

# Course Guide – Master Cognitive Science

Winter 2020/21

Version as of 20.10.2020

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## Enrollment for Courses

Students are automatically registered for the preparatory courses. Students have to register for their regular courses via eCampus. All relevant information concerning eCampus (e.g. ID and password) are provided during the enrollment process. If you have any technical problems concerning eCampus please contact the Helpdesk.

Please register for your courses as soon as you receive access to eCampus. The registration deadline is usually at the beginning of October. If you fail to register during this time span, please contact the instructor of the respective course, for example, at the first session. Only the instructors can register you later on.

Please note that some courses will not be available for registration on eCampus. This mainly concerns lectures and seminars offered by the Institute of Neuroinformatics. Again, please attend the first session and talk to the instructor. If a registration via eCampus is not possible, this should be indicated in the Course Guide.

**Please remember always to check time, place and CP for your classes in eCampus and/or with the respective course instructor. These details in the course guide are subject to change and for your convenience only.**

### **Essay Writing Course in Philosophy:**

For all students who did not study philosophy during the BA program but need to learn how to write an essay or still feel insecure about it, we recommend in the winter term the seminar of Alfredo Vernazzani "Epistemology: Understanding in Science and The Arts. Discussing Catherine Elgin's Book "True Enough". It can be evaluated as C1 or C2.

## FIRST YEAR PROGRAM

Every student is strongly recommended to participate in the preparatory courses. Exceptions have to be approved by Dr. Alfredo Vernazzani ([alfredo-vernazzani@daad-alumni.de](mailto:alfredo-vernazzani@daad-alumni.de)) or by Prof. Dr. Albert Newen ([albert.newen@rub.de](mailto:albert.newen@rub.de)). The course "Academic English" need not be passed by native speakers of English. The course "Biostatistics" need not be passed by students who have a standard BA in psychology.

# Preparatory Courses

## Academic English

*SEMINAR*

**ENGLISH FOR MASTER COGNITIVE SCIENCE (251211)**

EWA BEHLING

**TERM:** Winter 2020/21  
**MEETING TIME:** September 28 – October 9, 10.00 – 12.15  
**ROOM:** ONLINE

This course takes into account the particular needs of the students of the Master Program in Cognitive Science and covers all competencies that are necessary to study in English. It focusses on productive skills that will be practiced by means of discussions and short presentations on study-related issues. Using a task-based approach, listening, reading, writing and speaking skills will be trained intensively and social and intercultural competencies will be included as well. Authentic lectures and academic texts on chosen topics related to philosophy, psychology and neuroscience will be used throughout the course.

The course will be accompanied by a Moodle component to enhance classroom teaching and self-study at home. The Zoom-information will be also provided in Moodle.

At the end of the course the participants have to write a final test that will comprise all four skills taught in class.

Literature: Materials compiled from a variety of sources will be used.

## Biostatistics

*SEMINAR*

**BIostatISTICS (119212)**

MARTIN BORDEWIECK

**TERM:** Winter 2020/21  
**MEETING TIME:** October 12 – October 23: 9 - 12:15  
**ROOM:** IA 0/158-79 (PC-Pool 1) (IN PERSON or ONLINE)

"Biostatistics" will cover the basic statistical methods used by researchers in the life sciences to collect, summarize, analyze, and draw conclusions from data. The topics include descriptive statistics, univariate statistical tests, and experimental design.

## Mathematical Skills

*SEMINAR*

**MATHEMATICS AND COMPUTERSCIENCE FOR MODELING (310034)**

JAN TEKÜLVE

**TERM:** Winter 2020/21  
**MEETING TIME:** October 12 – October 23: 13 – 15:30  
**ROOM:** IA 0/158-79 (PC-Pool 1) (IN PERSON)

The "Informatics and Mathematics" preparatory course will combine a hands-on introduction to programming in python with a revision of elementary mathematical concepts. The topics include data types, data structures, control structures and data visualisation on the programming side and they will be applied to vector/matrix calculation, integration/differentiation of functions and differential equations.

# A1. Introduction to Cognitive Science

## A1.

Introduction to Cognitive Science

**OBLIGATORY FOR EVERY FIRST YEAR STUDENT**

*LECTURE & SEMINAR*

**INTRODUCTION TO COGNITIVE SCIENCE**

**(LECTURE 030007) (EXERCISE 030106)**

PROF. ALBERT NEWEN, PROF. MARTIN BRÜNE,  
PROF. ONUR GÜNTÜRKÜN, PROF. NIKOLAI AXMACHER,  
PROF. NIKOL RUMMEL, PROF. MARKUS WERNING  
PROF. TOBIAS SCHLICHT, PROF. GREGOR SCHÖNER,  
PROF. LAURENZ WISKOTT, PROF. SEN CHENG

<b>TERM:</b>	Winter 2020/21
<b>LECTURE:</b>	Wednesday, 10 – 12 (First Meeting: 28.10.2020)
<b>ROOM:</b>	<b>ONLINE</b>
<b>SEMINAR:</b>	Wednesday, 12 – 14 (First Meeting: 04.11.2020)
<b>ROOM:</b>	GA 03/49, first three meetings: tbc Online or NB 02/77
<b>CP:</b>	6

### Attention:

- The time of the lecture will not vary but the time of the seminar will vary somewhat: The details of the seminar plan will be announced later.
- Lecture and Seminar #14 take place in LWL-Universitätsklinik Bochum, Alexandrinenstraße 1, 44791 Bochum

The lecture introduces the interdisciplinary field of cognitive science in combining philosophy, psychology, computational modeling and neurosciences. The course has the aim to deliver important basic knowledge from empirical sciences in the framework of theory formation. The credit points are delivered on the basis of a written examination and of some active work in the obligatory additional seminar.

### The structure of the lecture:

1. Introduction: History of Cognitive Science
2. Basic Concepts in Cognitive Science
3. Cognitive Neuroscience of Perception
4. Modeling Vision
5. Consciousness of Perception
6. Development of Vision
7. Enacted and Embodied Cognition
8. Models of Motor Control
9. Cognitive Neuroscience of Emotion
10. Theories of Emotion
11. Psychology of Learning
12. Cognitive Neuroscience of Memory
13. Models of Learning and Memory
14. Social Cognition: Evolution, Development, Pathology

## BM. Basic Methods

Students are expected to learn (at least) three out of four basic methods: If you have a BA in psychology, you can skip the “Experimental Psychological Lab” but have to pass the three other basic methods. If you have a BA in philosophy you can skip the course “Logic” but have to learn the other three methods. Some with a BA in neuroscience can skip method BM 4. All the other students need to study all basic methods. Exceptions can be made if someone can prove to have already studied the content of a course but need explicit approval by Dr. Alfredo Vernazzani ([alfredo-vernazzani@daad-alumni.de](mailto:alfredo-vernazzani@daad-alumni.de)) or by Prof. Dr. Albert Newen ([albert.newen@rub.de](mailto:albert.newen@rub.de)).

One of the basic skills that need to be acquired during the program is the ability to write academic essays. This skill is not taught as one of the Basic Methods. It needs to be acquired during your course work. To do so, each student must write at least one essay in their first year of study, typically in C1 to C4. Students with little or no background in academic writing should write their essay in one of the courses that are sub-labelled “academic essay writing”. Those courses enable you to write academic texts as it will be needed for your master thesis, conference applications, or job applications.

### BM1.

#### BM1. Experimental Psychology Lab

*SEMINAR*

**EXPERIMENTAL PSYCHOLOGICAL LAB (119213)**

DR. SIMON E. BLACKWELL

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Thursday, 12 – 14 (First meeting: 05.11.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

The Experimental Psychology Lab course aims at introducing the principles of experimental psychology. The participants will learn how to plan and conduct own experimental studies, and how to analyze the data.

As a result, all participants will write a first scientific report. The lab course will be held in small groups.

