

●●●●● *Guide to the Structured Doctoral Program*  
●●●●●●●● *of the Berlin School of Mind and Brain*



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## *Welcome to the Berlin School of Mind and Brain!*

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This guide is designed to provide you with information about the three-year structured doctoral program at the Berlin School of Mind and Brain. Here you will find tips regarding program organization, course requirements and supervision. This guide attempts to answer questions like “How are the three years of the program organized?” “How many credit points do I have to collect during my doctorate and in which areas?” “Which soft-skill courses are on offer?” “What kind of academic degree will I be awarded after completing my doctorate?”.

If you have more questions, or in case of any problems, the staff of the Berlin School of Mind and Brain as well as Humboldt Graduate School will be glad to assist you.

We look forward to working with you.

Professor Dr. MICHAEL PAUEN  
*Academic Director*

Professor Dr. ARNO VILLRINGER  
*Academic Director*

ANNETTE WINKELMANN  
*Managing Director*

● ● ● ● THE BERLIN SCHOOL OF MIND AND BRAIN

Recent progress in the neurosciences has opened up new and exciting avenues for research that raise challenging conceptual and ethical questions. The Berlin School of Mind and Brain offers doctoral candidates a unique research and training environment where natural science and the humanities intersect. Founded in 2006 as part of Germany's *Excellence Initiative*, the School offers a three-year interdisciplinary doctoral program in English. Of particular interest are research areas that fall on the borders between the mind sciences (e. g., philosophy, linguistics, behavioral and cognitive science, and economics), and the brain sciences (e. g., neurophysiology, computational neuroscience, neurology, and other areas of neurobiology). Research focuses on three paradigmatic mental functions – conscious and unconscious perception, decision-making, and language – and on two key determinants of any mental function, namely ontogenetic development (brain plasticity and lifespan ontogeny) and pathological alterations (brain disorders and mental dysfunction).

Hosted by Humboldt-Universität, the School is situated in the center of Berlin, adjacent to grounds of the Charité, the largest medical campus in Europe. The School has a faculty composed of nearly 60 distinguished researchers, which include scientists from several Berlin-based institutions – the Freie Universität, the Technische Universität, the Bernstein Center for Computational Neuroscience Berlin, and the Max Planck Institutes for Human Development and for the History of Science – as well as the MaxPlanck Institute for Human Cognitive and Brain Sciences in Leipzig, and the nearby universities of Potsdam and Magdeburg.

Doctoral candidates work – in conjunction with two professorial advisors (one from the brain sciences, the other from the mind sciences) – on any projects that are relevant to interdisciplinary questions relating to mind and brain. During the first half of their doctoral program, doctoral candidates acquire a solid interdisciplinary foundation by attending eight one-week classes. These classes cover many different aspects of mind/brain-related research and allow doctoral candidates to explore research methods and topics to which they have not previously been exposed to.

The research of doctoral candidates is part of the interdisciplinary scientific exchange within the School. For example, doctoral candidates participate in journal and methods clubs, and present the results of their research to the Scientific Council for annual review. In addition, the School hosts a weekly lecture series with leading guest speakers. Non-subject-specific assistance also gets high priority. Doctoral students participate in soft-skill courses tailored to their individual scientific careers and may participate in a career mentoring program by application.

### *Statute*

The Statute of the School which delineates the official rules, objectives, and tasks of the School, its faculty, students, and staff can be downloaded at

► [www.mind-and-brain.de/102.o.html](http://www.mind-and-brain.de/102.o.html)



● ● ● ● RESEARCH ENVIRONMENT

Nearly 60 scientists from many different areas of research and from a wide range of partner institutions make up the faculty of the Berlin School of Mind and Brain. For an overview of faculty members with individual contact information have a look at:

► [www.mind-and-brain.de/87.o.html](http://www.mind-and-brain.de/87.o.html)

## Partner Institutions

- Humboldt-Universität zu Berlin (host university)
- Charité – Universitätsmedizin Berlin
- Freie Universität Berlin
- Technische Universität Berlin
- Otto-von-Guericke-Universität Magdeburg
- Universität Potsdam
- Max Planck Institute for Human Development, Berlin
- Max Planck Institute for the History of Science, Berlin
- Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig
- Mind & Brain Institute, Berlin
- Bernstein Center for Computational Neuroscience, Berlin
- Berlin NeuroImaging Center
- Neuroscience Research Center, Charité
- Center for General Linguistics (ZAS), Berlin
- Interdisciplinary Center for Meaning in Language, Berlin
- Max Delbrück Center for Molecular Medicine, Berlin
- Institute for Advanced Study, Berlin
- Fraunhofer Institute for Computer Architecture and Software Technology, Berlin

