Course Guide – Master Cognitive Science

Winter 2015/16

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Enrollment for Courses

Students in the first semester will be registered by the lecturers in the first session of each course. Advanced students (from the second semester on) are requested to register with the university's **VSPL**-system (info: vspl-support@rub.de) and should be aware of earlier VSPL-deadlines. Exceptions include the courses held by Wiskott, Schöner and Würtz. Here, there will be **no VSPL-registration**, but a manual enrollment in the first session.

FIRST YEAR PROGRAM

Every student is strongly recommended to participate in the preparatory courses. Exceptions have to be approved by Peter Brössel (peter.broessel@rub.de). The course "Academic English" need not be passed by native speakers of English. The course "Biostatistics" need not be passed by students who have a standard BA in psychology.

Preparatory Courses

Academic English

SEMINAR
ENGLISH FOR MASTER COGNITIVE SCIENCE (251210)
ANNA SOLTYSKA

TERM: Winter 2015/16
MEETING TIME: Sep 29 – Oct 10, 8.30 – 10.30
ROOM: GABF 04/253

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

The course will be accompanied by a Blackboard/Moodle component to enhance classroom teaching and self-study at home.
At the end of the course the participants have to write a final test that will comprise all four skills taught in class.

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

SEMINAR
BIOSTATISTICS (119212)
SATISH KUMAR

TERM:	Winter 2015/16
MEETING TIME:	2015, October 5−9: 11.30 − 12.30 and 13.00 − 14.30
	2015, October 12−15: 11.30 − 12.30 and 13.00 − 14.30
	2015, October 16: 9.00 − 12.00
ROOM:	GAFO 04/615 ("Medienraum")

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

A1. Introduction to Cognitive Science

A1.

LECTURE & SEMINAR

INTRODUCTION TO COGNITIVE SCIENCE (030005 & 119012)
PROF. ALBERT NEWEN, PROF. MARTIN BRÜNE,
PROF. ONUR GÜNTÜRKÜN, PROF. MAGDALENA SAUVAGE,
PROF. TOBIAS SCHLICHT, PROF. GREGOR SCHÖNER,
PROF. LAURENZ WISKOTT, PROF. SEN CHENG

TERM:	Winter 2015/16
LECTURE:	Wednesday, 10.00 – 12.00 (First Meeting: October 21, 2015)
ROOM:	HGA 30
SEMINAR:	Wednesday, 12.00 – 14.00 (First Meeting: October 21, 2015)
ROOM:	GAFO 03/252
CP:	6

Attention:

- Seminar on October, 21 takes place in GA 03/149
- Lecture and Seminar on October, 28 in GAFO 03/252
- Lecture and Seminar on December, 16 in GAFO 03/252

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

The structure of the lecture:

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

BM1.

SEMINAR
EXPERIMENTAL PSYCHOLOGY LAB (119213)
MARCEL MEYER

TERM:	Winter 2015/16
MEETING TIME:	***
	(First Meeting: please consult the lecturer's office hours)
ROOM:	to be announced (t.b.a.)
CP:	6

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

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

BM2.

SEMINAR
LOGIC ONLINE-COURSE (030066)
DR. PETER BRÖSSEL

TERM:	Winter 2015/16
MEETING TIME:	Tuesday, 14.00 – 16.00 (First Meeting: 2015, October 22)
ROOM:	GA 03/46
CP:	4

Arguments are the central method in philosophy. This course aims at delivering a systematic introduction into the field of logic from the perspective of philosophy. Thus there will be made use of examples from philosophy. Then main aim is to teach the main concepts of first order logic and to train intensely the formal methods of propositional logic and the basis of predicate logic.

The seminar is organized as an online-seminar. Thus you need online access to get the scriptum, to do the exercises and to submit the homework (Computers with online access are available at the Computer- Center (NA) or at the library of the "Lehreinheit Philosophie" (Bibliothek, GA, 3. Etage): On the plattform blackboard we will offer a script of the lecture as well as exercises with immediate feedback. The seminar will be supported by an online-tutorial. There will be four meetings at the university during the semester. The first meeting will take place on Thursday, 22.10.2015, 14.00-16.00, Introduction of the technical background and Introductory Lecture, Ruhr-Universität Bochum. Further meetings will be announced in the first meeting. A precondition for receiving a certificate is 1.) to pass of the weekly homework regularly (minimum of 50 % of the points has to be reached) and 2.) to pass the written exam at the end of the course. The certificate can be with or without grade (dependent on the amount of work).

Please register by sending an email to peter.broessel@rub.de

Literature
Additional literature (as add-on to the script): Graeme Forbes: Modern Logic. Oxford University Press, Oxford, 1994.
Wesley C. Salmon: Logik. Reclam, 1983.

A basic course in neural networks is obligatory. On the one hand, we recommend to study the basic methods ideally in the first semester; but to give students a bit more flexibility in arranging their program, we also offer the possibility to postpone the course on „BM3: Neural Networks" to the summer semester (offered by M. Yoshida). Please discuss this option explicitly with Dr. Peter Brössel or Prof. Albert Newen.

BM3.

Neural Networks

COMPACT COURSE
BASIC NEURAL SIMULATION (118518)
PROF. MOTOHARU YOSHIDA

TERM:	Winter 2015/16
MEETING TIME:	9:00 – 16:00, September 21-24, 2015
ROOM:	GAFO 04/615
CP:	5

Due to the overlap of the content with my other seminar, students who also participate in "Intracellular electrophysiological recording technique" (modules C3 or I4) can only gain a reduced number of credit points, namely 3.

The goal of this seminar is 1) to understand basic electrophysiological properties of neurons and 2) to learn how to implement this knowledge into a computational model of a neuron.

First, students will learn basic electrophysiological properties such as the maintenance of the resting membrane potential and the generation of an action potential through lectures. Students will then build their own neuron model using a programming environment called Matlab. Simulation using computers will not only help solidify the students' understanding of electrophysiological properties but also will allow them to use this knowledge in the future research. Acquiring this technique will enable students for example to estimate the consequence of a malfunction of certain ionic channel in a disease or to estimate the specific character of specific neuron types of their interest. Advanced students will have the opportunity to expand this single neuron model to a neural network model to simulate a role of a brain region of their interest. This course will also provide necessary skills regarding computational simulation and it does not require previous experience in modeling or programming. Basic knowledge about electric circuit would be of advantage.

BM3.