*SEMINAR***LOGIC AND PHILOSOPHICAL METHODOLOGY (030093)**

JUN. PROF. PETER BRÖSSEL

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Tuesday, 14 – 16 (First meeting: 27.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

The aim of this course is to provide an overview of the fundamental philosophical methods relevant for theory construction in cognitive science and in philosophy. Students will acquire (i) basic competences in classical logic and probability theory, (ii) an introduction to methods of concept clarification such as conceptual analysis, explication, and explicit and implicit definitions and (iii) insights into the basics of constructing, testing, and revising theories and models within cognitive science and philosophy. A part of the course will be devoted to practical exercises to consolidate the acquired competencies. A precondition for receiving ECTS points is 1.) to submit weekly homework regularly and 2.) to pass the written exam at the end of the course.

Literature: Nolt J., Rohatyn D., Varzi A. 2011. Logic. Schaum's Outlines.

## General Remark Concerning BM3 – Neural Networks

A basic course in neural networks is obligatory. The course of Prof. Schöner is the standard course for the students in Cognitive Science. If you are coming with more background in mathematics, you feel free to choose other offers. A BA in informatics or mathematics or an equivalent knowledge of mathematics and programming is required in this course. Students only have to pass one course in BM3.

# BM3.

BM3. Neural Networks

*LECTURE & EXERCISE*

**COMPUTATIONAL NEUROSCIENCE – NEURAL DYNAMICS**

**(310001 & 310011)**

PROF. GREGOR SCHÖNER

<b>TERM:</b>	Winter 2020/21
<b>LECTURE:</b>	Thursday, 14 – 16 (First Meeting: 29.10.2020)
<b>ROOM:</b>	ONLINE
<b>EXERCISE:</b>	Thursday, 16.15 – 17.00 (First Meeting: 05.11.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

This course is recommended as the standard course for BM3. A further background in informatics or mathematics is not required.

This course lays the foundations for a neurally grounded understanding of the fundamental processes in perception, in cognition, and in motor control, that enable intelligent action in the world. The theoretical perspective is aligned with ideas from embodied and situated cognition, but embraces concepts of neural representation and aims to reach higher cognition. Neural grounding is provided at the level of populations of neurons in the brain that form strongly recurrent neural networks and are ultimately linked to the sensory and motor surfaces.

The theoretical concepts on which the course is based come from dynamical systems theory. These concepts are used to characterize neural processes in strongly recurrent neural networks as neural dynamic systems, in which stable activation states emerge from the connectivity patterns within neural populations. These connectivity patterns imply that neural populations represent low-dimensional feature spaces. This leads to neural dynamic fields of activation as the building blocks of neural cognitive architectures. Dynamic instabilities induce change of attractor states from which cognitive functions such as detection, change, or selection decisions, working memory, and sequences of processing stages emerge. The course partially follows a textbook (Dynamic Thinking—A primer on Dynamic Field Theory, Schöner, Spencer, and the DFT research group. Oxford University Press, 2016), of which chapters will serve as reading material. Exercises will focus on hands-on simulation experiments, but also involve readings and the writing of short essays on interdisciplinary research topics. Tutorials on mathematical concepts are provided, so that training in calculus and differential equations is useful, but not a prerequisite for the course.

Please find more information at <https://www.ini.rub.de/teaching/courses/>

*LECTURE & EXERCISE***ARTIFICIAL NEURAL NETWORKS (310002+310012)**

PROF. SEN CHENG

<b>TERM:</b>	Winter 2020/21
<b>LECTURE:</b>	Monday, 16 – 18 (First Meeting: 26.10.2020)
<b>ROOM:</b>	ONLINE
<b>EXERCISE:</b>	Friday, 10-12 (First Meeting: 06.11.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

Artificial neural networks (ANN) were inspired by the architecture and function of the brain. Nevertheless, their greatest strength is not that they are good models of the brain, but rather that they are powerful function approximators. Since the 1980's many types of ANN have been developed and tricks for training ANNs on data proliferated. Recent advances in computing hardware and the availability of large datasets have made it possible to train ANNs such that they perform better than humans, e.g. on image recognition. In this class, students will, firstly, gain a theoretical understanding of the principles underlying the methods applied to neural networks and, secondly, learn practical skills in implementing neural networks and applying them for data analysis.

Topics: optimization problems, regression, logistic regression, biological neural networks, model selection, universal approximation theorem, perceptron, MLP, backpropagation, deep neural networks, recurrent neural networks, LSTM, Hopfield network, Boltzmann machine

Software: python, numpy, scipy, matplotlib, scikit-learn, tensorflow

Moodle-Link: <https://moodle.ruhr-uni-bochum.de/m/enrol/index.php?id=22627>

Prerequisites: Calculus, linear algebra, statistics, programming.

*LECTURE***CLINICAL NEUROPSYCHOLOGY (112621)**

PROF. BORIS SUCHAN

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Tuesday, 10.00 – 12.00 (First Meeting tbc: 27.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	3

Aim of this lecture is to get an insight in the organization of the human brain, functional neuroanatomy and neuropsychology. Starting with an overview of basic methods used in neuroscience, the full brain starting at the occipital lobe and ending at the frontal lobe will be explored with respect to its functional organization. Beside functional organization, neuropsychological syndromes like neglect apraxia and amnesia will be discussed.

## Literature:

Kolb & Wishaw: Fundamentals in human neuropsychology.

K.M. Hellmann & E. Valenstein (1993). Clinical Neuropsychology: Oxford University Press.

## C. Topics Selection

# C1.

C1. Social Cognition & Meta-Science

*SEMINAR ESSAY WRITING*

**EPISTEMOLOGY: UNDERSTANDING IN SCIENCE AND THE ARTS.  
DISCUSSING CATHERINE ELGIN'S BOOK "TRUE ENOUGH" (030098)**  
DR. ALFREDO VERNAZZANI

**TERM:** Winter 2020/21  
**MEETING TIME:** Thursday, 10 – 12 (First Meeting tbc: 29.10.2020)  
**ROOM:** GABF 04/358 (IN PERSON)  
**CP:** 6

Much of the epistemological tradition has valorized truth and knowledge. While truth and knowledge have an undeniable epistemic value, recently philosophers have started raising doubts that a knowledge-centered epistemology can hope to capture the epistemic standing of contemporary science. Science aims to increase our understanding of how the natural world works. But what does it mean to understand something? Can understanding be reduced to knowledge? Many philosophers today believe that understanding and knowledge represent two distinct kinds of epistemic achievement. For instance, while knowledge is factual, it is matter of debate whether understanding is factual as well.

A major recent contribution to the debate is provided by Catherine Z. Elgin's latest book *True Enough* (MIT Press, 2017). In this work, Elgin defends a non-veritist account of understanding that sheds light on the nature of understanding in both science and the arts. On this account, not only science, but the arts as well, contribute to enhance our understanding of the world.

Part of the reading material will be made available through Moodle, but I recommend that students buy the book. Access to the Moodle seminar requires a password, which will be disclosed on the first meeting, or alternatively, by email.

The seminar should take place in person, but we will shift online in case new distancing rules are enforced.

As a way of introduction, I recommend reading the following papers:

Catherine Z. Elgin (2004), "True Enough" *Philosophical issues* 14, pp. 113-131.  
Michael Hannon (forth.), "Recent Work in the Epistemology of Understanding" *American Philosophical Quarterly*.

**WEBINAR:** At the end of the seminar, there will be a 2 hours' webinar with Catherine Z. Elgin (Harvard University) on her book. Active participation in the webinar will be part of the examination. Further details will be disclosed on the first meeting day.

**C1.**

Social Cognition &amp; Meta-Science

SEMINAR

**THE ETHICS OF ARTIFICIAL INTELLIGENCE (030090)**

KRZYSZTOF DOLEGA

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Wednesday 14 – 16 (First Meeting tbc: 28.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

Much of our everyday lives - from what we see in our social media feeds, to whether or not we get a bank loan - is governed by artificially intelligent systems. As the algorithms behind contemporary technology become more sophisticated they take over more and more of human decision-making. However, the ways in which these algorithms draw inferences are usually opaque and the conclusions they draw have often been found to be biased towards certain outcomes. Thus, the questions of the ethical ramifications regarding the use of such systems have become especially pertinent.

