# Datenkontrollblatt zur Veranstaltung New mathematical methods in bioelectromagnetism and their neuroscientific applications

## Veranstaltungsgrunddaten

| | | | |
|---|---|---|---|
| **Veranstaltungsnr.** | 102367 | **Veranst. SWS** | 4 |
| **Veranstaltung** | New mathematical methods in bioelectromagnetism and their neuroscientific applications | **Semester** | SoSe 2023 |
| | | **Erwart. Teil.** | |
| | | **Max. Teil.** | |
| **Kurztext** | | **Hyperlink** | |
| **Veranst.-Art** | Lecture | | |
| **Belegpflicht** | J | | |
| **Studienjahr** | | | |

## Veranstaltungstermine, Räume und Personal

Wed 16:00 - 17:30 weekly 05.04.2023 - 05.07.2023

## Personen

Jochen Bauer
Joachim Groß
Gabriel Möddel
Carsten Wolters

## Studiengänge

Master/Mathematics; -
Dr rer med/Medizin. Wiss.; -
Staatsex.-Medizin; -
Medizin. Wissenschaften; -

## Einordnung Vorlesungsverzeichnis

6. Biomagnetismus und Biosignalanalyse
Vorlesungen und Übungen in Angewandter Mathematik
Spezialisierungen

## Zuordnung zu Prüfungen

Lecture 2 (20003)
Lecture 1 (20001)

## Zuordnung zu Prüfungen

20003 Lecture 2 - Master Mathematics
20001 Lecture 1 - Master Mathematics

## Zuordnung zu Prüfungsorganisationssätzen

## Einrichtungen

Fachbereich 05 Medizinische Fakultät
Fachbereich 10 Mathematik und Informatik

## Hyperlinks

## Literatur

http://www.sci.utah.edu/~wolters/LiteraturZurVorlesung/

## Bemerkung

Even if we largely prefer to teach in the seminarroom of the IBB, we will offer the lecture in hybrid mode, please find below the zoom link
for the SS2023 lectures:

Carsten Wolters lädt Sie zu einem geplanten Zoom-Meeting ein.
Thema: Lecture "New mathematical methods in bioelectromagnetism and their neuroscientific applications"
Uhrzeit: 5.Apr. 2023 04:00 PM Amsterdam, Berlin, Rom, Stockholm, Wien

Jede Woche am Mi
5.Apr. 2023 04:00 PM
12.Apr. 2023 04:00 PM
19.Apr. 2023 04:00 PM
26.Apr. 2023 04:00 PM
3.Mai 2023 04:00 PM
10.Mai 2023 04:00 PM
17.Mai 2023 04:00 PM
24.Mai 2023 04:00 PM
7.Juni 2023 04:00 PM
14.Juni 2023 04:00 PM
21.Juni 2023 04:00 PM

28.Juni 2023 04:00 PM
5.Juli 2023 04:00 PM
Laden Sie die folgenden iCalendar-Dateien (.ics) herunter und importieren Sie sie in Ihr Kalendersystem.
Wöchentlich: https://wwu.zoom.us/meeting/u5AlfuyvqDwsEtOdQIpw87AGjw8D8hk5j5ub/ics?icsToken=98tyKu-spjIvHdKSth-GAR_MIGor4Z-3wpmZdj7dymC7MEzcLNSLRPPUaFup3G43a
Zoom-Meeting beitreten
https://wwu.zoom.us/j/64895767687?pwd=bWJYTnNaWmhMa2dOb08zRXZPS1hQdz09
Meeting-ID: 648 9576 7687
Kenncode: 639275
Schnelleinwahl mobil
+31207940854,,64895767687# Niederlande
+31202410288,,64895767687# Niederlande
Einwahl nach aktuellem Standort
+31 20 794 0854 Niederlande
+31 20 241 0288 Niederlande
Meeting-ID: 648 9576 7687
Ortseinwahl suchen: https://wwu.zoom.us/u/cd6fA7tpDJ
Über SIP beitreten
64895767687@fr.zmeu.us
Über H.323 beitreten
213.19.144.110 (Amsterdam
Niederlande)
213.244.140.110 (Deutschland)
Kenncode: 639275
Meeting-ID: 648 9576 7687

## Kurzkommentar

Nowadays devices and tools are available for analyzing and monitoring the human brain at a high level of detail. These details are necessary, e.g., for successful surgery or, more generally, for basic brain research. Rapid advances were achieved in the fields of structural and functional imaging modalities such as Magnetic Resonance Imaging (MRI), ElectroEncephaloGraphy (EEG) and MagnetoEncephaloGraphy (MEG). Since the functional modalities EEG and MEG each have their strengths and weaknesses, they complement each other and synergetic effects are expected from their integration. Non-invasive computational methods are often used in the field of neurosciences. The field of EEG/MEG source analysis is a representative of such methods. Non-invasive tools are of course preferable to invasive methods which may be of high risk to patients. In fundamental brain research, most often there is no other choice besides computational methods.

Furthermore, in recent years, new methodologies were developed for manipulating the human brain using brain stimulation methods such as Transcranial Electric Stimulation (TES) and Transcranial Magnetic Stimulation (TMS).

This lecture will focus on mathematical methods for the analysis of EEG, MEG, MRI, TES and TMS. We will study registration and segmentation methods for the structural modalities T1-weighted MRI, T2-weighted MRI and Diffusion Tensor MRI (DT-MRI) and signal analysis, Maxwell equations, Helmholtz' reciprocity law, boundary and finite element forward methods, inverse approaches such as current density reconstruction and Bayesian inversion as well as optimization approaches for multi-sensor brain stimulation modalities such as TES and TMS.

Finally, we will apply the new methodologies for reconstructing and manipulating neuronal networks in the human brain in neuroscientific applications and in clinical fields of neurology and psychiatry.