LECTURE & EXERCISE

COMPUTATIONAL NEUROSCIENCE – NEURAL DYNAMICS
(310001 & 310011)
PROF. GREGOR SCHÖNER

TERM:	Winter 2015/16
LECTURE:	Thursday, 14.15 – 16.00 (First Meeting: 2015, October 22)
ROOM:	NB 3/57
EXERCISE:	Thursday, 16.15 – 17.00 (First Meeting: 2015, October 22)
ROOM:	NB 3/57
CP:	6

This course provides an introduction into the theoretical behavioral and functional neurosciences from a particular theoretical vantage point, the dynamical systems approach. This approach emphasizes the evolution in time of behavioral and neural patterns as the basis of their analysis and synthesis. Dynamic stability, a concept shared with the classical biological cybernetics framework, is one cornerstone of the approach. Instabilities (or bifurcations) extend this framework and provide a basis for understanding flexibility, task specific adjustment, adaptation, and learning.

The course will include tutorial modules the provide mathematical foundations. Theoretical concepts will be exposed in reference to a number of experimental model systems which will include the coordination of movement, postural and configurational stability, the perception of motion, and elementary forms of spatial cognition. In the spirit of Braitenberg's "synthetic psychology", autonomous robots will be used to illustrate some of the ideas.

Exercises will be integrated into the lectures. They will consist of elementary mathematical exercises, the design of (thought) experiments and their analysis, and the design of simple artificial systems, all on the basis of the theoretical framework exposed in the main lectures.

BM4.

LECTURE
METHODS OF BRAIN IMAGING (118513)
PROF. BORIS SUCHAN

TERM:	Winter 2015/16
MEETING TIME:	Wednesday, 14.00 – 16.00 (First Meeting: 2015, October 28)
ROOM:	GAFO 05/609
CP:	3

In diesem Seminar sollen die für den/die Neuropsychologen/in relevante Bildgebende Verfahren vorgestellt werden. Hierbei werden sowohl die theoretischen Grundlagen, als auch die Methoden in der Versuchsplanung und Auswertung vorgestellt. Anhand von ausgewählten Arbeiten werden die Kenntnisse in Methode und Anwendung vertieft. Folgende bildgebende Verfahren, deren Anwendung und Auswertung werden vorgestellt: Positronen Emissions Tomographie (PET), Single Photonen Emissions Computer Tomographie (SPECT), Magnet Resonanz Tomographie/Funktionelle Magnet Resonanz Tomographie, Magnet Enzephalographie (MEG), Transkranielle Magnetstimulation (TMS). Statistical Parametic Maps (SPM). Es ist geplant, eine Auswertung eines Experimentes exemplarisch während des Seminars durchzuführen. Eventuelle praktische Sitzungen (MRT-Scans) sind je nach Terminplanung auch möglich.

BM4.

LECTURE
NEUROPSYCHOLOGY (112621)
PROF. BORIS SUCHAN

TERM:	Winter 2015/16
MEETING TIME:	Tuesday, 10.00 – 12.00 (First Meeting: 2015, October 27)
ROOM:	GAFO 02/364
CP:	3

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

Literature: Kolb & Wishaw: Fundamentals in human neuropsychology.

C. Topics Selection

C1.

SEMINAR

JOINT ACTION AND COLLECTIVE INTENTIONALITY (030085)

JUDITH MARTENS, DR. JOULIA SMORTCHKOVA

TERM:	Winter 2015/16
MEETING TIME:	Wednesday, 10.00 − 12.00 (First Meeting: 2015, October 21)
ROOM:	GABF 04/358
CP:	6

"Ask yourself what you must take for granted in order that you can ever have or act on collective intentions" (Searle 1990). This course will study the main body of texts with approaches to answering this question. We will discuss subject, object, and mode accounts of collective intentionality.

The seminar will have three parts. In the first part we will provide the theoretical tools necessary for studying collective intentions and joint actions, in particular we will examine the relation between intention and action. From there we will make the step to planning theories of collective intentionality and joint action (e.g. Searle, Bratman, Tuomela, Gilbert). The last part of the course will focus on bottom-up approaches that focus on empirical data to understand joint action (Tollefsen, Sebanz, Knoblich, Butterfill). We are constantly adjusting our behavior to the people that are surrounding us. What are we synchronizing, imitating, and aligning? What mechanisms underlie such processes? And how can it help us in collective intentionality and joint action?

C1.

SEMINAR

MENTAL REPRESENTATIONS IN PHILOSOPHY AND COGNITIVE SCIENCE (030086)

DR. JOULIA SMORTCHKOVA

TERM:	Winter 2015/16
MEETING TIME:	Monday, 10.00 – 12.00 (First Meeting: 2015, October 19)
ROOM:	GA 03/46
CP:	6

As the philosopher William Ramsey notes in his influential 2007 book, Representation reconsidered: "It has become almost a cliché to say that the most important explanatory posit today in cognitive research is the concept of representation. Like most clichés, it also happens to be true." Along similar lines, the psychologist George Miller, one of the founding fathers of cognitive science, wrote that "[...] the original dream of a unified science that would discover the representational [emphasis added] and computational capacities of the human mind and their structural and functional realization in the human brain still has an appeal that I cannot resist.". As these quotes make clear, since the "cognitive revolution" in the 1950s, the notion of "mental representation" has played an absolutely crucial role throughout the cognitive sciences. This theoretical concept is at the heart of research projects in neuroscience, cognitive psychology, social psychology, linguistics, artificial intelligence, cognitive anthropology, animal cognition and philosophy of mind. It is used to explain central psychological abilities, such as language, perception, memory, reasoning, and action. In other words, to understand the notion of "mental representation" is to understand the very nature of thought itself.

The course will be divided in two parts. In the first part I will introduce the notion of mental representation, its history, and its uses in philosophy of mind and in cognitive science (in particular based on readings from Fodor, Block, Dretske, Millikan, Sterelny, Ryder). I will focus on the debate about the naturalization of mental representations and introduce some of the theories that try to provide a naturalistic account of mental representations (Fodor, Dretske, Millikan). In the second part, I will discuss some of the main critiques against the notion of mental representation and its centrality in philosophy of mind and cognitive science (Clark, Churchland, Egan, Ramsey).

C1.

COMPACT COURSE

MIRROR NEURONS AND THEIR ROLE IN SOCIAL COGNITION (030088)

LARISSA HEEGE

TERM:	Winter 2015/16
MEETING TIME:	2016, March 14-18, 9:15-13:30
	(First Meeting: 2015, November 18, 18.00-19.00)
ROOM:	GABF 04/716
CP:	6

Mirror neurons were first discovered in 1990 by a research group around Giacomo Rizzolatti at the University of Parma: In experiments with macaques they found neurons that fired both when the macaque took a raisin and when he observed an experimenter taking a raisin. Soon after also in humans bimodal neurons were discovered: These fire both when somebody executes an action and when he/her observes somebody else executing that same action. Furthermore, neurons were found that fire when somebody is disgusted as well as when he/she observes somebody else being disgusted.

