Course title	Stochastic processes I
Volume *(number of credit points)*	3
Volume *(number of contact hours)*	48
Number of lectures	34
Number of seminars, practical and laboratory works	14
Course level: 1-4 – bachelor; 5-6 – master; 7 – doctoral; T – further education	3
Prerequisites	Probability theory
Science field, science sub-field	Mathematic
Equivalent course	-

COURSE DESIGNER(S)

Name	*Surname*	*Personal ID No*
Viktorija	Carkova	200540-10107

COURSE ABSTRACT

The aim of this course is to explain to mathematical specialty students the main concepts of the stochastic process theory, to acquaint with contemporary approach to stochastic processes modeling based on Markov property, including Markov chains, classification of states, the Chepmen-Kolmogorov equations, ergodic theorem and branching processes; to study the most useful in applied probability theory Wiener (Brownian motion) process and counting processes with emphasis on the Poisson process; to explain the main concepts of the queuing theory, including the Erlang's formulae and its applications.

RESULTS

On completion of the course the students should be able to describe the general principles of stochastic processes, and their classification into different types; to state the essential features of a Markov chain, to calculate the stationary distribution for a Markov chain in simple cases, to derive and analyse the Chapman-Kolmogorov equations; to define a Poisson process, derive the distribution of the number of events in a given time interval, derive the distribution of inter-event times, and apply these results, to solve the Kolmogorov differential equations in simple cases; to explain the definition and basic properties of univariate Brownian motion or Wiener process.

REQUIREMENTS FOR AWARDING CREDIT POINTS

Praktical works (30%). The examination for course (70%).

COURSE PLAN

No.	*Topic*	*Planned amount in hours*
1.	**Definition of the stochastic process**	**2**
2.	**Process with independent increments**	**2**
3.	**Markov chains**	**2**
4.	**The Chapman-Kolmogorov equations**	**2**
5.	**Classification of states of Markov chains**	**4**
6.	**Necessary and sufficient conditions for recurrence of state**	**4**

7.	**Solidarity theorem**	**2**
8.	**Periodical Markov chains**	**4**
9.	**A random walk**	**4**
10.	**Limiting probability. Ergodic theorem**	**6**
11.	**Transition probability matrix of reducible Markov chain**	**4**
12.	**Erlang's formulae**	**6**
13.	**The Kolmogorov differential equations**	**6**
14.	**Branching processes**	**2**

LITERATURE

Basic textbooks

1.	**V. Carkova. Markova ķedes. R:LU,2001**
2.	**V.Carkova, D.Kalniņa Gadījuma procesi. R:LU,1981.**
3.	**A. Borovkovs. Varbūtību teorija.M:Nauka,1986 (kriev)**
4.	**S.Ross. Introduction to Probability Models. NY: academic Press Inc.,1985**
1.	**V. Carkova. Markova ķedes. R:LU,2001**
2.	**V.Carkova, D.Kalniņa Gadījuma procesi. R:LU,1981.**

Further reading Basic textbooks

1.	**W.Feller. Introduction to Probability Theory and its Application.Vol.I,II. NY: John Wiley&Sons Inc,1957**
2.	**J. Rozanov. Gadījuma procesi. M: Fizmat.,1987. (kriev)**

Periodicals, internet resources and other sources

1.	**http://www.winlab.rutgers.edu/~crose/545_html/stochastic2/node1.html**
2.	**http://en.wikipedia.org/wiki/Stochastic_process**
3.	**http://gams.nist.gov/serve.cgi/Class/M/**