

| Module description: Stochastic Processes | | | |
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| Module Code | t.BA.WI.STOP.19HS | | |
| ECTS Credits | 4 | | |
| Language of Instruction/Examination | German | | |
| Organizational Unit | IDP | | |
| Module Coordinator | Thoralf Mildenerger | | |
| Legal Framework | The module description is part of the legal basis in addition to the general academic regulations. It is binding. During the first week of the semester a written and communicated supplement can specify the module description in more detail. | | |
| Module Characteristic | Type 2a 4 consecutive lecture lessons per semester week and class | | |
| Module Description | The module introduces students to the basic principles of stochastic processes. Discrete-time and continuous-time Markov processes with finite state space and point processes are introduced. | | |
| Module Content | <ul style="list-style-type: none"> Markov chains with finite state space: - Basic concepts: transition probabilities, state distributions, properties of states - Analysis of transitions and duration of stay - Costs with finitely many time steps and - costs in the long run (asymptotics) Markov Chain Monte Carlo as a simulation method based on Markov chains Point processes: - Poisson processes - Renewal processes - Cumulative processes Time-continuous Markov processes with finite state space: - Basic concepts: transition, rate and generator matrices, state distributions - Analysis of transitions - Costs in the long run (asymptotics) | | |
| Prerequisite Knowledge | WaSt 2 | | |
| Learning Objectives (Competences) | Students... | Competencies | Taxonomies |
| | You have understood the basic concept of stochastic processes (modelling of dynamic processes using dependent random variables). | F, M | K1, K2 |
| | You know time-continuous, state discrete Markov processes and their most important properties. You know the most important methods for analyzing behavior and can apply them to solve new problems. | M, F | K1, K2, K3 |
| | You know time- and state-discrete Markov chains and their most important properties. You can recognize for which problems they are suitable for modeling. You know the most important methods for analyzing both the behavior for a small number of steps and the long-term behavior, and you can use these methods to solve new problems. | M, F | K1, K2, K3 |
| | You know different simple types of point processes and their most important properties. You know the most important methods for analyzing behavior and can use them to solve new problems. | M, F | K1, K2, K3 |
| | You can implement calculations and simulations for concrete problems in a programming language (e.g. R). | F, M | K5 |

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| Performance Assessment | End-of-module exam | Assessment | Length (min.) | Weighting | Form | |
| | written exam | Grade | 90 | 60 | acc. to module agreement | |
| | Performance assessment during the semester | | Assessment | Length (min.) | Weighting | Form |
| | 6 Notebooks <i>6 R Markdown Notebooks</i> | | Grade | | 40 | acc. to module agreement |
| Classroom Attendance Requirement | None | | | | | |
| Learning material | | | | | | |
| Comments | | | | | | |