Several Theories in the field of Cognitive Science are built on these findings of mirror neurons: Theories on how we understand the actions and emotions of others and on how we empathise with other people. However, in the last years there has been an increasing criticism on mirror neuron theory, which claims that researchers have read too much into the discovery of these bimodal neurons. In the compact course shall be discussed the empirical bases of mirror neurons, theories that are built on the finding of mirror neurons and critique of these theories.

C2.

LECTURE & EXERCISE
ARTIFICIAL NEURAL NETWORKS (310002 & 310012)
PD DR. ROLF WÜRTZ

TERM:	Winter 2015/16
LECTURE:	Friday, 12.15 – 14.00 (First Meeting: October 23, 2015)
ROOM:	HZO 100
EXERCISE:	Wednesday, 15.00 – 16.00 (and/or 16.00- 17.00)
	(First Meeting: October 28, 2015)
ROOM:	NB 5/99
CP:	5

This lecture presents standard algorithms and new developments of feedforward Artificial Neural Networks, their functioning, application domains, and connections to more conventional mathematical methods. Examples show the potential and limitations of the methods. Supervised as well as unsupervised learning methods are introduced. In detail:

1) Introduction, some biological facts
2) Mathematical foundations: probability theory and partial derivatives
3) One layer networks and linear discriminants
4) Multilayer networks and error backpropagation
5) Universality of two-layer networks
6) Radial basis function networks
7) Neuronal maps: Kohonen network, Growing Neural Gas
8) Optimization methods

Learning objectives:
Theoretical understanding of feedforward neural networks, practical skills in computer implementations
Soft skills:
Each student must present the results of one exercise.
Individual competences:
Programming selected routines in C++, theoretical understanding of feedforward Neural Networks

C2.

LECTURE
INTRODUCTION TO PERCEPTION (118311)
PROF. SEN CHENG

TERM:	Winter 2015/16
MEETING TIME:	Monday, 10.00 – 12.00 (First Meeting: 2015, October 26)
ROOM:	GA 04/187
CP:	3

Perception of sensory inputs can be studied along three different dimensions: modality, description level and methodology. This lecture will discuss several different examples along each dimension and highlight common principles, when possible. Modalities include, for instance, vision, audition, olfaction and proprioception. The description level will range from receptor physiology to Gestalt psychology. The methodology will include psychophysics, electrophysiology and computational modeling.

C2.

ONE-WEEK INTERNSHIP
AUTONOMOUS ROBOTICS (310036)
PROF. GREGOR SCHÖNER

TERM:	Winter 2015/16
MEETING TIME:	January or February 2016 (whole day),
	see www.ini.ruhr-uni-bochum.de/courses
ROOM:	robotic labs
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 minature mobile robots, equipped with a differential drive, combined infrared/proximity sensors and a video camera. The course covers elementary problems in robot odometry, use of sensors and motor control. It then teaches basic dynamic methods for robot navigation, in which the robot's sensors are used for obstacle avoidance and approach to a target location.

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

Contact: sebastian.schneegans@ini.rub.de

C2.

LECTURE
LEFT BRAIN - RIGHT BRAIN (118111)
PROF. ONUR GÜNTÜRKÜN

TERM:	Winter 2015/16
MEETING TIME:	Thursday, 12.00 – 14.00 (GAFO 03/252)
ROOM:	GAFO 03/252
CP:	3

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

C2.

SEMINAR
THEORIES OF CONSCIOUSNESS (030072)
DR. BEATE KRICKEL

TERM:	Winter 2015/16
MEETING TIME:	Tuesday, 14.00 – 16.00 (First Meeting: 2015, October 20)
ROOM:	GABF 04/354
CP:	6

Consciousness is one of the most exciting and at the same time most puzzling problems philosophers and other scientists deal with. Although nothing seems to be as familiar to us as our own conscious states, there is wide disagreement on what consciousness actually is. So far, a great variety of different approaches to consciousness have been developed. In this seminar we will discuss the central positions regarding the nature of consciousness that have been developed in contemporary philosophy of mind.

Literature:
Theories of Consciousness by William Seager
Further reading: http://plato.stanford.edu/entries/consciousness/#SpeTheCon

C2.

SEMINAR
THE NEURAL BASIS OF VISION (118312)
DR. MARTIN PYKA

TERM:	Winter 2015/16
MEETING TIME:	Monday, 14.00 – 16.00
	(Pre-Meeting: Wednesday, October 14, 14.00 – 16.00)
ROOM:	GA 04/187
CP:	t.b.a.

Of all modalities vision is best studied, perhaps due to the dominance of the visual sense in humans. Even so much is still unknown about the neural basis of vision and visual plasticity. The goal of this seminar is to introduce students to the classic and current research literature.

Therefore, a range of experimental approaches will be covered, including electrophysiology and imaging techniques such as fMRI, EEG and MEG.

C3.

LECTURE & EXERCISE
MACHINE LEARNING: UNSUPERVISED METHODS
(310003 & 310013)
PROF. LAURENZ WISKOTT

TERM:	Winter 2015/16
EXERCISE:	Tuesday, 10.30 – 12.00 (First Meeting: 2015, October 27)
LECTURE:	Tuesday, 12.15 – 13.45 (First Meeting: 2015, October 20)
ROOM:	NB 3/57
CP:	6

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

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

C3.

SEMINAR
NEUROPHYSIOLOGY OF MEMORY (118911)
PROF. MOTOHARU YOSHIDA

TERM:	Winter 2015/16
MEETING TIME:	Wednesday, 14.15 – 15.45 (First Meeting: 2015, October 28)
ROOM:	GA 04/187
CP:	3

How do we remember? Thousands of neurons are working in the brain to support memory function. They are not randomly active but are coordinated properly. This seminar focuses on the cellular mechanisms which support memory function. The seminar will be a combination of lectures and literature presentations by students. Topics of the seminar are: synaptic plasticity, encoding and consolidation stages of memory, roles of oscillations, modulation of ion channels during memory tasks, roles of neuromodulators, and neural network dynamics.

C3.

