# Computer-Aided design and simulation of manufacturing processes - opis przedmiotu

### Informacje ogólne

Computer-Aided design and simulation of manufacturing processes
06.9-WM-ZIP-ZL-ANG-D-14_20
Wydział Nauk Inżynieryjno-Technicznych
Management and Production Engineering
ogólnoakademicki
drugiego stopnia z tyt. magistra inżyniera
semestr zimowy 2023/2024

#### Informacje o przedmiocie

Semestr	2
Liczba punktów ECTS do zdobycia	4
Typ przedmiotu	obowiązkowy
Język nauczania	angielski
Sylabus opracował	dr hab. inż. Sławomir Kłos, prof. UZ

Formy zajęć							
Forma zajęć	Liczba godzin w semestrze (stacjonarne)	Liczba godzin w tygodniu (stacjonarne)	Liczba godzin w semestrze (niestacjonarne)	Liczba godzin w tygodniu (niestacjonarne)	Forma zaliczenia		
Laboratorium	30	2	-	-	Zaliczenie na		
					ocenę		
Wykład	15	1	-	-	Zaliczenie na		
					ocenę		

## Cel przedmiotu

The aim of the course is to acquaint students with the method of computer simulation and familiarization with the techniques of building simulation models of processes and production systems. After completion of the course students should be able to use the selected software to simulate production processes (eg. Tecnomatix Plant Simulation, Enterprise Dynamics, Arena, etc.), model building (mapping the actual system in a form of a simulation model), Designing of simulation experiments and analysis of research results.

### Wymagania wstępne

Knowledge of basic production processes implemented in enterprises.

### Zakres tematyczny

Computer simulation as a research method - introduction. Stages of the construction of a simulation model. Generating pseudorandom data based on various probability distributions. Basic objects needed to build the simulation model of the production system. Planning of a simulation experiment. Modelling and simulation of discrete manufacturing processes. Modelling and simulation of assembly processes. Analysis of the efficiency of utilization of production resources. Analysis of the efficiency of logistics processes and inventory levels of work in progress. Analysis of the effectiveness of employees on the basis of a simulation model of the production system.

Lecture 1. Introduction to modeling and simulation of production processes.

- Lecture 2. Methodology of building a simulation model of the production system.
- Lecture 3. Tecnomatix Plant Simulation system functionality user interface and the most important tools, production flow.
- Lecture 4. Tecnomatix Plant Simulation system functionality production resources.

Lecture 5. The functionality of the Tecnomatix Plant Simulation system - analysis and reports.

Lecture 6. Tecnomatix Plant Simulation system functionality - simulation experiments.

Lecture 7. Tecnomatix Plant Simulation system functionality - artificial intelligence methods.

Lecture 8. 3D modeling.

#### Laboratories

Lab 1. Introduction to modeling production processes in Tecnomatix Plant Simulation.

Lab 2, Lab 3 - Modeling and simulation of discrete processes.

Lab 4, Lab 5 - Modeling of production processes with the use of AGV trucks.

Lab 6, Lab 7 - Analysis of the efficiency of production processes.

Lab 8, Lab 9 - Modeling of production processes carried out with the participation of employees (machine operators).

Lab 10, Lab 11 - Modeling of production logistics processes with the use of pallets. Production flow models for different production batch sizes.

Lab 12, Lab 13 - Modeling and simulation of energy consumption in production systems.

Lab 14, Lab 15 - Designing simulation experiments.

#### Metody kształcenia

Lecture - Conventional lecture with the use of a videoprojector.

Laboratory- practical classes carried out with the use of Tecnomatix Plant Simulation.

### Efekty uczenia się i metody weryfikacji osiągania efektów uczenia się

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
The student is able to obtain, integrate and interpret knowledge, draw conclusions and	• K_W04	<ul> <li>kolokwium</li> </ul>	<ul> <li>Wykład</li> </ul>
formulate opinions on the basis of catalogue entries issued by manufacturers of appliances,	• K_U04	<ul> <li>wykonanie sprawozdań</li> </ul>	<ul> <li>Laboratorium</li> </ul>
advertising material, information obtained from literature, databases and other modern means	S	laboratoryjnych	
of communication, which relate to issues of mechanical engineering and management			
methods in this field.			
The student has an orderly, theoretical knowledge of computer-aided management in an enterprise.	• K_W09	• kolokwium	• Wykład
The student has knowledge of development trends and new developments in manufacturing engineering.	• K_W16	• kolokwium	• Wykład
The student is able to choose and use appropriate computer applications for calculation,	• K_U12	<ul> <li>kolokwium</li> </ul>	<ul> <li>Wykład</li> </ul>
simulation, designing and verification of solutions related to Management and Production		<ul> <li>wykonanie sprawozdań</li> </ul>	<ul> <li>Laboratorium</li> </ul>
Engineering.		laboratoryjnych	
The student is able to think and act both creatively and entrepreneurially.	• K_K06	<ul> <li>wykonanie sprawozdań laboratoryjnych</li> </ul>	• Laboratorium

### Warunki zaliczenia

Lecture - a written exam at the end of the semester.

Laboratory – final grade is the weighted sum of grades obtained for the completion of individual laboratory classes. The contribution of individual components of evaluation: grade for laboratories - 50%, grade for the lecture – 50%.

Final grade = 50 % of grade for lecture + 50 % of grade for project classes.

#### Literatura podstawowa

- 1. Klos S., The simulation of manufacturing systems with Tecnomatix Plant Simulation, Wydawnictwo UZ, 2017
- 2. S. Bangsow, Tecnomatix Plant Simulation: Modeling and Programming by Means of Examples, Springer; 2016
- 3. S. Bangsow, Manufacturing Simulation with Plant Simulation and Simtalk: Usage and Programming with Examples and Solutions, Springer, 2010
- 4. G. L. Curry, R. M. Feldman, Manufacturing Systems Modeling and Analysis, Springer, 2010

#### Literatura uzupełniająca

1. Tecnomatix on-line documentation

#### Uwagi

Zmodyfikowane przez dr hab. inż. Sławomir Kłos, prof. UZ (ostatnia modyfikacja: 14-04-2023 15:02)

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