MODULE DESCRIPTION

Module code	**Z-ZIP-103z**
Module name	**Podstawy automatyzacji**
Module name in English	**Fundamentals of Automation**
Valid from academic year	**2016/2017**

A. MODULE PLACEMENT IN THE SYLLABUS

Field of study	**Management and Production Engineering**
Level of education	**1st degree** *(1st degree / 2nd degree)*
Studies profile	**General** *(general / practical)*
Form and method of conducting classes	**Full-time** *(full-time / part-time)*
Specialisation	**All**
Unit conducting the module	**The Department of Automatics and Robotics in the Laser Processing Research Centre**
Module co-ordinator	**Leszek Płonecki, PhD hab., Eng., Professor of the University**
Approved by:	

B. MODULE OVERVIEW

Type of subject/group of subjects	**Major** *(basic / major / specialist subject / conjoint / other HES)*
Module status	**Compulsory** *(compulsory / non-compulsory)*
Language of conducting classes	**English**
Module placement in the syllabus - semester	**6th semester**
Subject realisation in the academic year	**Summer semester** *(winter / summer)*
Initial requirements	**No requirements** *(module codes / module names)*
Examination	**Yes** *(yes / no)*
Number of ECTS credit points	**4**

Method of conducting classes	Lecture	Classes	Laboratory	Project	Other
Per semester	**30**	**15**			

C. TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Module target	The aim of the module is to familiarise students with basic knowledge of automatics (which is connected with the issues of production engineering) useful in several specialist subjects. Basic knowledge concerning automatics will be passed, i.e. basic notions of automatics; automation systems; their classification and mathematical description; Laplace transformation; object transmittance; the elements of linear automation systems and their characteristics; stability criteria; control methods; systems of infinitely and non-infinitely variable adjustment; hydraulic, pneumatic, and electric elements of automation systems as well as the examples of their application. Moreover, the aim of the subject is to present the principles and significance of automatisation in production and other types of enterprises as well as its influence on efficiency and obtained quality.

Effect symbol	Teaching results	Teaching methods *(l/c/lab/p/other)*	Reference to subject effects	Reference to effects of a field of study
W_01	A student knows basic principles of automation systems, the principles of their work, and usefulness of their application.	l	K_W11	T1A_W03
W_02	A student has knowledge as regards the principles of modelling simple mechanical, electric, and fluid systems.	l	K_W01 K_W02 K_W04 K_W11	T1A_W01 T1A_W02 T1A_W03 T1A_W06 T1A_W07
W_03	A student has knowledge as regards the elements and systems of automatics in a time domain.	l	K_W01 K_W11	T1A_W01 T1A_W03 T1A_W07
W_04	A student has knowledge as regards automatics elements and systems in a frequency domain.	l	K_W01 K_W11	T1A_W01 T1A_W03 T1A_W07
W_05	A student has knowledge as regards algebra of block diagrams.	l	K_W11	T1A_W03
W_06	A student has knowledge connected with examining stability and quality assessment concerning automated regulation.	l	K_W01 K_W11	T1A_W01 T1A_W07 T1A_W03
W_07	A student has basic knowledge as regards the analysis and synthesis of automation systems.	l	K_W11	T1A_W03
U_01	A student is able to determine transmittance of a simple physical model.	c	K_W11 K_U03	T1A_W03 TA1_U03
U_02	A student is able to utilise Laplace transformation in analysing automation systems as well as their elements.	c	K_W11 K_U03	T1A_W03 TA1_U03
U_03	A student is able to determine a system response to a given disturbance.	c	K_W11 K_U03	T1A_W03 TA1_U03
U_04	A student can determine frequency characteristics of a system.	c	K_W11 K_U03	T1A_W03 TA1_U03
U_05	A student can determine system substitution transmittance.	c	K_W11 K_U03	T1A_W03 TA1_U03
U_06	A student is able to examine system stability and determine the values of quality indicators of the automation system.	c	K_W11 K_U03	T1A_W03 TA1_U03
K_01	A student is aware of the influence of applying automation system on the development of production engineering.	l/c	K_W11 K_U15	T1A_W03 TA1_U02 TA1_U10
K_02	A student understands the necessity of continuous improvement of his/her knowledge as regards automation systems with reference to their dynamic	l/c	K_K01 K_U06	T1A_K01 TA1_U05

	development.			