SEMINAR

INTRACELLULAR ELECTROPHYSIOLOGICAL RECORDING TECHNIQUE (112921)

PROF. MOTOHARU YOSHIDA

TERM:	Winter 2015/16
MEETING TIME:	Wednesday, 10.00 − 12.00 (First Meeting: 2015, October 28)
ROOM:	GAFO 02/365
CP:	5

Due to the overlap of the content with my other seminar "Basic Neural Simulation", students who already took this seminar can only gain a reduced number of credit points in "Intracellular Electrophysiological Recording Technique", namely 3.

Brain functions are based on the activity of single neurons. Intracellular electrophysiological recording techniques enable us to observe the activity and to study the properties of single neurons. In this seminar, students will learn in-vitro patch-clamp recording, which is a popular and powerful intracellular recording technique. This seminar consists of both theoretical background studies and practical hands-on lab experiences. In more details, students will learn 1) the theory of intracellular recording, 2) brain slice preparation using animal brains, 3) patch-clamp recording, 4) visualization of recorded neurons, and 5) data analysis. Intracellular electrophysiological recording technique is not restricted to the study of single-cell properties. When combined with extra-cellular stimulation electrode, one can easily study properties of synaptic connections such as long-term synaptic potentiation and depression. Therefore, this method is also often used to study properties of neural networks which are believed to be crucial for functions of the brain.

C3.

EXERCISE
LEARNING (119214)
DR. ALEXIS GARLAND

TERM:	Winter 2015/16
MEETING TIME:	Tuesday, 14.00 – 16.00 (First Meeting: 2015, October 27)
ROOM:	GAFO 05/609
CP:	3

This practical participation-based course with online components will provide an applied overview of the psychological foundations of learning and behavior, touching on the neurophysiological basis of learning and memory processes with a view to potential applications in technology, therapy and other areas. Participants will present on various aspects of learning and behavior - such as habituation, sensitization, conditioning and extinction - and place our understanding of these mechanisms in a relevant real-world context. This course will aim at an overview of general knowledge, as well as an in-depth look at early and current examples of human and animal research studies.

Learning Objectives
1. Acquire general content knowledge about the field of 'Learning' and 'Behavior' within a psychological context.
2. Find, read and understand more specific in-depth knowledge related to content by looking at published experiments (primary source materials).
3. Comfortably, clearly and concisely present about both general and in-depth knowledge to peers.
4. Engage in classroom discussion, expanding upon and applying topics to experience.

Instructor: Dr. Alexis Garland
Office: GAFO 05/622
Phone: +49 234 32 26845
E-Mail: Alexis.Garland@rub.de

Text: Domjan, M (2009). The principles of learning and behavior (6th Edition)
Moodle Course ID: To Be Announced   Password: To Be Announced

C4.

COMPACT COURSE

COMMUNICATION AND COGNITION: A COMPARATIVE APPROACH TO ANIMAL VOCALIZATION, VERBAL LANGUAGE AND MUSIC (030089)
DR. PIERA FILIPPI

TERM:	Winter 2015/16
MEETING TIME:	March 1-5, 2016
ROOM:	GA 03/46
CP:	6

This course will cover key topics on animal cognition and communication, and is divided into four modules: 1) signal production, 2) semantics and syntax, 3) the ability of rational thoughts, 4) social pragmatics: the role of sound modulation in verbal language and music. These modules will be addressed through a comparative approach to experimental findings on animal cognition. Philosophical reasoning will be constantly solicited, with the aim of putting key empirical questions on animal linguistic and rational behaviors into a broader perspective. The course will ultimately favor a deep understanding of the modern debates surrounding the evolution of language.

C4.

SEMINAR
THINKING ABOUT LOGIC (030087)
DR. MATHIEU BEIRLAEIN

TERM:	Winter 2015/16
MEETING TIME:	Tuesday, 10.00 – 12.00 (First Meeting: 2015, October 20)
ROOM:	GABF 04/609
CP:	4

The study of logic raises interesting philosophical questions and puzzles about knowledge, meaning, rationality, and reality. Why should we accept an inference as valid? When and how is deduction justified? How do we decide what counts as a logical connective and what does not? Besides classical logic, what are the alternative conceptions of logical inference? What, if anything, does logic tell us about the world out there?

This course is intended to familiarize students with these questions by means of a number of classic essays in the field, which are carefully selected in terms of their significance, clarity, and accessibility. Most of the text will be short and non-technical, although a basic understanding of propositional logic is recommended.

The seminar will be taught in English. Below is a preliminary selection of texts to be included in the literature list for this course.

Literature:
N. Belnap. Tonk, Plonk, and Plink. Analysis 22:130-134, 1962.
L. Carroll. What the Tortoise said to Achilles. Mind 4:278-280, 1895.
R. Cook. Let a Thousand Flowers Bloom: A Tour of Logical Pluralism.
Philosophy Compass 5(6): 492-504, 2010.
M. Dummett. The Justification of Deduction. In M. Dummett (ed.), Truth and Other
Enigmas (Harvard University Press, 1978).
S. Haack. Dummett's Justification of Deduction. Mind 91(362):216-239, 1982.
E.J. Lowe. Not a Counterexample to Modus Ponens. Analysis 47:142-146, 1987.
V. McGee. A Counterexample to Modus Ponens. Journal of Philosophy 82:462-471, 1985.
A.N. Prior. The Runabout Inference Ticket. Analysis 21:38-39, 1960.
W.V. Quine. On what there is. Review of Metaphysics 2:21-38 (1948).
S. Read. Thinking about Logic (Oxford University Press, 1995).

AM. Advanced Methods

Advanced methods are usually studied in the second semester. One exception is the "FMRI"-course which is only offered in the winter. Students who already have basic knowledge in cognitive neuroscience can choose to learn the "FMRI"-technique in the first semester. Necessary background: basic knowledge in cognitive neuroscience. The FMRI-seminar must be integrated into the course program during the first or the third semester; in the case you want to learn the FMRI –technique in the first semester, an individual application for the course is necessary: boris.suchan@rub.de.

The laboratory-class "Neural substrates of memory function" is a flexible whole day course that can be integrated whenever a student is free to do so; usually it only makes sense in the semester breaks.

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

The two following courses are independent but they can also be studied in parallel. The first course (practical course and seminar) introduces into fMRI in detail and in practice. The second seminar is a course which introduces an advanced method of data analysis which enables new experimental results.

