Course: Singular Stochastic Partial Differential Equations

Teacher(s): Dora Seleši, Danijela Rajter Ćirić

Course status: elective

ECTS: 12

Prerequisites: Generalized Stochastic Processes

Goal

Introducing students to the application of various spaces of generalized stochastic processes to solving stochastic differential equations with singularities.

Outcomes

Mastering several methods to solving stochastic partial differential equations with singularities and nonlinear stochastic partial differential equations.

Contents

Theoretical teaching

Stochastic partial differential equations with singular coefficients and singular initial conditions. Colombeau algebras of generalized stochastic processes and applications to solving nonlinear stochastic differential equations.

White noise spaces. Stochastic differential equations with Wick products. The Hermite transform and its application to solving stochastic differential equations. Polynomial chaos expansions and application of the propagator method to solving equations. The Karhunen-Loeve expansion, Wong-Zakai expansion and applications to solving equations.

Practical teaching

Implementation of the theoretically analyzed methods.

Recommended bibliography

1. Walsh J. B., An introduction to stochastic partial differential equations, Springer Lecture Notes in Mathematics, 1980.
2. H. Holden, B. Oksendal, J. Uboe, T. Zhang, Stochastic partial differential equations: A modeling, white noise functional approach, 2nd Edition, Springer Verlag, 2010.
3. H. H. Kuo, White noise theory. Handbook of stochastic analysis and applications, Statist. Textbooks Monogr., 163, Dekker, New York, 2002.
4. Z. Zhang, G. Karniadakis, Numerical Methods for Stochastic Partial Differential Equations with White Noise, Springer Verlag, 2017.

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