POLYTECHNIC OF MEĐIMURJE IN ČAKOVEC

COURSE SYLLABUS

ACADEMIC YEAR: 2020/2021

1. GENERAL COURSE INFORMATION				
1.1 Course name	**Basics of Automation**			
1.2 Study program/s	Undergraduate professional study Sustainable Development			
1.3 Course status (O,E)	Obligation	**1.6 Mode of instruction (number of hours)**	**Lectures**	15
1.4 Course code			**Exercises**	30
1.5 Course abbreviation	OA		**Seminars**	
1.6 Semester	IV		**E-learning**	
1.7 ECTS	4	**1.7 Place and time of instruction**	Premises of the Polytechnic of Međimurje in Čakovec, according to the schedule published on the website	
2. TEACHING STAFF				
2.1 Course leader/s-title	prof. Sarajko Baksa, Ph.D.	**contact**	sbaksa@mev.hr	
	- - -	**contact**	- - -	
2.2 Assistant/s- title	- - -	**contact**	- - -	
	- - -	**contact**	- - -	
2.3 Instruction held by-title	- - -	**contact**	- - -	
3. COURSE DESCRIPTION				
3.1 Course goals	The aim of the course is to acquire basic knowledge in the field of automation. Explain and use knowledge about the maintenance of automated devices within the production process. Describe and identify the type of automation. Detect, calculate and connect the necessary equipment according to the attached schemes. Design and prepare the basics of application of individual executive components of automated processes.			
3.2 Prerequisites	Passed exams in Technical Drawing, Structural Modeling, Mathematics I, II, and / or Management Software			
3.3 Course outcomes	After successfully passing the course, the student will be able to: 1. Explain the basic postulates in the field of automation. 2. Interpret the basic postulates in the field of automation. 3. Identify and distinguish the type of automation. 4. Design the maintenance of automated devices within the production process. 5. Manage the maintenance of automated devices within the production process. 6. Design schematic drawings of automated processes. 7. Calculate schematic drawings of automated processes. 8. Apply and evaluate schematic drawings of automated processes. 9. Detect and connect the necessary equipment according to the schematic drawings. 10. Develop and build leadership, regulation and automation process management.			
3.4 Course content	The course presents contents related to the concept, possibilities and role of automation and automated machines and devices within the production process.			

3.5 Types of coursework

x	Lectures	x	Exercises	x	Blended e-learning	x	Individual activities		Laboratory
x	Seminars and workshops	x	Distant learning	x	Field classes	x	Multimedia and network	x	Mentorship
	Other								

3.6 Language of instruction

Croatian / English

3.7 Monitoring students' work (enter the number of ECTS credits for each activity so that the total number of ECTS credits is equal to the total ECTS value of the course, 1 ECTS = 30 hours)

1,5	Class attendance	0,2	Seminars		Essay
	Class activity	0,2	Project		Report/paper
0,2	Midterm exams	0,2	Practical task	0,2	Continuous knowledge check
1,0	Written exam		Experimental work		
0,5	Oral exam		Research		

3.8 Assessment and evaluation of students' work during classes and at the final exam

Activity specification	Percent %	Points
Assessment during instruction		
Attendance	5%	5
Class activity	5%	5
Project / Practical work	20%	20
Seminar / Colloquium I	20%	20
Seminar / Colloquium II	20%	20
Oral exam	30%	30
Exam assessment for the students who failed to fullfil all the obligatory requirements during the semester		
Written exam	*60%*	*60*
Total:	**100%**	**100**

3.9 Assessment criteria – analysis per learning outcomes

Ways of evaluating learning outcomes							
	Atten-dance	**Activity**	**Project**	**Mid-term exam 1**	**Mid-term exam 2**	**Practic work**	**Total**
Outcome 1			2	4		3	9
Outcome 2			2	4		3	9
Outcome 3			2	4		3	9
Outcome 4			2	4		3	9
Outcome 5			2	4		3	9
Outcome 6			2		4	3	9
Outcome 7			2		4	3	9
Outcome 8			2		4	3	9
Outcome 9			2		4	3	9
Outcome 10			2		4	3	9
Outcome not-related	5	5					10
Total	**5**	**5**	**20**	**20**	**20**	**30**	**100**

The course has defined 10 learning outcomes, a system of scoring outcomes, in order to pass the exam the student must achieve at least 50% points for each learning outcome.

