

Course Guide

Master Cognitive Science

Summer 2023

Version as of 30.03.2023

FIRST YEAR PROGRAM.....	2
C. Topics Selection	3
C1. Social Cognition & Meta-Science	3
C2. Perception & Action	14
C3. Memory, Learning & Decision Making	23
C4. Language, Logic & Categories.....	29
AM. Advanced Methods	34
AM1. Theory Formation & Conceptual Analysis	34
AM2. Advanced Analysis of Language & Logic	37
AM3. Behaviour Studies & Data Analysis	39
AM4. Computational Modeling.....	36
AM5. Special Methods in Neuroscience & Genetics	48
AM6. EEG-training	51
D1. Free Selection	53
SECOND YEAR PROGRAM.....	60
I. Interdisciplinary Research Module	60
I1. Cognitive Philosophy	60
I2. Psychology	65
I3. Computational Modeling.....	66
I4. Cognitive Neuroscience	69

Enrollment for Courses

Students are requested to register with the university's eCampus-system and should be aware of the deadlines. Exceptions include the courses in neuroinformatics, e.g. held by Prof. Wiskott and Prof. Schöner. Here, there will be **no eCampus registration**, but a manual enrollment in the first session.

Please notice that one and the same course can only be used to be part of one module for each student. Double use of the same course is not allowed.

If you have studied at the RUB during your Bachelor's, please be aware that you are not allowed to take classes you have already completed in the Bachelor program again in the Master program.

IMPORTANT: The summer term starts on 01.04.2023. Please consult eCampus for up-to-date information regarding the course format, starting dates and further detail.

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.

FIRST YEAR PROGRAM

C. Topics Selection

C1

C1. Social Cognition & Meta-Science

SEMINAR

INTRODUCTION TO THE PHILOSOPHY OF SCIENCE AND PSYCHOLOGY (030109)

JUN. PROF. DR. JOACHIM HORVATH

TERM:	Summer 2023
MEETING TIME:	Thursday, 10-12 (First Meeting: 06.04.2023)
ROOM:	tba
CP:	3 or 6

This seminar will be a “crash course”-style introduction to the basic philosophical concepts and problems concerning science in general and scientific psychology in particular. The main idea behind this approach is that an introduction to philosophy of psychology on its own – without some general philosophical perspective on science – threatens to be overly myopic, given that psychology shares many of its basic problems and concerns with other scientific disciplines. For this reason, the course will begin with general topics in the philosophy of science, such as explanation, realism, scientific change and scientific revolutions, and science criticism. After that, we will turn to more specific methods and problems of scientific psychology, especially those related to psychological experiments and the statistical analysis of data.

LECTURE

GENERAL PHILOSOPHY OF SCIENCE (030003)

JUN.PROF. DR. JAN BAEDKE

TERM:	Summer 2023
MEETING TIME:	Thursday, 14 – 16 (First meeting: 06.04.2023)
ROOM:	HGA 30
CP:	3 or 6

Philosophy of science reflects on the foundations, methods and aims of science. General philosophy of science includes further subjects like patterns of the historical development and the social structure of science. In the closer sense, it can be retraced continuously from the ancient world until present. Several disciplinary terms (such as “philosophy of mathematics” or later “philosophy of physics” and “philosophy of biology”) have been developed not until the 18th century and reflect the increasing significance of specific scientific knowledge for modern philosophy. The lecture gives an overview over the present status of general philosophy of science. It deals, on the one hand, with problems of methods and certain key concepts (such as “explanation” and “understanding”); on the other hand, it examines questions that focus on the significance of the historicity of scientific knowledge for the present sciences.

The lecture is addressed to advanced B.A. and M.A. students of philosophy in general and to students of the master program HPS+ in particular. It is open for interested students of other subjects with (at least) basic knowledge in theoretical philosophy, which is possible to gain in the module “Introduction to theoretical philosophy” (SE1).

The language of the lecture will be English. You will be informed about modalities concerning credits in the first session of the lecture.

Introductory Literature:

Martin Curd, M. & James A. Cover (Eds.), *Philosophy of Science. The Central Issues*. 2nd ed., New York, London 2013.

Simon Lohse & Thomas Reydon (Hgg.): *Grundriss Wissenschaftsphilosophie. Die Philosophien der Einzelwissenschaften*. Hamburg 2017.

Alexander Rosenberg, *Philosophy of Science. A Contemporary Introduction*. 2nd ed., New York 2005.

Note:

If you would like to additionally participate in the supplementary seminar (**Special topics in philosophy of science, 030094**), the seminar can be used in the D-module. To participate in the seminar, the lecture must be attended as well.

C1

C1. Social Cognition & Meta-Science

*SEMINAR***MORAL PSYCHOLOGY (112319)**

DR. VLADIMIR PONIZOVSKIY

TERM:	Summer 2023
MEETING TIME:	Wednesday, 14 – 16
ROOM:	IA 1/157
CP:	3

The ideas of “right” and “wrong”, “good” and “bad” are central to our decision-making. How does ethical decision-making develop? How do reasoning and affect contribute to making ethical decisions? What beliefs and principles underlie ethical choices?

In this seminar, the students will engage with key theoretical and empirical articles in the field of moral psychology. Passing the course will require regular reading and critical engagement with the texts through presentations and class discussions.

The students will read and discuss one reading per week. The students will be expected to read the weekly text and prepare three questions about it before class. The graded assignments will include a group presentation of a reading, and a final paper.

SEMINAR

**EINFÜHRUNG IN DIE ETHIK DER KÜNSTLICHEN INTELLIGENZ
(030038)**

DR. WANJA WIESE

TERM:	Summer 2023
MEETING TIME:	Wednesday, 14 – 16
ROOM:	GA 03/149
CP:	3 or 6

Language of instruction: German

Achtung! Dieses Seminar ist keine Einführung in die Ethik. Vorkenntnisse in der allgemeinen Ethik sind erwünscht.

Künstliche Intelligenz (KI) und maschinelles Lernen durchdringen viele Bereiche unseres Alltags. Oft merken wir gar nicht, dass bei einer Anwendung KI oder maschinelles Lernen im Einsatz sind. Ethische Probleme, die sich aus KI-Anwendungen ergeben, sind daher im Alltag nicht immer offensichtlich. Bei Überlegungen zu ethischen Problemen der KI richtet sich die Aufmerksamkeit leichter auf mögliche künftige KI-Systeme, deren Fähigkeiten menschliche Fähigkeiten in den verschiedensten Bereichen weit übersteigen, oder auf aktuelle Anwendungen, in denen die ethischen Fragen und Probleme besser zu erkennen sind, wie zum Beispiel bei autonomen Fahrzeugen und Waffensystemen, Pflegerobotern oder Sex-Robotern.

Im Seminar werden wir uns nicht nur mit den naheliegenden Fragen und Problem aus der KI-Ethik befassen, sondern auch die Sensibilität für ethische Probleme stärken, die sich aus wenig sichtbaren, alltäglichen KI-Anwendungen ergeben. Dazu werden wir zunächst untersuchen, was KI ist und wo sie zum Einsatz kommt. Im Anschluss werden wir die ethischen Fragen und Probleme, die sich aus der Anwendung von KI ergeben, an zentralen Beispielen diskutieren.

Insbesondere werden wir folgende Fragen besprechen:

- Was ist KI und wo kommt sie zum Einsatz?
- Wie sollte man mit dem Risiko umgehen, das durch Vorurteile (biases) in KI-Anwendungen entsteht?
- Welche Probleme in Bezug auf informationelle Selbstbestimmung und Datenschutz ergeben sich aus KI-Anwendungen?
- Welche Bedeutung hat KI für soziale Beziehungen?
- Wie können autonome KIs so eingesetzt werden, dass sie die menschliche Autonomie nicht beschränken, sondern fördern?
- Wie kann man sicherstellen, dass die Ziele autonomer KIs mit unseren übereinstimmen?
- Sollten autonome KIs in der Kriegsführung erlaubt sein?
- Stellen zukünftige KIs eine existenzielle Bedrohung für die Menschheit dar?

Wer aktiv am Seminar teilnimmt, gewinnt einen Einblick in die Philosophie der KI und in aktuelle Debatten zur Philosophie der KI-Ethik. Ein Interesse an KI-Forschung und die Fähigkeit und Bereitschaft, auch englischsprachige Literatur zu lesen, werden vorausgesetzt.

Studierende können 3 CP für die aktive Teilnahme („kleine Studienleistung“) erhalten und 6 CP für die aktive Teilnahme mit Prüfung („große Studienleistung mit Hausarbeit/mündl. Prüfung“).

Literature:

- Bartneck, C., Lütge, C., Wagner, A. R., & Welsh, S. (2019). *Ethik in KI und Robotik*. Hanser.
- Coeckelbergh, M. (2019). *AI ethics*. MIT Press.
- Kersting, K., Lampert, C., & Rothkopf, C. (Hrsg.). (2019). *Wie Maschinen lernen: Künstliche Intelligenz verständlich erklärt*. Springer Fachmedien Wiesbaden.
- Loh, J., & Loh, W. (Hrsg.) (2022). *Social Robotics and the Good Life: The Normative Side of Forming Emotional Bonds With Robots*. transcript Verlag.
- Misselhorn, C. (2018). *Grundfragen der Maschinenethik*. (Vierte Auflage.) Reclam.
- Misselhorn, C. (2021). *Künstliche Intelligenz und Empathie: Vom Leben mit Emotionserkennung, Sexrobotern & Co*. Reclam.
- Mitchell, M. (2019). *Artificial Intelligence: A Guide for Thinking Humans*. Penguin UK.
- Vallor, S. (2016). *Technology and the virtues: A philosophical guide to a future worth wanting*. Oxford University Press.

C1

C1. Social Cognition & Meta-Science

SEMINAR

THE SOCIAL MIND (030099)

DR. ELMARIE VENTER

TERM:	Summer 2023
MEETING TIME:	Monday, 14 – 16 (First Meeting: 03.04.2023)
ROOM:	GABF 04/609
CP:	3 or 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?

Students can receive either 3 CP -graded or ungraded- or 6 CP graded.

Literature:

- Lavelle, J. S. (2019) *The Social Mind: A Philosophical Introduction*. New York: Routledge.
- Further literature will be provided on Moodle.

LECTURE

SOZIALE NEUROWISSENSCHAFTEN (11901)

PROF. DR. DIRK SCHEELE

TERM:	Summer 2023
MEETING TIME:	Tuesday, 16 – 18 (First Meeting: 04.04.2023)
ROOM:	IA 02/461
CP:	3

Language of instruction: German

In der Vorlesung werden neue Methoden und aktuelle Forschungsfragen der sozialen Neurowissenschaften beim Menschen vorgestellt. Zu Beginn werden innovative Entwicklungen und Fortschritte bei bildgebenden Verfahren (bspw. laminare Ableitungen) und Methoden der nicht-invasiven Hirnstimulation (insbesondere transkranielle Gleichstromstimulation und repetitive transkranielle Magnetstimulation) besprochen. Anschließend wird ein Schwerpunkt auf die soziale Funktion und neuronalen Korrelate von in der Forschung häufig vernachlässigten sensorischen Modalitäten (Olfaktorik und Haptik) gelegt. Neben Befunden zur interozeptiven Wahrnehmung werden ferner Studien zur Synchronizität in der sozialen Dyade (im Sinne der „second-person neuroscience“) näher betrachtet. Zum Abschluss der Vorlesung wird der moderierende Einfluss von frühen Lebenserfahrungen (insbesondere Traumatisierung) und Geschlechtsunterschieden thematisiert.

Als Prüfung wird eine Klausur geplant.

*SEMINAR***SOCIAL NEUROSCIENCE (11902)**

LAURA STEVENS

TERM:	Summer 2023
MEETING TIME:	Thursday, 14 – 16 (First Meeting: 06.04.2023)
ROOM:	IA 02/460
CP:	3

Social neuroscience is a rapidly growing field that integrates principles from psychology, sociology, and neuroscience to understand the neural basis of social behavior and interactions. The aim of this seminar is to provide an overview of this interdisciplinary field and the methods commonly used, as well as to discuss current research and future directions. The seminar will cover topics such as empathy, emotion recognition and contagion, social connection (e.g., loneliness and love), and social touch. It will also address neural mechanisms of impaired social functions due to trauma or psychological disorders. Methods such as behavioral tasks, neuroimaging (fMRI, fNIRS), EEG, tDCS, and psychophysiological measures will be explored and illustrated by discussing recent papers critically.