Teaching contents:

1. Teaching contents as regards lectures

Lecture number	Teaching contents	Reference to teaching results for a module
1	Introduction. Basic notions appearing in automatics; general schemata of the automation system and the classification of automation systems; examples of automated systems.	W_01 K_01 K_02
2-3	The description of elements and linear systems. Laplace transformation, operator transmittance and transmittance matrix; system description using state coordinates, determining static characteristics and response to a particular input function from operator transmittance	W_02 W_03 K_01 K_02
3-4	Static and dynamic properties of basic linear elements: proportional first-order, integral, differential, oscillatory, and retarding as well as their examples.	W_02 W_03 K_01 K_02
5-6	Block diagrams algebra. Basic connections, block diagrams transformation, and the methods of determining substitution transmittance of complex systems.	W_05 K_01 K_02
6-7	Forming block diagrams on the basis of the physical schemata. Determining and initial transmittance analysis.	W_02 W_05 K_01 K_02
7-8	Frequency characteristics. Spectral transmittance, the types of characteristics, frequency characteristics of basic elements, logarithmic characteristics for serial connection, and basic methods of experimental determining frequency characteristics.	W_04 K_01 K_02
9	Characteristics of typical regulation objects. Static and astatic objects as well as their step and frequency characteristics; sample objects; experimental determining static, step, and frequency objects.	W_02 W_07 W_03 W_04 K_01 K_02
10	PID controllers. Structures, characteristics of PID-2 controllers.	W_03 W_04 W_07 K_01 K_02
11-12	Stability of linear automation systems. General conditions of stability, stability criteria: Hurwitz, Nyquist for amplitude-phase and logarithmic characteristics.	W_06 K_01 K_02
12-13	The quality of automation systems. Static accuracy, quality indicators of time courses; indicators concerning frequency characteristics; integral quality indicators.	W_06 K_01 K_02
13-14	The selected issues of linear syntheses concerning automation systems. Choosing controller types, the selection of controller settings according to principal features of the transient process, and the Ziegler-Nichols method.	W_07 K_01 K_02
14-15	On-off control systems. Characteristics of controllers, the courses in constant-value control systems; correction of on-off controllers.	W_07 K_01 K_02

2. Teaching contents as regards classes

Class number	Teaching contents	Reference to teaching results for a module
1	Determining equations of automatics elements.	W_02

		U_01
2	Laplace transformation.	W_03 U_02
3	Determining responses of systems to a given input function.	W_03 U_02 U_03
4	Block diagrams algebra.	W_05 U_05
5	Frequency characteristics.	W_04 U_04
6	The stability of linear systems.	W_06 U_06
7	Quality assessment of automation systems.	W_06 U_06
8	Obtaining a credit for the classes.	

3. Teaching contents as regards laboratory classes

Laboratory class number	Teaching contents	Reference to teaching results for a module

