit from browsing the following web page

http://abrg.group.shef.ac.uk/

https://www.sheffield.ac.uk/psychology/prospectivepg/masters/ccn

https://www.sheffield.ac.uk/psychology/prospectivepg/masters/cnhn

http://www.sheffield.ac.uk/postgraduate/taught/

This specification represents a concise statement about the main features of the programme and should be considered alongside other sources of information provided by the teaching department(s) and the University. In addition to programme specific information, further information about studying at The University of Sheffield can be accessed via our Student Services web site at www.shef.ac.uk/ssid.