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

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)

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