Syllabus

MATH 7613: Probability Theory (Spring 2017)

Instructor:	Dr. Michael Pokojovy
Office:	Dunn Hall 366
Contact:	michael.pokojovy@kit.edu
Office hours:	by appointment
Class time and room:	Tue and Thu, 11:20am–12:45pm, Dunn Hall 203

Description

The course is intended as a (slighly) "more advanced" probability course. Whereas the first part is dedicated to seminal probabilistic concepts, constructions and techniques, the second part gives a first insight into the theory of martingales. The following topics will be covered:

- probability measures;
- distribution functions;
- independence;
- mathematical expectation;
- modes of convergence;
- Borel-Cantelli lemma;
- weak and strong laws of large numbers;
- Glinvenko-Cantelli lemma;
- characteristic function inversion theorems;
- Slustky's theorem;
- Central limit theorems of Lyapunov, Lindeberg-Levy and Lindeberg-Feller;
- multivariate extensions;
- Berry-Esseen theorem;
- conditional expectations; martingales;
- Doob's inequality;
- martingale convergence and decomposition theorems;
- martingale central limit theorem;
- stopping times;
- martingale transforms;
- concentration inequalities;
- Markov chains.

Prerequisites

MATH 6350 is a prerequisite. Knowledge of MATH 6635 is recommended.

Homework

- Homework will be assigned biweekly.
- 50%–100% of the assigned problems will be graded.
- Homework will only be accepted before the due date.

Exams

- There will be two take-home exams during the semester.

Grading

- Homework – 40% of points
- Two take-home exams – 30% points each

Grades

The final grade will be computed according to the following scale based on the percentage p of points obtained:

$85\% \leq p \leq 100\%$	$70\% \leq p < 85\%$	$55\% \leq p < 70\%$	$40\% \leq p < 55\%$	$p < 40\%$
A	B	C	D	F

Textbooks

Comprehensive lectures with handouts and/or a set of lecture notes are intended. Additional information can be found in the following textbooks and monographs:

[1] Billingsley, P. (1986) Probability and Measure (3rd ed.), Wiley

[2] Chung, K.L. (2001) A Course in Probability Theory, Academic Press

[3] Durrett, R. (2014) Probability: Theory and Examples (4th ed.), Cambridge University Press

[4] Fristedt, B.E. and Gray, L.G. (1997) A Modern Approach to Probability Theory, Springer

[5] Kallenberg, O. (2006) Foundations of Modern Probability, Springer

[6] Khoshnevisan, D. (2007) Probability, AMS Press

[7] Leadbetter, R. et al. (2014) A Basic Course in Measure and Probability: Theory for Applications, Cambridge University Press

Disclaimer

The syllabus is intended as a guideline for expectation and evaluation in this course. However, the instructor reserves the right to make any changes that may be deemed necessary during the course of the semester.