- Berlin-Brandenburg Academy of Sciences and Humanities
- Physikalisch-Technische Bundesanstalt, Berlin

### *Doctoral Candidates*

Each year the School accepts ten to fifteen doctoral candidates into its program. In 2009 the School welcomed its third-year intake of student members. Currently the School has over 30 doctoral candidates from Germany, Brazil, Poland, Austria, USA and Iran.

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OF MIND  
AND BRAIN

RESEARCH  
ENVIRONMENT

DOCTORAL  
PROGRAMM

BODIES AND  
COMMITTEES

### *Guests and Associated Researchers*

Our school regularly invites guest researchers from abroad for research tours. In addition, a number of research projects from German researchers are connected with the School.

- ▶ [www.mind-and-brain.de/98.o.html](http://www.mind-and-brain.de/98.o.html) (Associated Researchers)
- ▶ [www.mind-and-brain.de/104.o.html](http://www.mind-and-brain.de/104.o.html) (Visiting Students)

### *Partnerships*

The Berlin School of Mind and Brain has close collaborative links with local neuroscience projects. Such partnerships are listed on a joint website operated by the Berlin School of Mind and Brain and the Medical Neurosciences Program (▶ [www.neuroscience-berlin.de](http://www.neuroscience-berlin.de)). This neuroscience project alliance organizes the biennial Berlin Neuroscience Forum and the annual doctoral conference Berlin Brain Days. The Berlin School of Mind and Brain also cooperates with neuroscience schools across Germany (▶ [www.neuroschools-germany.com](http://www.neuroschools-germany.com)) and the members of the Network of European Neuroscience Schools (▶ [www.fens.mdc-berlin.de/nens/about.html](http://www.fens.mdc-berlin.de/nens/about.html)). The School creates courses in cooperation with the Medical Neurosciences and Computational Neuroscience doctoral programs as well as other neuroscience schools.

## *Humboldt Graduate School*

The Berlin School of Mind and Brain is a founding member of Humboldt Graduate School (HGS), an overarching service structure for doctoral programs at Humboldt-Universität. Humboldt Graduate School offers doctoral candidates a wide range of customized academic soft-skill courses. Together with Humboldt Graduate School the Berlin School of Mind and Brain offers its members assistance with visa applications, matriculation, health insurance, and local administration.

► <http://humboldt-graduate-school.de>

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## *German Language Classes*

As an international graduate program all correspondence, teaching, and lectures at the Berlin School of Mind and Brain are in English. Moreover, as an international city where many residents' second language is English, it is quite possible to live and work for years without more than a rudimentary grasp of German. However, while it is possible to subsist without speaking German, the School recommends both for practical reasons and to maximize cultural engagement with the city that doctoral candidates learn *Deutsch*. There are many different approaches for doing this. If you are interested please contact Patrick Wilken (► [patrick.wilken@hu-berlin.de](mailto:patrick.wilken@hu-berlin.de)) who can suggest a number of potential strategies and give advise on how the School can assist you.

● ● ● ● DOCTORAL PROGRAM

## *Structure*

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The doctoral program of the Berlin School of Mind and Brain comprises eight weeks of research-related instruction (*teaching weeks*). Furthermore, it includes a weekly international lecture series, journal and methods clubs, annual progress reviews, conference and workshop attendance, academic soft-skill courses, and mentoring.