AM7. fMRI-training

PRACTICAL COURSE & SEMINAR
FMRI-TRAINING (114511 & 114512)
DR. LORENA DEUKER, DR. MARIE FELLNER

TERM:	Winter 2015/16
SEMINAR:	Monday, 10.00 – 12.00 (First Meeting: 2015, October 26)
ROOM:	GAFO 05/609
PRACTICAL COURSE:	Monday, 14.00 – 16.00 (First Meeting: 2015, October 26)
ROOM:	GAFO 04/271
CP:	6

A whole fMRI experiment will be conducted in this practical course and seminar. Based on an actual scientific question, which will be developed with the students, we will setup an experiment, conduct this experiment, analyze the data and discuss the results. This is a "one of a kind" opportunity for hands on functional magnetic resonance imaging doing everything that has to be done by oneself. These courses will also provide experiences with the program package SPM (Statistical Parametric Mapping) which is one of the most used software in the world to analyze functional imaging data.

AM7.

SEMINAR

THE WHOLE IS MORE THAN THE SUM OF ITS PARTS: MOVING FROM "MASS-UNIVARIATE" TO MULTIVARIATE APPROACHES IN COGNITIVE NEUROSCIENCE (117026)
DR. LORENA DEUKER

TERM:	Winter 2015/16
MEETING TIME:	Tuesday, 12.00 – 14.00 (First Meeting: 2015, October 20)
ROOM:	GAFO 03/974
CP:	t.b.a.

Traditional analysis methods for neuroimaging data looked at activity within a single measurement unit (e.g. one voxel) and tested for significant differences in means; this was then repeated for every measurement unit in the brain until one had statistical results for every individual unit - the so-called "mass-univariate" approach. Apart from the need for very strong effect sizes due to increasing alpha error, this method might not get the whole picture of what is happening in the brain. Percepts or memories might be better understood by investigating the pattern of activity across many different measurement units. This seminar will provide an introduction to methods of analysis for fMRI and EEG data that go beyond univariate analysis. We will discuss the relevant literature and will also do some hands-on demonstration with example datasets.

Content:
- very short introduction to what is tested by traditional fMRI analysis methods (prior knowledge recommended)
- flaws of traditional approach
- introduction to multi-voxel pattern analysis methods
- representational similarity analysis (RSA) in fMRI data
- pattern classification in fMRI data
- traditional versus advanced analysis methods for EEG and intracranial EEG (iEEG)
- RSA analysis of time-frequency decomposed iEEG data
- pattern classification on iEEG data

Presupposition for participating in this course is basic knowledge about what fMRI data are delivering and how they are standardly used. If you are not sure whether this course is adequate for you, please contact in advance: Lorena Deuker <lorenadeuker@gmail.com>

AM7.

SEMINAR
FROM BASIC TO ADVANCED FMRI-METHODS (118517)
DR. HUI ZHANG

TERM:	Winter 2015/16
MEETING TIME:	Thursday, 12.00 – 14.00 (First Meeting: 2015, October 28)
ROOM:	GAFO 05/609
CP:	t.b.a.

This seminar seeks to provide a broad, comprehensive, and rigorous introduction to fMRI research. We will start from a systematic review of the physics and biology of fMRI and then extend upward into modern fMRI research. Attendants will learn about proton spin, experimental design, the general linear model, and signal processing.We will discuss chapters of an introductory book by Huettel, Song and McCarthy.Ein zentrales Lernziel dieser Veranstaltung - und damit auch Grundlage für die erfolgreiche Teilnahme und Leistungsbewertung - ist die regelmäßige aktive Beteiligung am wissenschaftlichen Diskurs. Daher ist eine regelmäßige Anwesenheit im Umfang von mindestens zwei Dritteln der Termine notwendig.

D1. Free Selection

If there is a problem to complete a module, in principle, the courses in the free selection module can be used for other modules. But this has to be explicitly confirmed in advance by Dr. Peter Brössel or Prof. Albert Newen.

D1. Free Selection

SEMINAR
DISKURS DER NEUROPSYCHOLOGIE (118611)
PROF. NIKOLAI AXMACHER

TERM:	Winter 2015/16
MEETING TIME:	Thursday, 10.00 – 12.00 (First Meeting: 2015, October 29)
ROOM:	GAFO 02/365
CP:	3

Hier wird der intensive Austausch über ein vorgegebenes Forschungsthema in einer kleinen Gruppe ermöglicht. Ein wichtiger Aspekt ist auch die Einladung und Betreuung von Gastrednern und die Teilnahme am wissenschaftlichen Vortrag. Die kritische Auseinandersetzung mit den Lerninhalten in Form von Diskussionen ist ein zentrales Lernziel und geht in die Bewertung mit ein.

D1.

COLLOQUIUM

FORSCHUNGSKOLLOQUIUM KOGNITIONSPSYCHOLOGIE UND PSYCHONEUROENDOKRINOLOGIE (115113)
PROF. OLIVER WOLF

TERM:	Winter 2015/16
MEETING TIME:	Tuesday, 16.00 – 18.00 (First Meeting: 2015, October 27)
ROOM:	GAFO 02/378
CP:	3

In diesem Forum werden aktuelle Forschungsprojekte der Arbeitseinheit Kognitionspsychologie (u.a. Masterarbeiten, Diplomarbeiten, Promotionsprojekte) vorgestellt. Ein inhaltlicher Schwerpunkt liegt auf der experimentellen Stressforschung. Hierbei interessiert sowohl die Frage „Was stresst uns" als auch die Frage „Wie beeinflusst Stress unsere kognitiven Fertigkeiten". Darüber hinaus werden eingeladene Gäste aus anderen Arbeitseinheiten der Fakultät, aus angrenzenden Fakultäten der RUB oder von anderen Universitäten aktuelle Forschungsbefunde zu kognitionspsychologischen oder psychoneuroendokrinologischen Fragestellungen präsentieren.

Eine Terminübersicht ist ab Anfang Oktober auf der Homepage der AE einsehbar.

D1.

LECTURE
STRESS (117031)
PROF. OLIVER WOLF

TERM:	Winter 2015/16
MEETING TIME:	Wednesday, 10.00 – 12.00 (First Meeting: 2015, October 28)
ROOM:	HGA 20
CP:	t.b.a.

Ursachen und Folgen von Stress werden aus einer psychologischen Perspektive beleuchtet. Es werden sowohl Apsekte der biopsychologischen Grundlagenforschung als auch Aspekte der anwendungsbezogenen Forschung (Gesundheitspsychologie, Klinische Psychologie, Wirtschaftspsychologie) berücksichtigt. Die Vorlesung gibt einen Überblick über aktuelle Forschungsthemen der Stressforschung. Folgende Fragen werden adressiert: Was ist Stress? Was ist ein Stressor? Welche psychischen und biologischen Veränderungen treten in Reaktion auf Stress auf? Wie kann man sich die große

interindividuelle Varianz im Stresserleben erklären? Wann ist Stress adaptiv und unter welchen Umständen kann er negative Konsequenzen haben (maladaptiv sein)? Welche Auswirkungen hat Stress auf affektive und kognitive Prozesse? Wie wird unser Körper und unser Gehirn durch Stress beeinflusst? Neben psychologischen Ansätzen werden Theorien und Befunde aus den Forschungsfeldern der Psychoneuroendokrinologie, der Psychoneuroimmunologie und den affektiven und kognitiven Neurowissenschaften besprochen.

