

**Modules:**

physics700 **Elective Advanced Lectures**  
 physics720 **Applied Physics**

**Course:**

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

**Course No.:** physics772

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

**Requirements:****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)