Table 1 – Structure

	YEAR 1	YEAR 2	YEAR 3
<b>FOCUS</b>			
	Research project	Research project	Research project
	Interview with Curriculum Committee to assess teaching week requirements		
	Teaching weeks (six weeks)	Teaching weeks (two weeks)	
<b>PLUS</b>			
	Academic soft-skill courses	Academic soft-skill courses	Academic soft-skill courses
		Mentoring (by application)	Mentoring (by application)
	Lecture series (weekly)	Lecture series (weekly)	Lecture series (weekly)
	Meeting with supervisors once per semester	Meeting with supervisors once per semester	Meeting with supervisors once per semester
	Annual progress reviews (poster presentations or talks)	Annual progress reviews (poster presentations or talks)	Annual progress reviews (poster presentations or talks)
	Individual academic contributions, e. g. attending conferences, hand in articles for publication, organize a meeting, take part in a research internship, teach a class, etc.		
			Thesis defense / <i>viva voce</i>

## Credit Points

A candidate is required to collect a total of 180 credit points (CPS) during the three-year doctoral program. Credit points are awarded for the doctoral thesis and for participating in the teaching weeks, the academic soft-skill courses, the lecture series, the journal and methods clubs, the annual progress reviews and for individual academic contributions.

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*Table 2 – Overview*

PROGRAM ELEMENTS	CREDIT POINTS	TOTAL
Research project	50 CP per year	150 CP
Teaching weeks (compulsory): eight courses / weeks	2.5 CP per course	20 CP
Academic soft-skill courses (three compulsory courses)	5 CP cumulative over three years	5 CP
Journal and methods clubs, lecture series, progress reviews, individual academic contributions	5 CP cumulative over three years	5 CP
<b>Total</b>		<b>180 CP</b>

## Teaching Program

### Teaching Weeks

The compulsory teaching weeks must be attended during the first half of the doctoral program. These weeks lay the foundation for more advanced mind and brain research by teaching doctoral candidates analytical, theoretical and methodological skills. Doctoral candidates attend eight one-week courses: four core courses, and four supplementary courses. Teaching usually takes place on Mondays and Tuesdays, Thursdays and Fridays, between 9.00 and 17.00. Tests are scheduled for Fridays.

Details on the upcoming teaching weeks, including timetables, textbooks and locations, are announced well in advance on the website

► [www.neuroscience-berlin.de](http://www.neuroscience-berlin.de)

### Structured Teaching Weeks

#### Core courses (recurrent, every year)

- 1 Neuroanatomy and Neurophysiology
- 2 Neuroimaging
- 3 Cognitive Neuroscience
- 4 Basic Philosophical Concepts and Philosophy of Mind

#### Supplementary Courses (alternate, every two years)

- 5 Computational Neuroscience and Statistics
- 6 Cognitive Science
- 7 Lifespan and Plasticity (7 a) and Clinical Neuroscience (7 b)
- 8 Practical Philosophy (8 a) and Language and the Brain (8 b)

For a detailed description of the course contents, please see the appendix at the end of this document or visit our website

► [www.mind-and-brain.de/81.o.html](http://www.mind-and-brain.de/81.o.html)

*Table 3 – Example Schedule*

Start of program	Course 1
Year 1 (spring)	Courses 2, 3, 4
Year 1 (fall)	Courses 5, 6 or courses 7, 8
Year 2 (spring)	No course
Year 2 (fall)	Courses 7, 8 or courses 5, 6
Year 3 (spring)	No course
Year 3 (fall)	No course

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### *Participation, Tests, Attendance*

#### **Attendance Requirements**

Participation in courses is compulsory. Doctoral candidates must attend at least 80 percent of a course to be permitted to take the test.

#### **Enrollment**

All doctoral candidates of the Berlin School of Mind and Brain are required to enrol for classes with the course administrator (► [anne.loechte@hu-berlin.de](mailto:anne.loechte@hu-berlin.de)). Doctoral candidates who wish to replace a course must comply with proper procedures in accordance with the School's regulations (see below). In case of non-compliance, the respective course will be listed as failed.

#### **Tests**

All doctoral candidates must pass a multiple-choice test for each of the eight teaching weeks. In order to pass a test, a student needs to achieve a score of at least 75 percent of the average of the three best test results; this computed average figure represents a 100-percent rating. If students fail a test, they may take an oral exam with the course organizer four weeks after the last teaching week of the respective spring or fall segment. The examiner will pick topics from the textbook for the oral exam. If students have attended a course and failed the test but do not wish to take

an oral exam, they may repeat the written test in the respective year during which the course is conducted, with or without re-attending the respective course.