SEMINAR

MINDSHAPING (030049)

PROF. DR. TOBIAS SCHLICHT

TERM:	Summer 2023
MEETING TIME:	Thursday, 12 – 14 (First Meeting: 06.04.2023)
ROOM:	GA 03/46
CP:	3 or 6

Most of the literature on social cognition and interaction is focused on mindreading, our everyday practice to make sense of other people's behavior via the attribution of mental states like beliefs, desires, and intentions. We can call this the epistemic function of our folk-psychology. Mindshaping, by contrast, refers to the practical function of folk-psychology, namely, to shape each other's minds in contexts such as pedagogy, cultural learning by imitation, norm institution, narrative self-and group constitution.

In his book *Mindshaping*, Tadeusz Zawidzki develops this notion and relates it to the more familiar notion of *mindreading*.

In this seminar, we will study this book to become familiar with this important aspect of social cognition.

Literature: Tad Zawidzki: *Mindshaping*. MIT Press

LECTURE

NEW FORMS OF SOCIAL INTERACTION WITH INTELLIGENT SYSTEMS (030010)

PROF. DR. TOBIAS SCHLICHT

TERM:	Summer 2023
MEETING TIME:	Thursday, 14 – 16 (First Meeting: 06.04.2023)
ROOM:	GA 03/33-34 / Zoom
CP:	3 or 6

Changes in our interaction with each other via social media and with AI systems pose a central challenge for modern society. Messenger services, chatbots, robot co-workers: Our everyday interactions are no longer limited to exchange with human beings. Which changes does this development bring about? How do we shape and manage them? And what are the risks and opportunities that come along with it?

Language assistants, chatbots, and social media increasingly affect our social interaction. What are the core principles guiding personal human-human interaction, and how are they changed by increased communication via social media? On the one hand, it fosters one-sided information (filter bubbles), fake news, and conspiracy theories; on the other hand, it opens up new possibilities for shaping social relationships and for maintaining social groups (families and friends) over long distances.

Similar challenges are to be expected for our social interaction with intelligent AI systems. Which stance should we take towards them? Simply transferring the principles of human-human interaction to this case would create the risk of inadequately anthropomorphizing machines. Even though AI systems are becoming increasingly autonomous – no longer remaining rigidly programmed machines – which can even simulate emotions, they are still to be distinguished from sentient human beings. How could we best shape and steer the interaction and cooperation between human beings and AI systems in pedagogical and work contexts?

This interdisciplinary lecture series combines perspectives from humanities with social and behavioral sciences to address such questions. There will be assigned reading for each week.

Literature: Sven Nyholm, 2023: *This is Technology Ethics*. Wiley.

SEMINAR

CONSCIOUSNESS, VALUE, AND MORAL STATUS (030068)

DR. FRANÇOIS KAMMERER

TERM:	Summer 2023
MEETING TIME:	Thursday, 14 – 16 (First Meeting: 06.04.2023)
ROOM:	GAFO 04/271
CP:	6

Consciousness appears to be an important source of value. If we were not conscious – if we did not feel things, if we did not experience things – then it is not clear that our lives would still have the value they have. Similarly, it also seems like one of the most important sources – if not the source – of our moral status. The fact that we are conscious seems key to ground the fact that should be treated with a certain sort of moral consideration. Similarly, we take it that other conscious (or “sentient”) creatures, such as various non-human animals, deserve to be treated with a certain sort of moral consideration, precisely because they are conscious.

Why does consciousness ground value and moral status? Which conscious experiences in particular play this sort of role? Can the view that consciousness ground value and moral status resist in front of various objections coming from materialist conceptions of the mind? How can this view help illuminate difficult cases, such as the case of the moral status of artificial intelligences, non-human animals, or humans with conditions responsible for impoverishment of consciousness?

This course will be taught in English. It will mainly (though not exclusively) be based on a reading of Joshua Shepherd’s book (see below).

Literature: Preliminary reference list:

Shepherd, J. (2018). Consciousness and moral status

SEMINAR

PURSUITWORTHINESS IN SCIENTIFIC INQUIRY (030116)

PROF. DR. DUNJA ŠEŠELJA

TERM:	Summer 2023
MEETING TIME:	Friday, 12.00 – 13:30 (First Meeting: 14.04.2023)
ROOM:	GABF 04/358
CP:	3 or 6

The topic of pursuitworthiness in scientific inquiry received a lot of attention throughout the last decades of the 20th century. While this theme draws its roots from Peirce's 'economy of research' and discussions that followed Reichenbach's distinction between the context of discovery and the context of justification, pursuitworthiness became an explicit topic of philosophical accounts in the post-Kuhnian literature. Starting from Laudan's (1977) 'context of pursuit', to McMullin's (1976) 'heuristic appraisal', to Anne-Whitt's (1992) 'indices of theory-promise' different accounts aimed at explicating ways of evaluating the promising character of scientific inquiry. The importance of distinguishing the 'comparative evaluation of problem-solving efficiency and promise' and the 'evaluation of completed research' (Nickles 1980) remained central to subsequent philosophical debates: from discussions on the role of values in scientific research, to the literature on scientific pluralism, to debates concerning particular controversies in empirical sciences, to epistemological discussions on the norms underlying the process of inquiry – to mention only some examples (see, for example, articles in the special issue of the *Studies in History and Philosophy of Science*: <https://www.sciencedirect.com/journal/studies-in-history-and-philosophy-of-science/special-issue/108S7MF9JM2>).

In this course we will read both the classics as well as contemporary articles on the topic of pursuitworthiness, aiming to connect traditional discussions with recent debates concerning this notion.

Literature: The reading list will be provided during the course.

C2

C2. Perception & Action

*LECTURE***PERCEPTION (118311) [WAHRNEHMUNG]**

PROF. DR. JONAS ROSE

TERM:	Summer 2023
MEETING TIME:	Wednesday, 12 – 14 (First Meeting: 05.04.2023)
ROOM:	GAFO 02/364
CP:	3

In this lecture, we will cover the neural basis of different sensory modalities. Starting with the physical stimulus and its detection at the receptor we will then continue along the sensory hierarchy in the brain. Finally, the modulation of the stimulus through attention, categorization and multimodal integration will be covered. In addition to our focus on human sensory systems, we will compare the sensory systems and capabilities of different species.

The lecture will be held in English.

C2

C2. Perception & Action

*SEMINAR***PERCEPTION (118312) [WAHRNEHMUNG]**

PROF. DR. JONAS ROSE

TERM:	Summer 2023
MEETING TIME:	Friday, 10 – 12 (First Meeting: 14.04.2023)
ROOM:	GA 04/187
CP:	3

This seminar complements the lecture 'perception' by adding a more hands-on approach. You will give short lectures and conduct mini-experiments to highlight specific topics and deepen the understanding of selected mechanisms.

*LECTURE***ADVANCED EPISTEMOLOGY (030007)**

JUN. PROF. DR. PETER BRÖSSEL

TERM:	Summer 2023
MEETING TIME:	Wednesday, 14 – 16 (First Meeting: 05.04.2023)
ROOM:	HGA 30
CP:	6

This lecture provides an (opinionated) overview of recent progress concerning some of the essential topics of epistemology. Those topics are:

- 1.) Theories of Knowledge
- 2.) Theories of Belief and Truth
- 3.) Theories of Justification and Rationality.
- 4.) Sources of Knowledge/Justification
 - (i) Perception,
 - (ii) Memory,
 - (iii) Testimony

This class will be graded.

C2

C2. Perception & Action

SEMINAR

JOURNAL CLUB: NEUROBIOLOGY (190573)**[WISSENSCHAFTLICHE PRÄSENTATIONEN IN ENGLISCH]**

PROF. DR. MELANIE MARK

TERM:	Summer 2023
MEETING TIME:	Wednesday, 9 - 11 (First Meeting: tba)
ROOM:	ND6/56a
CP:	3

This course is a weekly journal club with focus on neuroscience. Please contact sekretariat@neurobiologie.ruhr-uni-bochum.de or Melanie.Mark@rub.de for further information.

Requirements: basic understanding of neurosciences

C2

C2. Perception & Action

SEMINAR

IS THE MIND EXTENDED? (030108)

PROF. DR. TOBIAS SCHLICHT

TERM:	Summer 2023
MEETING TIME:	Thursday, 10 - 12 (First Meeting: 06.04.2023)
ROOM:	GAFO 04/271
CP:	3 or 6

Where does the mind end and the world begin? This question about boundaries of mind, cognition, and consciousness have puzzled philosophers and cognitive scientists at least since Andy Clark and David Chalmers published their landmark paper "The extended mind" in 1998. At the core of their position is the claim that when it comes to the realization base of our cognitive processes, drawing the boundary either at the skull or at the body seems arbitrary and ill-founded. Rather, they claim, depending on the function or cognitive task involved, our cognitive processes can extend into tools like smartphones or hammers and others, possibly also virtual tools and sometimes other people, such that the mind can extend.

This year marks the 25th anniversary of this highly influential paper and we will discuss a variety of philosophical texts on this topic, some of them advancing and others criticizing the claim, starting with Clark and Chalmers' paper.

Literature: Clark, A., Chalmers, A. (1998): The extended mind. *Analysis* 58(1), 7-19.

SEMINAR

THE PROBLEM OF CONSCIOUSNESS (030067)

DR. FRANÇOIS KAMMERER

TERM:	Summer 2023
MEETING TIME:	Thursday, 12 – 14 (First Meeting: 06.04.2023)
ROOM:	GAFO 04/271
CP:	6

Phenomenal consciousness is the form of consciousness corresponding to mental states such that there is “something it’s like to be in them” – mental states which feel like something for the subject. It is also known by other names such as “subjective experience”, “raw feelings”, or “qualitative consciousness”.

It is often thought to be a significant but mysterious feature of our mental lives. Some influential arguments and considerations have tried to show that this feature resists attempts at reducing it to material processes, such as brain processes. Consciousness seems unexplainable by appealing to features of the brain. At the same time, knowing whether or not phenomenal consciousness reduces to material processes (and which material processes) seems key, for instance, to discover which animals are conscious, or whether computers and robots can be conscious, etc.

This philosophy of mind seminar will explore the problem of consciousness, and examine major solutions to it, from materialist to non-materialist solutions, and including radical solutions – for example, solutions implying that consciousness is everywhere and is a fundamental aspect of reality, or, on the other hand, solutions implying that it is nowhere, and is nothing but an illusion.

Preliminary reference list:

Chalmers, D. (1995). Facing up to the problem of consciousness. *Journal of Consciousness Studies*, 2(3), 200-219.

Nagel, T. (1974). What is it like to be a bat? *Philosophical Review*, 83(October), 435-450.

*BLOCK SEMINAR***COGNITIVE SYSTEMS AND THE EXTENDED MIND (030081)**

DR. ELMARIE VENTER

TERM:	Summer 2023
BLOCK:	31.07.23 – 04.08.23, 10 – 14
ROOM:	GABF 04/354
CP:	3 or 6

In this course, we will work through Rob Rupert's 2009 'Cognitive Systems and the Extended Mind'. The book is a survey of philosophical issues that are faced by situated cognition with a particular focus on extended cognition – the view that cognitive processes extend beyond the boundary of the agent. The book deals, amongst other issues, with the problem of demarcation – the question about what is cognitive and what is not. Rupert argues that an extended approach to this problem is implausible. He posits a systems-based approach, i.e., the view that "a state is cognitive if and only if it consists in, or is realized by, the activation of one or more mechanisms that are elements of the integrated set members of which contribute causally and distinctively to the production of cognitive phenomena" (Rupert, 2009). We will critically examine this debate and evaluate the implication for both the situated and classical views in cognitive science.

Students can receive either 3 CP (ungraded or graded) or 6 CP (graded).

Literature:

Rupert, R. (2009). *Cognitive Systems and the Extended Mind*. United Kingdom: Oxford University Press. Further literature will be provided on Moodle.

C2

Perception & Action

SEMINAR

**MIND AND TIME: PERCEPTION AND THE FLOW OF EXPERIENCE
(030110)**

DR. ALFREDO VERNAZZANI

TERM:	Summer 2023
MEETING TIME:	Thursday, 10 – 12
ROOM:	GABF 04/709
CP:	3 or 6

If this course is used for Module AM1, it cannot be used for Module C2.

Our minds and cognitive processes are not atemporal. Cognitive and perceptual processes have a beginning and an end, and our experiences unfold in time. While we seem to perceive that time passes, it is not clear how to make sense of the temporal unfolding of our experiences, and to what extent this reflects the passing of time. In this seminar, we focus on the issue of the temporal unfolding of our perceptual experiences from the perspective of both philosophy and cognitive science. The seminar is divided into three parts. In the first part we will discuss selected philosophy classics on time perception, focusing on Augustine, Kant, James, and Husserl. In the second part, we will focus on scientific studies on how the mind segments experience into events, the brain and conscious time, as well as time consciousness in depression, dreams, and schizophrenia. Finally, in the third part we will focus on contemporary philosophical speculations about time consciousness.

