<table>
<tr><td>COURSE NAME</td><td colspan="5">STOCHASTIC PROCESSES</td></tr>
<tr><td>Code</td><td>PMM219</td><td>Year of study</td><td colspan="3">2nd year of graduate study</td></tr>
<tr><td>Course teacher</td><td>Nikola Koceć Bilan</td><td>Credits (ECTS)</td><td colspan="3">6</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>E</td></tr>
<tr><td>30</td><td></td><td>30</td></tr>
<tr><td>Status of the course</td><td>Compulsory</td><td>Percentage of application of e-learning</td><td colspan="3">30%</td></tr>
<tr><td colspan="6">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="5">The objectives will be to achieve a deep understanding of particular stochastic processes and to learn to use some advanced tools for analyzing and developing stochastic processes.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="5">Successful completion of course „Probability I“</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="5">Upon successful completion of the requirements for this course, students should have the knowledge and skills to:
be able to apply models of random processes
adapt models to real problems and be able to comment on possible problems with the application of processes
be able to mathematically prove basic concepts and main results of particular processes
differentiate between (time) discrete and continuous random processes
understand Markov type dependence
understand the idea behind point processes</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Introduction. Examples of random processes. Simple random walk. Branching processes. Markov chains.
Markov Chains. Definition and basic properties. Examples of Markov chains.
Decomposition of the state space. Absorbing probabilities.
Strong Markov property.
Transience and recurrence.
Invariant measures and stationary distributions.
Limit distributions and the ergodic theorem.
Renewal theory. Basics. The elementary renewal theorem.
The renewal equation. Asymptotic properties.
Point processes. Introduction. Poisson point process.
Continuous time Markov chains. Definition and examples.
Construction of continuous time Markov chains.
The backward equation and the generator matrix.</td></tr>
<tr><td>Format of instruction</td><td colspan="5">Exercises section and lectures.</td></tr>
<tr><td>Student responsibilities</td><td colspan="5">Students are expected to be present for every lecture and exercise section.</td></tr>
<tr><td>Screening student work (name the</td><td colspan="5">Attending lectures and exercises (2)
Written final exam/mid-term exams (2)</td></tr>
</table>

proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)	Oral exam (2)
Grading and evaluating student work in class and at the final exam	There are 2 mid-term exams during a semester. Passing both mid-term exams enables students to take an oral exam. Successfully passing the oral exam leads to successful completion of the course. Final grade is derived as the arithmetic mean of scores in mid-term exams (or a written exam) and the oral exam. In the case of failure in mid-term exams or the oral exam students must undergo a written exam before approaching oral exam again.
Required literature (available in the library and via other media)	**Title** 1. Sidney. I. Resnick. Adventures in Stochastic Processes. Birkhauser. 2005. 2. Script (Markovljevi lanci i Slučajni procesi): http://web.math.pmf.unizg.hr/~vondra/index.html
Optional literature (at the time of submission of study programme proposal)	1. S. M. Ross - Introduction to Probability Models , Academic Press, 2002. 2. J. R. Norris - Markov Chains , Cambridge University Press, 1998. 3. S. Karlin, H. M. Taylor - A first course in stochastic processes , Academic press, New York-London, 1975. 4. G. Grimmett, D. Stirzaker - Probability and Random Processes , Clarendon Press, Oxford, 1992.
Quality assurance methods that ensure the acquisition of exit competences	Detailed statistics of student results, gathering feedback from students through official questionnaires and lecturer's self-evaluation.
Other (as the proposer wishes to add)	