### Replacement of Courses

Within certain limits, doctoral candidates may devise a personalized curriculum in accordance with their individual needs and interests. Doctoral candidates already familiar with certain topics may replace up to two core courses and two supplementary courses. In this case, however, suitable advanced-level substitute courses in the same area of study will have to be attended. If a student's existing proficiency in a given area meets or exceeds advanced-level standards, a substitute course from a different area of study may be chosen. All replacements will have to be approved by the Curriculum Committee at the beginning of the three-year doctoral program.

### Replacement Procedure

- Personal interview with and subsequent permission from two members of the Curriculum Committee (currently: John-Dylan Haynes and Michael Pauen). Verification of existing proficiency is required.
- Counseling on suitable substitute courses to complement existing scientific skills or advance proficiency in a given area.
- In order to justify replacements of the School's courses, contents of substitute courses need to be sufficiently different or advanced *vis-à-vis* the School's respective offerings.
- Substitute courses must meet the School's standards regarding quality, duration and examination requirements.
- As a rule, the School's policy does not include reimbursement for travel expenses or fees for substitute courses taking place outside Berlin.

## Soft-Skill Courses

Doctoral candidates have to participate in three academic soft-skill courses, developed and conducted in collaboration with Humboldt Graduate School. Verification of attendance is required. Participation in other soft-skill courses offered by Humboldt Graduate School is non-compulsory but recommended.

### *Key academic soft-skill courses (compulsory)*

- Scientific presentation
- Scientific writing
- Grant-application writing

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### *Other academic soft-skill courses offered by Humboldt Graduate School include:*

- Scientific communication
- Didactics
- Dissertation coaching
- Dissertation defense / *viva voce* coaching
- Career management
- Work–life balance

For a detailed program, see website

- ▶ <http://humboldt-graduate-school.de/pr-en/key-competencies>

## Lecture Series

The Berlin School of Mind and Brain hosts three lecture series: the Mind–Brain Lectures, the Distinguished Lecture Series, and the Neuroesthetics Talk Series. Doctoral candidates are expected to attend the first two series as part of their course requirements. All lectures start promptly at 18.30 and are usually held in the Festsaal at Luisenstraße 56. Suggestions for future speakers should be forwarded (for the Distinguished Lecture Series) to John-Dylan Haynes (► [haynes@bccn-berlin.de](mailto:haynes@bccn-berlin.de)) or for any of the three lecture series to Annette Winkelmann (► [annette.winkelmann@hu-berlin.de](mailto:annette.winkelmann@hu-berlin.de)). Doctoral candidates have the opportunity to interact with speakers from the Distinguished Lecture Series via an additional, doctoral candidates-only Q&A session (“Meet the Speaker”) that usually takes place the day after the lecture. This allows doctoral candidates to get to know distinguished researchers and to discuss open questions in a relatively informal setting.

## Journal and Methods Club

Once a week, doctoral candidates meet for a Journal and Methods Club. The club is organized by the doctoral candidates themselves and can be used to discuss, for example, new research papers, important classical papers, or methodological issues, or to prepare for the Teaching Weeks or the Distinguished Lecture talks and “Meet the Speaker” sessions. Doctoral candidates may also use the club as a forum to present and discuss their own projects and to practice giving talks.

## Progress Review

Once every six months doctoral candidates and supervisors meet and discuss the progress of the candidate’s thesis on the basis of intermediary reports, and/or single chapters of the thesis (alternatively: research results prepared for publication). The doctoral candidate will take minutes and record what was agreed on during the meeting. The minutes will be signed by the supervisors and archived by the management of the School. Once a year all doctoral candidates will appear before the Scientific Council for their progress review. Together with their supervisors they will present the current state of their research projects.

## Mentoring

The Berlin School of Mind and Brain offers doctoral candidates participation in a mentoring program. The program targets doctoral candidates (second year or higher) striving for a career in academia. Experienced academic mentors help candidates make career decisions and find promising post-doctoral opportunities. One of the mentoring program's core activities focuses on assisting the academic careers of female doctoral candidates. For students in the first year of their dissertation a peer mentoring program is offered. For more information, please contact Anne Löchte (► [anne.loechte@hu-berlin.de](mailto:anne.loechte@hu-berlin.de)).

