

Course code: 02-EMS-PCICT-SP2

Plan position: .....

### A. INFORMATION ABOUT THE COURSE

#### B. Basic information

Name of course	Process control in chemical technology
Field of studies	
Level of studies	
Profile of studies	General academic
Form of studies	Stationary
Specialty	
Unit responsible for the field of studies	Faculty of Chemical Technology and Engineering
Name and academic degree of teacher(s)	Małgorzata Kaczorowska, Ph.D., D.Sc., Associate Professor; Katarzyna Witt-Kalicińska, Ph.D., D.Sc., Associate Professor Jan Lamkiewicz, PhD, Assistant Profesor
Introductory courses	
Introductory requirements	

#### C. Semester/week schedule of classes

Semester	Lectures (W)	Auditorium classes (Ć)	Laboratory classes (L)	Project classes (P)	Seminar (S)	Field classes (T)	Number of ECTS points
summer	15 <sup>E</sup>		30				8

## 2. LEARNING OUTCOME

No.	Learning outcomes description	The reference to the learning outcomes of specific field of study	The reference to the learning outcomes for the area
<b>KNOWLEDGE</b>			
W1	Student knows the principles of operation of control-measurement systems and electronic control systems.	K_W06	P6S_WG
W2	Knows the basics of chemical process kinetics and technical as well as chemical thermodynamics	K_W10	P6S_WG
<b>SKILLS</b>			
U1	Applies knowledge (including the use of engineering thermodynamics) in the implementation and design of simple chemical processes and unit operations and explains the basic phenomena associated with relevant processes in chemical technology and engineering.	K_U07	P6S_UW
U2	Able to apply appropriate methods to control chemical processes.	K_U17	P6S_UW

### 3. TEACHING METHODS

#### A. Traditional methods used \*\*\*

Multimedia lectures, laboratory classes.

#### B. Distance learning methods used \*\*\*

**Synchronous method** (classes conducted in a way that ensures direct interaction between the student and the teacher in real time, enabling immediate flow of information, the method can be used only if it is provided for in the study plan for a given cycle of education):

e.g. remote lecture in the form of videoconference, remote discussion, etc.

**Asynchronous method** used as an auxiliary (a method that does not ensure direct interaction between the student and the teacher in real time, used only as an auxiliary / complementary method):

e.g. online educational videos, online multimedia presentations, etc.

### 4. METHODS OF EXAMINATION

Lectures - written exam, laboratory classes - completing scheduled exercises and preparing reports. The form of assessment may also be changed by the teacher.

### 5. SCOPE

Lectures	Process measurement and control fundamentals. Flow, electrochemical, and optical measurement methods. Rheological measurements. Machine vision and AI in quality control. Automation and Industry 4.0 integration. Meters, flow meters. Process control of wastewater treatment. Process control of powder coating process technology.
Laboratories	The student performs a selected exercise from the set: Purification of a chemical tank. Dynamics of temperature controller operation. Energy efficiency of the distiller. Monitoring the leaching of contaminants from a retention tank. Catalytic reaction kinetics. Dynamic equilibria of ion exchange. Regulation and control of the heating and cooling process. Flow regulation and control. Regulation and control of pressure. Distillation process control. Temperature regulation and control. Control of chemical reactions. Monitoring and control of chemical concentrations. Water pressure monitoring. Control of the drying process. Control of cold storage. Control of reactions. Control of osmosis.

### 6. METHODS OF VERIFICATION OF LEARNING OUTCOMES

LEARNING OUTCOME	Form of assessment					
	Oral examination	Written exam	Colloquium	Project	Presentation	Report
W1		x				
W2		x	x			
U1						x
U2						x

### 7. LITERATURE

Basic literature	1. Johnson C.D., 2009, Process Control Instrumentation Technology, Pearson/Prentice Hall. 2. Speight J.G., 2002, Chemical and process design handbook, McGraw-Hill. 3. Chohey N.P., 1996, Instrumentation and Process Control, McGraw-Hill.
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	3. Peter J. Woolf Chemical Process Dynamics and Controls Publisher: openmichigan 2009 4. McMillan G.K. Ed., 1999, Process industrial instruments and controls handbook, McGraw-Hill.
Supplementary literature	1. Instrument Engineers' Handbook, Process Measurement and Analysis, 2003, Vol. I, Lipták B. G. Editor-in-chief, ISA-The Instrumentation, Systems, and Automation Society, CRC Press, Boca Raton London New York Washington, D.C.

**8. TOTAL STUDENT WORKLOAD REQUIRED TO ACHIEVE EXPECTED LEARNING OUTCOMES EXPRESSED IN TIME AND ECTS CREDITS**

Student's activity		Student workload– number of hours
Classes conducted under a direct supervision of an academic teacher or other persons responsible for classes	Participation in classes indicated in point 1B	45
	Supervision hours	20
Student's own work	Preparation for classes	40
	Reading assignments	50
	Other (preparation for exams, tests, carrying out a project etc)	45
Total student workload		200
Number of ECTS points		8