COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Sample Surveys	

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: Andrius Čiginas **Other(s):**	Faculty of Mathematics and Informatics Institute of Applied Mathematics Department of Statistical Analysis

Study cycle	Type of the course unit (module)
Second level	Optional

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Face-to-face	Master studies, the second semester	Lithuanian / English

Requirements for students	
Prerequisites: Probability theory, basics of statistics	**Additional requirements (if any):** External study of the course unit is not allowed.

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
5	125	42	83

Purpose of the course unit (module): programme competences to be developed

- Creatively solve non-standard theoretical and empirical problems;
- Design and realize practical surveys;
- Estimate the adequacy of the models and adjust the models.

Learning outcomes of the course unit (module)	Teaching and learning methods	Assessment methods
Design sample survey	Problem-oriented teaching, analysis of examples, laboratory work, individual reading	Midterm exam, laboratory work, exam
Construct the estimators of the parameters of the surveyed population and estimate the accuracy		
Apply sampling methods and simulated modeling for complex problems of estimation, optimization, and model selection		
Associate theoretical models with empirical problems		
Know the main stages of applied survey		

Content: breakdown of the topics	Contact hours							Self-study work: time and assignments	
	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work placement	**Contact hours**	**Self-study hours**	**Assignments**
1. Basic concepts in survey sampling: survey populations, survey samples, population structures and sampling frames, descriptive population parameters, probability sampling and design-based inference.	3		2				**5**	**8**	Work with supplementary reading list; exercises and problem solving.
2. Simple single-stage sampling methods: simple random sampling without replacement, simple random sampling with replacement, simple systematic sampling, central limit theorems and confidence intervals, and sample size calculation.	4		2				**6**	**10**	Work with supplementary reading list; exercises and problem solving.
3. Stratified sampling and cluster sampling: stratified simple random sampling, sample size allocation under stratified sampling, single-stage cluster sampling, two-stage cluster sampling, and stratified two-stage cluster sampling.	6		2				**8**	**15**	Work with supplementary reading list; exercises and problem solving. Laboratory work no. 1.
4. General theory and methods of unequal probability sampling: sample inclusion probabilities, the Horvitz-Thompson estimator, the Hájek estimator, and probability-proportional-to-size sampling.	4		2				**6**	**15**	Work with supplementary reading list; exercises and problem solving. Laboratory work no. 1.
5. Model-based prediction and model-assisted estimation. The generalized ratio and regression estimators.	5		2				**7**	**10**	Work with supplementary reading list; exercises and problem solving. Laboratory work no. 2.
6. Calibration weighting and estimation: calibration estimators, and model-calibration estimators.	3		2				**5**	**15**	Work with supplementary reading list; exercises and problem solving. Laboratory work no. 2.
7. Resampling and replication methods: the with-replacement bootstrap, the pseudo-population bootstrap, and replication weights for public-use survey data.	3		2				**5**	**10**	Work with supplementary reading list; exercises and problem solving. Laboratory work no. 2.
Total	**28**		**14**				**42**	**83**	

Assessment strategy	Weight,%	Deadline	Assessment criteria
Laboratories	30%	During the semester	The lecturer formulates the problem for the first laboratory. The problem for the second laboratory is that the students can choose from the list presented by the lecturer. The laboratory can be done by a group consisting of 2 students. The solutions (results) are presented during the seminar and discussed. The printed report is also allowed. The cumulative method and interim points are used. Each laboratory can be evaluated up to 15 interim points. Laboratories are evaluated according to the requirements presented in advance. The complexity of the problem, originality, quality of the processing and presentation are taken

			into account.
Mid-term exam.	30%	In the middle of the semester	The outcome of the first part of the course (Topics 1-3) is evaluated. The simple exercise, a more complicated theoretical problem consisting of several parts is to be solved. The colloquium can be evaluated up to 30 (interim) points.
Final exam	40%	Exam session	The outcome of the second part of the course (Topics 4-7) is evaluated. The final exam is evaluated for up to 40 interim points. The type of exercises and theoretical problems are similar to those of suggested for the colloquium. The final evaluation is on 10 points scale. The sum of interim points is divided by 10 and rounded.

Author	**Year of publication**	**Title**	**Issue of a periodical or volume of a publication**	**Publishing place and house or web link**
Compulsary reading				
A. Čiginas		Course material		VU VLE
C. Wu & M. E. Thompson	2020	Sampling Theory and Practice		Springer
Optional reading				
S. L. Lohr	2022	Sampling: Design and analysis		CRC Press (VU online resources)
S. L. Lohr	2022	R Companion for Sampling: Design and analysis		*https://www.sharonlohr.com/sampling-design-and-analysis-3e*