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## Supervision

Doctoral research projects at the Berlin School of Mind and Brain are supervised by two professorial advisors. Since mind/brain projects must be inherently interdisciplinary, one of these advisors typically has a mind background and the other a brain background. A supervision and training agreement between the doctoral student and the School, represented by the two thesis supervisors and one of the academic directors of the School, will be drawn up at the beginning of the doctoral candidate's degree (*Betreuungsvereinbarung* – download at ► [www.mind-and-brain.de/G1.o.html](http://www.mind-and-brain.de/G1.o.html)).

## Degrees and Titles

Doctoral candidates of the Berlin School of Mind and Brain work for a prestigious research doctorate. Students will receive the title typically awarded by the department in which they are enrolled. Which department students choose will depend on earlier degrees and on the affiliation of their main supervisor. Exact requirements for the final examinations (doctoral thesis or series of peer-reviewed publications, expertise, thesis defense) depend on the regulations of the respective department. Generally, doctoral theses may be written and defended in German or English.

Customarily, a student enrolled in one of the following departments will be awarded the following titles:

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DOCTORAL PROGRAMM	BIOLOGY	▶	<i>Doctor rerum naturalium</i> (Dr. rer. nat.)
	PSYCHOLOGY	▶	<i>Doctor rerum naturalium</i> (Dr. rer. nat.), or <i>Doctor philosophiae</i> (Dr. phil.)
BODIES AND COMMITTEES	PHILOSOPHY	▶	<i>Doctor philosophiae</i> (Dr. phil.)
	LINGUISTICS	▶	<i>Doctor philosophiae</i> (Dr. phil.)
	ECONOMICS	▶	<i>Doctor rerum politicarum</i> (Dr. rer. pol.)
	MEDICINE	▶	<i>Doctor medicinae</i> (Dr. med.), or <i>Doctor rerum medicinalium</i> (Dr. rer. medic., for non-medics enrolled in the medical department)

All above-mentioned doctoral degrees are highly regarded nationally and internationally.

## Certificates, Supplements, Transcripts

To highlight the interdisciplinary nature of the School's graduate program, a special certificate will be issued together with the university's doctoral certificate. A supplement will describe the educational concept (teaching program, lecture series, presentations, etc.) and the quality standards of the School's doctoral program and degree. A transcript of records will list teaching weeks, academic soft-skill courses and conferences attended.

## *Travel Grants*

As part of the School's commitment to maximizing doctoral candidates' research opportunities, the School encourages and provides financial assistance for students to conduct research abroad during the course of their doctoral candidacy. The School also financially supports doctoral candidates in participating in conferences that are important for their research.

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If doctoral candidates wish to apply for financial support and subsequent reimbursement, they have to follow the following procedure:

- Fill out the "Travel Grant" application form (available in the School's main office) with a 100-word explanatory statement. This form must be handed in four weeks before the start of the trip to Annette Winkelmann, for approval.
- If the application is approved: Fill out the required forms (available in the office) before starting your trip.
- Originals of bills and receipts must be retained and submitted to the School's office in order to be reimbursed (and more forms must be filled out).
- In addition a report of 500 words must be submitted to Annette Winkelmann, which gives a brief description of the meeting and its importance/relevance to the student's research.

Please note: Reimbursements are only possible within six months of departure for the research or conference trip.

● ● ● BODIES AND COMMITTEES

## Academic Directors

**MICHAEL PAUEN, ARNO VILLRINGER**

The Berlin School of Mind and Brain has two academic directors, one from the mind sciences, one from the brain sciences. They represent the School within Humboldt-Universität and to third parties and have a multiplicity of programmatic and representative tasks.

## Managing Director

**ANNETTE WINKELMANN**

The managing director heads the management staff and is responsible for finances, personnel, the servicing of committees and all administrative matters.

## Junior Researchers' Representatives

**SO YOUNG PARK, FRANZISKA PREUSSE**

Doctoral candidates elect three representatives on an annual basis. They will see to it that the interests of the junior researchers are sufficiently incorporated into the School's efforts and are involved in the School's program and development.

## Ombudsperson

**UWE HEINEMANN**

The Ombudsperson is appointed by the Academic Directors and functions as an arbitration authority at the School and may be informally approached by all members.