The course deals with ethics of artificial intelligence, focusing on issues related to machine learning (algorithmic bias, interpretability, fairness, responsibility in algorithmically assisted decision-making, privacy and surveillance, etc.), but other topics in the ethics of technology specific to artificial agents, human-robot interactions, and super intelligence will also be discussed. No previous technical knowledge of machine learning or ethics is presupposed, though general background in philosophy will be helpful. Course meetings will be divided into three parts, each dedicated to elucidating different aspects of the topic. These sections will roughly correspond to the ethical theory background behind debates in AI ethics, issues associated with the technical side of current AI systems, and specific, real world use cases and their ramifications.

Recommended readings:

- <https://plato.stanford.edu/entries/ethics-ai/>
- Lo Piano, S. (2020) Ethical principles in machine learning and artificial intelligence: cases from the field and possible ways forward. *Humanit Soc Sci Commun* 7: 9. <https://doi.org/10.1057/s41599-020-0501-9>
- The Oxford Handbook of Ethics of AI. (2020). Edited by Markus D. Dubber, Frank Pasquale, and Sunit Das, Oxford University Press.

**C1.**

Social Cognition &amp; Meta-Science

*SEMINAR***INTRODUCTION TO EXPERIMENTAL PHILOSOPHY (030088)**

JUN-PROF. DR. JOACHIM HORVATH

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Thursday 10 – 12 (First Meeting tb: 29.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

Experimental philosophy is a still quite recent philosophical movement that started its life in the early 2000s. The initial idea was to investigate the psychology of philosophical thought experiments, with a special focus on intuitions about thought experiment cases, and how they might vary with philosophically irrelevant factors. However, experimental philosophy has broadened its scope considerably since then, and now also includes studies that use corpus analysis, methods from psycholinguistics, or behavioral data, e.g., concerning the ethical behavior of professional moral philosophers in “real life”. We will begin this course with an introduction and overview concerning what experimental philosophy is all about, followed by discussion of some classic papers in experimental philosophy, and continuing with more advanced and/or methodological topics, such as the basics of experimental design and test statistics, or the replication crisis in psychology, and how it affects experimental philosophy. Time permitted, the course will conclude with a little experimental project of our own and/or work-in-progress by members of the EXTRA research group. Basic familiarity with philosophical methods, experimental design, or the philosophy of psychology would be helpful, but is not at all required for participation.

**C1.**

Social Cognition &amp; Meta-Science

*SEMINAR***THE CONCEPT OF AFFORDANCES BEYOND ECOLOGICAL  
PSYCHOLOGY (030097)**

DR. ROY DINGS

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Wednesday 14 – 16 (First Meeting tbc: 28.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

'Affordances' are possibilities for action offered by the environment. This concept was introduced by James J. Gibson in the 1960s to play a pivotal role in his ecological approach to vision science. Since then, it has become widespread across various fields of cognitive science. In this seminar we will critically evaluate this trend and see whether and to what extent the concept of affordances is up to the many tasks it has been given. Questions to be addressed include, but are not limited to: How did Gibson originally conceptualize affordances and how was it revised by e.g. Harry Heft and Edward Reed?; what role do affordances play in our understanding of e.g. memory and language?; to what extent can affordances help us understand typically human behavior, e.g. intentional behavior and socially mediated behavior?; do affordances have a place, as some have argued, in fields such as psychiatry, ethics and religious studies?

## SEMINAR

**MENTAL REPRESENTATION AND SITUATED COGNITION (030104)**

PROF. DR. MARKUS WERNING, DR. ANCO PEETERS

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Thursday 12 – 14 (First Meeting: 29.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6
<b>TUTORIAL:</b>	Tuesday, 12:00 - 14:00, GA 04/187 (First Meeting: 27.10.2020)

A revolution is taking place in the Philosophy of Mind and Cognitive Science: Whereas there used to be wide agreement that mental representations are the main building blocks of the mind, the new paradigm of situated cognition seeks to dethrone this view. Mental representations have been postulated to explain the interaction between humans or non-human animals and the world: They serve as a relay between perception and action and provide a format of cognition where inferences take place by means of operations on internal vehicles that carry external content. Positions of situated cognition are heterogenous and range from moderate to radical positions that finally aim at abolishing the idea of mental representation tout courts. The multifarious proponents of situated cognition try to characterize cognition by recurring to the four Es: embodied, enacted, embedded and extended.

The seminar will provide an overview of the current controversies on mental representation and situated cognition. It starts from an outline of the Representational Theory of Mind and leads over to the debate between classicist and connectionist architectures. We will then move on to introduce embodied views of representation according to which cognition is not decoupled from sensorimotor processes but grounded therein. A further step will lead us to the idea that cognition extends beyond the body and essentially involves environmental factors, such as cultural tools. Returning to the questions of the format of cognition we will discuss enactivist positions, partly inspired by the phenomenological tradition, and relate recent debates in situated cognition to the predictive processing approach on perception, memory, and action.

Students will have the opportunity to link up with our DFG Research Training Group “Situated Cognition” as well as with our DFG research group “Constructing Scenarios of the Past”. Aside from active participation, participants will be expected to give a presentation in English. Assistance regarding the English language will be provided.

Tutorial: The seminar will be accompanied by an optional tutorial in which aspects of the teaching material will be worked through and deepened.

## Literature

Chemero, A. (2011). *Radical Embodied Cognitive Science*. Cambridge, MA: MIT Press.

Fodor, J., & Pylyshyn, Z. (1988). Connectionism and Cognitive Architecture: A Critical Analysis. *Cognition*, 28, 3–71.

- Gallagher, S. (2017). *Enactivist Interventions: Rethinking the Mind*. Oxford: Oxford University Press.
- Hohwy, J. (2013). *The Predictive Mind*. Oxford: Oxford University Press.
- Horgan, T., & Tienson, J. (1996). *Connectionism and the Philosophy of Psychology*. Cambridge, MA: MIT Press.
- Werning, M. (2003). Synchrony and Composition: Toward a Cognitive Architecture between Classicism and Connectionism. In B. Löwe, W. Malzkorn, & T. Raesch (Eds.), *Applications of Mathematical Logic in Philosophy and Linguistics* (pp. 261–278). Dordrecht: Kluwer.
- Werning, M. (2012). Non-symbolic compositional representation and its neuronal foundation: Towards an emulative semantics. In M. Werning, W. Hinzen, & E. Machery (Eds.), *The Oxford handbook of compositionality* (pp. 633–654). Oxford University Press.

**C1.***SEMINAR***THE SOCIAL MIND (030102)**

ELMARIE VENTER, M.A.

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Tuesday 10 – 12 (First Meeting tbc: 27.10.2020)
<b>ROOM:</b>	ONLINE AND IN PERSON SESSIONS
<b>CP:</b>	6

Interacting with other agents is a central part of our everyday lives insofar as we rely on others for information about the world and our social environment influence our possibilities for action and interaction. Other agents also serve as a mirror of our own behaviors and intentions and furthermore play a role in how we shape our beliefs and behavior. There are several key philosophical theories concerning social cognition that will form the core of this seminar. Some questions to be addressed in this seminar are: How do we think about other people's minds? What cognitive capacities do we need to think about another agent's mental states? Can non-human agents think about other minds?

Literature:

Literature will be provided on Moodle.

Lavelle, J. S. (2019) *The Social Mind: A Philosophical Introduction*. New York: Routledge.

**C1.**

SEMINAR

**UNIFICATION IN COGNITIVE SCIENCE (030101)**

NINA POTH

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Wednesday 10 – 12 (First Meeting tbc: 28.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

Unifying theories relate a diversity of phenomena under a common framework of understanding, and this ability is often a criterion of theory choice. For example, Copernicus' hypothesis that the Earth moves around the Sun unifies the different motion paths associated with the observations of other planets like Venus or Saturn. This has motivated scientists to value and adopt Copernicus' hypothesis over Ptolemy's hypothesis that the Sun moves around the Earth. Unifying theories are often said to be 'good', but there is much debate about why this is so. Recently, this debate has been carried to the domain of Cognitive Science, a cluster of disciplines such as Psychology, Linguistics, Philosophy, Anthropology, AI and Neuroscience. In this course, we will focus on two questions within this debate.

