DOCTORAL (PHD) STUDIES
COURSE DESCRIPTION

Course title	Field of science	Faculty	Institute
Bayesian Statistics	Mathematics (N 001)	Faculty of Mathematics and Informatics	Institute of Applied Mathematics
Study method	Number of credits	Study method	Number of credits
Lectures	0	Consultations	1
Individual work	4	Seminars	0

Course summary
Bayesian approach is a common way to model uncertainty. It is easy to understand, simply incorporates prior information and provides a natural solution to the small sample problem. Along with Monte Carlo methods it extends the scope of statistical applications and enables one to construct and deal with complex multilevel models otherwise practically intractable. The students learn Bayesian principles and thinking, master Bayesian calculations including MCMC methods. Although the course is designed for students in mathematics, its adapted version suits students of other specialities as well. **Topics:** 1.The Bayesian approach. Prior and posterior distributions. Bayesian updating. 2. Applications of Bayesian methods in classical statistical inference. Bayesian risk and Bayesian estimators. Credible intervals, high posterior density regions. Testing of hypotheses and Bayesian factors. 3. Prior selection. Priors: noninformative, improper, reference. Maximum entropy principle. Hierarchical and empirical Bayes.. 4. Bayesian calculations. Markov chain Monte Carlo methods. Gibbs sampling. 5. Bayesian methods in survey sampling. 6. Applied Bayesian modelling and inference.
Main literature
1. Geweke, John. (2005) *Contemporary Bayesian Econometrics and Statistics.* John Wiley & Sons, New Jersey, 231 p.
2. Marin, J.-M. and Robert C.P. Bayesian Essentials with R. Springer-Verlag, New York 2013, 296 p.
3. Albert, Jim. (2007) *Bayesian Computation with R.* Springer, New York, 267 p.
4. Ghosh, Malay and Meeden G. (1997) *Bayesian Methods for Finite Populations Sampling.* Chapman & Hall.
5. T. Rachev, J. Hsu, B. Bagasheva F. Fabozzi. Bayesian Methods in Finance. Wiley, 2008, 329 p.
6. Robert, Christian P. (2007) *The Bayesian Choice. Springer texts in Statistics* (2nd ed.), New York, 602 p.
7. R. King, B. Morgan, O. Gimenez, S. Brooks. Bayesian Analysis for Population Ecology, Chapman and Hall/CRC, 2009, 456 p.

Consulting teacher	Scientific degree	Pedagogical name	Main publications in the field of science of the last 5 year period
Marijus Radavičius	Dr.	Assoc. Prof.	1. Radavičius M. 2020. A Consistent Estimator of Structural Distribution. *Austrian Journal of Statistics*, 49: 99–105. 2. Radavičius, M., Rekašius, T., Židanavičiūtė, J. 2019. Local symmetry of non-coding genetic sequences. *Informatica*, **30** (3): 553-571. 3. Radavičius M. 2019. Structural Distribution Estimation. Computer Data Analysis and Modeling: Stochastics and Data Science, Proceedings of the 12th International Conference, Minsk, September 18-221, 2019, pp. 280–284. Publishing Center BSU, Minsk. 4. Radavičius, M. 2016. Hoeffding Type Inequalities for Likelihood Ratio Test Statistic.// Computer Data Analysis and Modeling: Theoretical and Applied Stochastics: Proc. of the Eleventh Intern. Conf., Minsk, September 6-10, 2016, pp.182-184. Publishing center BSU, Minsk.

			5. Murauskas, G; Radavičius, M. 2016. Multi-unit assignment problem: FCFS course allocation system data analysis. Lithuanian Journal of Statistics, 55 (1): 70-80 (in Lithuanian).

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Board Chairman – assoc. prof. dr. Kristina Lapin