	The grade is calculated as follows: • 87.51-100.00 points: rating Excellent (5) • 75.01- 87.5 points: rating Very good (4) • 62.51 -75.00 points: rating Good (3) • 50.01- 62.5 points: rating Pass (2) • 00.00- 50.00 points: rating Fail (1)	
3.10 Specific features related with taking the course	If the student collects 50% of the points of each outcome, he / she directly takes the exam, provided that he / she has done practical work (seminars / project). During the exam, it is possible to orally check the knowledge from practical work (seminars / project). Once earned points for each learning outcome are no longer deleted unless the student, with the express approval of the course leader, decides to correct the result for each learning outcome, whereby the points won are deleted and newly earned points for that learning outcome are entered. The final grade is obtained on the exam period and is the sum of points earned during classes. Students who did not take the colloquium access the written part of the exam where all learning outcomes are checked, and are required to have completed practical work (seminars / project) before taking the exam.	
3.11 Students obligations	Full-time students are required to attend at least 70% of the total number of hours of lectures and exercises in order to exercise the right to take the exam. Part-time students are required to attend at least 30% of the total number of hours of lectures and exercises in order to exercise the right to take the exam. If the student has not fulfilled all the obligations set by the course, he is obliged to attend the lectures again and meet the conditions for taking the exam. Attendance can be offset by online tuition, organised webinars and added assignments given by teachers. One lesson lasts 45 minutes, and several hours form a teaching unit. Absence from one teaching unit is counted as one absence. Delays and apologies are recorded separately. In that case, if the student missed more than 50% of classes, and has a justifiable reason/apology, the request should be submitted to the Department Council, which then decides on the justification of student absences with the obligatory opinion of the course leader.	
3.12 Written assignments	Seminars / Projects	
3.13 Required reading	1.	Z. Vukić, Lj. Kuljača: Automatsko upravljanje – analiza linearnih sustava, Kigen, Zagreb, 2004.
	2.	Z. Vukić, Lj. Kuljača, D. Đonlagić, S. Tešnjak: Nonlinear Control Systems, Marcel Dekker, Inc., New York, 2003
3.14 Additional reading	1.	R. N. Clark: Control System Dynamics, Cambridge University Press, 1996.
4 ADDITIONAL COURSE INFORMATION		
4.1 Quality control	The quality of the program, teaching process, teaching skills and level of mastery of the material will be established by conducting a written evaluation	

	based on questionnaires, and in other standardised ways and in accordance with the by-laws of the Polytechnic of Međimurje in Čakovec.
4.2 Contact the teacher	Students can contact the teacher during the office hours and during classes, while for short questions and explanations they can contact him/her any day during working hours by coming in person or by landline. It is possible to ask questions and e-mail which will be answered as soon as possible.
4.3 Information about the course	It is the obligation of each student to be regularly informed about the course. All relevant information and notices related to classes and exams, maintenance or any year, will be reported in a timely manner on the bulletin board and on the website of the Polytechnic of Međimurje in Čakovec.
4.4 Course contribution to the study program	Apply the basic postulates of automation within the engineering profession.

5. ANALYSIS OF COURSE TOPICS (the number of hours is equal to the number of lectures and exercises of the course)

LECTURES

Hours	**Topic and description**	**Method** • Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion) • Group learning • Case study • Field classes…	**Learning outcomes**	**Course outcome**
1.	Introduce students to the lecture program, teaching conditions, literature and criteria for evaluating knowledge. Development and perspective of automation, a historical overview of development with an impact on the development of society	Lecture, Discovery learning, Presentation	Use knowledge of historical development and future perspective projections of automation	I1
2.	System types and system features, Example of a technical system, Relationship between system and environment. Example of a mixed system, input and output sizes.	Lecture, Discovery learning, Presentation	Distinguish system models and system features, input and output sizes.	I2
3.	Production part, guide part, connection of production part with guide part. Principles of process management.	Lecture, Discovery learning, Presentation	Distinguish the principles of managing production processes	I3
4.	Feedback principle. Room temperature control on the example of feedback.	Lecture, Discovery learning, Presentation	Use feedback principles	I3
5.	The principle of advanced connection. Room temperature control on the example of an advanced connection.	Lecture, Discovery learning, Presentation	Use the principles of advanced connection	I3
6.	Basic concepts of process monitoring and measurement, Example of process measurement. Measuring transducer and measuring signal, Types of measuring signal.	Lecture, Discovery learning, Presentation	Distinguish measurement processes, transducers and types of measurement signals	I4