## Curriculum Committee and Examination Board

JOHN-DYLAN HAYNES (chair)  
FELIX BERMPOHL  
RAINER DIETRICH  
MICHAEL PAUEN  
LAEL SCHOOLER  
ARNO VILLRINGER  
So YOUNG PARK (advisory)  
FRANZISKA PREUSSE (advisory)  
ANNETTE WINKELMANN (advisory)

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The Curriculum Committee and Examination Board consist of at least five faculty members. Two junior researchers' representatives and the managing director act as consultant members. The committee's task is to conceive and develop the School's doctoral program and its qualifying concept and is charged with coordination and quality control.

## Admissions Committee

MANFRED KRIFKA (chair)  
FELIX BERMPOHL  
HAUKE HEEKEREN  
GOLO KRONENBERG  
KLAUS OBERMAYER  
MICHAEL PAUEN  
RALF STOECKER  
ANDREAS STRÖHLE  
ELKE VAN DER MEER  
ARNO VILLRINGER  
ANNETTE WINKELMANN (advisory)

The Admissions Committee, consisting of at least five faculty members, is tasked with coordinating the identification and admission of doctoral candidates for the School.

## Scientific Council

For a complete list, please see website:

► [www.mind-and-brain.de/93.o.html](http://www.mind-and-brain.de/93.o.html)

The Scientific Council is a gathering of all Berlin School of Mind and Brain faculty members and convenes for a scheduled session at least once a year. The Scientific Council has a multiplicity of tasks, among other things the admission of doctoral candidates, development of Mind and Brain's scientific profile and research agenda and selection of the Curriculum Committee and Examination Board and the Admissions Committee. 25

## APPENDIX

## *Contents of Teaching Weeks*

### **I Neuroanatomy and Neurophysiology**

#### *Course description*

The course provides a basic understanding of where (anatomy) in the brain what (physiology) happens. It is of particular value for those doctoral candidates whose background is mainly in a “mind” science such as linguistics, philosophy, or economics.

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#### *Qualification aims*

Participating doctoral candidates will learn about the fundamental units of brain anatomy, such as lobes, areas, columns, etc. A special emphasis will be put on structure function relationship, i. e., which brain area is responsible for which aspect of brain function. It will be explained how brain areas interact, and what theories exist about bringing together aspects of information from different brain areas into one percept or thought (binding). The physiology part of the course will address fundamentals of neuronal functioning, interaction of neurons, neurotransmission, and will provide an understanding of neurovascular coupling, a basis of the most important functional neuroimaging method, fMRI.

#### *Course components*

This course intends to provide basic knowledge about brain structure (anatomy) and function (physiology).

#### *This comprises*

- (a) Labelling of brain lobes, cytoarchitectonically defined brain areas, microscopical cortical architecture, structure–function relationship of brain areas,
- (b) Function of neuron, groups of neurons, neuronal networks. Role of neurotransmitters, anatomical distribution of neurotransmitter. Neurovascular coupling as basis of functional magnetic resonance imaging.

*This course addresses the following Mind and Brain research topics*

Topic 1: Conscious and unconscious perception

Topic 2: Decision-making

Topic 3: Language

Topic 4: Brain plasticity and lifespan ontogeny

Topic 5: Brain disorders and mental dysfunction

## 2 Neuroimaging

### *Course description*

The course provides an introduction to a number of key non-invasive research methods in structural and functional neuroimaging.

### *Qualification aim*

Participating doctoral candidates will learn about the basics of functional MRI, EEG, MEG and TMS including technological and physiological foundations, experimental design and basic and advanced statistical methods. The goal is to provide an understanding of functional neuroimaging that will allow doctoral candidates to design, perform and analyse their own studies.

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### *Course components*

- MRI: MRI physics, technology and sequences
- MRI: MRI-safety
- MRI: Neurovascular coupling and the BOLD-response
- MRI: Preprocessing of fMRI data
- MRI: Statistical modelling and hypothesis testing (GLM)
- MRI: Connectivity analyses (PPI, DCM, Granger causality)
- MRI: Multivariate methods (ICA, clustering, pattern classification)
- EEG/MEG: Technical, physiological and bioelectric/bio-magnetic principles
- EEG/MEG: Evoked potentials
- EEG/MEG: Spectral analyses
- TMS

### *This course addresses the following Mind and Brain research topics*

Topic 1: Conscious and unconscious perception

Topic 2: Decision-making

Topic 3: Language

Topic 4: Brain plasticity and lifespan ontogeny

Topic 5: Brain disorders and mental dysfunction

### 3 Cognitive Neuroscience

#### *Course description*

The course provides an introduction to the field of cognitive neuroscience where the focus is on the neural basis of cognitive and emotional processing in the intact human brain.