- (1) What does 'unification' in cognitive science mean?
- (2) Should theories in cognitive science be 'unified'?

To critically discuss these questions, we will proceed in two stages. In the first half of the semester, we will read and discuss introductory material on unification in the Philosophy of Science with a focus on the relation between unification, explanation and theory choice. A general introduction to this topic can be found in

Cat, J. (2017). The Unity of Science, In E. Zalta (ed.), The Stanford Encyclopedia of Philosophy (Fall Edition). URL = <https://plato.stanford.edu/archives/fall2017/entries/scientific-unity/>.

In the second half of the semester, we will focus on unification in the context of Cognitive Science. We will read and discuss a set of recent texts, such as

Danks, D. (2014). *Unifying the mind: Cognitive representations as graphical models*. Mit Press,

Miłkowski, M. (2016). Unification strategies in cognitive science. *Studies in Logic, Grammar and Rhetoric*, 48(1), 13-33 and

Colombo, M., & Hartmann, S. (2017). Bayesian cognitive science, unification, and explanation. *The British Journal for the Philosophy of Science*, 68(2), 451-484.

*ONE-WEEK INTERNSHIP***AUTONOMOUS ROBOTICS (310036)**

PROF. GREGOR SCHÖNER

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	<b>22.-26.02.2021 (ONE WEEK, ALL DAY)</b> (Preliminary meeting at 10:15, 18.02.2021, Room NB 3/57)
<b>ROOM:</b>	NB 02/77
<b>CP:</b>	3

The practical course gives an introduction to mobile robotics with a focus on dynamical systems approaches. In the exercises, the computing environment Matlab is used to control e-puck miniature mobile robots, equipped with a differential drive, combined infrared/proximity sensors and a video camera. The course covers elementary problems in robot odometry, use of sensors and motor control. It then teaches basic dynamic methods for robot navigation, in which the robot's sensors are used for obstacle avoidance and approach to a target location.

Interested students who do not have experience in Matlab should attend the Matlab introduction of the lab exercise Computer Vision (typically the week before this course). Details about availability and credit points have to be clarified early via email.

**Enrollment:** 01.12.2020 - 22.01.2021 Flexnow and/or by the responsible examination office AND via e-mail to [jan.tekuelve@ini.rub.de](mailto:jan.tekuelve@ini.rub.de)

*LECTURE***LEFT BRAIN - RIGHT BRAIN (118111)**

PROF. ONUR GÜNTÜRKÜN

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Thursday, 12- 14 (First meeting tbc: 29.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	3

Most of our brain's processes are executed by different mechanisms in the left and the right hemisphere. Language, spatial orientation, motor control, emotional processing, face perception, and even the ability to comprehend the rhythm of a drum are guided by neural circuits that are differently tuned within the two hemispheres. These asymmetries of mental processing mean that damages of the human brain cannot be understood without a thorough understanding of asymmetries. The lecture aims at explaining the current knowledge about the structure and the mechanisms of cerebral asymmetries by making use of highly interactive teaching methods.

C2.

Perception & Action

*LECTURE*

**EPISTEMOLOGY(030006)**

JUN.-PROF. DR. PETER BRÖSSEL

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Tuesday, 12 – 14 (First Meeting: 27.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

This lecture provides an (opinionated) introduction into the most important topics of epistemology. Those topics are:

- 1.) Theories of Knowledge
- 2.) Theories of Truth
- 3.) Theories of Belief
- 4.) Theories of Justification
- 5.) Sources of Knowledge/Justification
  - 5.1) Perception
  - 5.2) Rational Reasoning
  - 5.3) Testimony

Literature: Bernecker, Sven; Pritchard, Duncan (ed) 2011. The Routledge Companion to Epistemology. Routledge.

*SEMINAR***METAPHYSICS OF SENSORY EXPERIENCE (030100)**

PROF. DR. TOBIAS SCHLICHT

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Friday, 10– 12 (First meeting tbc: 30.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

Right now I am looking at a yellow ball in the middle of my garden lawn. In so doing, I am having a conscious visual experience, constituted by my instantiating certain conscious properties, properties that I would cease to possess if I closed my eyes. Similarly, I can hear various background noises, and I can feel the hardness of the chair I am sitting on. These are further sensory experiences involving further conscious properties.

This seminar is about the nature of conscious sensory properties, like the visual, aural and tactual properties that I am having right now. What kinds of properties are these? How are they structured? Can they be analyzed into more basic components?

We will read and discuss David Papineau's forthcoming book with the same title and will also have the opportunity to discuss questions about the book with David himself when he will join us online for a session. In addition, we will organize a workshop with 10 prestigious speakers in January which rounds up the seminar and will hopefully give students the opportunity to discuss with philosophers of perception themselves.

*LECTURE & EXERCISE***MACHINE LEARNING: UNSUPERVISED METHODS****(310003 & 310013)**

PROF. LAURENZ WISKOTT

<b>TERM:</b>	Winter 2020/21
<b>LECTURE:</b>	Tuesday, 12.15 – 13.45 (First Meeting: 27.10.2020)
<b>EXERCISE:</b>	Tuesday, 9 – 12 (First Meeting: 03.11.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

This course covers a variety of unsupervised methods from machine learning such as principal component analysis, independent component analysis, vector quantization, clustering, self-organizing maps, growing neural gas, Bayesian theory and graphical models. We will also briefly discuss reinforcement learning.

The mathematical level of the course is mixed but generally high. The tutorial is almost entirely mathematical. Criteria for a certificate for the tutorial are an active participation, in particular presentation of selected exercises, and at least 50% in the final exam.

**C3.**

Memory and Learning

*SEMINAR***S DISKURS NEUROPSYCHOLOGIE (118611)**

ANNE BIERBRAUER

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Thursday, 10 – 12 (First meeting: 29.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	3

Max. 5 participants

Within this course you will be provided with an opportunity to participate in an intensive exchange on a predetermined research topic within a small group of people. One of the key features is the invitation of and assistance to guest speakers as well as engagement in scientific talks. The central teaching objective of this course – and thus the basis for the successful participation and awarding of credit points – is regular active participation in the scientific discourse.

*BLOCKSEMINAR***WORKING MEMORY AND COGNITIVE CONTROL (118921)**

PROF. DR. JONAS ROSE, DORIAN RÖDERS, M.Sc.

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	March, 8 <sup>th</sup> -March 12 <sup>th</sup> (Preliminary Meeting: 23.02, 18:00)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	3

This course will cover Working Memory and Cognitive Control from different viewpoints. The students will learn theoretical concepts of both and learn to distinguish working memory from other memory models. One emphasis of the course is the neuronal basis of these concepts. We will talk about measurement techniques and experimental design. There will be a practical exercise in experimental design as well. A second focus will be the comparison of working memory and cognitive control between birds and mammals. We will also discuss current research papers in those areas, which will be presented by the students.

## SEMINAR

**HOW DOES THE MIND GRASP MEANING? THE MENTAL LEXICON AND ITS ROLE IN COGNITION (030099)**

DR. MATTHIAS UNTERHUBER

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Monday, 12 – 14 (First Meeting: 26.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

The human ability to grasp meaning in language is nothing short of stellar. The average language user stores tens of thousands of entries in the mental lexicon and can still access lexical meaning in less than half a second. The seminar will tackle this issue by inquiring how lexical meaning is stored in the human brain. To that end, we will discuss a range of approaches on the structure and nature of the mental lexicon, including its neuro-cognitive underpinnings and its cognitive organizing principles. We will thereby take into account recent findings on the issue of embodiment as well as distributional semantics and examine the general criticism of the concept of a mental lexicon. The discussion will then serve as basis for inquiring how on-line processing of lexical items, as done in EEG experiments, can inform about the structure of the mental lexicon and its interaction with contextual information.