D1.

SEMINAR
LERNEN UND PROBLEMLÖSEN (030269)
MALTE ELSON

TERM:	Winter 2015/16
MEETING TIME:	Tuesday, 18.00 – 20.00 (First Meeting: 2015, October 20)
ROOM:	GA 03/42
CP:	4

Die Fähigkeit Probleme zu lösen wird als eine der Schlüsselkompetenzen für die Bewältigung von Anforderungen im beruflichen wie privaten Alltag angesehen. Entsprechend stellt sich die Frage, wie eine solche Problemlösefähigkeit zu vermitteln ist. Gleichzeitig wird Problemlösen als Instruktionsmethode genutzt. Dadurch stellt sich die Frage nach dem Zusammenspiel von Problemlösen und Lernen. In dem Seminar wird zunächst auf theoretischer Basis Problemlösefähigkeit definiert und der Fähigkeit zu Lernen gegenübergestellt. Darauf aufbauend werden Möglichkeiten der Diagnose und der Förderung von Problemlösefähigkeit erörtert.

Anforderungen für einen kleinen Studiennachweis: Die Gesamtnote konstituiert sich aus einer individuell und schriftlich zu erbringenden Leistung, deren Form von der/dem Lehrenden festgelegt wird. Darüber hinaus werden weitere, jedoch unbenotete Leistungen verlangt, wie zum Beispiel die Vorbereitung einer Sitzung u.a.m.

D1.

LECTURE & EXERCISE
LERNEN (112231)
PROF. ONUR GÜNTÜRKÜN

TERM:	Winter 2015/16
LECTURE:	Thursday, 16.00 – 18.00 (First Meeting: 2015, October 29)
ROOM:	HGA 10
EXERCISE:	Tuesday, 14.00 – 16.00 (First Meeting: 2015, October 27)
ROOM:	***
CP:	6

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

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

Literatur:
Als Vorbereitung ist folgendes Buch zu empfehlen:
The Principles of Learning and Behavior, Michael Domjan, 6. Auflage, 2009.

D1.

SEMINAR

JOURNAL CLUB NEUROPSYCHOLOGY (118915)

PROF. NIKOLAI AXMACHER

TERM:	Winter 2015/16
MEETING TIME:	Thursday, 16.00 – 18.00
	(First Meeting:
	see http://www.ruhr-uni-bochum.de/neuropsy/lehre.html)
ROOM:	GAFO 05/609
CP:	t.b.a.

In Analogie zu den Kognitiven Neurowissenschaften - der Untersuchung der neuronalen Korrelate kognitiver Prozesse - wurden in den letzten Jahren auch Konzepte der Psychoanalyse mit bildgebenden Methoden untersucht. Dieses Seminar vermittelt einen Überblick über diese Studien. Dabei werden aktuelle Untersuchungen zu zentralen psychoanalytischen Konzepten (Verdrängung, Konversion, Träume, Traumatisierung...) aber auch Studien zu den Mechanismen der psychodynamischen Psychotherapie sowie psychodynamische Konzeptualisierungen neuropsychologischer Symptome vorgestellt und diskutiert. Die kritische Auseinandersetzung mit den Lerninhalten in Form von Diskussionen ist ein zentrales Lernziel und geht in die Bewertung mit ein.

D1.

LECTURE
SOZIALPSYCHOLOGIE II (112321)
PROF. JENS FÖRSTER

TERM:	Winter 2015/16
MEETING TIME:	Thursday, 10.00 – 12.00
	(First Meeting: 2015, October 29)
ROOM:	HGA 10
CP:	t.b.a.

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

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

D1.

COLLOQUIUM
FORSCHUNGSKOLLOQUIUM SOZIALPSYCHOLOGIE (115915)
PROF. JENS FÖRSTER

TERM:	Winter 2015/16
MEETING TIME:	Thursday, 16.00 – 18.00
	(First Meeting: 2015, October 22)
ROOM:	GAFO 03/974
CP:	t.b.a.

In diesem Kolloquium sollen Pläne für wissenschaftliche Studien, Ergebnisse und Methoden diskutiert werden. Wissenschaftlerinnen und Wissenschaftler in den unterschiedlichsten Phasen ihrer Karriere berichten über neue Entwicklungen und Probleme sozialpsychologischer Forschung. Für Studierende mit gutem Vorwissen.

SECOND YEAR PROGRAM

I. Interdisciplinary Research Module

I1.

Cognitive Philosophy

COLLOQUIUM
RESEARCH COLLOQUIUM (030125)
PROF. TOBIAS SCHLICHT

TERM: Winter 2015/16
MEETING TIME: Tuesday, 12.00 – 14.00 (First Meeting: October 20, 2015)
ROOM: GA 3/143
CP: 6

I1.

COLLOQUIUM

PHILOSOPHY MEETS COGNITIVE SCIENCE – INVESTIGATING MIND AND LANGUAGE (030128)
PROF. MARKUS WERNING, DR. PETER BRÖSSEL

TERM: Winter 2015/16
MEETING TIME: Thursday, 16.00 – 18.00 (First Meeting: 2015, October 22)
ROOM: GA 04/187
CP: 2-6

In the research colloquium current topics at the interface between Philosophy and Cognitive Science will be discussed. In the colloquium we focus on the investigation of mind and language. The colloquium hosts talks by visiting leading experts and local researchers as well as presentations by doctoral and master students. The aim of the colloquium is to offer a platform for the discussion of ongoing research and to support the education of students at the Master and PhD level. Students who are accepted for a presentation in this seminar will receive a special training in preparing presentations in English.

PhD students can receive 2 credit points for an active participation. Master students can receive 4-6 CP for a presentation in the colloquium (for graded CPs, master students have to write an additional essay). Topics can be freely chosen such that master students can develop a talk in the area of their intended master thesis.

I1.

