Data field	Explanation
Module number	M03
German title / English title	Stochastische Modellierung und Optimierung / Stochastic Modeling and Optimization
Credits	5 ECTS
Workload	68 Contact hours (4 SWS SU), 82 Hours of independent study
Subject coverage	Subject-Specific specialization
Learning outcomes	Students master the fundamentals of the theory of probability and stochastic processes. They know how stochastic models are applied to practical communications engineering problems in signal processing, signal transmission, network engineering, or parameter estimation and detection, and they can design and analyze optimum systems on the basis of such models.
Requirements	None
Level	1. Semester
Type of module	Seminar
Status	Required module
Semesters when offered	Winter semester
Method of assessment / Type of examination	The method of assessment / type of examination must be defined by the lecturer within the deadline determined in §19 (2) RSPO. Should the deadline pass without determination of the form of assessment in the module, the following method of assessment / type of examination applies: Written examination (120 minutes)
Grade assessment	See study and examination regulations
Content	• Probability, random variables, univariate and multivariate distribution and density function, expected value, moments, correlation • Stochastic processes: ensemble and time average, characteristics of stochastic processes, correlation, power density spectrum • Examples of stochastic processes: Gaussian process and variants, Poisson and Erlang process, Markov chains, ARMA process • Transformation of stochastic processes: non-linear static systems, linear systems with memory • Design and analysis of optimum systems: estimation and detection problem, estimation characteristics, optimization criteria • Applications in communications engineering: e.g. statistic linearization, histogram equalization, Bayes estimation and detection, Maximum-likelihood estimation, linear prediction, Wiener filter, Kalman filter, queuing theory, communication source and channel models, entropy, channel capacity, coding
Reading list	A. Papoulis, S. Pillai: Probability, Random Variables, and Stochastic Processes, McGraw Hill S. Kay: Fundamentals of Statistical Signal Processing, Prentice Hall
Further information	Language employed in the module: English
Required Room type	SU-Sem