Course: Generalized Stochastic Processes	
Teacher(s): Dora Seleši, Danijela Rajter Ćirić	
Course status: elective	
ECTS: 12	
Prerequisites: -	

Goal

Introducing students to the fundamentals of stochastic analysis and generalized stochastic processes, primarily with Colombeau's stochastic processes and with white noise theory and chaos expansions in the spaces of generalized stochastic processes.

Outcomes

Mastering the theory of classical and generalized stochastic processes, as well as their relationships with the theory of deterministic generalized functions.

Contents

Theoretical teaching

Spaces of generalized functions. Positive measures. Colombeau algebras. Fundaments of stochastic analysis: conditional expectation, martingales, Brownian motion, white noise, stochastic integration, Gaussian, Poissonian and Levy processes.

Some classes of generalized stochastic processes: Gelfand-Vilenkin processes and their properties, Colombeau processes and their properties, etc.

Projective and inductive topology. Nuclear spaces. Hermite polynomials and Hermite functions. White noise space. Wiener-Ito's chaos expansion. Hida spaces. Kondratiev spaces. Wick products. Ito and Skorohod integrals.

Practical teaching

Implementation of the theoretically analyzed methods.

Recommended bibliography

1. M. Gel'fand, N. Ya. Vilenkin, Generalized functions, Volume 4, Academic Press, 1964.
2. Nedeljkov, M., Pilipović, S., Scarpalezos, D., Linear Theory of Colombeau's Generalized Functions, Addison Wesley, Longman, 1998.
3. H. Holden, B. Oksendal, J. Uboe, T. Zhang, Stochastic partial differential equations: A modeling, white noise functional approach, 2nd Edition, Springer Verlag, 2010.
4. T. Hida, H. H. Kuo, J. Potthoff, L. Streit, White Noise: An Infinite Dimensional Calculus, Kluwer Academic Publishers, 1993.
5. H. H. Kuo, White noise theory. Handbook of stochastic analysis and applications, Statist. Textbooks Monogr., 163, Dekker, New York, 2002.

Active teaching hours:	Theoretical: 4	Practical:

Methods of teaching

Plenary lectures, problem solving sessions, independent student expositions.

Knowledge estimation: (max 100 points)

50 Colloquia, 50 Exam