Students can receive either 3 CP ungraded or 6 CP graded.

Literature:

Learning material will be made available on Moodle by the course instructor.

By way of introduction, I recommend Robin Le Poidevin's (2019) entry "The experience and perception of time" from the *Stanford Encyclopedia of Philosophy*

<https://plato.stanford.edu/entries/time-experience/>

SEMINAR

ARTIFICIAL CONSCIOUSNESS (030098)

DR. WANJA WIESE

TERM:	Summer 2023
MEETING TIME:	Tuesday, 16 – 18 (First Meeting: 04.04.2023)
ROOM:	GA 03/46
CP:	3 or 6

Organisational remark: As part of the active participation, it will be mandatory to attend talks at a workshop on consciousness in animals and artificial systems, organized by Albert Newen and Wanja Wiese. The talks that all participants have to attend will take place on the 2nd of June 2023 at Ruhr University Bochum. In turn, some of the seminar's sessions in June and July will be dropped.

Can artificial systems be conscious? If yes, how could we find out? Understanding consciousness in human and non-human animals is hard, but understanding artificial consciousness seems even harder. At the same time, rapid advances in AI and growing ethical concerns about the creation of artificial consciousness demand an answer to the question under what conditions consciousness should be ascribed to artificial entities.

The seminar has a systematic focus on contemporary philosophy of consciousness and machine ethics. We will first discuss theories and general problems of consciousness. We will then apply these to the question under what conditions artificial systems can be conscious. Finally, we will discuss ethical questions of artificial consciousness: Would conscious artificial systems be able to suffer, perhaps in ways we cannot even imagine? Is the attempt to create conscious artificial systems unethical, or do the potential benefits outweigh the risks? What moral rights should conscious robots have? Could machines be moral agents and have moral responsibility?

Students can receive 3 CP for active participation or 6 CP with additional essay/oral exam.

Literature:

Dehaene, S., Lau, H., & Kouider, S. (2017). What is consciousness, and could machines have it? *Science*, 358, 486–492.

Gamez, D. (Ed.). (2018). *Human and Machine Consciousness*. Open Book Publishers. <https://doi.org/10.11647/OBP.0107>

Graziano, M. S. A. (2017). The Attention Schema Theory: A Foundation for Engineering Artificial Consciousness. *Frontiers in Robotics and AI*, 4, 60.

BLOCKSEMINAR

DIE MACHT DER GERÜCHE. WIE DAS RIECHEN UNSER VERHALTEN BEEINFLUSST (118141)

PD DR. CHRISTOPH VAN THRIEL

TERM:	Summer 2023
PRELIMINARY MEETING:	Tuesday, 11.04.2023, 16 – 18 (Room: IA 02/452)
BLOCK:	08.07.23 & 09.07.23, 9-17 (IfADo)
CP:	3

Language of instruction: German

Das Blockseminar findet am Leibniz-Institut für Arbeitsforschung in Dortmund statt (Ardeystr. 67, 44139 Dortmund).

Das olfaktorische System des Menschen unterscheidet sich erheblich von den anderen Sinnessystemen. Die physiologischen Grundlagen des Riechens sind im Einführungstext (Albrecht and Wiesmann 2006) beschrieben. In einem aktuellen Review (Stevenson 2010) werden drei Bereiche des Geruchssinnes beschrieben, bei denen angenommen wird, dass das olfaktorische System das Verhalten des Menschen beeinflussen kann. Diese Bereiche sind:

1. Nahrungsaufnahme/Ernährung
2. Vermeidung von Gefährdungen aus der Umwelt
3. Soziale Kommunikation

Ein weiterer, relevanter Bereich, der in diesem Review nicht angesprochen wird, ist die Wirkung von Gerüchen auf kognitive Leistungen (Beispieltext: Habel et al. 2007).

In den letzten Jahren beschäftigt sich die kognitive Neurowissenschaft zunehmend mit dem olfaktorischen System. Im Seminar sollen aktuelle Forschungsarbeiten zu den vier o.g. Funktionsbereichen referiert werden. Dabei können neben Humanstudien auch tierexperimentelle Studien vorgestellt werden. Die Themen/Studien werden während der Vorbesprechung vergeben. Dabei wird eine aktive Mitarbeit der TeilnehmerInnen bei diesem Auswahlprozess erwartet.

Literatur:

Stevenson, R.J., 2010. An initial evaluation of the functions of human olfaction. *Chem Senses* 35, 3–20. <https://doi.org/bjp083> [pii] 10.1093/chemse/bjp083

Hatt, H., 2019. Geruch, in: Brandes, R., Lang, F., Schmidt, R.F. (Eds.), *Neuro- Und Sinnesphysiologie*. Springer, Berlin, pp. 781–788. https://doi.org/10.1007/978-3-662-56468-4_62

Albrecht, J., Wiesmann, M., 2006. [The human olfactory system. *Anatomy and physiology*]. *Nervenarzt* 77, 931–939. <https://doi.org/10.1007/s00115-006-2121-z>

*LECTURE & EXERCISE***AUTONOMOUS ROBOTICS: ACTION, PERCEPTION, AND COGNITION (211048)**

PROF. DR. RER. NAT. GREGOR SCHÖNER

TERM:	Summer 2023
LECTURE:	Thursday, 14.15 – 16.00 (First Meeting: 06.04.2023)
EXERCISE:	Thursday, 16.15 – 17.00 (First Meeting: 06.04.2023)
ROOM:	NB 3/57
CP:	6

If this seminar is used for Module I3, it cannot be used for C2.

Autonomous robotics is an interdisciplinary research field in which embodied systems equipped with their own sensors and with actuators generate behavior that is not completely pre-programmed. Autonomous robotics thus entails perception, movement generation, as well as core elements of cognition such as making decisions, planning, and integrating multiple constraints.

This course touches on various approaches to this interdisciplinary problem. In the first half of the course, the main emphasis will be on dynamical systems methods for generating movement in vehicles. The main focus of the course is, however, on solutions to autonomous movement generation that are inspired by analogies with how nervous systems generate movement. The second half of the course will review core problems in human movement science, including the degree of freedom problem, coordination, motor control, and the reflex control of muscles.

Requirements

The emphasis of the course is on learning concepts, practicing interdisciplinary scholarship including reading and writing at a scientific and technical level. Mathematical concepts are used throughout, so understanding these concepts is important. Mathematical skills are not critical to mastering the material, but helpful. The mathematics is mostly from the qualitative theory of dynamical systems, attractors and their instabilities. Short tutorials on some of these concepts will be provided.

Registration

You can register for the course here: <https://www.ini.rub.de/elearning/?eid=392>

Further reading

Readings will be posted on the INI web page. Also have a look at the web page of the Dynamic Field Theory community that is interested in related problems and solutions: <https://dynamicfieldtheory.org/>

There you find more exercises, reading material, slides and lecture videos that have some overlap with the lecture.

Find more information on the INI web page: https://www.ini.rub.de/teaching/courses/autonomous_robotics_action_perception_and_cognition_summer_term_2023/

C3

C3. Memory, Learning & Decision Making

SEMINAR

DISCOURSE NEURAL BASIS OF LEARNING (118161)

PROF. DR. JONAS ROSE, JUAN MEDINA PESCHKEN

TERM:	Summer 2023
MEETING TIME:	Monday, 9 - 11 (First Meeting: 03.04.2023)
ROOM:	GA 04/187
CP:	3

Current literature in cognitive neuroscience will be presented and discussed in depth. We aim to follow up on novel approaches, interesting angles and to have a critical discussion of research methods and interpretations.

If you would like to participate in this course and receive credit points, please send an e-mail to Juan.MedinaPeschken@rub.de.

C3

C3. Memory, Learning & Decision Making

SEMINAR

DISKURS "HOW DOES SLEEP AFFECT MEMORY? (118163)

DR. HUI ZHANG

TERM:	Summer 2023
MEETING TIME:	Wednesday, 10 – 12 (First Meeting: 05.04.2023)
ROOM:	IB 6/127
CP:	3

In this course, we will review the literature about the role of sleep in memory. We try to answer a list of questions. Why does sleep boost memory? How do different sleep stages affect memory? Can we manipulate memory by manipulating sleep?

*LECTURE & EXERCISE***INTRODUCTION TO COMPUTATIONAL NEUROSCIENCE
(211046)**

PROF. DR. SEN CHENG

TERM:	Summer 2023
LECTURE:	Monday, 12 – 14 (First Meeting: 03.04.2023)
RECITATIONS:	Friday, 14 – 16 (First Meeting: 18.04.2023)
ROOM:	NB 3/57
CP:	6

If this course is used for Module AM4, it cannot be used for C3.

Computational neuroscience uses quantitative methods to describe what nervous systems do, study how they function, and explain the underlying principles. This class introduces the basics of the mathematical and computational methods used in contemporary neuroscience research. These methods are applied to problems in perception, motor control, learning, and memory.

Knowledge of calculus, linear algebra, and statistics is required for this class, knowledge of neuroscience is not.

Assessment written final exam - 120 min - date: TBA

Course material available on Moodle (registration required)

Literature "Theoretical Neuroscience" by Dayan and Abbott, MIT Press

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

Office hours: Thursdays 14:00-15:00

Enrollment: eCampus/Flexnow

SEMINAR

MEMORY AND EXPERIENCE**(030089)**

PROF. DR. MARKUS WERNING

TERM:	Summer 2023
MEETING TIME:	Thursday, 12 – 14 (First meeting: 06.04.2023)
ROOM:	GA 04/187
CP:	3 or 6

Students can receive 3 CP by giving a presentation or 6 CP by giving a presentation and writing an essay.

This seminar will explore cutting-edge issues in the philosophy of memory, with a special focus on the nature and role of experience. One dimension of its focus concerns mnemonic experiences themselves: the phenomenological character of remembering, the role of emotion and the body, the (dis)continuities between remembering and certain sorts of imagining, and the applications of the predictive processing framework to the case of episodic remembering. The second dimension will concern the experiential basis of episodic memory: what kind(s) of experiences can lay the basis for the formation of an episodic memory; are memories of dreamt or hallucinated events different in kind from memories of veridical perceptual experiences; and, can vicarious or narrative experiences of events extend the scope of episodic memory beyond the bounds of one's own personal past?

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

Literature

- Bernecker, S., & Michaelian, K. (Eds.). (2019). *The Routledge handbook of philosophy of memory*. New York, NY: Routledge.
- Berninger, A., & Vendrell Ferran, Í. (Eds.). (2023). *Philosophical Perspectives on Memory and Imagination* (1st ed.). London: Routledge. Retrieved from <http://doi.org/10.4324/9781003153429>
- Michaelian, K. (Ed.). (2018). *New directions in the philosophy of memory*. New York: Routledge, Taylor & Francis Group.
- Sant'Anna, A., McCarroll, C. J., & Michaelian, K. (Eds.). (2022). *Current controversies in philosophy of memory*. London: Routledge.
- Werning, M. (2020). Predicting the Past from Minimal Traces: Episodic Memory and its Distinction from Imagination and Preservation. *Review of Philosophy and Psychology*, 11, 301–333. doi: 10.1007/s13164-020-00471-z
- Werning, M., & Liefke, K. (accepted). Remembering Dreams: Parasitic Reference by Minimal Traces in Memories from Non-Veridical Experiences. In D. Gregory & K. Michaelian (Eds.), *Dreaming and Memory: Philosophical Issues*. Springer.

SEMINAR

**FROM BIOLOGICAL TO ARTIFICIAL NEURAL NETWORKS
(211131)**

PROF. DR. SEN CHENG

TERM:	Summer 2023
MEETING TIME:	Tuesday, 10 – 12 (First meeting: 04.04.2023)
ROOM:	NB 3/57
CP:	3

Artificial neural networks were not only inspired by the brain, but were created in an effort to understand and model the functioning of the brain. In this seminar, we will read and discuss historic scientific articles that track the development of neural networks from the 1940s to the present. Specific topics include:

- McCulloch-Pitts Neurons/ Boolean networks
- Perceptron
- Hubel and Wiesel
- NeoCognitron
- Convolutional Neural Networks
- Hopfield
- Reservoir Computing
- LSTM
- RBM
- NetTalk
- AlexNet

Learning Outcomes:

After successful completion of this seminar, students will be able to

- read and understand scientific articles in neural network research
- know in which situations neural networks are applied
- understand and discuss the advantages and disadvantages of specific neural networks
- understand the historical development of neural networks
- present the results of research in neural networks to an audience

Examination: Oral Presentation

Requirements:

Solid knowledge of calculus, linear algebra, and statistics are required, e.g. Mathematik 1 und 2, Statistik. Knowledge of artificial neural networks.

