Σεμινάριο Τμήματος Μαθηματικών

7 Ιουλίου 2025

18.00–18.50: *Mathematical Models of Infectious Diseases: SIR-SEIR-Type Models*

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In this seminar, we will focus on a specific application of non-linear differential equation systems. This application is the mathematical models of epidemics of the:

- Susceptible-Infected-Recovered (SIR) type modeling.

- These models are generally constructed with ODE systems.

- These models are extremely flexible and can become very complex to model the behavior of complex diseases.

However, in this talk we will limit ourselves to the basic SIR model and a few other, more general models. After this seminar, the listener (researcher) will be able to read articles from the mathematical biology and epidemiology literature that include simple models and they will be motivated to do some work.

19.00–19.50: *Lévy processes switching at Poissonian times*

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In this paper, we derive identities for the upward and downward exit problems and resolvents for a process whose motion changes between two Lévy processes if it is above (or below) a barrier b and coincides with a Poissonian arrival time. This can be expressed in the form of a (hybrid) stochastic differential equation, for which the existence of its solution is also discussed. All identities are given in terms of new generalisations of scale functions (counterparts of the scale functions from the theory of Lévy processes).

To illustrate the applicability of our results, the probability of ruin is obtained for a risk process with delays in the dividend payments.