Subject code	ECTS credits
MAT4015	6

Course title in Lithuanian

IŠGYVENAMUMO ANALIZĖ

Course title in English

SURVIVAL ANALYSIS

Short course annotation in Lithuanian (up to 500 characters)

Įgyjamos žinios apie išgyvenamumo analizės metodus ir jų praktinį taikymą medicinos duomenų analizėje. Kurso metu gaunamos žinios apie cenzūruotus duomenis, išgyvenamumo bei rizikos funkcijos parametrinius modelius, Kaplano-Mejerio įvertį, išgyvenamumo funkcijų palyginimą, regresinius išgyvenamumo modelius, proporcingos regresijos modelį bei praktinį taikymą šių metodų taikymą. Kurso metu taip pat įgyjami praktiniai įgūdžiai naudojant SPSS bei R programų paketus, įvertinti ir palyginti išgyvenamumo funkcijas, sudaryti Kokso regresinį modelį, sudaryti nepalankios prognozės rizikos įvertį.

Short course annotation in English (up to 500 characters)

Acquired knowledge of the survival‘s methods and its applications for medical data. The course will provide the knowledge to censored data, the parametric models of survival and risk functions, the comparison of survival curves, regression models of survival function, Cox‘s proportional hazards model and gain of these survivals methods. After completion of this course students will be competent to use of statistical packages SPSS and R for estimate and compare survivals functions, able to create Cox model and risk score for failure event.

Prerequisites for entering the course

Mathematical Analysis, Probability Theory, Mathematical Statistic

Course aim

The aim of the course is to provide knowledge of survival analysis and it application for medical data.

Links between course outcomes, criteria of learning achievement evaluation, study methods and methods of learning achievement assessment

No	Course outcomes	Criteria of learning achievement evaluation	Study methods	Methods of learning achievement assessment
1.	Knowledge and understanding of censoring, assessment the survival function, and compare few survival functions	Student demonstrates the ability to assess the survival function, hazard function, and use log-rank test.	Lectures, practical works, individual work, consulting	Mid-term exam, Assessment of practical works
2.	Knowledge and understanding of regression survival models	Student demonstrates the ability to assess the unknown parameters of the model by using R package	Lectures, practical works, individual work, consulting	Mid-term exam, Assessment of practical works
3.	Knowledge and understanding of proportional regression survival models, competing Risks models, and counting process approach in the survival analysis	Student demonstrates the ability to assess the parameters in the Cox model by using R package	Lectures, practical works, individual work, consulting	Final exam, assessment of practical works
4.	Perform the assessment of the risk in the epidemiological and clinical studies	Student estimated the odds ratio and hazard ratio by using logistic and Cox model	Lectures, practical works, individual work, consulting	Final exam, assessment of practical works

Links between study programme outcomes and course outcomes

Study programme outcomes	Running number of course outcome			
	1	**2**	**3**	**4**
Comprehend and be able to apply probabilistic and statistical methods for data analysis	+	+	+	+
Summarize and evaluate critically scientific and professional literature, as well as use various tools for collecting of information for the study process and for solving fixed practical/theoretical problems			+	+
Identify the problem, collect and analyze real/theoretical data using various mathematical methods, tools and IT technologies	+	+	+	+
Think logically and analytically, evaluate alternative ways of task solving and implement optimal solutions		+	+	+
Work individually and/or in groups by developing and adopting appropriate mathematical models and tools for use in case analysis	+	+	+	
Demonstrate awareness of economic, legal, social, ethical and environmental context in mathematical projects			+	+

Content

No	Content (topics)
1.	Medical data; statistical methods for analyze of medical data. Survival data.
2.	Censoring. Survival function, risk function.
3.	Parametric survival models. The assessment of unknown parameters. Maximum likelihood method.
4.	Kaplan-Meier estimator.
5,	Compare two and more survival functions. Log-rank test.
6.	Analyses using the R package "survival"
7.	Regression survival models.
8.	Proportional Hazard Models. Cox model. Time-varying Covariates
9.	Risk assessment by using logistic regression and Cox model. Hazard ratio.
10.	Competing Risks Survival Analysis. Other survival models.
11.	An Introduction to the Counting Process Approach to Survival Analysis.

Distribution of workload for students (contact and independent work hours)

Lectures	**45 hours**
Practical work	**30 hours**
Individual students work	**85 hours**
Total:	**160 hours**

Structure of cumulative score and value of its constituent parts

Final written exam (50%), mid-term written exam (25%), assessment of practical work (25%).

Recommended reference materials

No	Publication year	Authors of publication and title	Publishing house	Number of copies in		
				University library	*Self study rooms*	*Other libraries*
Basic materials						
1.	2010	Venclovienė, Jonė Statistiniai metodai medicinoje	Kaunas : Vytauto Didžiojo universitetas	8	5	

2.	2012	Xian Liu Survival Analysis: Models and Applications	Wiley		1	
3.	2003	Lee ET, Wang JW Statistical methods for survival data	Wiley-interscience	http://evunix.uevora.pt/~pinfante/eb1011/Maths%20&%20Stats%20-%20Statistical%20Methods%20for%20Survival%20Data%20Analysis%20-%203rd,2003%20%5BWiley%5D.pdf		
Supplementary materials						
1.	2016	Moore DF Applied Survival Analysis Using R	Springer			

Course programme designed by

Prof. dr. Jonė Venclovienė