Students should have taken the class "Artificial Neural Networks", or something equivalent, before enrolling in this seminar.

Literature:

The articles will be announced in the first meeting.

Background reading: "Neural Networks and Deep Learning" by Charu C. Aggarwal, Springer

LECTURE

MACHINE LEARNING: SUPERVISED METHODS (211024)

PROF. DR. TOBIAS GLASMACHERS

TERM:	Summer 2023
MEETING TIME:	Thursday, 10 - 14 (First meeting: 06.04.2023)
ROOM:	IA 0/158-79 PC-Pool 1 (exceptions: April, 27: ID 03/121 + 139 June 29: ID 03/121 see ecampus)
CP:	6

Please note the requirements and enrolment in this class on the page after (*more detailed than in ecampus*)

Content:

The field of machine learning constitutes a modern approach to artificial intelligence. It is situated in between computer science, neuroscience, statistics, and robotics, with applications ranging all over science and engineering, medicine, economics, etc.

Machine learning algorithms automate the process of learning, thus allowing prediction and decision making machines to improve with experience.

This lecture will cover a contemporary spectrum of supervised learning methods. All lecture material will be in English.

The course will use the inverted classroom concept. Students work through the relevant lecture material at home. The material is then consolidated in a 4 hours/week practical session.

Learning Outcomes:

After the successful completion of the module

- participants understand the basics of statistical learning theory,
- participants know the most important algorithms of supervised statistical learning and can apply them to learning problems,
- participants know strengths and limitations of different learning methods,
- participants are able to use standard machine learning software to solve new problems.

Assessment: written exam (90 min.)

Requirements:

The course requires a relatively deep understanding of basic mathematical tools from linear algebra, calculus, and especially probability theory. Therefore, it is in most cases not suitable for students holding a Bachelor of Arts but a background in engineering or natural sciences can be a suitable for this class.

More advanced mathematical material will be introduced as needed. The practical sessions involve programming exercises in Python. Participants need basic programming experience in Python. They are expected to bring their own devices (laptops).

Enrollment: In order to participate in the exam, please contact informatik-pruefungsamt@rub.de before registration deadline. Information about the date of the exam and the registration deadline can be found here: <https://informatik.rub.de/studium/pruefungsamt/>

Please do not contact the lecturer for course registration.

Please include the following details in your e-mail to the examination office:

- surname, name
- student ID
- study program (MSc. Cognitive Science)
- current certificate of enrolment
- exam that you want to register for + date of the exam

SEMINAR

BAD LANGUAGE: THE MEANING OF INSULTS, SLURS, AND BULLSHIT (030091)

JUN. PROF. DR. KRISTINA LIEFKE

TERM:	Summer 2023
MEETING TIME:	Thursday, 14 – 16 (First Meeting: 06.04.2023)
ROOM:	GA 04/187
CP:	3 or 6

If this course is used for Module AM2, it cannot be used for C4.

Traditionally, philosophy of language has focused on notions like reference and truth. However, much of our everyday language does not serve to describe reality: we use language to impress our peers and insult our opponents (*you fool*), to signal social belonging (*we won*), to express emotions (*the damn laptop . . .*), to be polite ('weather'-talk), and to win time. Language can even be used to change reality: this is achieved by silencing inconvenient voices, by asking leading questions, and by using manipulative speech. The latter work by exploiting linguistic trust: In these cases, the speaker is not as cooperative, honest, or helpful as the listener takes them to be.

This seminar gives an introduction to non-idealized language use like the above, based on Cappelen & Dever's introductory textbook *Bad Language*. Over the course of the semester, students will learn about Gricean communication, linguistic intention, context-dependence, and non-literal / social meaning.

Literature:

Textbook: Cappelen, Herman and Dever, Josh. 2019. *Bad Language*. Oxford: Oxford University Press.

Assessment:

Students can receive 3 CP for active participation and giving a presentation.

Students can receive 6 CP for giving a presentation + essay/oral exam.

SEMINAR

MEANING IN THE BRAIN**(030112)**

PROF. DR. MARKUS WERNING

TERM:	Summer 2023
MEETING TIME:	Wednesday, 14 – 16 (First Meeting: 05.04.2023)
ROOM:	GA 04/187
CP:	3 or 6

Students can receive either 3 CP by giving a presentation or 6 CP by giving a presentation and writing an essay.

When we, as competent speakers of a language, listen to a speech or read a text, meaning seems to be given to us immediately, as if it were part of the input. However, arriving at an interpretation does not only involve the sensory input, but a complex multi-layered construction process in which our expectations about what the speaker is going to say as well as our world knowledge plays a major role. In the seminar, we will focus on the semantic and pragmatic dimensions of this process and link existing neurolinguistic evidence to theoretical models and principles. On the empirical side, the seminar will provide an overview of electrophysiological and neuroimaging results. On the theoretical side, we will focus mainly on Rational Speech Act Theory, Predictive Processing and Compositionality, a.o., at experiments and theoretical frameworks from our own lab, we will try to connect results of neurolinguistic and to those of formal semantics and probabilistic pragmatics. The main reading will be the book *Meaning in the Brain* by Giosuè Baggio

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

Literature

- Baggio, G. (2018). *Meaning in the brain*. Cambridge, Massachusetts: MIT Press.
- Baggio, G. (2022). *Neurolinguistics*. Cambridge, Massachusetts: The MIT Press.
- Brouwer, H., & Crocker, M. W. (2017). On the Proper Treatment of the N400 and P600 in Language Comprehension. *Frontiers in Psychology*, 8, 1327. doi: /10.3389/fpsyg.2017.01327
- 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). doi: 10.3389/fpsyg.2017.00813
- Kutas, M., & Federmeier, K. D. (2011). Thirty Years and Counting: Finding Meaning in the N400 Component of the Event-Related Brain Potential (ERP). *Annual Review of Psychology*, 62(1), 621–647. doi: 10.1146/annurev.psych.093008.131123
- Spychalska, M., Kontinen, J., & Werning, M. (2016). Investigating scalar implicatures in a truth-value judgement task: Evidence from event-related brain potentials. *Language, Cognition and Neuroscience*, 31(6), 817–840. doi: 10.1080/23273798.2016.1161806

*SEMINAR***REASONING ABOUT ACTION AND AGENCY IN LOGIC (030096)
& EXERCISE TUTORIALS (030095)**

CORNELIS VAN BERKEL

TERM:	Summer 2023
MEETING TIME:	Wednesday, 10 – 12 (First Meeting: 05.04.2023)
TUTORIAL:	Wednesday, 16-18 (First Meeting: 05.04.2023)
ROOM:	GABF 04/358
CP:	3 or 6

If this course is used for Module AM2, it cannot be used for C4.

In this course, students will acquire theoretical knowledge of the state of the art on logical formalisms for reasoning about agency and action. The course introduces the main approaches in this field, several theoretical applications of the discussed logics, and an overview of various challenges and open problems. Students will obtain skills in formalizing agency scenarios, proving statements, and critically evaluating theories.

Logical formalisms provide mathematically precise means for reasoning with and enhancing our understanding of philosophical concepts. Theories of agency and action have been well-studied using logical methods. Most of these formalisms use modal logic. In this course, we look at some of the most influential logics of agency used in philosophical logic and AI, as developed over the past decades. Throughout, we introduce basic concepts and methods in modal logic.

We will cover the three most prominent logical formalisms of agency: Seeing to it that Logic, Dynamic Logic, and Belief-Desire-Intention Logic. Each formalism emphasizes a different aspect of agency theory: Seeing to it that Logic focuses on the concept of choice, Dynamic Logic takes action as its fundamental concept, and Belief-Desire-Intention Logic deals with agents as goal-driven planners. We consider extensions of these formalisms that include reasoning about obligations and prohibitions, and discuss specific challenges such as the philosophical nature of negative actions, i.e., "not-acting".

The course consists of lectures and tutorials where we work on exercises.

Recommended background:

Knowledge of classical propositional logic. Familiarity with modal logic and axiomatic proof systems is helpful but not required.

Literature: The reading list will be provided during the course.

*LECTURE & EXERCISE***INTRODUCTION TO ARTIFICIAL INTELLIGENCE (211045)**

PROF. DR. RER. NAT. LAURENZ WISKOTT, PROF. DR. SEN CHENG,
 PROF. DR. TOBIAS GLASMACHERS, PROF. DR. RER. NAT. GREGOR
 SCHÖNER, PROF. DR. CHRISTIAN STRAßER,
 JUN. -PROF. DR. -ING. MARIBEL ACOSTA DEIBE,
 PROF. DR. ASJA FISCHER, PROF. DR. ROBERT SCHMIDT

TERM:	Summer 2023
MEETING TIME:	Friday, 10 – 12 (First Meeting: 14.04.2023) Friday 12-14 (First Meeting: 14.04.2023)
ROOM:	HGD 20
CP:	6

This course gives an overview over representative methods in artificial intelligence: formal logic and reasoning, classical methods of AI, probabilistic reasoning, machine learning, deep neural networks, computational neuroscience, neural dynamics, perception, natural language processing, and robotics.

Enrollment:

For course registration, please send an email to Laurenz Wiskott: laurenz.wiskott@ini.rub.de
 In addition, please register for the class via ecampus.

Requirements: Basic knowledge of calculus and linear algebra.

Learning outcomes: After successful completion of this course, students will be able to

- summarize a number of fundamental methods in artificial intelligence,
- explain their mathematical basis and algorithmic nature,
- apply them to simple problems,
- decide which methods are suitable for which problems, and
- communicate about the above aspects in English.

Teaching format: This course is given with the flipped/inverted classroom concept. The students work through online material beforehand and this will then be deepened in the contact sessions, which will be used for an interactive exchange between students and with the lecturer in a flexible format.

Exam: The course is concluded with a digital written exam for 90 minutes within a 120 minutes time slot. We offer two dates in the semester of the course and none in the next semester. You are free to pick either of the two dates, but if you pick the second and you fail, the next opportunity to retry the exam is only about one year later. You can take the exam from home or any other convenient location, but you need a stable internet connection and working camera, because you have to login into Zoom and be visible. If you are not present in Zoom with your video on, we will grade the exam with 0 points or 5.0. This is an open book exam, thus you may use any tools (e.g. lecture notes or Wikipedia) except communication with other people. Registration for the exam with us happens at the end of the course, you will receive instructions on that in due time. There are no prerequisites for the exam, like 50% points in tutorials or the like.

Condition for granting the credit points: Passing grade on final written exam.

SEMINAR

RESEARCH SEMINAR ON CONTRADICTION LOGICS (030100)

PROF. DR. HEINRICH WANSING

TERM:	Summer 2023
MEETING TIME:	Tuesday, 14 – 16
ROOM:	tba
CP:	3 or 6

This seminar is related to the ERC-Advanced Grant project ConLog, Contradictory Logics: A Radical Challenge to Logical Orthodoxy, and contributes to the idea of research-based learning. The seminar is open to M.A. students with an interest in philosophical logic, the philosophy of logic, and the philosophies of language and of science.

In the 20th century, many systems of non-classical logic have been developed, including inconsistency-tolerant logics, which are typically all subsystems of classical logic. There are, however, logical systems that are radically different from classical logic insofar as they are non-trivial but contradictory. These logics are in glaring conflict with logical orthodoxy since Aristotle, who called the Principle of Non-Contradiction the firmest of all principles. Non-trivial contradictory logics not only permit inconsistencies in theories, but contain provable contradictions.

A prerequisite for a successful attendance in the seminar is some knowledge of non-classical logic and modal logic, including familiarity with Gentzen-style proof systems and Kripke models. We will discuss ongoing research into non-trivial contradictory logics and their applications in the philosophy of logic, and will read research papers, old and new, dealing with the notions of contradictoriness, consistency, negation, triviality, and related concepts. These papers may range from rather informal to formal studies. Students can earn credits by presenting a paper and will get detailed feedback. The seminar will continue to run over several semesters. From the winter term 2022/23 onwards, experimental work on the endorsement or rejection of certain logical principles will be included that play a crucial role in obtaining non-trivial negation-inconsistent logics.

AM. Advanced Methods

Advanced methods are usually studied in the second semester. Solely the "fMRI"-course is only offered during the winter term.

