

COURSE GUIDE

<u>Subject name</u>	Computer Simulation Of Manufacturing Processes
<u>Course of study</u>	Quality and Production Management
<u>The form of study</u>	Full-time
<u>Level of qualification</u>	I
<u>Year</u>	III
<u>Semester</u>	6
<u>The implementing entity</u>	Department of Production Engineering and Safety
<u>The person responsible for preparing</u>	dr inż. Marek Krynke
<u>Profile</u>	General academic
<u>Course type</u>	principal
<u>ECTS points</u>	4

TYPE OF TEACHING – NUMBER OF HOURS PER SEMESTER

LECTURE	CLASS	LABORATORY	PROJECT	SEMINAR
15		30	-	-

COURSE AIMS

- C1. Presentation of methodological assumptions of modeling and simulation of production systems.
 C2. To acquaint students with IT systems allowing for modeling of elements of production systems and their simulation.
 C3. Reporting and analyzing results from the functioning of the production systems data and improving those elements.

ENTRY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Computer handling
2. Fundamentals of managing a manufacturing and / or service company.
3. Knowledge of the operation of information systems.

LEARNING OUTCOMES

EU 1 - Diagnose and solve problems in the organization using simulation methods and production process modeling.

EU 2 - Design and propose changes to the organization and / or its selected areas using expert knowledge in the field of simulation of production processes.

EU 3 - Identification of methods (including: simulation and modeling of production processes) and IT tools for problem solving in selected areas of organization functioning.

COURSE CONTENT

Type of teaching – Lecture	Number of hours
W 1 - Concepts of modeling and simulation theory. Objectives, conditions and stages of the simulation model. Approaches to modeling the process and the system.	2
W 2 - Modeling and simulation of production systems, construction of virtual production process model.	2
W 3 - Input data for production process modeling.	1
W 4 - Defining the problem and identifying and collecting needed data and information.	1
W 5 - The steps of modeling and simulating the production process system..	1
W 6 - Selection of modeling and simulation software.	1
W 7 - Adding model logic and data management.	1
W 8 - Unit management and time tables. Grouping flow elements.	1
W 9 - Random models. Select the probability distribution. Use random sampling to control the simulation.	2
W 10 - Analysis of the resulting simulation data.	1
W 11 - Evaluation of profitability of production orders.	1
W12 - The question of reliability modeling. Simulation of machine failure, use of personnel for repairs.	1
Type of teaching - LABORATORY	Number of hours
L 1- Introduction to the FlexSim simulation package - functionality and navigation in the system.	2
L 2- Use a diagramming and schematic design package to visualize system models / production processes (eg Visio).	2
L 3- Building the basic sequence of model components: source, queue, processor, sink. Parameterization of model components.	2
L 4- Construction of models and simulation of processes to test the workload of one station.	2
L 5- Construction of the work load test model for many parallel work stations.	4
L 6- Possibility to visualize system operation / production process in FlexSim simulation package.	2
L 7- Production and simulation of the production department model.	6
L 8 - Simulations involving operator and transporter.	4
L 9- Use of built-in analytical and optimization tools for simulation package for system / process analysis.	4
L 10 - Reports and statistics on simulation results as a source of information on the functioning of processes / production systems (from the FlexSim package).	2

TEACHING TOOLS

1. Books and monographs
2. Audiovisual presentation

- Exercises using the computer and FlexSim software

WAYS OF ASSESSMENT (F – FORMATIVE, P – SUMMATIVE)

F1. Observation of students' work in the classroom.

P1. Final test.