SEMINAR
THEORIES OF CONSCIOUSNESS (030072)
DR. BEATE KRICKEL

TERM:	Winter 2015/16
MEETING TIME:	Tuesday, 14.00 – 16.00 (First Meeting: 2015, October 20)
ROOM:	GABF 04/354
CP:	6

Consciousness is one of the most exciting and at the same time most puzzling problems philosophers and other scientists deal with. Although nothing seems to be as familiar to us as our own conscious states, there is wide disagreement on what consciousness actually is. So far, a great variety of different approaches to consciousness have been developed. In this seminar we will discuss the central positions regarding the nature of consciousness that have been developed in contemporary philosophy of mind.

Literature:
Theories of Consciousness by William Seager
Further reading: http://plato.stanford.edu/entries/consciousness/#SpeTheCon

I1.

SEMINAR

JOINT ACTION AND COLLECTIVE INTENTIONALITY (030085)

JUDITH MARTENS, DR. JOULIA SMORTCHKOVA

TERM: Winter 2015/16
MEETING TIME: Wednesday, 10.00 – 12.00 (First Meeting: 2015, October 21)
ROOM: GABF 04/358
CP: 6

"Ask yourself what you must take for granted in order that you can ever have or act on collective intentions" (Searle 1990). This course will study the main body of texts with approaches to answering this question. We will discuss subject, object, and mode accounts of collective intentionality.

The seminar will have three parts. In the first part we will provide the theoretical tools necessary for studying collective intentions and joint actions, in particular we will examine the relation between intention and action. From there we will make the step to planning theories of collective intentionality and joint action (e.g. Searle, Bratman, Tuomela, Gilbert). The last part of the course will focus on bottom-up approaches that focus on empirical data to understand joint action (Tollefsen, Sebanz, Knoblich, Butterfill). We are constantly adjusting our behavior to the people that are surrounding us. What are we synchronizing, imitating, and aligning? What mechanisms underlie such processes? And how can it help us in collective intentionality and joint action?

12.

COLLOQUIUM

THEMEN DER KOGNITIVEN NEUROWISSENSCHAFT (118711)

PROF. ONUR GÜNTÜRKÜN, PROF. NIKOLAI AXMACHER

TERM: Winter 2015/16

MEETING TIME: Friday, 10.00 – 12.00

(First Meeting: see www.bio.psy.ruhr-unibochum.de/ or
http://www.ruhr-uni-bochum.de/neuropsy/index.html)

ROOM: GAFO 05/609

CP: t.b.a.

Interesse an neurowissenschaftlicher Master-Arbeit Kommentar: In dieser Veranstaltung werden laufende Forschungsprojekte, die sich für eine M.Sc. Arbeit eignen , vorgestellt.

Literatur: wird in der Veranstaltung bekannt gegeben

12.

SEMINAR

RESEARCH COLLOQUIUM GENETIC PSYCHOLOGY (118913)

PROF. ROBERT KUMSTA

TERM:	Winter 2015/16
MEETING TIME:	Monday, 16.00 – 18.00
	(First Meeting: please consult the lecturer's office hours)
ROOM:	GAFO 04/425
CP:	t.b.a.

Dieses Forum dient zur Vorstellung aktueller Forschungsprojekte und Qualifikationsarbeiten (Bachelorarbeiten, Masterarbeiten, Promotions-projekte) der Arbeitseinheit Genetic Psycho-logy. Darüber hinaus werden eingeladene Wis-senschaftler aktuelle Forschungsbefunde zur Genetik, Epigenetik und Entwicklungspsychobi-ologie präsentieren. Ein Zeitplan mit Informa-tion über Themen und Referenten wird zu Be-ginn des Semesters per Aushang und auf der Homepage bekannt gegeben.

12.

LECTURE
INTRODUCTION TO PERCEPTION (118311)
PROF. SEN CHENG

TERM:	Winter 2015/16
MEETING TIME:	Monday, 10.00 – 12.00 (First Meeting: 2015, October 26)
ROOM:	GA 04/187
CP:	3

Perception of sensory inputs can be studied along three different dimensions: modality, description level and methodology. This lecture will discuss several different examples along each dimension and highlight common principles, when possible. Modalities include, for instance, vision, audition, olfaction and proprioception. The description level will range from receptor physiology to Gestalt psychology. The methodology will include psychophysics, electrophysiology and computational modeling.

12.

LECTURE
LEFT BRAIN - RIGHT BRAIN (118111)
PROF. ONUR GÜNTÜRKÜN

TERM:	Winter 2015/16
MEETING TIME:	Thursday, 12.00 – 14.00 (GAFO 03/252)
ROOM:	GAFO 03/252
CP:	3

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

I3.

LECTURE & EXERCISE
MACHINE LEARNING: UNSUPERVISED METHODS
(310003 & 310013)
PROF. LAURENZ WISKOTT

TERM:	Winter 2015/16
EXERCISE:	Tuesday, 10.30 – 12.00 (First Meeting: ***)
LECTURE:	Tuesday, 12.15 – 13.45 (First Meeting: ***)
ROOM:	NB 3/57
CP:	6

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

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

13.

LECTURE & EXERCISE
ARTIFICIAL NEURAL NETWORKS (310002 & 310012)
PD DR. ROLF WÜRTZ

TERM:	Winter 2015/16
LECTURE:	Friday, 12.15 – 14.00 (First Meeting: October 23, 2015)
ROOM:	HZO 100
EXERCISE:	Wednesday, 15.00 – 16.00 (and/or 16.00- 17.00)
	(First Meeting: October 28, 2015)
ROOM:	NB 5/99
CP:	5

This lecture presents standard algorithms and new developments of feedforward Artificial Neural Networks, their functioning, application domains, and connections to more conventional mathematical methods. Examples show the potential and limitations of the methods. Supervised as well as unsupervised learning methods are introduced. In detail:

1) Introduction, some biological facts
2) Mathematical foundations:
   probability theory and partial derivatives
3) One layer networks and linear discriminants
4) Multilayer networks and error backpropagation
5) Universality of two-layer networks
6) Radial basis function networks
7) Neuronal maps: Kohonen network, Growing Neural Gas
8) Optimization methods

Learning objectives:
Theoretical understanding of feedforward neural networks, practical skills in computer implementations
Soft skills:
Each student must present the results of one exercise.
Individual competences:
Programming selected routines in C++, theoretical understanding of feedforward Neural Networks

I3.

ONE-WEEK INTERNSHIP
AUTONOMOUS ROBOTICS (310036)
PROF. GREGOR SCHÖNER

TERM:	Winter 2015/16
MEETING TIME:	January or February 2016 (whole day),
	see www.ini.ruhr-uni-bochum.de/courses
ROOM:	robotic labs
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 minature mobile robots, equipped with a differential drive, combined infrared/proximity sensors and a video camera. The course covers elementary problems in robot odometry, use of sensors and motor control. It then teaches basic dynamic methods for robot navigation, in which the robot's sensors are used for obstacle avoidance and approach to a target location.

