Course code: ……. **Plan position:** ……

A. INFORMATION ABOUT THE COURSE

B. Basic information

Name of course	***Process control in Chemical Technology***
Field of studies	Chemical technology
Level of studies	First degree
Profile of studies	General academic
Form of studies	Stationary
Specialty	1. Chemical process technology 2. Bioengineering 3. Chemistry and technology of cosmetics
Unit responsible for the field of studies	Faculty of Chemical Technology and Engineering
Name and academic degree of teacher(s)	Terese Rauckyte-Żak, PhD; Jan Lamkiewicz, PhD
Introductory courses	machinery and apparature of chemical industry, chemical engineering, chemical technology
Introductory requirements	knowledge of basics of chemical technology

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		30				5

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
KNOWLEDGE			
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
SKILLS			
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.

4. METHODS OF EXAMINATION

Lectures - written exam, laboratory classes - submit reports.

5. SCOPE

Lectures	Software for continuous process control. Temperature sensors in the control of heat transfer media. Pressure and mass sensors. Liquid and bulk materials. Process control of wastewater treatment. Meters, flow meters. Conductivity, pH, ORP, dissolved oxygen meters. Turbidimetric, fluorimetric, refractometric measurements, viscometric. Apparatus for the automatic determination of DOC, Na^+, Cl_2, ClO_2, PO_4^{3-}. Process control in the synthesis of monomers and polymers. Process control in the production of dyes, pigments, paints, processes petrochemicals, wastewater treatment plants, metal materials and in the food industry. On-line techniques in chemical and process analysis.
Laboratories	The student performs a selected exercises 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.

6. METHODS OF VERIFICATION OF LEARNING OUTCOMES

LEARNING OUTCOME	Form of assessment					
	Oral examination	Written exam	Colloquium	Project	Presentation	Report
W1		x				
W2		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. Chopey N.P., 1996, Instrumentation and Process Control, McGraw-Hill. 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	30
Student's own work	Preparation for classes	15
	Reading assignments	15
	Other (preparation for exams, tests, carrying out a project etc)	20
Total student workload		125
	Number of ECTS points	**5**