## Physics in Medicine: Fundamentals of Analyzing Biomedical Signals (A) - physics772

| *Course* | **Physics in Medicine: Fundamentals of Analyzing Biomedical Signals (A)** |
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| *Course No.* | physics772 |

| **Category** | **Type** | **Language** | **Teaching hours** | **CP** | **Semester** |
|---|---|---|---|---|---|
| Elective | Lecture with exercises | English | 3+1 | 6 | WT |

**Requirements for Participation:**

**Preparation:** Elementary thermodynamics; principles of quantum mechanics, principles of condensed matter

**Form of Testing and Examination:** Requirements for the examination (written or oral): successful work with the exercises

**Length of Course:** 1 semester

**Aims of the Course:** Understanding of the principles of physics and the analysis of complex systems

**Contents of the Course:**

Introduction to the theory of nonlinear dynamical systems; selected phenomena (e.g. noise-induced transition, stochastic resonance, self-organized criticality); Nonlinear time series analysis: state-space reconstruction, dimensions, Lyapunov exponents, entropies, determinism, synchronization, interdependencies, surrogate concepts, measuring non-stationarity.

Applications: nonlinear analysis of biomedical time series (EEG, MEG, EKG)

**Recommended Literature:**

Lehnertz: Skriptum zur Vorlesung

E. Ott; Chaos in dynamical systems (Cambridge University Press 2. Aufl. 2002)

H. Kantz, T. Schreiber ; Nonlinear time series analysis. (Cambridge University Press 2:Aufl. 2004).

A. Pikovsky, M. Rosenblum, J. Kurths; Synchronization: a universal concept in nonlinear sciences

(Cambridge University Press 2003)

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