STUDENT WORKLOAD

Form of activity		Average number of hours for realization of the activity		
		[h]	ECTS	ECTS
Contact hours with the teacher	LECTURE	15	0.6	1.2
Preparation for exam		15	0.6	
Contact hours with the teacher	LABORATORY	30	1.2	1.8
Preparation of the laboratory		15	0.6	
Getting Acquainted with the indicated literature		20	0.8	0.8
Consultation		5	0.2	0.2
TOTAL NUMBER OF HOURS / ECTS POINTS FOR THE COURSE		100	4	

BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

Basic resources:

- Malcolm Beaverstock, Allen Greenwood, Eamonn Lavery, William Nordgren. Applied Simulation Modeling And Analysis Using Flexsim. FlexSim Software Products. 2012.
- Averill M. Law. Simulation Modeling and Analysis. McGraw-Hill, 2015.
- Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol. Discrete-Event System Simulation. Pearson Education Limited. 2014.

Supplementary resources:

- Eric Rebertisch. Integrating Program Management and Systems Engineering: Methods, Tools, and Organizational Systems for Improving Performance. John Wiley & Sons. 2017.
- ZDANOWICZ R. Modelowanie i symulacja procesów wytwarzania. Wydawnictwo Politechniki Śląskiej 2007.
- Knosala R., Komputerowe wspomaganie zarządzania przedsiębiorstwem: nowe metody i systemy. PWE, Warszawa 2007.

TEACHERS (NAME, SURNAME, E-MAIL ADDRESS)

- dr inż. Marek Krynke, marek.krynke@wz.pcz.pl
- dr inż. Krzysztof Knop, krzysztof.knop@wz.pcz.pl

MATRIX OF LEARNING OUTCOMES REALISATION

Learning outcome	Reference of given outcome to outcomes defined for whole program (PRK)	Course aims	Course content	Teaching tools	Ways of assessment
EU 1	K_W01, K_W02, K_W03, K_W05, K_U01, K_U02, K_U04, K_U05, K_U06, K_U07, K_U08, K_U09, K_U10, K_K01	C1	W1, W11, W12, L1, L2	1,2, 3	F1, P1

EU 2	K_W05, K_W07, K_W09, K_U01, K_U02, K_U03, K_U04, K_U05, K_U06, K_U07, K_U08, K_U09, K_U10	C2	W2-W10, L3-L8,	1,2, 3	F1, P1
EU 3	K_W02, K_W05, K_W08, K_W09, K_U01, K_U02, K_U04, K_U05, K_U06, K_U07, K_U09, K_U10	C3	W6, L9, L10,	1,2, 3	F1, P1

FORM OF ASSESSMENT - DETAILS

	grade 2	grade 3	grade 4	grade 5
EU 1	The student can not plan a simulation experiment.	The student is able to independently plan a simulation experiment, allow for minor errors, and be able to analyze the test design.	Student can flawlessly and independently plan a simulation experiment, can do analysis of the structure of the research object for the needs of the simulation model. Minor errors are allowed.	Student can flawlessly and independently plan a simulation experiment, can do analysis of the structure of the research object for the needs of the simulation model.
EU 2	The student can not perform the simulation of the operation of the production process.	Student can simulate the operation of the given production process, but can not propose modifications of the simulation model.	The student is able to simulate the operation of the given production process, he can propose modifications of the simulation model, using the instructor's suggestion.	Student can flawlessly and perform simulation of the operation of the given production process, he can himself propose modifications of the simulation model.
EU 3	The student can not independently evaluate the results, he can not use the instructor's suggestions.	Student is able to evaluate the obtained results, he has problems with the proposal modifications of the model, it is necessary to help the instructor.	The student is able to evaluate the results and propose modifications to the model.	Student can flawlessly and independently evaluate the obtained results and propose modifications of the model, determine the impact of applied changes on the accuracy of the results.

ADDITIONAL USEFUL INFORMATION ABOUT THE COURSE

1. Information where presentation of classes, instruction, subjects of seminars can be found, etc. - presented to students during first classes, if required by the formula classes are sent electronically to the e-mail addresses of individual dean groups.
2. Information about the place of classes - Information can be found on the website of the Faculty of Management.

- 3. Information about the timing of classes (day of the week / time) - Information can be found on the website of the Faculty of Management
- 4. Information about the consultation (time + place) - Information can be found on the website of the Faculty of Management

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Coordinator