7.	Input and output characteristics of measuring transducers. Examples of input features. Measurement errors, Examples of measurement errors.	Lecture, Discovery learning, Presentation	Apply and distinguish input and output features	I5
8.	Transmission features: Example of static characteristic, Example of dynamic characteristic. Example of active and passive measuring transducer.	Lecture, Discovery learning, Presentation	Apply static and dynamic transmission features	I5
9.	Offset transducers, Example of offset transducers. Motion transducers, Example of motion transducers.	Lecture, Discovery learning, Presentation	Use the knowledge of the positional technical displacement transducer	I6
10.	Pneumatic actuators, Pneumatic single acting cylinders, Examples. Pneumatic double-acting cylinders, Examples.	Lecture, Discovery learning, Presentation	Apply the basic concept of pneumatic	I7
11.	Pneumatic symbols, Examples.	Lecture, Discovery learning, Presentation	Apply graphics of pneumatic symbols	I8
12.	Pneumatic motors, Examples. Pneumatic distributors, Examples.	Lecture, Discovery learning, Presentation	Explain the positions of the assembly and the switching technical pneumatic system	I9
13.	Pneumatic guidance, regulation and control.	Lecture, Discovery learning, Presentation	Explain Pneumatic guidance, regulation and control	I10
14.	Electrical guidance, regulation and control	Lecture, Discovery learning, Presentation	Explain Electrical guidance, regulation and control	I10
15.	Computer control, regulation and management	Lecture, Discovery learning, Presentation	Apply Computer control, regulation and management	I10
EXERCISES/ SEMINARS				
Hours	**Topic and description**	**Method** • Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion) • Group learning • Case study • Field classes…	**Learning outcomes**	**Course outcome**
1.	Introduce students to the lecture program, teaching conditions, literature and criteria for evaluating knowledge. Development and perspective of automation, a historical overview of development with an impact on the development of society	Lecture, Discovery learning, Presentation	Use knowledge of historical development and future perspective projections of automation	I1
2.	System types and system features, Example of a technical system, Relationship between system and	Lecture, Discovery learning, Presentation	Distinguish system models and system features, input and output sizes.	I2

	environment. Example of a mixed system, input and output sizes.			
3.	Production part, guide part, connection of production part with guide part. Principles of process management.	Lecture, Discovery learning, Presentation	Distinguish the principles of managing production processes	I3
4.	Feedback principle. Room temperature control on the example of feedback.	Lecture, Discovery learning, Presentation	Use feedback principles	I3
5.	The principle of advanced connection. Room temperature control on the example of an advanced connection.	Lecture, Discovery learning, Presentation	Use the principles of advanced connection	I3
6.	Basic concepts of process monitoring and measurement, Example of process measurement. Measuring transducer and measuring signal, Types of measuring signal.	Lecture, Discovery learning, Presentation	Distinguish measurement processes, transducers and types of measurement signals	I4
7.	Input and output characteristics of measuring transducers. Examples of input features. Measurement errors, Examples of measurement errors.	Lecture, Discovery learning, Presentation	Apply and distinguish input and output features	I5
8.	Transmission features: Example of static characteristic, Example of dynamic characteristic. Example of active and passive measuring transducer.	Lecture, Discovery learning, Presentation	Apply static and dynamic transmission features	I5
9.	Offset transducers, Example of offset transducers. Motion transducers, Example of motion transducers.	Lecture, Discovery learning, Presentation	Use the knowledge of the positional technical displacement transducer	I6
10.	Pneumatic actuators, Pneumatic single acting cylinders, Examples. Pneumatic double-acting cylinders, Examples.	Lecture, Discovery learning, Presentation	Apply the basic concept of pneumatic	I7
11.	Pneumatic symbols, Examples.	Lecture, Discovery learning, Presentation	Apply graphics of pneumatic symbols	I8
12.	Pneumatic motors, Examples. Pneumatic distributors, Examples.	Lecture, Discovery learning, Presentation	Explain the positions of the assembly and the switching technical pneumatic system	I9
13.	Pneumatic guidance, regulation and control.	Lecture, Discovery learning, Presentation	Explain Pneumatic guidance, regulation and control	I10
14.	Electrical guidance, regulation and control	Lecture, Discovery learning, Presentation	Explain Electrical guidance, regulation and control	I10
15.	Computer control, regulation and management	Lecture, Discovery learning, Presentation	Apply Computer control, regulation and management	I10