AM1

AM1. Theory Formation & Conceptual Analysis

SEMINAR, ESSAY WRITING COURSE

**WRITING A BACHELOR OR MASTER THESIS IN ENGLISH
(030106)**

PROF. DR. CHRISTIAN STRAßER, PROF. DR. DUNJA ŠEŠELJA

TERM:	Summer 2023
MEETING TIME:	Friday, 14 – 16 (First Meeting: 14.04.2023)
ROOM:	GA 03/46
CP:	3 or 6

In this course we will cover the basics of academic writing of philosophy theses and essays (including seminar papers, BA and MA theses), focusing on the following issues: How to structure and organize an academic article? How to concisely express the main theses and aims of the paper? How to develop strong arguments? How to find the relevant sources? And so forth.

The seminar is targeted at students who are in the process of writing a Bachelor or Master thesis, or who will do so soon.

Students have opportunities to present ideas and drafts of chapters. In the seminar these contributions will be examined in terms of academic language, argumentative structure, style, etc. Students will give (guided) peer review of the contributions.

The seminar will take place on Fridays, 14:15-15:45, as well as via individual (possibly online) coaching sessions.

BLOCK SEMINAR

INTEGRATED HISTORY AND PHILOSOPHY OF SCIENCE (030117)

PROF. DR. DUNJA ŠEŠELJA

TERM:	Summer 2023
MEETING TIME:	Block: 30.04.23, 04.06.23 & 16.07.23 10.00 – 16.00 online coaching sessions in between the blocks
ROOM:	Wasserstr. 221
CP:	3 or 6

The method of historical case studies is one of the central methodological approaches employed by philosophers of science. As Imre Lakatos famously put it "Philosophy of science without history of science is empty; history of science without philosophy of science is blind.". But how and why do we conduct historical case studies? Which philosophical questions can benefit from such inquiry, and which conceptual tools can help us to formulate fruitful answers?

In this course students will learn the basics of Integrated History and Philosophy of Science (HPS). In particular, they will learn how to conduct historical case studies to tackle philosophical questions. The seminar will consist of three main blocks, as well as online coaching sessions in between them:

1. Introductory block (April 30): during the first block of the course we will discuss some paradigmatic papers in the field of HPS, as well as philosophical problems frequently mentioned within this literature (such as scientific rationality, scientific objectivity, scientific pluralism, etc.);
2. Work on case studies and further discussion (Jun 4): after the first block students will choose a historical case study on which they will work for the remainder of the course. Second block will be devoted to additional readings in HPS as well as short student presentations of the chosen case studies.
3. Final presentations (July 16): students will present results of their work on historical case studies during the final block.

Literature: The reading list will be provided during the course.

SEMINAR

**MIND AND TIME: PERCEPTION AND THE FLOW OF EXPERIENCE
(030110)**

DR. ALFREDO VERNAZZANI

TERM:	Summer 2023
MEETING TIME:	Thursday, 10 – 12
ROOM:	GABF 04/709
CP:	3 or 6

If this course is used for Module C2, it cannot be used for Module AM1.

Our minds and cognitive processes are not atemporal. Cognitive and perceptual processes have a beginning and an end, and our experiences unfold in time. While we seem to perceive that time passes, it is not clear how to make sense of the temporal unfolding of our experiences, and to what extent this reflects the passing of time. In this seminar, we focus on the issue of the temporal unfolding of our perceptual experiences from the perspective of both philosophy and cognitive science. The seminar is divided into three parts. In the first part we will discuss selected philosophy classics on time perception, focusing on Augustine, Kant, James, and Husserl. In the second part, we will focus on scientific studies on how the mind segments experience into events, the brain and conscious time, as well as time consciousness in depression, dreams, and schizophrenia. Finally, in the third part we will focus on contemporary philosophical speculations about time consciousness.

Students can receive either 3 CP ungraded or 6 CP graded.

Literature:

Learning material will be made available on Moodle by the course instructor.

By way of introduction, I recommend Robin Le Poidevin's (2019) entry "The experience and perception of time" from the *Stanford Encyclopedia of Philosophy*

<https://plato.stanford.edu/entries/time-experience/>

SEMINAR

REASONING ABOUT ACTION AND AGENCY IN LOGIC (030096)
& EXERCISE TUTORIALS (030095)

CORNELIS VAN BERKEL

TERM:	Summer 2023
MEETING TIME:	Wednesday, 10 – 12 (First Meeting: 05.04.2023)
TUTORIAL:	Wednesday, 16-18 (First Meeting: 05.04.2023)
ROOM:	GABF 04/358
CP:	3 or 6

If this course is used for Module C4, it cannot be used for AM2.

In this course, students will acquire theoretical knowledge of the state of the art on logical formalisms for reasoning about agency and action. The course introduces the main approaches in this field, several theoretical applications of the discussed logics, and an overview of various challenges and open problems. Students will obtain skills in formalizing agency scenarios, proving statements, and critically evaluating theories.

Logical formalisms provide mathematically precise means for reasoning with and enhancing our understanding of philosophical concepts. Theories of agency and action have been well-studied using logical methods. Most of these formalisms use modal logic. In this course, we look at some of the most influential logics of agency used in philosophical logic and AI, as developed over the past decades. Throughout, we introduce basic concepts and methods in modal logic.

We will cover the three most prominent logical formalisms of agency: Seeing to it that Logic, Dynamic Logic, and Belief-Desire-Intention Logic. Each formalism emphasizes a different aspect of agency theory: Seeing to it that Logic focuses on the concept of choice, Dynamic Logic takes action as its fundamental concept, and Belief-Desire-Intention Logic deals with agents as goal-driven planners. We consider extensions of these formalisms that include reasoning about obligations and prohibitions, and discuss specific challenges such as the philosophical nature of negative actions, i.e., "not-acting".

The course consists of lectures and tutorials where we work on exercises.

Recommended background:

Knowledge of classical propositional logic. Familiarity with modal logic and axiomatic proof systems is helpful but not required.

Literature: The reading list will be provided during the course.

SEMINAR

BAD LANGUAGE: THE MEANING OF INSULTS, SLURS, AND BULLSHIT (030091)

JUN. PROF. DR. KRISTINA LIEFKE

TERM:	Summer 2023
MEETING TIME:	Thursday, 14 – 16 (First Meeting: 06.04.2023)
ROOM:	GA 04/187
CP:	3 or 6

If this course is used for Module C4, it cannot be used for AM2.

Traditionally, philosophy of language has focused on notions like reference and truth. However, much of our everyday language does not serve to describe reality: we use language to impress our peers and insult our opponents (*you fool*), to signal social belonging (*we won*), to express emotions (*the damn laptop . . .*), to be polite ('weather'-talk), and to win time. Language can even be used to change reality: this is achieved by silencing inconvenient voices, by asking leading questions, and by using manipulative speech. The latter work by exploiting linguistic trust: In these cases, the speaker is not as cooperative, honest, or helpful as the listener takes them to be.

This seminar gives an introduction to non-idealized language use like the above, based on Cappelen & Dever's introductory textbook *Bad Language*. Over the course of the semester, students will learn about Gricean communication, linguistic intention, context-dependence, and non-literal / social meaning.

Literature:

Textbook: Cappelen, Herman and Dever, Josh. 2019. *Bad Language*. Oxford: Oxford University Press.

Assessment:

Students can receive 3 CP for active participation and giving a presentation.

Students can receive 6 CP for giving a presentation + essay/oral exam.

LAB COURSE

OPEN NEURAL DATA (211426)

PROF. DR. ROBERT SCHMIDT

TERM:	Summer 2023
MEETING TIME:	Thursday, 12 – 14 (First Meeting: 06.04.2023)
ROOM:	NB 3/57
CP:	3

In November 2022 the International Brain Laboratory has released an unprecedented Big Open data set with brain recordings. In an international collaboration between 12 different research groups neural activity in 194 different brain regions (that's basically all of them!) was recorded in mice performing a standardized decision-making task. The data contains activity of 32784 neurons, which allows, for the first time, to examine how activity in any part of the brain is related to sensory, cognitive, and motor processing. For the published data the Open Neurophysiology Environment (ONE) API is available to access and process the different types of data files. In this computer programming practical you will learn about the research questions surrounding this exciting dataset and how to access and process the data. First, we will study the available documentation about the data set and the provided API, and learn the basics about brain recordings. Second, we will access and process the data so that it can be analysed. Finally, we will apply modern data science methods (such as clustering, dimensionality reduction, or computational statistics) to analyse the data and learn about information processing in the brain.

Learning Outcomes:

- obtain hands-on skills in accessing and processing of Big Open Data
- acquire relevant domain knowledge at the intersection of computer science and neuroscience
- become familiar with neural signals and how they are processed using data science methods
- visualize and interpret the results of data analysis

Examination: Exercises and reports during the semester

Requirements: Programming in Python, APIs

Registration: Seats are limited. If you want to participate, please send an e-mail to Prof. Schmidt: robert.schmidt@rub.de

Literature: Link to the IBL dataset: https://int-brain-lab.github.io/iblenv/notebooks_external/data_release_brainwidemap.html

LAB COURSE

INTRODUCTION TO PYTHON (211421)

PROF. DR. RER. NAT. LAURENZ WISKOTT, EDDIE SEABROOK

TERM:	Summer 2023
MEETING TIME:	Block (Mo-Fr): 18.09. - 29.09.2023, 10 – 16
ROOM:	ID 03/411
CP:	3

Python is a programming language that is widespread among scientists due to its readability and powerful standard libraries. This practical course teaches Python to students with prior experience in other programming languages. In addition to introducing the language itself, we will focus on scientific computing including vectors and matrices as well as data processing and mild machine learning. During the second week, participants will implement a project in Python.

Content

- **Python basics:** syntax, interpreter, control structures, data types, OOP
- **Scientific computing:** NumPy, Matplotlib, scikit-learn
- **Project:** realization of a project in Python

Grading

Grading is based on the project in the second week. If crucial components of Python are not covered in your project, we might also test your knowledge on the subject.

Requirements:

We expect fluency in one other programming language and familiarity with concepts like

- control structures
- data types
- functions
- object-oriented programming

These concepts will not be taught separately.

Registration:

Enrollment period: June 1 to 24, 2023.

During this time, spots will be filled on a first come first serve basis.

We only have a limited number of seats. Bachelor's students of "Angewandte Informatik" will be treated with priority as participation in one of the programming courses is mandatory for them.

Enroll by sending an email to python@ini.rub.de with the info below.

In your mail please include:

name, student ID number (Matrikelnummer), study program and semester (e.g., "Bachelor Angewandte Informatik PO13, 3rd semester"), a short explanation about your coding experience (one or two sentences)

SEMINAR

PROGRAMMIEREN IN MATLAB (118155)

DR. ROLAND PUSCH, PROF. DR. JONAS ROSE

TERM:	Summer 2023
MEETING TIME:	Thursday, 14 – 16 & 16 – 18 (First Meeting: 06.04.2023)
ROOM:	PC-Pool IB 02/109
CP:	6

Programming in Matlab

This course consists of two parts, a Matlab tutorial and a block seminar. Main aspect is a practical introduction to programming in Matlab, which will be trained in weekly meetings and supplemented by time-consuming homework. Moreover, students will participate in a research project and gain an insight into conduction of experiments, data analysis and data interpretation. As part of the practical course, students will plan, program, and conduct their own experiments. Students will then analyze the acquired data using their newly gained programming skills in Matlab. In an additional block seminar, the scientific content of the project will be elaborated. In the end, all three task areas will converge in a report, in which scientific content of the project, acquired data and data analysis are described. In case of any questions, please contact: roland.pursch@rub.de; jonas.rose@rub.de

There will be a group in German language and a group in English language.

SEMINAR

INTRODUCTORY MATH AND PROGRAMMING FOR
COMPUTATIONAL PHILOSOPHY (030053)

PROF. DR. CHRISTIAN STRÄBER, SOONG HWAN YOO, M.A.

TERM:	Summer 2023
MEETING TIME:	Tuesday, 10 – 12 (First Meeting: 04.04.2023)
ROOM:	GABF 04/709
CP:	3 or 6

In recent years, many philosophical developments have made use of heavy computer simulations and gigantic data sets. But for the average student of philosophy, it is difficult to engage with such literature. Required foundations, such as computer programming or probability theory, were not considered as traditional tool sets in philosophy. This course aims to equip students with these foundations in programming and math.

Thanks to the advance in modern technology and measurement techniques, scientists can carry out theoretical analyses that involve intense computations. For example, they can investigate how fake news or political propaganda spread in communities and neighborhoods, considering how people exchange information. Some theoretical frameworks such as theories of complex systems and networks can be used in these contexts of analyzing information propagation. But since these tools use large data sets and computer calculations, they come with the heavy burden of mathematics and computer programming skills.

