Warsaw University of Technology | Doctoral School No. 5

Course offered in the Doctoral School No. 5 – Spring semester of the 2021/2022 academic year

TITLE
Simulation methods for transport, logistics and production
CONDUCTING UNIT
Doctoral School No. 5
SCIENTIFIC DISCIPLINE
Civil engineering and transport
IMPLEMENTING UNIT
116000 - Faculty of Transport
SUMMARY DESCRIPTION
The aim of the course is to present the fundamental contexts and the discussion on the application of simulation methods in the modeling of processes, in particular processes of logistics, transport, production, and technological processes. During the meetings, Ph.D. students will be introduced to the basic issues of applying simulation methods and developing simulation models, in particular for the mentioned processes. In addition, participants will work on their own simulation model on an ongoing basis, which will allow for continuous verification of the obtained results.
FULL DESCRIPTION
Elements of modeling and simulation theory. Classification of simulation models and selected methodological aspects of research using simulation models. IT tools applied to analyze processes of logistics, transport, production, and technological processes in simulation methods. Stages of building simulation models. The original applications of simulation models of selected elements of logistics, transport, production, and technological systems and processes. Other topics developed on an ongoing basis.   The grade for the course will be obtained by the participant as a result of (1) passing the exam in the form of a test described below, and (2) constructing a simulation model for a process of logistics, transport, production or technological process of a participant's choice. Construction of a simulation model should be carried out taking into account the stages of construction presented during the meetings. The simulation model can be built in the simulation tools discussed during the classes. The simulation model together with the results will be presented to all participants of the course, as the audience. The presentation is obligatory, however, no separate points are awarded for it. The simulation model will be documented by a participant in the form of a written report showing the development of each stage of model construction with detailed example

results. Up to 10 points will be awarded for each stage of the simulation model construction (data and parameters, conceptual model, simulation model, verification, validation, experimentation, and results; a total maximum of 60 points). At the end of the course, there will be an examination on the subject in the form of a choice or supplementary test. A maximum of 21 points can be obtained from the test.
The points obtained on the basis of the report and the test translate into the following grades: 0 - 40 points -> 2.0, 41 - 50 points -> 3.0, 51 - 60 points -> 3.5, 61 - 70 points -> 4.0, 71 - 76 points -> 4.5, 77 - 81 points -> 5.0.

LITERATURE

Bangsow, S. Manufacturing Simulation with Plant Simulation and SimTalk. Usage and Programming with Examples and Solutions. Berlin Heidelberg: Springer-Verlag, 2010. ISBN 9783642050732; Bangsow S.: Tecnomatix Plant Simulation. Modeling and Programming by Means of Examples. Springer International Publishing Switzerland 2015. ISBN 978-3-319-19502-5; Kosacka-Olejnik, M.; Kostrzewski, M.; Marczewska, M.; Mrówczyńska, B.; Pawlewski, P. How Digital Twin Concept Supports Internal Transport Systems?—Literature Review. Energies 2021, 14, 4919. https://doi.org/10.3390/en14164919; Kostrzewski, M. Sensitivity Analysis of Selected Parameters in the Order Picking Process Simulation Model, with Randomly Generated Orders. Entropy 2020, 22, is. 4, 423, pp. 1021. https://doi.org/10.3390/e22040423; Kostrzewski M., Modelowanie i badanie wybranych elementów i obiektów logistycznych z wykorzystaniem metod symulacyjnych (ISBN 978-83-7814-750-3), Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2018.

LEARNING OUTCOMES

KNOWLEDGE:
1. A participant gains a basic knowledge of simulation methods as a fundamental research methodology in the disciplines represented in the doctoral school.
SKILLS:
1. Skills related to critical analysis of information knowledge related to transport and logistics
2. using English on B2+ level enabling participation in international conferences and scientific debate
COMPETENCES:
1. Related to thinking and doing research in creative and entrepreneurial manner

ASSESSMENT METHODS AND CITERIA; COURSE COMPLETION FORM

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LANGUAGE OF THE COURSE		**ECTS CREDITS**
English		3
TYPE OF CLASSES	**NUMBER OF HOURS**	**COURSE INSTRUCTOR**
Exam	30	Mariusz Kostrzewski, dr hab. inż., prof. uczelni