

**Applied Mathematics 601_20 ‘Topic in Applied Mathematics’
‘Introduction to Levy Processes
with Applications’**

Calendar Description:

Infinite divisibility, Levy processes (LP), the Levy-Khintchine formula; examples of LP; Poisson integration, the Levy-Ito decomposition, subordinators; Markov processes, semi-groups and generators of LP; Ito-formula for LP, quadratic variation; LP as time-changed Brownian motion, change of measure (Girsanov theorem); stochastic differential equations driven by LP; Feynman-Kac formula and martingale problem for LP; applications of LP; simulation of LPs

Prescription: Consent of the Division

Syllabus

Topic	Time
Infinite divisibility, stable random variables, Levy processes (LP), the Levy-Khintchine formula; examples of LP: jump-diffusion, variance gamma, normal inverse Gaussian, generalized hyperbolic processes	6
Poisson random measure, Poisson integration, the Levy-Ito decomposition, Subordinators	5
Markov processes, semi-groups and generators of LP	4
Stochastic integrals based on LP, Ito-formula for LP, quadratic variation	4
Martingales, exponential and stochastic martingales, change of measure for LP (Girsanov theorem), LP as time-changed Brownian motion	5
Feynman-Kac formula and martingale problem for LP	2
Stochastic differential equations driven by LP	3
Applications of LP in relativity and number theories, Markov processes and operator theories; applications of LP in mathematical finance: LP-based stock prices, option pricing formula.	5
Simulation of LPs: compound Poisson, Variance Gamma, Normal Inverse Gaussian processes	2
Total	36