M118	**Probability**	L	P	S	ECTS
		4	3	0	9

Course objectives. Adoption of the concepts of probability theory, understanding of theoretical results and analytical techniques used in their proofs and understanding of possible applications of these concepts.

Prerequisites. Undergraduate degree in Mathematics or related undergraduate degree.

Course content.

1. Probability as a measure. Random variable. Transformation of random variable. Distribution function. Mathematical expectation and higher order moments. L2 space. Important inequalities.
2. Random vector. Distribution function. Independence. Mathematical expectation, covariance matrix and correlation matrix. Transformations of random vector. Conditional distributions. Conditional expectation with respect to sigma algebra.
3. Probability generating functions. Characteristic functions.
4. Sequences of random variables. Types of convergence of random variables. Connections among convergence types. The laws of large numbers. Central limit theorems.

No.	LEARNING OUTCOMES
1.	Explaining the terms, results and concepts of probability theory and the possibilities of their applications.
2.	Using multidimensional distributions and analysing their properties and applications.
3.	Using conditional distributions, conditional expectation and their properties and applications.
4.	Solving problems related to sums and sequences of random variables by using generating functions and characteristic functions.
5.	Distinguishing between the types of convergence of random variables and understanding the relationships between them.
6.	Recognizing the conditions for applying the law of large numbers and central limit theorems.
7.	Combining of concepts and methods from course content for solving more complex theoretical and applied problems.
8.	Conducting mathematical proof of the validity of the analytical results and procedures from the course.

RELATING THE LEARNING OUTCOMES, ORGANIZATION OF THE EDUCATIONAL PROCESS AND ASSESSMENT OF THE LEARNING OUTCOMES

TEACHING ACTIVITY	ECTS	LEARNING OUTCOME **	STUDENT ACTIVITY*	EVALUATION METHOD	POINTS	
					min	max
Attending lectures and exercises	3	1-8	Lecture attendance, discussion, team work, independent work on given tasks and short examination	Attendance lists, tracking activities	0	5
Homework	1	1-8	Solving theoretical and practical problems	Evaluation	0	5
Written exam (Mid-terms)	3	1-8	Preparing for written exam	Evaluation	30	60

Final exam	2	1-8	Revision	Oral exam	20	30
TOTAL	9				50	100

Teaching methods and student assessment. Lectures and exercises are obligatory. The final exam is oral, taken after the completed lectures and exercises and achieved minimum number of credits at the midterm exams. Students can influence the grade by writing homework during the semester.

Can the course be taught in English: Yes

Basic literature:

1. N. Sarapa, Teorija vjerojatnosti, Školska knjiga, Zagreb, 1987.
2. A. N. Shiryaev, Probability, Springer, 2016.

Recommended literature:

1. M. Benšić, N. Šuvak, Uvod u vjerojatnost i statistiku, Sveučilište J .J. Strossmayera – Odjel za matematiku, Osijek, 2014.
2. L. E. Bain, M. Engelhardt, Introduction to Probability and Mathematical Statistics, BROOKS/COLE, Cengage Learning, 1992.
3. D. L. Cohn, Measure Theory, Birkhäuser, 2013.
4. R. Durrett, Probability: Theory and Examples, Cambridge University Press, 2010.
5. N. Elezović, Diskretna vjerojatnost, Element, Zagreb, 2007.
6. N. Elezović, Slučajne varijable, Element, Zagreb, 2007.
7. D. Jukić, Mjera i integral, Sveučilište J.J. Strossmayera - Odjel za matematiku, Osijek, 2012.
8. R. C. Mittelhammer, Mathematical Statistics for Economics and Business, Springer, 1996.