Philosophers, as well, have started to pay attention to such analytical methods that rely heavily on computers. Epistemologists have started to use such tools when looking into knowledge in a social context, where multiple agents interact with each other. Here, network analysis has also become a widely exploited method among philosophers of science and social epistemologists. But as this method involves applied mathematics---such as matrix algebra or graph theory---in computer coding, philosophers are also required to have this knowledge and skills.

As noted, this course aims to provide the necessary foundations in mathematics and computer programming. Participants are not expected to have taken prior math courses such as matrix algebra, statistics, graph theory, and computer coding. We plan to proceed in a step-by-step manner as follows.

We start by reading some seminal papers in the discipline of network epistemology. These articles are accessible themselves. But to fully comprehend the methodologies and to furthermore replicate their results, one needs to have some basic understanding of math and coding.

Therefore, we will provide the required basics of matrix algebra, statistics, and graph theory. Also, we will practice the concepts and materials on programming codes as we proceed. Eventually, we will go back to look into the codes of the seminal articles that we started with at the beginning.

*LAB COURSE***AUTONOMOUS ROBOTICS (211423)**

PROF. DR. RER. NAT. GREGOR SCHÖNER

TERM:	Summer 2023
MEETING TIME:	Block: 14.08.2023 - 18.08.2023, 10 – 18
ROOM:	NB 02/77
CP:	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.

Assessment:

The practical part of the lab course consists of a week of full-time work in which students solve programming tasks with simulated mobile robots. In the two weeks following the practical part, the students then write reports in which they describe and analyze the work they have done. The grade for the lab course is based on both the practical work and the report. Students will get support during programming.

TERM:	Summer 2023
LECTURE:	Monday, 12 – 14 (First Meeting: 03.04.2023)
RECITATIONS:	Friday, 14 – 16 (First Meeting: 18.04.2023)
ROOM:	NB 3/57
CP:	6

If this course is used for Module C3, it cannot be used for AM4.

Computational neuroscience uses quantitative methods to describe what nervous systems do, study how they function, and explain the underlying principles. This class introduces the basics of the mathematical and computational methods used in contemporary neuroscience research. These methods are applied to problems in perception, motor control, learning, and memory.

Knowledge of calculus, linear algebra, and statistics is required for this class, knowledge of neuroscience is not.

Assessment written final exam - 120 min - date: TBA

Course material available on Moodle (registration required)

Literature "Theoretical Neuroscience" by Dayan and Abbott, MIT Press

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

Office hours: Thursdays 14:00-15:00

Enrollment: eCampus/Flexnow

SEMINAR

SEMINAR COMPUTATIONAL NEUROSCIENCE

(211130)

PROF. DR. SEN CHENG

TERM:	Summer 2023
MEETING TIME:	Wednesday, 10 – 12 (First Meeting: 05.04.2023)
ROOM:	NB 3/57
CP:	3

Computational neuroscience uses quantitative methods to describe what nervous systems do, study how they function, and explain the underlying principles. This seminar will cover recent scientific publications in the field of computational neuroscience.

Specific topics:

- Neural Encoding
- Neural Decoding
- Information Theory
- The Action Potential
- Dynamics of Neural Networks
- Synaptic Plasticity
- Associative Networks
- Continuous Attractor Networks
- Associative Learning
- Classification
- Competitive Learning
- Generative Models

Learning Outcomes:

After successful completion of this seminar, students will be able to

- read and understand scientific articles in computational neuroscience
- apply computational models to describe the functioning of the nervous system
- understand the advantages and disadvantages of specific computational models
- discuss how neuroscience experiments are used to test computational models
- present the results of studies in computational neuroscience to an audience

Examination: Oral presentation

Requirements:

Knowledge of calculus, linear algebra, and statistics are required, e.g. Mathematik 1 und 2, Statistik. Knowledge of biology is not necessary, but basic computational neuroscience is.

Students should have taken the class „Introduction to Computational Neuroscience“, or something equivalent, before enrolling in this seminar. It is also possible to take this seminar in parallel with „Introduction to Computational Neuroscience“.

Literature:

The articles will be announced in the first meeting.

Background reading: “Theoretical Neuroscience” by Dayan and Abbott, MIT Press

LECTURE & EXERCISE

COMPUTATIONAL NEUROSCIENCE: SINGLE-NEURON MODELS
(211039)

PROF. DR. ROBERT SCHMIDT

TERM:	Summer 2023
LECTURE:	Monday, 8.30 – 10.00 (First Meeting: 03.04.2023)
ROOM:	IA 03/466
EXERCISE:	Friday, 12.00 – 14.00 (First Meeting: 14.04.2023)
ROOM:	ID 03/121 CIP-POOL 2
CP:	6

If this course is used for Module I3, it cannot be used for AM4.

This module starts with a primer on neuroscience and the role of computational neuroscience. The next part of the module covers biologically-grounded models of single neurons, including leaky-integrate-and-fire and conductance-based neurons, but also more abstract models of neural activity and spike trains. You will learn how these different computational models describe and simplify the underlying biological processes to a different degree. We will examine in detail how these different neuron models can be used in numerical simulations to address research questions on computation in single neurons and circuits. In the exercises accompanying the lectures you will gain hands-on experience in implementing the different neuron models in Python, running numerical simulations, and performing calculations related to analytical solutions of the model equations and biophysics. The focus is on single neuron models, but we will also make use of available software (e.g. NEST Desktop) to examine how single neuron models can be integrated into simulations of neural networks. While the emphasis throughout the module is on methodological issues, how models can be built, tested and validated at each level, we will also draw connections to specific brain regions to motivate and illustrate the models.

Learning Outcomes:

- apply techniques from computational neuroscience to simulate neural activity
- become familiar with different types of single neuron models, their mathematical description, and their different levels of biological abstraction
- acquire skills in modelling neurons, synapses and circuits and connect these models to biology and computation
- understanding of the biological basis for computation in neurons

Assessment: written exam at the end of the semester (120 min)

Requirements: Programming in Python, mathematical knowledge (linear algebra and calculus) and an interest in neurobiology

Literature:

Gerstner, W., Kistler, W. M., Naud, R., & Paninski, L. (2014). Neuronal dynamics: From single neurons to networks and models of cognition . Cambridge University Press.

Dayan, P., & Abbott, L. F. (2005). Theoretical neuroscience: computational and mathematical modeling of neural systems . MIT press.

LECTURE

MENSCHENZENTRIERTE ROBOTIK (136070)JUN. PROF. DR. LAURA KUNOLD, PROF. DR.-ING BERND KUHLEN-
KÖTTER, PROF. DR. ANNETTE KLUGE

TERM:	Summer 2023
MEETING TIME:	Tuesday, 14.15 – 17.00 (First Meeting: 04.04.2023)
ROOM:	LPS Lern- und Forschungsfabrik; Industriestraße 38c, 44894 Bochum
CP:	6

Language of instruction: German

Details im Moodle-Kurs: <https://moodle.ruhr-uni-bochum.de/course/view.php?id=34716>

Der erste Veranstaltungstermin am 4.4.23 gilt als Pflichttermin.

Die Studierenden werden in fachübergreifenden Gruppen an konkreten Problemstellungen im Bereich der Servicerobotik arbeiten. Zur Gestaltung des sozio-technischen Systems aus Mensch(en) und Roboter(n), werden sowohl ingenieurwissenschaftliche als auch psychologische Fragestellungen berücksichtigt.

Zur menschengerechten Gestaltung der Interaktion mit der Roboterplattform, wird eine Einführung in psychologische Effekte der Mensch-Technik-Interaktion gegeben, sowie die soziale Robotik und ihre Anwendungsfelder vorgestellt.

Auf dieser Basis bearbeiten die Studierenden dann in interdisziplinären Gruppen individuelle Problemstellungen unter wissenschaftlichen Gesichtspunkten zur Behindertenhilfe. Hierbei steht thematisch die erfolgreiche Kommunikation und Interaktion zwischen Mensch und Roboter (und der Eindruck des Roboters auf dem Menschen) im Vordergrund. Es besteht die Möglichkeit die ausgearbeiteten Lösungsansätze zu implementieren und somit eine Validierung des Konzeptes durchzuführen.

Anmeldung

In der Veranstaltung herrscht Anwesenheitspflicht. Um ein ausgewogenes Verhältnis unterschiedlicher Disziplinen bei begrenzten Teilnahmeplätzen zu ermöglichen, ist die Anzahl der Teilnehmenden beschränkt. In der ersten Vorlesung wird das Verfahren zur Anmeldung und der Gruppenaufteilung bekannt gegeben.

Termine

Die Veranstaltung findet jeden Dienstag 14:15 Uhr in der LPS Lern- und Forschungsfabrik statt und setzt sich aus Vorlesungen, Gruppenarbeit und Gruppenpräsentationen zusammen. Eine aktive und engagierte Teilnahme von jedem Studierenden ist bei dieser Lehrveranstaltung Voraussetzung. Die Projektarbeit in den Gruppen wird von den Studierenden selbst organisiert. Weitere Termine für beispielsweise die Abschlusspräsentationen werden in der Vorlesung bekannt gegeben.

Prüfungsleistung: Projektdokumentation (schriftlicher Bericht) und Abschlusspräsentationen

AM5

AM5. Special Methods in Neuroscience & Genetics

SEMINAR

TRAINING BIRDS: FROM AUTOSHAPING TO ELECTROPHYSIOLOGY (110013)

PROF. DR. JONAS ROSE, DORIAN ROEDERS

TERM:	Summer 2023
MEETING TIME:	Thursday, 11 – 13 (First Meeting: 06.04.2023)
ROOM:	IA 1/161
CP:	3

This course will cover the theoretical background of bird training, handling and electrophysiology. The students will learn the basics of literature research and experimental design for bird electrophysiology. The goal of the course is that the students are able to write a draft for an experimental plan and training steps, which will also be the basis of the course grade.

AM5

AM5. Special Methods in Neuroscience & Genetics

SEMINAR

TIERMODELLE IN DER PSYCHIATRIE (112636)

PROF. DR. JONAS ROSE, PATRICK REINHARDT

TERM:	Summer 2023
MEETING TIME:	Wednesday, 14 – 16 (First Meeting: 05.04.2023)
ROOM:	IA 1/161
CP:	3

Language of instruction: German

Wie verhalten sich schizophrene Mäuse? Können Ratten depressiv werden? Und warum werden Hamster nicht alkoholabhängig?

Tiermodelle sind in den Neurowissenschaften weit verbreitet, aber besonders im Kontext psychiatrischer Störungen nicht unumstritten. In diesem Seminar sollen unterschiedliche Tiermodelle psychiatrischer Störungen, ihre Aussagekraft und Limitationen besprochen werden. Ziel des Seminars ist es, den Teilnehmenden einen Überblick über Tierforschung im Kontext Psychiatrie zu geben, sowie sie in die Lage zu versetzen Studien methodenkritisch zu analysieren.

Die Basis des Seminars werden Impulsvorträge zu unterschiedlichen Modellen, sowie Gruppenarbeiten und Diskussionen im Plenum bilden.

Grundlegende Kenntnisse der klinischen Psychologie werden zur Teilnahme vorausgesetzt.

Literatur wird zu Beginn des Seminars bekanntgegeben.

Kontakt: patrick.reinhardt@rub.de

*SEMINAR***JOURNAL CLUB - MAGNETO- AND
ELECTROENCEPHALOGRAPHY IN COGNITIVE NEUROSCIENCE****(118915)**

DR. MARKUS WERKLE-BERGNER

TERM:	Summer 2023
MEETING TIME:	Thursday, 16 – 18
ROOM:	Zoom
CP:	3

We will read and discuss novel trends in M/EEG technology and analysis techniques for the use in modern cognitive neuroscience applications.

Literature: Literature will be given in the beginning of the course.

*PRACTICAL COURSE***MOLEKULARE PSYCHOLOGIE: MOLEKULARGENETISCHES
GRUNDPRAKTIKUM 1A (118156) OR 1B: (118159)**

DR. DIRK MOSER

TERM:	Summer 2022
MEETING TIME:	Preliminary Meeting: Monday, 17.04.2023, 13.00 (IB 5/103) both blocks: 1 week at the start of the summer semester break Monday to Friday, 9 – 13
ROOM:	IB 5/103
CP:	3

Language of instruction: German

Es kann nur eine der beiden Veranstaltungen belegt werden.