#### *Course content*

- (a) The field of cognitive neuroscience,
- (b) How neuroscientific methods can be used to study the neural basis of cognitive processes.

The course comprises lectures and discussions.

#### *Course components*

- Sensory processing (in particular visual perception)
- Attention
- Learning and memory
- Decision-making
- Executive functions
- Motor behaviour
- Emotion
- Cerebral lateralisation

*This course addresses the following Mind and Brain research topics*

Topic 1: Conscious and unconscious perception

Topic 2: Decision-making

## 4 Basic Philosophical Concepts and Philosophy of Mind

### *Course description*

The course provides a systematic overview over the most central issues in the philosophy of mind.

### *Qualification aim*

Participating doctoral candidates will learn to apply relevant philosophical concepts, they will be taught to construct a valid argument; they will learn how to distinguish between the most important options in the mind–body debate and how to assess the consequences of neuroscientific research.

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### *Course content*

This course intends to provide basic knowledge about basic philosophical issues and basic questions in the philosophy of mind.

### *Course components*

- Part I: Basic philosophical concepts: knowledge, explanation, argument, or causation.
- Part II: Basic problems: interactive dualism, epiphenomenalism, eliminative materialism, identity theory.
- Part III: Specific issues: self-consciousness, explanatory gap, emergence, reduction, free will.

### *This course addresses the following Mind and Brain research topics*

Topic 1: Conscious and unconscious perception

Topic 2: Decision-making

Topic 3: Language

## 5 Computational Neuroscience and Statistics

### *Course description*

The course provides an introduction to selected basic concepts of computational neuroscience.

### *Qualification aim*

The participating doctoral candidates will get to know examples of models on several levels of abstraction, from single cells to large networks. The main goal is to teach specific fundamental computational principles that are often encountered in cortical processing.

### *Course content*

This course intends to provide basic knowledge about computational models of single cells, small networks, and large scale networks, including some aspects of learning and neural coding. In addition, some basic aspects of statistics as often used in Neuroscience will be taught.

### *The course comprises*

- (a) Models of single cells (rate models, integrate and fire, membranes),
- (b) Models of networks (Hopfield, Perceptron, Winner-Take-All),
- (c) Hebbian learning, supervised learning (error backpropagation),
- (d) Statistics: Hypothesis testing, regression, model fitting, t-Test,  $\chi^2$ -Test, ANOVA.

### *This course relates to the following Mind and Brain research topics*

Topic 1: Conscious and unconscious perception

Topic 2: Decision-making

Topic 3: Language

Topic 4: Brain plasticity and lifespan ontogeny

Topic 5: Brain disorders and mental dysfunction

## 6 Cognitive Science

### *Course description*

The course provides an introduction to the key concepts and debates in cognitive science. The focus will be on the core assumptions behind the fields that compose cognitive science. Participating doctoral candidates will learn to relate these issues to their own field of study and research topic.

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### *Course content*

- (a) Foundations of cognitive science,
- (b) Cognitive psychology,
- (c) Artificial intelligence,
- (d) Linguistics, language, and its evolution.

### *Course components*

- Overview of cognitive science and its assumptions.
- Computational theory of mind
- What is computation?
- Levels of description in cognitive science.
- The role of modeling in cognitive science.
- Functional and evolutionary approaches.
- Controversies: reasoning, rationality, and human behavior.
- Understanding by building: Artificial Intelligence.
- Controversies: language. Is it an instinct?
- The evolution of language.

### *This course addresses the following Mind and Brain research topics*

Topic 1: Conscious and unconscious perception

Topic 2: Decision-making

Topic 3: Language

## 7A Lifespan and Plasticity

### *Course description*

The course provides information about changes in mental function and brain structure/function during lifespan and in disorders which affect the brain either so called neurological disorders (stroke, tumour) or psychiatric diseases (schizophrenia, depression)

### *Qualification aim*

Participating doctoral candidates will learn basics of cognitive changes during lifespan and changes in brain structure during the same period. Doctoral candidates will also learn basics of pathophysiology of important disorders of the brain and they will learn ways how the brain reacts to these challenges.