4. The characteristics of project assignments

The methods of assessing teaching results

Effect symbol	Methods of assessing teaching results *(assessment method, including skills – reference to a particular project, laboratory assignments, etc.)*
W_01	A written examination in the form of 5 questions selected by a student (from among 8). A C mark requires obtaining 50% of total number of points, an A mark requires obtaining 90% of total number of points.
W_02	A written examination in the form of 5 questions selected by a student (from among 8). A C mark requires obtaining 50% of total number of points, an A mark requires obtaining 90% of total number of points.
W_03	A written examination in the form of 5 questions selected by a student (from among 8). A C mark requires obtaining 50% of total number of points, an A mark requires obtaining 90% of total number of points.
W_04	A written examination in the form of 5 questions selected by a student (from among 8). A C mark requires obtaining 50% of total number of points, an A mark requires obtaining 90% of total number of points.
W_05	A written examination in the form of 5 questions selected by a student (from among 8). A C mark requires obtaining 50% of total number of points, an A mark requires obtaining 90% of total number of points.
W_06	A written examination in the form of 5 questions selected by a student (from among 8). A C mark requires obtaining 50% of total number of points, an A mark requires obtaining 90% of total number of points.
U_01	Written tests during every class; a mark for the classes is a GPA (grade point average). A written test at the end of the classes is scheduled for students with a GPA below minimum (which enables a student to obtain a credit); the test also facilitates raising a final mark.
U_02	Written tests during every class; a mark for the classes is a GPA (grade point average). A written test at the end of the classes is scheduled for students with a GPA below minimum (which enables a student to obtain a credit); the test also facilitates raising a final mark.
U_03	Written tests during every class; a mark for the classes is a GPA (grade point average).

	A written test at the end of the classes is scheduled for students with a GPA below minimum (which enables a student to obtain a credit); the test also facilitates raising a final mark.
U_04	Written tests during every class; a mark for the classes is a GPA (grade point average). A written test at the end of the classes is scheduled for students with a GPA below minimum (which enables a student to obtain a credit); the test also facilitates raising a final mark.
U_05	Written tests during every class; a mark for the classes is a GPA (grade point average). A written test at the end of the classes is scheduled for students with a GPA below minimum (which enables a student to obtain a credit); the test also facilitates raising a final mark.
U_06	Written tests during every class; a mark for the classes is a GPA (grade point average). A written test at the end of the classes is scheduled for students with a GPA below minimum (which enables a student to obtain a credit); the test also facilitates raising a final mark.
K_01	Observing a student's involvement during the classes; a discussion during the classes.
K_02	Observing a student's involvement during the classes; a discussion during the classes.

D. STUDENT'S INPUT

ECTS credit points		
	Type of student's activity	**Student's workload**
1	Participation in lectures	**30**
2	Participation in classes	**15**
3	Participation in laboratories	
4	Participation in tutorials (2-3 times per semester)	**4**
5	Participation in project classes	
6	Project tutorials	
7	Participation in an examination	**2**
8		
9	**Number of hours requiring a lecturer's assistance**	**52** *(sum)*
10	**Number of ECTS credit points which are allocated for assisted work** *(1 ECTS point=25-30 hours)*	**2**
11	Unassisted study of lecture subjects	**25**
12	Unassisted preparation for classes	**10**
13	Unassisted preparation for tests	**6**
14	Unassisted preparation for laboratories	
15	Preparing reports	
15	Preparing for a final laboratory test	
17	Preparing a project or documentation	
18	Preparing for an examination	**20**
19		
20	**Number of hours of a student's unassisted work**	**56** *(sum)*
21	**Number of ECTS credit points which a student receives for unassisted work** *(1 ECTS point=25-30 hours)*	**2**
22	**Total number of hours of a student's work**	**108**
23	**ECTS points per module** *1 ECTS point=25-30 hours*	**4**
24	**Work input connected with practical classes** *Total number of hours connected with practical classes*	**76**
25	**Number of ECTS credit points which a student receives for practical classes** (1 ECTS point=25-30 hours)	**3**

E. LITERATURE

Literature list	1. Żelazny M., *Podstawy automatyki*, PWN, Warszawa 1976. 2. Amborski K., *Teoria sterowania w ćwiczeniach*, PWN, Warszawa 1978. 3. Kaczorek T., *Teoria sterowania i systemów*, PWN, Warszawa 1996. 4. Stefański T., *Teoria sterowania t.1*, Wyd. Politechniki Śk. Skrypt Nr 367. Kielce 2002. 5. Dindorf R., Dziechciarz S., Łaski P., *Laboratorium z podstaw automatyzacji i robotyki*, Skrypt Politechniki Świętokrzyskiej nr 371, Kielce 2001. 6. Chłędowski M., *Wykłady z automatyki dla mechaników*, Wyd. Politechniki Rzeszowskiej, Rzeszów 2003.
Module website	