COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	1st Cycle (UNDERGRADUATE)		
COURSE CODE	**6126**	**SEMESTER**	**3rd**
COURSE TITLE	**Stochastic Processes I**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	4	8
Workshops		
Labs	2	

COURSE TYPE	Compulsory
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://www.dept.aueb.gr/en/stat/content/stochastic-processes-i-8-ects

(2) LEARNING OUTCOMES

Learning outcomes

Upon successful completion of the course, students should be able to: classify stochastic processes according to the state space and the parameterization set, determine whether a stochastic process is stationary or non-stationary, Gaussian or non-Gaussian, know the basic properties of a simple random walk process on the set of integers, Poisson and Wiener processes in continuous time, Markov chains in discrete time.

General Competences

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Autonomous work
- Promotion of free, creative and inductive thinking

(3) SYLLABUS

Introductory concepts and definitions of a stochastic process, its finite dimensional distributions, state space, parameterization set, sample-path functions, notions of stationarity and homogeneity, Gaussianity and the Cramer-Wold criterion. Random noise processes and derived random walks. Processes with independent increments, with emphasis on Poisson and Wiener processes. Simple random walk on the set of integer numbers, reflection principle, ballot theorems, arc-sine laws, distribution of maximum value, gambler's ruin and length of the game. Point processes and interconnections with counting processes and renewal processes. Markov chains in discrete time, matrix of transition probabilities, Chapman-Kolmogorov equations, communication and classification of states, recursion-transience criteria, asymptotic behavior, stationary distribution, equations of equilibrium. Branching processes and probability of extinction. Markov chains in continuous time, birth - death - migration processes.

Prerequisite Knowledge: Probability I, Probability II, Linear Algebra I, Calculus I.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	**YES**
TEACHING METHODS	see table below
STUDENT PERFORMANCE EVALUATION .	Written examination at the end of the semester It is announced in class and eclass.

Activity	*Semester workload*
Lectures	52
Studying and analyzing bibliography	2
Tutorials	26
Self Study	120
Course total	**200**

(5) ATTACHED BIBLIOGRAPHY

- Χρυσαφίνου Ουρανία (2008) *Εισαγωγή στις Στοχαστικές Ανελίξεις*, Εκδόσεις Σοφία.
- Κάκκουλος Θεόφιλος (1995) *Στοχαστικές Ανελίξεις*, Εκδόσεις Συμμετρία.
- Καλπαζίδου Σοφία (1991) *Στοιχεία Θεωρίας Στοχαστικών Ανελίξεων*, Εκδόσεις Ζήτη.

- Ross, S. M. (1996) *Stochastic Processes*, 2nd edition, Wiley.
- Ross, S. M. (2010). *Introduction to Probability Models*, 10th edition, Elsevier-Academic Press.
- Lawler GF (2006): *Introduction to Stochastic Processes*, 2nd edition, Chapman & Hall / CRC.
- Rosenthal JS (2020): *A First Look at Stochastic Processes*, World Scientific.
- Hoel PG, Port SC, Stone CJ (1972): *Introduction to Stochastic Processes*, Houghton Miffin Company.

- Karlin S. and H. Taylor (1975). A First Course in Stochastic Processes, Academic Press.
- Grimmett, G.R. and D.R. Stirzaker (2001). Probability and Random Processes. Oxford University Press.
- Norris, J.R. (1998). Markov Chains, Cambridge University Press.