Das Grundpraktikum "Molekulare Psychologie" soll interessierten Studierenden die Schnittmenge zwischen Psychologie und Biologie experimentell begreifbar machen. Hierzu wird jeder PraktikumssteilnehmerIn aus eigenem Blut DNA extrahieren und diese im Verlauf der Woche auf verschiedene, in der psychobiologischen Forschung prominente Genvarianten überprüfen. Hierzu finden eine Vielzahl molekularbiologischer Methoden Anwendung. Praktikumsbegleitend werden molekulare Grundlagen sowie experimentelle Möglichkeiten, sowie die Ergebnisse der eigenen praktischen Versuche in Spezialvorträgen präsentiert und diskutiert.

Voraussetzungen: Teilnahmevoraussetzung sind gute bis sehr gute Kenntnisse in Biologie/ Molekularbiologie/Psychobiologie

Literatur: Skript (wird nach der Vorbesprechung verteilt)

BLOCK SEMINAR & PRACTICAL COURSE
NEUROPSYCHOLOGICAL METHODS: EEG
 (118157 + 118158)

DR. LAURA-ISABELLE KLATT & DR. JULIAN ELIAS REISER

TERM:	Summer 2023
MEETING TIME:	Preliminary Meeting: date tba, online via Zoom
	Lab & Seminar: 15.04.2023 & 16.04.2023 9-18
	06.05.2023 & 07.05.2023 9-18
ROOM:	Leibniz Institut für Arbeitsforschung in Dortmund
CP:	6

This course takes place at the *Leibniz Institut für Arbeitsforschung* in Dortmund (Ardeystr. 67, 44139 Dortmund).

Please make early decision and contact the lecturers running the courses: Please notice the entry conditions of the courses.

SEMINAR: Seminar course neuropsychological methods: EEG (118158)
& LAB (Laboratory Course): Practical course neuropsychological methods: EEG (118157):

Students must enroll for both the “practical course” and the “seminar course”. Participation in both courses is mandatory to complete the module. The goal of the course is to be able to independently conduct and analyze a basic EEG study. On the basis of published neuropsychological literature, students will develop a research question and present the results of the experiment in a written report, according to the publishing standards of neuroscientific journals. The basic skills and literature will be discussed in the seminar. As of now, this course is planned to be held as in-person seminar, including data collection in the EEG laboratory. A first organizational meeting will be held online via Zoom. Along with the in-person meetings, additional materials and assignments will be provided on Moodle. The course language is English.

Requirements: Participation in both courses is mandatory for completion,
 basic knowledge of neuropsychology

SEMINAR

NEUROPSYCHOLOGISCHE VERHALTENSSTUDIEN
ENTWICKELN UND DURCHFÜHREN
(118151)

TERM:	Summer 2023
MEETING TIME:	Monday, 10 – 12 (First Meeting: 03.04.2023)
ROOM:	IA 02/460
CP:	3

Language of instruction:

German; depending on the group composition this seminar can also be held in English.

How to develop and implement neuropsychological behavioral studies

The objective measurement of behavioral aspects has an important role in cognitive neuroscience as a complement to questionnaires and neurobiological measures, for example in the context of clinical neuropsychological and basic research studies. In this seminar, the most important aspects in planning and implementing such studies, especially with regard to the development of neuropsychological behavioral paradigms, will be elaborated and put into practice.

The aim of the course is to enable participants to independently develop and conduct a study involving neuropsychological behavioral measurement.

D. Free Selection

Please notice that under the category "free selection" we only list courses held in German as additional offers. Please notice that you are only allowed to have maximally 12 CP from courses in German in the whole program.

Furthermore, any other course of the Cognitive Science Master Program can be counted as part of the free selection module, i.e., if you have completed (or have a clear plan of how you will complete) the obligatory modules, you may choose any additional courses from any module and credit them as part of the free selection module.

Additionally, it is possible to credit internships with up to 10 CPs in the category of free selection. The internship must of course be equivalent in working hours to the number of credit points and it must qualify for the Cognitive Science Master Program (ideally supporting your master thesis). If you aim to credit an internship as part of this module, then please contact the program coordinator (cogsci-info@rub.de) in advance.

D1	Free Selection
	<i>LECTURE</i> KOGNITION UND GEHIRN (112611) PROF. DR. OLIVER WOLF
TERM:	Summer 2023
MEETING TIME:	Monday, 14 – 16 (First Meeting: 03.04.2023)
ROOM:	HIA
CP:	3

Language of instruction: German

Die Vorlesung bietet einen Überblick über Befunde und Theorien zu aktuellen Themen der kognitiven Neurowissenschaft. Die Vorlesung setzt Grundkenntnisse der Kognitionspsychologie und der Biopsychologie voraus.

Literatur: wird zu Beginn der Veranstaltung bekannt gegeben und wird im Moodle zur Verfügung gestellt.

*SEMINAR***PSYCHIATRIE: NEUROPSYCHOLOGISCHE ASPEKTE (118125)**

PROF. DR. PATRIZIA THOMA

TERM:	Summer 2023
MEETING TIME:	Monday, 08.30 – 10.00 (First Meeting: 03.04.2023)
ROOM:	IA 02/445
CP:	3

Language of instruction: German

Bei dieser Veranstaltung haben die Studierenden der Master Psychologie Vorrang.

In diesem Seminar sollen die neuropsychologischen Veränderungen bei Schizophrenie, Depression, Sucht und anderen wichtigen Störungen dargestellt und diskutiert werden. Dabei erfolgt zunächst eine Darstellung allgemeiner Gesichtspunkte (Definition, Diagnose etc.) und eine Beschreibung zerebraler Veränderungen. Ausgehend von den zerebralen Veränderungen wird das kognitive Profil im Hinblick auf die kognitiven Bereiche Aufmerksamkeit, visuell-räumliche Leistungen und exekutive Funktionen erläutert.

Literatur: Eine Literaturliste ist zu Beginn des Semesters erhältlich.

*LECTURE***EVOLUTION UND EMOTION (112251)**

PROF. DR. PHIL. DR. H.C. ONUR GÜNTÜRKÜN

TERM:	Summer 2023
MEETING TIME:	Thursday, 16 – 18 (First Meeting: 06.04.2023)
ROOM:	HIA
CP:	3

Language of instruction: German

Wie verlief bisher die Geschichte des Lebens? Innerhalb welchen Gesamtszenarios bettet sich die Entstehung des Menschen ein und welche Anteile unseres heutigen Denkens, Handelns und Fühlens reflektieren die Gesetzmäßigkeiten, die bei der Phylogenese unseres Gehirns wirksam waren? Wie determiniert die Interaktion von Umweltfaktoren und genetischer Anlage unsere Entwicklung? Um solche Fragen beantworten zu können, müssen wir die Evolutionstheorie mit allen ihren Implikationen kennenlernen.

In der Vorlesung sollen folgende Themen behandelt werden:

- 1) Mechanismen der Genetik und Epigenetik
- 2) Verhaltensgenetik
- 3) Entwicklung des Lebens und des Menschen
- 4) Emotionsmechanismen
- 5) Soziobiologie

Literatur: Bekanntgabe der aktuellen Literatur während der Veranstaltung und über Moodle

*LECTURE***BIOPSYCHOLOGIE (112631)**

PROF. DR. PHIL. DR. H.C. ONUR GÜNTÜRKÜN

TERM:	Summer 2023
MEETING TIME:	Monday, 16 – 18 (First Meeting: 03.04.2023)
ROOM:	HIA
CP:	3

Language of instruction: German

Das Wissen um Hirnaufbau und Hirnfunktion ist die Grundlage für das Verstehen sämtlicher bio- und neuropsychologischer Fragestellungen. In dieser Vorlesung wollen wir uns exemplarisch das Sehsystem des Menschen vornehmen. Wir wollen seine Funktionen verstehen, indem wir die Anatomie und Physiologie des Sehsystems kennenlernen und neuropsychologische Ausfälle anschauen. Danach wollen wir kennenlernen, wie die visuelle Information in die Prozesse des präfrontalen Cortex integriert wird, sodass die Fähigkeit zum Behalten, Planen und Handeln entsteht. Kurz gesagt, wollen wir die neuronalen Grundlagen des Wahrnehmens und Erkennens kennenlernen.

Literatur:

Onur Güntürkün, Biopsychologie, Hogrefe Verlag 2012, Kapitel 5 - 12

Bekanntgabe weiterer aktueller Literatur während der Veranstaltung und über Moodle.

D1

Free Selection

BLOCK SEMINAR
NEUROPSYCHOLOGISCHE REHABILITATION I (118121)
OR II (118123)
PROF. DR. PATRIZIA THOMA/ PROF. DR. BORIS SUCHAN

TERM: Summer 2023

MEETING TIME: **Block I:**
Preliminary Meeting: Tuesday, 18.04.2023, 9-10 (IA 1/157)
Friday, 16.06.2023 9 – 17 (GD 02/156) &
Saturday, 17.06.2023 9 - 17 (GABF 04/514)

OR

Block II:
Saturday, 13.05.2023, 9 – 17 (GABF 04/514) &
Sunday, 14.05.2023, 9 - 17 (GABF 04/514)

Language of instruction: German

Bei dieser Veranstaltung haben die Studierenden der Master Psychologie Vorrang.

Es kann nur eine der beiden Veranstaltungen belegt werden.

In diesem Seminar sollen Möglichkeiten und Grenzen kognitiver neuropsychologischer Rehabilitation am Beispiel verschiedener neuropsychologischer Störungsbilder wie z.B. Schlaganfall, Demenz oder Multiple Sklerose aufgezeigt werden. Es werden aktuelle Konzepte und Inhalte neuropsychologischer Therapien bei Gedächtnis- Aufmerksamkeitsdefiziten etc. dargestellt. Ebenso werden psychotherapeutische Möglichkeiten zur Bewältigung psychologischer Folgen bei neurologischen Erkrankungen aufgezeigt und diskutiert.

Literaturhinweise: Eine Literatur ist zu Beginn des Seminars erhältlich

D1

Free Selection

*PROJECT SEMINAR***„PITCH YOUR SCIENCE“ – SCIENCE COMMUNICATION PROJECT**

DR. IVONNE MÖLLER

TERM:	Summer 2023
MEETING TIME:	Introductory Event 12.04.23, 16.00 Ideas Workshop 18.04.23, 16.00 Further Workshops 19.04.23 – 14.07.23 Exhibition of the Projects 15.07. & 16.07.23 (Planetarium Bochum)
ROOM:	Makerspace

Find further information here: https://www.sfb1491.ruhr-uni-bochum.de/cim/events/pitch_your_science_module_23.html.en

Topic in SoSe 23: Our Universe (Science Year 2023)

Contents:

In the practical project, students work in interdisciplinary groups to make science perceptible. Models or visualizations are developed that make current, socially relevant research tangible. This can be prototypes, mobile games, interactive simulations, VR applications as well as a podcast or a planetarium show. The aim of the practical project is to present these science communication projects outside the university, e.g., at the Bochum Planetarium. An overall theme connects all projects. In SoSe 23, this will be the topic "Our Universe", in line with the Science Year 2023.

The practical project will be carried out in cooperation with the Makerspace of RUB. There, the practical work on the projects will take place and workshops will be held.

Accompanying workshops on project management will also take place.

Students first develop project ideas, which they pitch in short presentations. After selecting the project, they write project plans outlining what skills they need to develop their project and what materials are required. Based on the project plan, workshops are arranged with the Makerspace and materials are purchased.

As they work on the projects, the progress is documented. Before the public exhibition, all students design the advertisement of the practical project together in a further workshop. All groups present their projects in a colloquium.

Learning Outcomes:

After completion of the project:

- Students know project management concepts and can work according to them.
- Students are able to communicate and work in an interdisciplinary group.
- Students have acquired the technical knowledge for the implementation of their project (3D printing, programming, laser cutting, ...).
- Students recognize what knowledge others bring with them and can present their research projects accordingly.
-

Format of Examination: Presentation

You can find the Makerspace here:

makerspace@ruhr-uni-bochum.de

O-Werk

Suttner-Nobel-Allee 4

44803 Bochum

Registration: Please send an E-Mail to sophie.aerdker@rub.de until 31.03.2023

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 your master thesis project.

Please notice that one and the same course can only be accepted as part of a single Module. It is prohibited to use the same course for two different Modules.

Usually, the interdisciplinary research modules should be completed in the third semester (winter semester). To keep flexibility for the students we offer some courses for these modules in the summer semester as well. Please check individually with the lecturer whether the colloquium will be held in English.

