Program	Type of studies (cycle)	Third cycle
	Name of the program	SEE Doctoral Studies in Mathematical Sciences

Course

Course title	Stochastic processes II			
Course code	Semester	Course status	ECTS credits	Contact hours
AMAT 680				30
Teaching staff	Teacher	Prof. Dr. Lejla Smajlović		
	Other staff	Prof. Dr. Wilhelm Schappacher		
Course goals	The course should provide a high level overview on stochastic processes			

Course content/topics

- Markov chains: Construction and properties, examples, Transience and recurrence, Canonical decomposition, Absorption probabilities, Limit distributions
- Renewal theory: Counting renewals, Renewal reward processes, The Renewal Equation, The Poisson Process, Discrete renewal theory, Stationary renewal processes, Improper renewal equations
- Point processes: The Poisson Process, Transforming Poisson Processes, Max-stable and stable random variables, More transformation theory, Marking and thinning, Variants of the Poisson Process, The linear birth process as a point process
- Continuous time Markov chains: Definitions and construction, Stability and explosions, The Markov property, Stationary and limiting distributions, Laplace transform methods
- Brownian motion: Introduction and construction of Brownian motion, Properties of the standard Brownian motion, The reflection principle, The distribution of the maximum Brownian motion with drift
- Martingales and semi-martingales: Introduction, Stability properties, examples, Stochastic integrals, The quadratic variation of a semimartingale, Change of variables (Ito's formula)
- Stochastic differential equations: Existence and uniqueness of solutions, Stability of stochastic differential equations, Stochastic exponentials and linear equations

LITERATURE

[1] Asmussen, S., and Glynn, P. W., Stochastic Simulation, Algorithms and Analysis, Stochastic Modelling and Applied Probability Vol. 57, Springer-Verlag, New York 2007.

[2] Protter, Ph. E., Stochastic Integration and Differential Equations, 2nd edition, Springer-Verlag, New York 2004.

[3] Resnick, S. F., Adventures in Stochastic processes, Birkhauser, Basel 1992.

[4] Ross, S., Stochastic Processes, John Wiley, New York 1996.

[5] Schuss, Z., Theory and Applications of Stochastic Processes, an Analytical Approach, Applied Mathematical Sciences Vol. 170, Springer-Verlag 2010.

Grading

	Criterion	Points	Cut-off points
1.	Homework assignment	20	12
2.	Project	50	26
3	Final exam	30	17
	Total	100	55