Each of these modules yields 9 ECTS, students have to choose three out of these eight modules

Neuro- and Electrophysiology
Module 406 (A. Kreiter)

In this module you will be systematically introduced into the methods of neurophysiological recordings in the mammalian cortex. You will learn to understand the electro-technical and neurobiological basics of different neurophysiological recording techniques and exercise how to perform the necessary preparatory steps including stereotactic approaches. After building up a recording apparatus, learning how to eliminate sources of artifacts and noise as well as planning your own recording experiment you will perform your own neurophysiological recording experiment in an anesthetized rat. Furthermore, you will learn how to perform behavioral training and neuronal recordings in awake, behaving animals and to analyze your data with state-of-the-art methods. Finally, you will present your data and critically discuss them in written and oral presentations.

Neuropharmacology
Behavioral Pharmacology
Module 407 (M. Koch)

This practical course includes behavioural pharmacology experiments focusing on the role of dopamine in reward-related learning. You will learn to perform stereotaxic surgery on rats how to administer systemic and intracranial drugs and conduct various behavioural tests. Finally, you will learn standard histology as well as statistical data analysis. Critical interpretation and discussion of your findings, writing a protocol (according to scientific standards) and an oral defence complete this module.

Experimental Neuroanatomy and Behavioral Physiology
Module 408 (U. Dicke)

You will learn how to perform recording and/or tracing experiments in single cells or in-vivo or in-vitro tract tracing and investigate the distribution of neurotransmitters/neuropeptides by immunocytochemistry. Data will be analyzed by means of light microscopic examination, software applications and statistical calculations. Finally, you will interpret your data on the basis of current hypotheses, consider experiment improvement possibilities, and present data in compliance with scientific standards. As a learning result you will be able to design, perform and analyze experiments by means of modern standard techniques used in neuroanatomy /neurophysiology. You will acquire expertise investigating the structure and function of animal brains, develop an understanding of relations between experiment and theory, and be qualified to handle experimental data critically.

Psychophysics and Human Neurophysiology
Systemic approaches to brain function
Module 409 (M. Fahle)

Lectures will present to you the theory, basic principles and methods of experiments testing human senso-motor behaviour, as well as of multi-channel recordings of human brain potentials, and of human brain imaging (functional MRI). This will lead to a better understanding of how to study mechanisms by which the human brain perceives and generates actions. In the practical course, you will perform experiments related to research questions currently studied by the research group. This involves modifying existing behavioural tests as well as electrophysiological paradigms and participating in the data collection and analysis of imaging data.

Experimental Neuropsychology
Approaches and research strategies in experimental neuropsychology, imaging techniques and electrophysiology
Module 410 (M. Herrmann/T. Fehr)

Based on lectures, lab teaching, computer simulations, and hands-on studies you will get an introduction into the experimental basics (transfer of hypotheses into study designs) of cognitive neuroscientific research. This module focuses on the appropriate translation of neuropsychological research ideas into human EEG and fMRI studies as well as the methodological basics of combining both research approaches.

Cognitive Psychology and Electroencephalography
Module 411 (C. Basar)

The module is intended as an introductory guide for students interested in the application of EEG/ERPs to answer questions which are of broad interest in cognitive neuroscience and related fields. Within the module basic knowledge is communicated by lectures as well as by performance and analysis of EEG experiments with humans. The topics of the lectures include information on the neural origins of EEG as well as the design and interpretation of EEG/ ERP experiments. The module aims at providing established knowledge on various approaches to EEG data analysis and giving an overview of the advantages and limitations of these approaches in cognitive neuroscience.

Structural and Functional Neuroimaging
Basics of functional magnetic resonance imaging
Module 412 (M. Herrmann, E. Küstermann)

In the first part of this module you will get an introduction into the tomographical or cross-sectional depiction (MRI and CAT scans) of brain lesions. This lecture will also be used for a brief summary of human brain anatomy based on slice topography. Within the more comprehensive functional magnetic resonance imaging (fMRI) part of the module we will employ lectures, lab teaching, computer simulations, and hands-on studies for introducing both the physical and methodological basics of fMRI as well as data pre- and post-processing, and the handling of an fMRI scanner.

Neurophysics
Theoretical neurosciences, data analysis and modelling
Module 413 (K. Pawelzik and Udo Ernst)

Based on the lecture and the computer course, this module delves into neuronal network modeling and data analysis. Problems selected from the fields of neuronal coding, neuronal decoding, data analysis and small neuronal networks will be treated in small projects. The focus lies on the development of simple, yet viable models and the performance of computer simulations required for obtaining significant results.