## Recommended Reading:

Aitchison, J. (2012). *Words in the Mind. An Introduction to the Mental Lexicon*. Malden, MA:

Wiley-Blackwell.

Jezek, E. (2016). *The Lexicon. An Introduction*. Oxford: Oxford University Press.

Pustejovsky, J. & Batiukova, O. (2019). *The Lexicon*. Cambridge: Cambridge University Press.

Office Hours: Thursday, 11.30–12.00

Additional Information: The course requires regular online meetings via zoom (a link will be provided) but is planned to include at least three on-site meetings. Despite this, the first meeting will be held online.

## SEMINAR

**COMPOSITIONALITY IN LANGUAGE, MIND AND BRAIN (030105)**

PROF. DR. MARKUS WERNING

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Tuesday, 16 – 18 (First Meeting: 27.10.2020)
<b>ROOM:</b>	GA 04/187 (tbc ONLINE OR IN PERSON)
<b>CP:</b>	6

Compositionality is a key concept in linguistics, the philosophy of mind and language, and throughout the cognitive sciences. Understanding how it works is a central element of syntactic and semantic analysis, and a challenge for models of cognition. In this seminar, we will read papers on the state of the art in all aspects of the subject from every relevant field. They reveal the connections in different lines of research, and highlight its most challenging problems and opportunities. The force and justification of compositionality have long been contentious. First proposed by Frege as the notion that the meaning of an expression is syntax-dependently determined by the meaning of its parts, it has since been deployed as a constraint on the relation between theories of syntax and semantics, as a means of analysis, and, more recently, as underlying the structures of representational systems such as mental concepts, computer programs, and neural architectures. This seminar will put an emphasis on the empirical investigation and theoretical modelling of compositionality in language, mind and brain. It explores these and many other dimensions of one of the most exciting fields in the study of language and cognition.

Aside from active participation, participants will be expected to give a presentation in English. Assistance regarding the English language will be provided.

Tutorial: The seminar will be accompanied by several tutorial sessions that provide an introduction into EEG methodology relating to the investigation of compositionality and related issues.

## Literature

- Cosentino, E., Baggio, G., Kontinen, J., & Werning, M. (2017). The time-course of sentence meaning composition. N400 effects of the interaction between context-induced and lexically stored affordances. *Frontiers in Psychology*, 8(818). <https://doi.org/10.3389/fpsyg.2017.00813>
- Werning, M., Hinzen, W., & Machery, M. (Eds., 2012). *The Oxford Handbook of Compositionality*. Oxford: Oxford University Press.

*SEMINAR***INTRODUCTION TO MODEL THEORY (030046)**

DR. GRIGORY OLKHOVIKOV

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Friday, 14 – 16 (First Meeting tbc: 30.10.2020)
<b>ROOM:</b>	GABF 04/358
<b>CP:</b>	3

This is Part II of the introductory course in model theory. The textbook used is B. Poizat "A Course in Model Theory" and the students who did not take the first part of the course are advised to study pp.1-55 of the said book before joining this second part. The focus in this part of the course will be on Chapters 5-7 of the book.

Literature:

B. Poizat. "A Course in Model Theory. An Introduction to Contemporary Mathematical Logic". Springer, 2000.

## AM. Advanced Methods

Advanced methods are usually studied in the second semester. The following courses are exceptions, while the "fMRI"-course is only offered in the winter term.

### Remarks for AM5

There is a laboratory lab class on molecular genetics offered within the semester break for students with a background knowledge in biology, molecular biology or psychobiology. The class will be held in German language. Participation in this basic lab class is required for attending the advanced lab class next summer semester.

### Remarks for AM7

Students who already have basic knowledge in cognitive neuroscience can choose to learn the "fMRI"-technique in the first semester. Necessary background: basic knowledge in cognitive neuroscience. The FMRI-seminar must be integrated into the course program during the first or the third semester; in the case you want to learn the FMRI –technique in the first semester, an individual application for the course is necessary: [N.N.](#) \*\*\*t.b.a.

Further advanced methods can be found in the program from the last summer semester on our webpage: [http://www.ruhr-uni-bochum.de/philosophy/mcs/program\\_courses.html](http://www.ruhr-uni-bochum.de/philosophy/mcs/program_courses.html). They will again be offered in the upcoming summer semester.

## SEMINAR

**INTRODUCTION TO EXPERIMENTAL PHILOSOPHY (030088)**

JUN.-PROF. DR. JOACHIM HORVATH

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Thursday, 10 – 12 (First meeting tbc: 27.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

Experimental philosophy is a still quite recent philosophical movement that started its life in the early 2000s. The initial idea was to investigate the psychology of philosophical thought experiments, with a special focus on intuitions about thought experiment cases, and how they might vary with philosophically irrelevant factors. However, experimental philosophy has broadened its scope considerably since then, and now also includes studies that use corpus analysis, methods from psycholinguistics, or behavioral data, e.g., concerning the ethical behavior of professional moral philosophers in “real life”. We will begin this course with an introduction and overview concerning what experimental philosophy is all about, followed by discussion of some classic papers in experimental philosophy, and continuing with more advanced and/or methodological topics, such as the basics of experimental design and test statistics, or the replication crisis in psychology, and how it affects experimental philosophy. Time permitted, the course will conclude with a little experimental project of our own and/or work-in-progress by members of the EXTRA research group. Basic familiarity with philosophical methods, experimental design, or the philosophy of psychology would be helpful, but is not at all required for participation.

*PRACTICAL COURSE/EXERCISE***NEUROPSYCHOLOGICAL METHODS: FMRI (118519)**

PROF. NIKOLAI AXMACHER, DR. PHIL. NAT. ERHAN GENC

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	First Meeting: 28.10.2020, 10-12, following sessions – see below
<b>ROOM:</b>	IB 02/109. PC-Pool (IN-PERSON)
<b>CP:</b>	tba

**Practical course and seminar have to be attended both together. They cannot be taken individually. Please also see remarks for AM7 above.**

This practical course can only be taken in combination with the seminar. Participants must participate in both courses to get credit points: The aim of this course is to learn how magnetic resonance imaging can be used to acquire new scientific knowledge. Its main aim is to give the participants an insight into the evaluation and analysis of structural and functional MRI data and present their results in a scientific manner. The structural data are composed of high-resolution anatomical and diffusion-weighted measurements (DTI) which can be used to visualize the white matter fiber bundles. The functional data include common fMRI and restingstate measurements to determine spontaneous brain activity. To pass this course, participants must be present on at least 2/3 of the seminar. This course is designed specifically for students of the cognitive science master program and due to the practical exercises, the number of participants is limited to 12.

After the subscription in eCampus where everyone is placed on the waiting list participants will be selected during the first meeting.

Please register online if interested.

Sessions:

Mi (28.10.2020), 10:00 bis 12:00, IB 02/109. PC-Pool or via Zoom

Sa (16.01.2021), 10:00 bis 18:00, IB 02/109. PC-Pool

So (17.01.2021), 10:00 bis 18:00, IB 02/109. PC-Pool

Sa (30.01.2021), 10:00 bis 18:00, IB 02/109. PC-Pool

So (31.01.2021), 10:00 bis 18:00, IB 02/109. PC-Pool

## SEMINAR

## NEUROPSYCHOLOGICAL METHODS: FMRI (118518)

PROF. NIKOLAI AXMACHER, DR. PHIL. NAT. ERHAN GENC

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	First Meeting: 28.10.2020, 10-12, following sessions – see below
<b>ROOM:</b>	IB 02/109. PC-Pool (IN-PERSON)
<b>CP:</b>	t.b.a.