I1

I1. Cognitive Philosophy

COLLOQUIUM

RESEARCH COLLOQUIUM: RATIONALITY AND COGNITION (030125)

JUN. PROF. DR. PETER BRÖSSEL

TERM:	Summer 2023
MEETING TIME:	Wednesday, 16 – 18 (First Meeting: 05.04.2023)
ROOM:	GABF 04/709
CP:	3 or 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). We investigate formal models of perception, rational reasoning, and rational action. Students at the master's or doctoral level will be given the opportunity to present their research in English.

*COLLOQUIUM***EXTRA RESEARCH COLLOQUIUM "METAPHILOSOPHY,
EXPERIMENTAL PHILOSOPHY, AND ARGUMENTATION
THEORY" (030126)**

JUN. PROF. DR. JOACHIM HORVATH

TERM:	Summer 2023
MEETING TIME:	Wednesday, 16 – 18:15
ROOM:	GAFO 04/619
CP:	3 or 6

In this colloquium in seminar-style, we will discuss current topics from argumentation theory, epistemology, experimental philosophy, and metaphilosophy, broadly construed. The colloquium will also host a number of talks by external guests, many of which are leading experts in their field. Students at the advanced bachelor, master, or doctoral level are especially welcome in the colloquium, and they can also acquire the normal range of credit points. Moreover, student participants will have the option of presenting their own work, e.g., related to their thesis, in English.

*COLLOQUIUM***PHILOSOPHY MEETS COGNITIVE SCIENCE:
MEMORY AND LANGUAGE (030132)**

PROF. DR. MARKUS WERNING

TERM:	Summer 2023
MEETING TIME:	Tuesday, 16 – 19 (First Meeting: 04.04.2023)
ROOM:	GA 04/187
CP:	3 or 6

In cooperation with the German Language Department (RUB) and the Center for Philosophy of Memory (Grenoble)

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". A detailed schedule will be published in due course at <https://www.ruhr-uni-bochum.de/phil-lang/colloquium.html>. Talks will be held either online via Zoom or in person.

Assessment:

Students can receive either 3 CP by giving a presentation or 6 CP by giving a presentation and writing an essay.

*COLLOQUIUM***COLLOQUIUM: PHILOSOPHY OF LOGIC, LANGUAGE AND INFORMATION (030120)**

JUN. PROF. DR. KRISTINA LIEFKE, PROF. DR. DOLF RAMI

TERM:	Summer 2023
MEETING TIME:	Wednesday, 16 – 18 (First Meeting: 05.04.2023)
ROOM:	GA 04/187
CP:	3 or 6

This colloquium serves the discussion of current topics at the semantic interface of logic, the philosophy of language, and the philosophy of information. The colloquium will combine talks by international experts with presentations of local researchers and (PhD/MA) students. Students will be given the opportunity to present their (ongoing) work in English. A detailed schedule will be available by end-March at <https://www.ruhr-uni-bochum.de/phil-inf/colloquium/index.html.en>.

Assessment:

Students can receive 3 CP for active participation and giving a presentation.
Students can receive 6 CP for giving a presentation + essay/oral exam.

11

Cognitive Philosophy

COLLOQUIUM
COLLOQUIUM: PHILOSOPHY OF INFORMATION AND COMMUNICATION (030119)
JUN. PROF. DR. KRISTINA LIEFKE

TERM:	Summer 2023
MEETING TIME:	Tuesday, 16 – 18 (First Meeting: 04.04.2023)
ROOM:	GABF 04/354
CP:	3 or 6

This colloquium (co-organized with Prof. Daniel Gutzmann, Germanistik) serves the discussion of current topics in semantics, pragmatics, and the philosophy of language. The colloquium combine talks by international experts with presentations of local researchers and (PhD/MA) students. Students will be given the opportunity to present their (ongoing) work in English. A detailed schedule will be available by mid-March at <https://www.ruhr-uni-bochum.de/phil-inf/colloquium/index.html.en>.

Assessment:

Students can receive 3 CP for active participation and giving a presentation.
Students can receive 6 CP for giving a presentation + essay/oral exam.

11

Cognitive Philosophy

COLLOQUIUM
RESEARCH COLLOQUIUM: LOGIC AND EPISTEMOLOGY (030128)
DR. NILS KÜRBIS, DR. DANIEL SKURT

TERM:	Summer 2023
MEETING TIME:	Thursday, 16 – 18
ROOM:	GA 03/46
CP:	6

In this colloquium students will have an opportunity to present a paper on a topic of their choice from philosophical logic or epistemology. This paper may or may not be related to an MA thesis. Background knowledge in analytic epistemology and philosophical logic is required. In addition to presentations by students, there will be talks by guests and invited speakers.

*COLLOQUIUM***RESEARCH COLLOQUIUM IN COGNITIVE PSYCHOLOGY AND
PSYCHONEUROENDOCRINOLOGY (118913)**

PROF. DR. OLIVER T. WOLF

TERM:	Summer 2023
MEETING TIME:	Tuesday, 16.00 – 18.00 (First Meeting: 04.04.2023)
ROOM:	IB 6/127
CP:	3

Research talks on current topics in the areas of Cognitive Psychology and Psychoneuroendocrinology will be given by members from the department. In addition external invited guests will present their latest findings. A timetable will be posted on the homepage of the department at the beginning of the semester.

*LECTURE & EXERCISE***COMPUTATIONAL NEUROSCIENCE: SINGLE-NEURON MODELS
(211039)**

PROF. DR. ROBERT SCHMIDT

TERM:	Summer 2023
LECTURE:	Monday, 8.30 – 10.00 (First Meeting: 03.04.2023)
ROOM:	IA 03/466
EXERCISE:	Friday, 12.00 – 14.00 (First Meeting: 14.04.2023)
ROOM:	ID 03/121 CIP-POOL 2
CP:	6

If this course is used for module AM4, it cannot be used for module I3.

This module starts with a primer on neuroscience and the role of computational neuroscience. The next part of the module covers biologically-grounded models of single neurons, including leaky-integrate-and-fire and conductance-based neurons, but also more abstract models of neural activity and spike trains. You will learn how these different computational models describe and simplify the underlying biological processes to a different degree. We will examine in detail how these different neuron models can be used in numerical simulations to address research questions on computation in single neurons and circuits. In the exercises accompanying the lectures you will gain hands-on experience in implementing the different neuron models in Python, running numerical simulations, and performing calculations related to analytical solutions of the model equations and biophysics. The focus is on single neuron models, but we will also make use of available software (e.g. NEST Desktop) to examine how single neuron models can be integrated into simulations of neural networks. While the emphasis throughout the module is on methodological issues, how models can be built, tested and validated at each level, we will also draw connections to specific brain regions to motivate and illustrate the models.

Learning Outcomes:

- apply techniques from computational neuroscience to simulate neural activity
- become familiar with different types of single neuron models, their mathematical description, and their different levels of biological abstraction
- acquire skills in modelling neurons, synapses and circuits and connect these models to biology and computation
- understanding of the biological basis for computation in neurons

Assessment: written exam at the end of the semester (120 min)

Requirements: Programming in Python, mathematical knowledge (linear algebra and calculus) and an interest in neurobiology

Literature:

Gerstner, W., Kistler, W. M., Naud, R., & Paninski, L. (2014). *Neuronal dynamics: From single neurons to networks and models of cognition*. Cambridge University Press.

*LECTURE & EXERCISE***AUTONOMOUS ROBOTICS: ACTION, PERCEPTION, AND COGNITION (211048)**

PROF. DR. RER. NAT. GREGOR SCHÖNER

TERM:	Summer 2023
LECTURE:	Thursday, 14.15 – 16.00 (First Meeting: 06.04.2023)
EXERCISE:	Thursday, 16.15 – 17.00 (First Meeting: 06.04.2023)
ROOM:	NB 3/57
CP:	6

If this seminar is used for Module C2, it cannot be used for I3.

Autonomous robotics is an interdisciplinary research field in which embodied systems equipped with their own sensors and with actuators generate behavior that is not completely pre-programmed. Autonomous robotics thus entails perception, movement generation, as well as core elements of cognition such as making decisions, planning, and integrating multiple constraints.

This course touches on various approaches to this interdisciplinary problem. In the first half of the course, the main emphasis will be on dynamical systems methods for generating movement in vehicles. The main focus of the course is, however, on solutions to autonomous movement generation that are inspired by analogies with how nervous systems generate movement. The second half of the course will review core problems in human movement science, including the degree of freedom problem, coordination, motor control, and the reflex control of muscles.

Requirements

The emphasis of the course is on learning concepts, practicing interdisciplinary scholarship including reading and writing at a scientific and technical level. Mathematical concepts are used throughout, so understanding these concepts is important. Mathematical skills are not critical to mastering the material, but helpful. The mathematics is mostly from the qualitative theory of dynamical systems, attractors and their instabilities. Short tutorials on some of these concepts will be provided.

Registration

You can register for the course here: <https://www.ini.rub.de/elearning/?eid=392>

Further reading

Readings will be posted on the INI web page. Also have a look at the web page of the Dynamic Field Theory community that is interested in related problems and solutions: <https://dynamicfieldtheory.org/>

There you find more exercises, reading material, slides and lecture videos that have some overlap with the lecture.

Find more information on the INI web page: https://www.ini.rub.de/teaching/courses/autonomous_robotics_action_perception_and_cognition_summer_term_2023/

*SEMINAR***JOURNAL CLUB: LEARNING AND MEMORY (211125)**

PROF. DR. SEN CHENG

TERM:	Summer 2023
MEETING TIME:	Tuesday, 14 – 16 (First Meeting: 04.04.2023)
ROOM:	NB 3/72
CP:	3

This course can be assigned to module I2, too.

We will discuss the latest research results in learning and memory at the systems level. Each session will consist of either a presentation based on a published article or a research talk. Presentations will be given by one participant and will be followed by a group discussion. Research talks will be given by members of the computational neuroscience group or external invited guests. Some meetings will be held via video conferencing with participants from the USA. To accommodate the schedule of external participants, some meetings might have to be moved to a different date and time. The topics to be discussed will focus on the functional role of the mammalian hippocampus in spatial navigation and episodic memory. They will cover a diverse set of approaches: electrophysiology, imaging, computational modeling, and robotics. Students will select articles to present in consultation with the instructor.

Assessment: presentation in class

Prerequisites: advanced knowledge of learning and memory

Course material: available on Trello (www.trello.com/b/ETW0pTnY)

Capacity: max. 15 students

Enrollment: eCampus

Literature: journal articles to be selected by students in consultation with the instructor

*COLLOQUIUM***COLLOQUIUM: NEURAL BASIS OF LEARNING (118923)**

PROF. DR. JONAS ROSE, LUTZ WEHRLAND

TERM:	Summer 2023
MEETING TIME:	Friday, 12 – 14 (First meeting: 14.04.2023)
ROOM:	GA 04/187
CP:	3

A broad range of current research topics in cognitive neuroscience will be covered by internal and external speakers. Our focus lies in a mechanistic understanding of crucial processes that in turn form the basis of higher cognition.

If you want to participate in this course and receive credit points, please send an e-mail to jonas.rose@rub.de.

A schedule will be available on the homepage from the beginning of April.

<https://www.ngl.psy.ruhr-uni-bochum.de/ngl/>

14

14. Cognitive Neuroscience

*COLLOQUIUM***BIOPSYCHOLOGY RESEARCH COLLOQUIUM (118914)**

PROF. DR. PHIL. DR. H.C. ONUR GÜNTÜRKÜN

TERM:	Summer 2023
MEETING TIME:	Monday, 13 – 15 (First meeting: 03.04.2023)
ROOM:	IB 6/127
CP:	3

The research colloquium is open to all employees and graduate students of the Biopsychology department. The aim is to present and discuss their research. In addition, external guests are invited to give talks on different aspects of biopsychology.

You can have a look at the schedule at the department's information board and our homepage: <http://www.bio.psy.ruhr-uni-bochum.de/>.

14

14. Cognitive Neuroscience

*COLLOQUIUM***RESEARCH COLLOQUIUM NEUROPSYCHOLOGY (118912)**

PROF. DR. NIKOLAI AXMACHER

TERM:	Summer 2023
MEETING TIME:	Thursday, 14 – 16 (First Meeting: 06.04.2023)
ROOM:	IB 6/127
CP:	3

Presentation of ongoing research, as well as lectures by guest lecturers on clinical neuropsychological topics. A schedule with information about topics and speakers will be announced at the beginning of the semester via notice board and on the homepage: <http://www.ruhr-uni-bochum.de/neuropsych/>.

An important aim of this course, and basis for successful participation and grading, is a regular and active participation in the scientific discourse.