

STAT 761 'Stochastic Processes'

Calendar Description:

Elements of Stochastic Processes, Markov chains, Renewal processes, Martingales, Brownian motion, Branching processes, Stationary processes, Diffusion processes, Levy processes

Prescription: Consent of the Division

Syllabus

Topic	Time
Elements of stochastic processes: review of basic terminology, two simple examples, classification, definition	2h
Markov chains (MC): examples, transition probabilities, classification of states, recurrence, continuous time, birth and death process, Poisson process, finite state continuous time MC	4h
Renewal processes (RP): definition, examples, Renewal Equation and Renewal Theorem, application of RP, superposition of RP	4h
Martingales: definition, examples, supermartingales and submartingales, the Optional Sampling Theorem (OST), applications of OST, special martingales, applications (finance)	4h
Brownian motion (BM): background, joint probabilities, continuity of paths and the maximum value, functionals of BM by martingale methods, multidimensional BM, applications (finance)	4h
Branching processes (BP): discrete time, generating function, extinction probabilities, examples, continuous-time BP (extinction probabilities), applications	4h
Stationary processes (SP): definition, examples, ergodic theory and SP, Gaussian systems, stationary point processes, applications	4h
Diffusion processes (DP): definition, examples, existence and uniqueness theorem, Ito formula, applications (finance)	4h
Levy processes (LP): definition, examples, infinite divisibility, Levy-Khintchine Formula, Levy-Ito decomposition, Levy processes as time-changed Brownian motion, Ito formula and applications (finance)	6h
Total	36