### *Course content*

This course intends to provide basic knowledge about

- (a) lifespan/plasticity,
- (b) mental dysfunction and brain disorders.

### *Course components*

- (a) **Lifespan and plasticity**
  - Cognitive function at different ages, normal development, deviations from normal development. Successful aging.
  - Development of the brain from birth to old age. Differential development of certain brain areas. Differential involvement of brain areas in aging process.
- (b) **Mental dysfunction and brain disorders**
  - Psychopathology/neurological symptoms of important diseases: schizophrenia, depression, stroke, Parkinson's disease.
  - Pathophysiological processes underlying these disorders, e.g. the role of the dopaminergic system, seronergica system, hormesis, etc.

### *This course addresses the following Mind and Brain research topics*

Topic 4: Brain plasticity and lifespan ontogeny

Topic 5: Brain disorders and mental dysfunction

## 7 B Clinical Neuroscience

### *Course description*

The course provides basic knowledge about lifespan and plasticity research and exemplary insights in the neuroscience of clinical psychiatry and neurology.

Participating doctoral candidates will learn how alterations of different cognitive systems result in psychiatric and neurological disorders, e. g., dementia.

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### *This course intends to demonstrate*

- (a) how alterations of different cognitive systems (e. g., emotion regulation, attention, reward), result in mental disorders,
- (b) how these alterations can be studied using neuroscience methods,
- (c) how this knowledge may translate into therapeutic applications.

### *The course comprises*

- lectures
- literature discussion
- patient interviews
- film presentations
- group work
- presentations by doctoral candidates working in the field of clinical neuroscience
- visit to a TMS lab

### *Course components*

- Physiological and pathological ageing
- Cerebrovascular system and stroke
- Cognitive Neurology I: Perception, agnosia and related disorders
- Cognitive Neurology II: Language, aphasia and frontal lobe disorders
- Epilepsy
- Coma and brain death
- Motor system and movement disorders
- Sensory system and pain
- Emotion regulation and affective disorders

- Dopamine, glutamate, and schizophrenia
- Reward system and substance abuse
- Personality and personality disorders
- Sleep
- Fear/arousal system and anxiety disorders
- Attention, activity and attention deficit hyperactivity disorder

*This course addresses the following Mind and Brain research topics*

Topic 4: Brain plasticity and lifespan ontogeny

Topic 5: Brain disorders and mental dysfunction

## 8A Practical Philosophy

### *Course description*

Participants will be familiarized with basic ethical concepts and theories and will gain an overview of ethically-relevant aspects of neuroscience. Thereby, participants will learn to know how ethical issues are tackled in philosophical ethics, and they will get an overall view of the theoretical interfaces between ethics and neuroscience.

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### *Course content*

The course provides an introduction to central notions and theories discussed in philosophical ethics and an overview of ethical issues in neuroscience as well as of consequences neuroscience does or might have for ethics.

### *Course components*

- (a) Ethics: basic concepts and foundational issues: metaethics vs. normative ethics, consequentialism, deontology, moral responsibility,
- (b) Ethical issues in neuroscience (“ethics of neuroscience”),
- (c) Ethical implications of neuroscience (“neuroscience of ethics”).

*This course addresses the following Mind and Brain research topics*

Topic 2: Decision-making

Topic 5: Brain disorders and mental dysfunction

## 8 B Language and the Brain

### *Course description*

The course provides a road map to basic theoretical concepts of the structure and processing of language and their cognitive and neurological correlates. Participants will be familiarized with current research questions in the field of language and the brain and the appropriate methods and paradigms to address these questions.

### *Course content*

This course intends to provide basic knowledge about the levels of the description of language structure and the cognitive representation and neural implementation of language processing.

### *This entails*

- (a) The nature of sounds, the structure of sentences, and semantic interpretation,
- (b) The nature and acquisition of linguistic knowledge, its use, neural representation, and disorders.

### *Course components*

- (a) **Language structure**
  - Sounds and words
  - Basic sentence structure
  - Structure of complex sentences
  - Meaning
- (b) **Cognition and neurology of language**
  - The mental lexicon
  - Acquisition
  - Production
  - Comprehension

*This course addresses the following Mind and Brain research topic*

Topic 3: Language



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