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

Contact: sebastian.schneegans@ini.rub.de

13.

COMPACT COURSE
GENERATIVE AND DEVELOPMENTAL SYSTEMS (310024)
DR. MARTIN PYKA

TERM:	Winter 2015/16
MEETING TIME:	October 15-22, 10.00 – 12.00
ROOM:	IC 03/134
CP:	3

Current issues of the artificial development of structures (in particular of artificial neural networks) are discussed in this seminar. The focus is on description languages inspired by biological encoding systems (DNA, gene regulatory networks), principles of self-organization and convenient evolution strategies for the development of scalable solutions.
The participants give oral presentations, the topics of which are assigned in the first seminar.

The course is given in English upon request.

13.

COLLOQUIUM
CURRENT TOPICS IN NEUROINFORMATICS (310024)

TERM:	Winter 2015/16
MEETING TIME:	Wednesday, 12:15 – 13:30 (First Meeting: October 21, 2015)
ROOM:	IC 03/112
CP:	3

14.

SEMINAR
NEUROPHYSIOLOGY OF MEMORY (118911)
PROF. MOTOHARU YOSHIDA

TERM:	Winter 2015/16
MEETING TIME:	Wednesday, 14.00 – 16.00 (First Meeting: 2015, October 28)
ROOM:	GA 04/187
CP:	3

How do we remember? Thousands of neurons are working in the brain to support memory function. They are not randomly active but are coordinated properly. This seminar focuses on the cellular mechanisms which support memory function. The seminar will be a combination of lectures and literature presentations by students. Topics of the seminar are: synaptic plasticity, encoding and consolidation stages of memory, roles of oscillations, modulation of ion channels during memory tasks, roles of neuromodulators, and neural network dynamics.

14.

SEMINAR

INTRACELLULAR ELECTROPHYSIOLOGICAL RECORDING TECHNIQUE (112921)
PROF. MOTOHARU YOSHIDA

TERM: Winter 2015/16
MEETING TIME: Wednesday, 10.15 – 11.45 (First Meeting: 2015, October 28)
ROOM: GA 04/187
CP: 5

Due to the overlap of the content with my other seminar "Basic Neural Simulation", students who already took this seminar can only gain a reduced number of credit points in "Intracellular Electrophysiological Recording Technique", namely 3.

Brain functions are based on the activity of single neurons. Intracellular electrophysiological recording techniques enable us to observe the activity and to study the properties of single neurons. In this seminar, students will learn in-vitro patch-clamp recording, which is a popular and powerful intracellular recording technique. This seminar consists of both theoretical back-ground studies and practical hands-on lab experiences. In more details, students will learn 1) the theory of intracellular recording, 2) brain slice preparation using animal brains, 3) patch-clamp recording, 4) visualization of recorded neurons, and 5) data analysis. Intracellular electrophysiological recording technique is not restricted to the study of single-cell properties. When combined with extra-cellular stimulation electrode, one can easily study properties of synaptic connections such as long-term synaptic potentiation and depression. Therefore, this method is also often used to study properties of neural networks which are believed to be crucial for functions of the brain.

14.

COLLOQUIUM
BIOPSYCHOLOGY RESEARCH COLLOQUIUM (118914)
PROF. ONUR GÜNTÜRKÜN

TERM: Winter 2015/16
MEETING TIME: Monday, 13.00 – 15.00
(First Meeting: see www.bio.psy.ruhr-unibochum.de/)
ROOM: GAFO 05/425
CP: t.b.a.

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-unibochum.de/

14.

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

TERM:	Winter 2015/16
MEETING TIME:	Friday, 10.00 – 12.00
	(First Meeting: see www.bio.psy.ruhr-unibochum.de/ or
	http://www.ruhr-uni-bochum.de/neuropsy/)
ROOM:	GAFO 05/609
CP:	t.b.a.

Interesse an neurowissenschaftlicher Master-Arbeit Kommentar: In dieser Veranstaltung werden laufende Forschungsprojekte, die sich für eine M.Sc. Arbeit eignen , vorgestellt.

Literatur: wird in der Veranstaltung bekannt gegeben

14.

LECTURE
INTRODUCTION TO PERCEPTION (118311)
PROF. SEN CHENG

TERM:	Winter 2015/16
MEETING TIME:	Monday, 10.00 – 12.00 (First Meeting: 2015, October 26)
ROOM:	GA 04/187
CP:	3

Perception of sensory inputs can be studied along three different dimensions: modality, description level and methodology. This lecture will discuss several different examples along each dimension and highlight common principles, when possible. Modalities include, for instance, vision, audition, olfaction and proprioception. The description level will range from receptor physiology to Gestalt psychology. The methodology will include psychophysics, electrophysiology and computational modeling.

14.

SEMINAR
THE NEURAL BASIS OF VISION (118312)
DR. MARTIN PYKA

TERM:	Winter 2015/16
MEETING TIME:	Monday, 14.00 – 16.00
	(Pre-Meeting: Wednesday, October 14, 14.00 – 16.00)
ROOM:	GA 04/187
CP:	t.b.a.

Of all modalities vision is best studied, perhaps due to the dominance of the visual sense in humans. Even so much is still unknown about the neural basis of vision and visual plasticity. The goal of this seminar is to introduce students to the classic and current research literature.

Therefore, a range of experimental approaches will be covered, including electrophysiology and imaging techniques such as fMRI, EEG and MEG.

14.

COLLOQUIUM
RESEARCH COLLOQUIUM NEUROPSYCHOLOGY
PROF. NIKOLAI AXMACHER

TERM:	Winter 2015/16
MEETING TIME:	Thursday, 14.00 – 16.00
	(First Meeting: see www.bio.psy.ruhr-unibochum.de/ or
	http://www.ruhr-uni-bochum.de/neuropsy/)
ROOM:	GAFO 05/609
CP:	t.b.a.

Inhalt der Veranstaltung ist die Vorstellung laufender Forschungsarbeiten der Arbeitseinheit Neuropsychologie sowie Vorträge der Gastdozenten zu klinisch-neuropsychologischen Themen.

Ein Zeitplan mit Informationen über die Themen und Referenten wird zu Beginn des WS per Aushang bekannt gegeben.

Auch unter:
http://www.ruhr-uni-bochum.de/neuropsy/