**Practical course and seminar have to be attended both together. They cannot be taken individually. Please also see remarks for AM7 above.**

This seminar can only be taken in combination with the practical course. Participants must participate in both courses to get credit points: The aim of this course is to learn how magnetic resonance imaging can be used to acquire new scientific knowledge. Its main aim is to give the participants an insight into the evaluation and analysis of structural and functional MRI data and present their results in a scientific manner. The structural data are composed of high-resolution anatomical and diffusion-weighted measurements (DTI) which can be used to visualize the white matter fiber bundles. The functional data include common fMRI and restingstate measurements to determine spontaneous brain activity. To pass this course, participants must be present on at least 2/3 of the seminar. This course is designed specifically for students of the cognitive science master program and due to the practical exercises, the number of participants is limited to 12.

After the subscription in eCampus where everyone is placed on the waiting list participants will be selected during the first meeting.

Please register via online registration if interested.

Sessions:

Mi (28.10.2020), 10:00 bis 12:00, IB 02/109. PC-Pool or via Zoom

Sa (16.01.2021), 10:00 bis 18:00, IB 02/109. PC-Pool

So (17.01.2021), 10:00 bis 18:00, IB 02/109. PC-Pool

Sa (30.01.2021), 10:00 bis 18:00, IB 02/109. PC-Pool

So (31.01.2021), 10:00 bis 18:00, IB 02/109. PC-Pool

## D1. Free Selection

There is one free selection module in the program which can take any course of the program you passed and do not need to complete the modules. If there is a problem to complete a module, in principle, the courses in the free selection module can be used for obligatory modules. But this has to be explicitly confirmed in advance by Dr. Alfredo Vernazzani or Prof. Albert Newen. Students are only allowed to take maximally 3 German courses in the whole program up to maximally 12 credit points.

D1.

Free Selection

*LECTURE*

**STRESS (117031)**

PROF. OLIVER WOLF

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Monday, 12 – 14 (First Meeting: 26.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	tba

Ursachen und Folgen von Stress werden aus einer psychologischen Perspektive beleuchtet. Es werden sowohl Aspekte der biopsychologischen Grundlagenforschung als auch Aspekte der anwendungsbezogenen Forschung (Gesundheitspsychologie, Klinische Psychologie, Wirtschaftspsychologie) berücksichtigt. Die Vorlesung gibt einen Überblick über aktuelle Forschungsthemen der Stressforschung. Folgende Fragen werden adressiert: Was ist Stress? Was ist ein Stressor? Welche psychischen und biologischen Veränderungen treten in Reaktion auf Stress auf? Wie kann man sich die große interindividuelle Varianz im Stresserleben erklären? Wann ist Stress adaptiv und unter welchen Umständen kann er negative Konsequenzen haben (maladaptiv sein)? Welche Auswirkungen hat Stress auf affektive und kognitive Prozesse? Wie wird unser Körper und unser Gehirn durch Stress beeinflusst? Neben psychologischen Ansätzen werden Theorien und Befunde aus den Forschungsfeldern der Psychoneuroendokrinologie, der Psychoneuroimmunologie und den affektiven und kognitiven Neurowissenschaften besprochen.

*LECTURE*  
**LERNEN (112231)**  
PROF. ONUR GÜNTÜRKÜN

<b>TERM:</b>	Winter 2020/21
<b>LECTURE:</b>	Thursday, 16.00 – 18.00 (First Meeting: 29.10.2019)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	3

Die Vorlesung soll einen Überblick über die Lerngesetze, ihre Anwendungsmöglichkeiten in therapeutischen Verfahren und die hirneurologischen Grundlagen von Lern- und Gedächtnisprozessen bieten. Soweit möglich, sollen alle drei Aspekte immer zusammen besprochen werden; z.B. werden bei der klassischen Konditionierung zuerst die historischen Entwicklungslinien, dann die Details des eigentlichen Lernphänomens, dann die therapeutischen Anwendungen (z.B. systematische Desensibilisierung) und anschließend die synaptischen Mechanismen referiert.

Begleitend zur Vorlesung "Lernen" von Prof. Dr. Güntürkün soll dieses Seminar verschiedene Fragen zur wissenschaftlichen Auseinandersetzung mit dem Thema Lernen vertiefen. Dazu werden die Studierenden wissenschaftliche Artikel und Kapitel aus Lehrbüchern in Referatsform vortragen.

Literatur:

Als Vorbereitung ist folgendes Buch zu empfehlen: The Principles of Learning and Behaviour, Michael Domjan, 7. Auflage, 2015

*LECTURE***SOZIALPSYCHOLOGIE II (112321)**

PROF. WILHELM HOFMANN

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Thursday, 10.00 – 12.00 (First Meeting: 29.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	3

Max. 5 participants

Wie erfahren wir, wer wir sind? Brauchen Menschen eher Freiheit oder eher Orientierung? Was ist das Unbewusste? Wie gehen wir mit Misserfolgen um und wie erreichen wir unsere Ziele? Wie können wir uns motivieren, etwas zu tun? Wie überwinden wir Hindernisse? Neigen alle Menschen dazu, andere zu diskriminieren? Haben wir alle aggressive Anteile? Wie entsteht Aggression? Und wie entstehen Konflikte zwischen Gruppen? Wie kann man Zivilcourage fördern? Fördert Brainstorming die Kreativität oder behindert sie sie?

In der Vorlesung zur Sozialpsychologie 2 wollen wir die Inhalte der Vorlesung zur Sozialpsychologie 1 vertiefen. Zudem sollen Anwendungsaspekte diskutiert und Forschungsmethoden anhand von Experimenten dargestellt werden. Brücken zur soziologischen, philosophischen, konsumentenpsychologischen, organisationspsychologischen, emotionspsychologischen, motivationspsychologischen und wirtschaftspsychologischen Forschung werden geschlagen, Überschneidungen werden diskutiert.

**D1.**

Free Selection

*VORLESUNG***GRUNDLAGEN DER NEURO- UND SINNESPHYSIOLOGIE (112241)**

PROF. NIKOLAI AXMACHER

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	<b>asynchron</b> (previous meeting time Wednesday, 8-10, First meeting: 28.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	3

Ziel der Vorlesung ist es, ein Grundverständnis der Informationsverarbeitung im ZNS und der Sinnesorgane zu übermitteln. Neben den anatomischen Grundlagen im Aufbau von Nervenzellen werden auch das Verhalten, d.h. die Erregungsleitung und -übertragung, sowie die Verrechnungsprozesse an Synapsen näher betrachtet. Hierbei soll auch ein Schwerpunkt auf die synaptische Plastizität gelegt werden. Auch die in der Psychologie und Medizin eingesetzten diagnostischen Verfahren, wie z. B. das EEG, sollen erläutert werden.

**D1.**

Free Selection

*VORLESUNG***MOTIVATION UND VOLITION (112271)**

DR. MARLIES PINNOW

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Monday, 16 – 18 (First meeting: 26.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	3

Die Vorlesung führt in das Gebiet der Motivations- und Volitionspsychologie ein. In einem ersten Abschnitt wird in einem kurzen Überblick über die Forschungs- und Problemgeschichte, eine Gegenstandsbestimmung der Motivationspsychologie und ihrer zentralen Fragestellungen erarbeitet. Darüber hinaus werden zentrale Methoden der Motivationsforschung erörtert. Auf dieser Basis werden dann einzelne Verhaltenssysteme wie Hunger, Neugier, Angst, Leistung, Aggression diskutiert. Spezifische Ansätze wie Attributionstheorien, Erwartungs- X Wert-Modelle, Instrumentalitätstheorie etc. werden innerhalb der Motivsysteme oder als Exkurse behandelt. Den Abschluss bildet eine Erörterung handlungstheoretischer und volitionaler Probleme zielgerichteten Verhaltens.

The course will be held in German. Students may choose to take the exam in English. The recommended literature for those following this option is:

Heckhausen J. & Heckhausen, H. (2010). Motivation and Action. Cambridge: Cambridge University Press.

Schmalt, H.-D. & Langens, T. A. (2009): Motivation (4. vollständig überarbeitete Auflage). Stuttgart: Kohl-

hammer Heckhausen, J. & Heckhausen, H. (2010): Motivation und Handeln (4. Auflage). Berlin: Springer.

