Stochastic Partial Differential Equations, 7.5 hp

Course period:
October 30, 2017 – January 13, 2018

Last day for application:
October 30, 2017

Course leader / Address for applications:
Annika Lang / annika.lang@chalmers.se

Course description (Advertisement for Ph.D. students):
Stochastic partial differential equations (SPDE) are considered in the sense of Itô. We extend the theory of Itô stochastic differential equations to infinite dimensions by considering SPDE in the framework of Hilbert spaces. This requires the definition of Wiener processes in Hilbert space and the derivation of the stochastic integral in that abstract setting. We show existence and uniqueness of mild solutions to linear SPDE. Mild solutions are then simulated which requires approximation in space, time, and of the infinite-dimensional driving Wiener noise. We prove strong and weak convergence rates of the considered approximation schemes.

The course will start in the end of October and run twice a week (4 hours) until mid-January (LP2 2017/18). The schedule will be decided by the participants at an introductory meeting.

Responsible department and other participation departments/organizations:
Department of Mathematical Sciences

Teacher:
Annika Lang

Examiner:
Annika Lang

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1. Confirmation
The syllabus was confirmed by the Head of the Department of XXX 200X-XX-XX, 200X-XX-XX.

Disciplinary domain: Science
Department in charge: Department of Mathematical Sciences
Main field of study: Mathematics / Mathematical Statistics / Applied Mathematics and Statistics

2. Position in the educational system
Elective course; third-cycle education

3. Entry requirements
Probability theory, partial differential equations, stochastic processes

4. Course content
The course will cover a suitable subset of the following topics. The final curriculum will be decided upon during the course.

- Gaussian measures on Hilbert space
- Hilbert-space-valued Wiener processes and stochastic integration
- Existence and uniqueness of solutions to stochastic partial differential equations
- Strong and weak approximations of mild solutions with convergence analysis
- Simulation of Wiener processes
- Monte Carlo and multilevel Monte Carlo methods

5. Outcomes
At the end of the course, the students will have acquired basic knowledge about stochastic partial differential equations and the approximation of solutions.

6. Required reading
Besides lecture notes a list with recommended literature is distributed to all participants in the beginning of the course.

7. Assessment
There will be exercises, an individual project, presentations, and lectures given by the students.

A Ph.D. student who has failed a test twice has the right to change examiners, if it is possible. A written application should be sent to the Department.

In cases where a course has been discontinued or major changes have been made a Ph.D. should be guaranteed at least three examination occasions (including the ordinary examination occasion) during a time of at least one year from the last time the course was given.

8. Grading scale
The grading scale comprises Fail, (U), Pass (G)

9. Course Evaluation
The course evaluation is carried out together with the Ph.D. students at the end of the course, and is followed by an individual, anonymous survey. The results and possible changes in the course will be shared with the students who participated in the evaluation and to those who are beginning the course.

10. Language of instruction
The language of instruction is English.