

## ■ CE53 - Probability II

### GENERAL

<b>SCHOOL</b>	EXACT SCIENCES		
<b>DEPARTMENT</b>	MATHEMATICS		
<b>LEVEL OF STUDIES</b>	UNDERGRADUATE		
<b>COURSE CODE</b>	CE53	<b>SEMESTER</b>	E
<b>COURSE TITLE</b>	PROBABILITY II		
<b>INDEPENDENT TEACHING ACTIVITIES</b>	<b>WEEKLY TEACHING HOURS</b>	<b>ECTS</b>	
Lectures	4	5	
<b>COURSE TYPE</b>	Scientific Field		
<b>PREREQUISITE COURSES</b>	Probabilities I		
<b>LANGUAGE OF TEACHING AND EXAMINATIONS</b>	Greek/English		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	YES		
<b>COURSE WEBSITE (URL)</b>	<a href="http://eclass.uowm.gr/">http://eclass.uowm.gr/</a>		

### LEARNING OUTCOMES

<b>Learning Outcomes</b>
<p>With this course, the students:</p> <ul style="list-style-type: none"> <li>• will be familiarized with the notion of multi-dimensional random variable,</li> <li>• will be able to study the marginal random variables of a multi-dimensional random variable,</li> <li>• will be able to gauge moments of multi-dimensional random variables,</li> <li>• will be able to study conditional random variables of a multi-dimensional random variable,</li> <li>• will be able to handle moment generating functions of multi-dimensional random</li> </ul>

variables, • will be able to apply the central limit theorem.
<b>General Competencies</b>
• Search for, analysis and synthesis of data and information, by use of the necessary technology. • Decision making. • Production of free, creative and inductive thinking, which is based on mathematical processes.

### CONTENT OF THE COURSE

<p>Axiomatic definition of probabilities. Definition of a random variable and a random vector. Probability distribution and density functions. Multi-dimensional random variables (discrete and continuous ones). Multi-dimensional distributions. Radon-Nikodym theorem. Useful multi-dimensional distributions. Properties of multi-dimensional random variables (multi-dimensional mean values, variance-covariance matrices etc.). Conditional probability distributions. Ordered random variables. Characteristic functions of multi-dimensional random variables. Moment and probability generating functions of multi-dimensional random variables. Applications of multi-dimensional random variables, Convergence of sequences of random variables- convergence classification. Limit Theorems (laws of large numbers, Central limit theorems etc.)</p>
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### TEACHING AND LEARNING METHODS - EVALUATION

<b>TEACHING METHOD</b>	In the classroom.	
<b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b>	Use of e-class. Communication through face-to-face discussions and e-mails.	
<b>TEACHING ORGANIZATION</b>	<b>Activity</b>	<b>Semester Workload</b>
	Lectures	52 hours
	Projects	20 hours
	Individual Study	53 hours
	Course Total (25 hours per ECTS)	125 hours
<b>STUDENT</b>	Projects 20%.	

**EVALUATION**

Written final examination 80%.

**RECOMMENDED BIBLIOGRAPHY**

1. Kounias E. and Kalpazidou S., Probabilities II Theory and Exercises, Ziti Publications 1991 (Greek).
2. Charalampidis C. A., Probability theory and applications, S. Athanasopoulos Publications, 2009 (Greek).
3. Sheldon R., A first course in probability, Pearson Prentice Hall.
4. Feller W. An Introduction to Probability Theory and its applications, Vol. 1, John Wiley & Sons Inc.