PROBABILISTIC METHODS IN PDE

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TYPE OF COURSE : New | Elective | PG
COURSE DURATION : 12 weeks (27 Jan' 20 - 17 Apr' 20)
EXAM DATE : 26 Apr 2020

INTENDED AUDIENCE : Doctoral students or researchers in the area of partial differential equations or stochastic processes who wish to learn the probabilistic techniques in PDE for solving research problems either in pure or applied mathematics such as Mathematical Finance or Mathematical Physics.

PREREQUISITES : Appropriate for students with MSc in Pure Mathematics with specialization in Analysis and/or Probability Theory. Prerequisite courses: Measure Theory, Functional Analysis, Probability Theory, Stochastic Processes,

COURSE OUTLINE :
Probabilistic method in PDE is equally used in Pure and Applied Mathematics research. This is regarded as a very powerful tool by the researchers working on the theory of differential equations. This course content is mainly based on two different books, one on stochastic calculus and another on semigroup theory. Many theorems would be proved in the lectures with greater details than the reference books.This course develops tools to solve deterministic Evolution Problem arising in physical scenarios with random noise. The evolution problems include, for example, heat equation and option price equations. Cutting edge R&D sectors of Finance industry course.

ABOUT INSTRUCTOR :
Anindya Goswami received his Bachelor's degree in Mathematics from St. Xavier's College, Calcutta in 2002. Later in the same year, he joined the Integrated Ph.D. program in the Department of Mathematics in Indian Institute of Science, Bangalore.

COURSE PLAN :

Week 1 : Mathematical formulation of stochastic processes

Week 2 : Brief review of L2 theory of stochastic integration

Week 3 : Ito's formula

Week 4 : Probabilistic method in Dirichlet problem

Week 5 : Further topics of Dirichlet problem and Probabilistic method in heat equation

Week 6 : Further topics of Probabilistic method in heat equation

Week 7 : Feynman Kac formula

Week 8 : Stochastic differential equations

Week 9 : PDE with general elliptic operators

Week 10 : Feynman Kac formula and its abstraction with semigroup theory

Week 11 : Mild solution to linear evolution problems

Week 12 : Mild solution to semilinear evolution problem