**D1.**

Free Selection

*BLOCKSEMINAR***SOCIAL PSYCHOLOGY OF PREJUDICE (112322)**

LUSINE GRIGORYAN

**TERM:** Winter 2020/21  
**MEETING TIME:** Wednesday, 10-12 (First Meeting tbc: 28.10.2020)  
**ROOM:** ONLINE  
**CP:** 6

Max. 5 participants

Social psychology of prejudice II: In this seminar, students will apply their knowledge of social-psychological theories of intergroup relations to real-life problems by designing an intervention program to reduce prejudice among different target groups. This intervention program should be presented as an online class. English is the language of instruction.

**D1.**

Free Selection

*SEMINAR***CROSS CULTURAL PSYCHOLOGY (112327)**

LUSINE GRIGORYAN

**TERM:** Winter 2020/21  
**MEETING TIME:** Wednesday, 12 - 14 (First Meeting tbc: 28.10.2020)  
**ROOM:** ONLINE  
**CP:** 6

Max. 5 participants

This seminar focuses on the relationship between psychological functioning and culture. We will cover the following topics: How to measure differences between cultures? Cognition, emotion, and culture; Personality across cultures; Migration and acculturation; Intercultural communication and diversity management. Students who attended this seminar in SoSe 2020 cannot register. English is the language of instruction.

**D1.**

Free Selection

*SEMINAR***UNDERSTANDING ECONOMIC MODELS (030069)**

DR. BENEDIKT FAIT

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Wednesday, 10 – 12 (First meeting tbc: 28.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

Though the philosophical reflection on economics is as old as economics itself, the first philosopher of economics in the proper sense of the word is John Stuart Mill (1806–1873). Since then, there has been an ongoing and quite diverse development of the subject. Particularly in the last thirty years, economics and philosophy have come closer together due to advances and aspirations on both sides. But still, economics is a science with certain peculiarities which makes it quite interesting from the philosophy of science point of view. Albeit philosophy of economics comprises also ethical issues, the seminar will focus solely on theoretical issues, especially on models and causation in economics. Hence, the (highly interrelated) questions the seminar will deal with are, among others: what is economics in the first place? What is a (good) economic model? How must one assess the fact that many economic models rely on highly unrealistic assumptions? What about causation in economics – do paradigmatic macroeconomic generalizations like the Phillips Curve represent causal relationships? What is the ontological status of economic phenomena? And can economics be a proper science at all?

Prior knowledge of (philosophy of) economics is recommended but not presupposed. The relevant literature will be provided via Moodle. A preliminary discussion will take place at the first meeting.

Literature (suitable for preparation):

Backhouse, R. E. and Medema, S. G. (2009): "On the Definition of Economics", *The Journal of Economic Perspectives*, 23(1), 221–234.

Frigg, R. and Hartmann, S. (2020): "Models in Science", in: Zalta, E. N. (Ed.): *The Stanford Encyclopedia of Philosophy* (Spring 2020 Edition), URL = <<https://plato.stanford.edu/archives/spr2020/entries/models-science/>>.

Hausman, D. M. (2018): "Philosophy of Economics", in: Zalta, E. N. (Ed.): *The Stanford Encyclopedia of Philosophy* (Fall 2018 Edition), URL = <<https://plato.stanford.edu/archives/fall2018/entries/economics/>>.

**D1.**

Free Selection

*SEMINAR***NOVEL APPROACHES TO ASSESS AND TREAT PSYCHOSIS****(115224)**

DR. MAR RUS-CALAFELL

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Wednesday, 10 – 12 (First meeting tbc: 28.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

Max. 3 participants. Registration via e-mail to [sekretariat-newen@rub.de](mailto:sekretariat-newen@rub.de)

This course will focus on new approaches (cognitive, relational and phenomenological) to understand the onset and maintenance (mechanisms) of psychotic disorders. It will develop into specific methods of assessment (for both young and adult population) as well as novel forms of evidence-based psychological treatment. This course will also provide an overview of the work that has been done during the last decade on the application of digital technology to assess and treat psychosis. This seminar will be taught in English.

**D1.**

Free Selection

*SEMINAR***LERNEN: THEORIE UND PRAXIS IM TIERMODELL TAUBE  
(112182)**

PROF. DR. JONAS ROSE, DR. ROLAND PUSCH

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Tuesday, 14 – 16 (First meeting: 27.10.2020)
<b>ROOM:</b>	IA 1/157 (IN PERSON)
<b>CP:</b>	tba

In dieser Veranstaltung soll die experimentelle Arbeit mit Tieren vermittelt werden. Thematisch werden wir uns mit grundlegenden Prozessen des Lernens beschäftigen und diese auf Verhaltensebene untersuchen. Im Rahmen der Veranstaltung werden Tauben von den Teilnehmerinnen trainiert, um so lerntheoretische Fragestellungen zu untersuchen. Diese Verhaltensdaten werden wir dann auswerten um so einen Einblick in diese faszinierenden Mechanismen zu bekommen.

## SECOND YEAR PROGRAM

### I. Interdisciplinary Research Module

Choosing a course from C1 - C4 as a substitute for I1 - I4 is only possible if the substitute course is closely connected to the master thesis project.

I1.

I1. Cognitive Philosophy

*COLLOQUIUM*

**EXTRA RESEARCH COLLOQUIUM "METAPHILOSOPHY AND  
EXPERIMENTAL PHILOSOPHY" (030128)**

JUN-PROF. DR. JOACHIM HORVATH

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Wednesday, 16:30 – 18 (First Meeting tbc: 28.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

In this research colloquium, we will discuss current topics from metaphilosophy and experimental philosophy, broadly construed. The colloquium will also host talks by a number of external guests, many of which are leading experts in their field. Students at the master or doctoral level will be given the opportunity to present their work in English.

*RESEARCH COLLOQUIUM***PHILOSOPHY MEETS COGNITIVE SCIENCE ADVANCED TOPICS ON  
MEMORY AND LANGUAGE (030131)**

PROF. DR. MARKUS WERNING

IN COOPERATION WITH: DR. KRISTINA LIEFKE (FRANKFURT),  
PROF. DR. KOURKEN MICHAELIAN (GRENOBLE), AND DR. ANCO  
PEETERS (BOCHUM)

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Thursday, 16 – 19 (First Meeting: 29.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

In the research colloquium current topics at the interface between Philosophy and Cognitive Science will be discussed. The colloquium hosts talks by leading international experts and local researchers as well as presentations by doctoral and master students. Students will be given the (assisted) opportunity to present their projects in English.

This semester the sessions of the research colloquium will alternate in a bi-weekly rhythm between the topics "Memory" and "Language". The memory talks will be organized in cooperation with Prof. Kourken Michaelian and Dr. Anco Peeters. The language talks will be hosted together with Dr. Kristina Liefke. A detailed schedule will be published in due course at <https://www.ruhr-uni-bochum.de/phil-lang/colloquium.html>. With few exceptions, talks will be held via Zoom and will be open to the international academic public.

# 11.

## Cognitive Philosophy

*RESEARCH COLLOQUIUM*  
**RATIONALITY AND COGNITION (030125)**  
JUN.-PROF. DR. PETER BRÖSSEL

**TERM:** Winter 2020/21  
**MEETING TIME:** Tuesday, 16 – 18 (First Meeting: 27.10.2020)  
**ROOM:** ONLINE  
**CP:** 6

In this seminar we study research articles (some of which will be work in progress) from the intersection of normative epistemology and descriptive epistemology (i.e., psychology and cognitive science). Among others, we investigate formal models of perception, rational reasoning and rational action. Acquaintance with formal methods in philosophy such as logic, set theory and probability theory will be presupposed. Students at the master or doctoral level will be given the opportunity to present their research in English.

