

(1.) Course Title: INFPHD 108 Simulation methods	Credits: 6
Course Classification: Optional	
Theoretical or Practical Nature of the Course, ' <i>training character</i> ' ¹³ : 100% theory (credit%)	
Type of Class: lecture and number of hours: 2/week in the given semester, <i>(If the course is not (only) taught in Hungarian, then the language: English)</i> Additional (specific) methods and characteristics² used in delivering the knowledge <i>(if any)</i>: -	
Assessment Method (Exam / Midterm Grade / Other³): examen Additional (specific) methods⁴ applied in knowledge assessment <i>(if any)</i>: -	
Course Placement in Curriculum (Semester Number): 3	
Prerequisites <i>(if any)</i> : Probability theory	
Course Description: A concise yet informative description of the knowledge to be acquired.	
- Concept and classification of simulation methods -Random number generators and their testing -Modeling of probability variables -Calculation of integrals: estimation of the expected value, procedures for reducing variance, a weighting of the number of sample elements -Markov chains application in simulations: -finite-state Markov chains and their application to solving systems of linear equations, the Laplace and Poisson equations, -integral equations -Markov chains with absorbing states -Stochastic approximation -Monte Carlo Method and the strong law of large numbers -Simulation of Markov processes, variance reduction, -sochastic algorithms	
2-5 Most Important Required and Recommended Literature List of required and recommended literature (notes, textbooks) with bibliographic data (author, title, publication details, (possibly pages), ISBN).	
-Carl Graham, Denis Talay: Stochastic Simulation and Monte Carlo Method (Springer 2012) -Ding-Geng Chen, John Den Chen: Monte-Carlo Simulation-Based Statistical Modeling (Springer, 2017) -Philipp O,J, Scherer, Computational Physics, Simulation of classical and quantum systems,(Springer 2017)	
List of Prescribed Professional Competencies and Competency Elements (knowledge, skills, etc., KKK Section 8) that the course significantly contributes to developing (highlight the most important ones). a) Knowledge	

- Has a research-level understanding of the general and specific characteristics, major directions, and precisely developed boundaries of the subject area within the discipline, as well as the agreed and debated interrelations.
- Creatively comprehends the interrelations, theories, and conceptual frameworks and terminologies of the given field of study.¹
- Possesses research methodology knowledge necessary for independent research in the given discipline/field.

b) Skills

- Capable of creative analysis of the field, synthesizing comprehensive and specific interrelations with a new perspective, and conducting appropriate evaluative and critical activities.
- Able to apply and further develop the specialized learning and problem-solving methods of the field.
- Can creatively elaborate on the novel, previously unknown practical implications of theoretical issues.
- Capable of planning and executing new projects, conducting research in the field, and developing new techniques and approaches.
- Able to identify unforeseen professional problems and uncover the detailed theoretical and practical background necessary for their resolution at a research level.
- Can construct and communicate new relations relevant to the field, as well as comprehensive interrelations significant for personal and communal existence.

c) Attitudes

- Represents and further develops the relations that contribute to the process of human self-creation based on the field's characteristics.
- Possesses an interest and learning ability that enable identifying and solving currently unpredictable research problems in the field.
- Demonstrates a firm professional commitment, a continuous dedication to exploring new approaches, and an acceptance of the necessity for persistent effort.

d) Autonomy and Responsibility

- Builds and initiates new knowledge areas with creative independence and proposes new practical solutions.
- Participates in formulating theoretical and practical questions with a leadership role and high-level cooperation.
- Engages as an equal discussion partner with professionals in the field.
- Takes responsibility for raising and addressing new ethical questions concerning theoretical and practical aspects of the profession.

¹**Section 108**, Article 37 of the National Curriculum Act (Nftv.) 37. lesson: a session (lecture, seminar, exercise, consultation) requiring the personal involvement of the instructor to fulfil the academic requirements specified in the curriculum, the duration of which is at least forty-five minutes and not more than sixty minutes.

² e.g. case studies, role play, thematic presentations, etc.

³ e.g. continuous debriefing, mid-year report

⁴ e.g. request for case studies, thematic papers, essays, business, organisational plans, etc.

Course responsible (name, position, academic degree): **Dr. Ágnes Fülöp, Habil. Associate Professor, PhD**

Instructor(s) involved in teaching the course (if any) (name, position, academic degree):
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