# 12.

## 12. Cognitive Psychology

*COLLOQUIUM*  
**RESEARCH COLLOQUIUM GENETIC PSYCHOLOGY (118913)**  
PROF. ROBERT KUMSTA

**TERM:** Winter 2020/21  
**MEETING TIME:** Monday, 16.00 – 18.00 (First Meeting tbc: 26.10.2020)  
**ROOM:** IA 1/161 (tbc ONLINE OR IN PERSON)  
**CP:** 3

This course serves to present the current research work and qualification theses (Bachelor, Master theses, PhD project) of the Genetic Psychology unit. Moreover, invited scientists will present the latest research results in the area of Genetics, Epigenetics and Development Psychobiology. An overview of the topics and speakers will be announced with posters and on the Homepage.

# 12.

Focus Module Psychology

*COLLOQUIUM*

**SCIENTIFIC COLLOQUIUM: COGNITIVE PSYCHOLOGY AND  
PSYCHONEUROENDOCRINOLOGY (115113)**

PROF. OLIVER T. WOLF

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Tuesday, 16.00 – 18.00 (First Meeting: 03.11.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

In this forum, scientific projects (i.e. Master and PhD projects) of the Cognitive Psychology work group will be presented. The main focus is on experimental stress studies. Here we will try to answer the questions, “what makes us stressed” and “how does stress affects our cognitive skills”. In addition, invited guests from our faculty, from other faculties of the RUB and from other universities world wild will present their current research findings on topics that relate to cognitive psychology or psychoneuroendocrinology.

An overview of the schedule will be available on the AE homepage at the beginning of the semester.

The seminar will be held in the English language.

Students in the 3rd semester who think about conducting their master thesis with our AE can participate.

# 12.

Cognitive Psychology

*COLLOQUIUM*

**CURRENT RESEARCH AND GENERAL RESEARCH SKILLS (115914)**

PROF. DR. MAIKE LUHMANN

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Monday, 12 – 14 (First Meeting tbc: 26.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	3

This seminar consists of biweekly sessions and one block session. The date of the block session will be announced in the seminar. In the biweekly sessions, we discuss new publications on psychological methods and research on well-being, loneliness, and personality psychology, and develop general research skills. In the block session, ongoing research projects by the participants will be presented. The seminar is open to everyone.

*SEMINAR***JOURNAL CLUB: NEUROPSYCHOANALYSE (118915)**

PROF. NIKOLAI AXMACHER

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Thursday, 16 – 18 (First Meeting tbc: 29.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	tba

In Analogie zu den Kognitiven Neurowissenschaften - der Untersuchung der neuronalen Korrelate kognitiven Prozesse - wurden in den letzten Jahren auch Konzepte der Psychoanalyse mit bildgebenden Methoden untersucht. Inhalt der Veranstaltung ist die Vorstellung laufender Forschungsarbeiten der Arbeitseinheit Neuropsychologie sowie Vorträge der Gastdozenten zu klinisch-neuropsychologischen Themen. Dabei werden aktuelle Untersuchungen zu zentralen psychoanalytischen Konzepten (Verdrängung, Konversion, Träume, Traumatisierung...), aber auch Studien zu den Mechanismen der psychodynamischen Psychotherapie sowie psychodynamische Konzeptualisierungen neuropsychologischer Symptome vorgestellt und diskutiert. Ein zentrales Lernziel dieser Veranstaltung - und damit auch Grundlage für die erfolgreiche Teilnahme und Leistungsbewertung - ist die regelmäßige aktive Beteiligung am wissenschaftlichen Diskurs. Daher ist eine regelmäßige Anwesenheit im Umfang von mindestens zwei Dritteln der Termine notwendig. Ein Zeitplan mit Informationen über die Themen und Referenten wird zu Beginn des WS per Aushang bekannt gegeben. Auch unter: <http://www.ruhr-uni-bochum.de/neuropsy/>

*LECTURE & EXERCISE***MACHINE LEARNING: UNSUPERVISED METHODS****(310003 & 310013)**

PROF. LAURENZ WISKOTT

<b>TERM:</b>	Winter 2020/21
<b>LECTURE:</b>	Tuesdays, 12:15 – 13:45 (First Meeting: 27.10.2020)
<b>EXERCISE:</b>	Tuesdays, 9 – 12 (First Meeting: 03.11.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	6

This course covers a variety of unsupervised methods from machine learning such as principal component analysis, independent component analysis, vector quantization, clustering, self-organizing maps, growing neural gas, Bayesian theory and graphical models. We will also briefly discuss reinforcement learning.

The mathematical level of the course is mixed but generally high. The tutorial is almost entirely mathematical. Criteria for a certificate for the tutorial are an active participation, in particular presentation of selected exercises, and at least 50% in the final exam.

# 13.

Computational Modeling

*SEMINAR*

**JOURNAL CLUB "LEARNING AND MEMORY" (310026)**

PROF. SEN CHENG

**TERM:** Winter 2020/21  
**MEETING TIME:** Tuesday, 14 – 16 (First Meeting: 27.10.2020)  
**ROOM:** ONLINE  
**CP:** 3

We will focus on the neural basis of learning and memory at the systems level. In each session a journal article will be presented by one participant and discussed by all participants. The articles will be selected particularly in the areas of spatial and episodic memory. They will focus on the functional role of the mammalian hippocampus in these processes and include a diverse set of approaches: electrophysiology, imaging, computational modeling, and robotics.

Contact: Prof. Sen Cheng, NB 3/33, sen.cheng@rub.de

Capacity: max. 15 students

# 13.

Computational Modeling

*COLLOQUIUM*

**CURRENT TOPICS IN NEUROINFORMATICS CLUB "LEARNING AND MEMORY" (310029)**

PROF. DR. GREGOR SCHÖNER

**TERM:** Winter 2020/21  
**MEETING TIME:** Wednesday, 12:30 – 13.15 (First Meeting: 28.10.2020)  
**ROOM:** tba ONLINE or IN PERSON  
**CP:** tba

In this series of seminars and colloquia we intermix short presentations by INI members about their current research with colloquium talks given by invited external speakers.

**14.**

14. Cognitive Neuroscience

*COLLOQUIUM***THEMEN DER KOGNITIVEN NEUROWISSENSCHAFT (118711)**PROF. ONUR GÜNTÜRKÜN, PROF. OLIVER WOLF,  
PROF. NIKOLAI AXMACHER

<b>TERM:</b>	Winter 2020/210
<b>MEETING TIME:</b>	Friday, 10.00 – 12.00 (First meeting tbc: 30.10.2020)
<b>ROOM:</b>	IB 6/127 (ONLINE)
<b>CP:</b>	3

In dieser Veranstaltung werden laufende Forschungsprojekte, die sich für eine M.Sc. Arbeit eignen, vorgestellt. Ein zentrales Lernziel dieser Veranstaltung - und damit auch Grundlage für die erfolgreiche Teilnahme und Leistungsbewertung - ist die regelmäßige aktive Beteiligung am wissenschaftlichen Diskurs. Daher ist eine regelmäßige Anwesenheit im Umfang von mindestens zwei Dritteln der Termine notwendig.

Voraussetzungen: Interesse an neurowissenschaftlicher Master-Arbeit

Literatur: wird in der Veranstaltung bekannt gegeben.

**14.**

Cognitive Neuroscience

*COLLOQUIUM***RESEARCH COLLOQUIUM NEUROPSYCHOLOGY (118916)**

PROF. NIKOLAI AXMACHER

<b>TERM:</b>	Winter 2020/21
<b>MEETING TIME:</b>	Thursday 14 – 16 (First meeting tbc: 29.10.2020)
<b>ROOM:</b>	ONLINE
<b>CP:</b>	3

The content of this course is to present current research work in the spheres of neuropsychology and talks by guest professors on clinical neuropsychological topics. The schedule with information on the topics and speakers will be posted on the information board and at <http://www.ruhr-uni-bochum.de/neuropsy/> before the start of the WS. The central educational goal of this course – and as such the basis for a successful participation and awarding of credits – is regular active contribution to the scientific discourse. Therefore, regular attendance in the scope of at least 2/3 of the sessions is required.