



POLYTECHNIC OF MEĐIMURJE IN ČAKOVEC

COURSE SYLLABUS

ACADEMIC YEAR: 2020/2021

1. GENERAL COURSE INFORMATION

1.1 Course name	Computer architecture			
1.2 Study program/s	Undergraduate professional study of Computer Science			
1.3 Course status (M,E)	Mandatory	1.6 Mode of instruction (number of hours)	Lectures	30
1.4 Course code	5014		Exercises	45
1.5 Course abbreviation	AR		Seminars	
1.6 Semester	III		E-learning	
1.7 ECTS	6	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	Željko Knok/ Master of Science	contact	zknok@mev.hr
		contact	
2.2 Assistant/s- title	Marko Markulija/Assistant	contact	markomarkulija@yahoo.com
		contact	
2.3 Instruction held by- title		contact	

3. COURSE DESCRIPTION

3.1 Course goals	The student should get acquainted with the components that make up the computer as a whole, different computer architecture, how to execute instructions and programming in machine code.									
3.2 Prerequisites	To take the course, it is necessary to pass the courses Digital Electronic Circuits and Computer Applications									
3.3 Course outcomes	After successfully completing the course, students will be able to: O1 - Explain the building blocks of the computer and the architecture of the Atmel Atmega328p microcontroller O2 - Draw the connection of digital inputs and outputs with a microcontroller O3 - Create an assembler program that uses input-output circuits and arithmetic logic operations O4 - Create a program in assembler that uses timing and interrupts									
3.4 Course content	The course presents contents related to working with the database through objects, stored tasks, permissions and access controls. In the practical part, open source tools are used.									
3.5 Types of coursework	x	Lectures	x	Exercises		Blended e-learning	x	Individual activities		Laboratory
		Seminars and workshops		Distant learning		Field classes		Multimedia and network		Mentorship
		Other								
3.6 Language of instruction	Croatian /English									
	1,00	Class attendance				Seminars				Essay

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)	1,00	Class activity		Project		Report/paper																																																									
	2,00	Midterm exams	2,00	Practical task	1,00	Continuous knowledge check																																																									
		Written exam		Experimental work																																																											
		Oral exam		Research																																																											
3.8 Assessment and evaluation of students' work during classes and at the final exam	<table border="1"> <thead> <tr> <th>Activity specification</th> <th>Percent %</th> <th>Points</th> </tr> </thead> <tbody> <tr> <td colspan="3" style="text-align: center;">Assessment during instruction</td> </tr> <tr> <td>Attendance</td> <td>5%</td> <td>5</td> </tr> <tr> <td>Class activity</td> <td>5%</td> <td>5</td> </tr> <tr> <td>Seminar/ project/ essay</td> <td>30%</td> <td>30</td> </tr> <tr> <td>Midterm exam 1</td> <td>30%</td> <td>30</td> </tr> <tr> <td>Midterm exam 2</td> <td>30%</td> <td>30</td> </tr> <tr> <td colspan="3" style="text-align: center;"><i>Exam assessment for the students who failed to fulfil all the obligatory requirements during the semester</i></td> </tr> <tr> <td>Written exam</td> <td>60%</td> <td>60</td> </tr> <tr> <td>Total:</td> <td>100%</td> <td>100</td> </tr> </tbody> </table>						Activity specification	Percent %	Points	Assessment during instruction			Attendance	5%	5	Class activity	5%	5	Seminar/ project/ essay	30%	30	Midterm exam 1	30%	30	Midterm exam 2	30%	30	<i>Exam assessment for the students who failed to fulfil all the obligatory requirements during the semester</i>			Written exam	60%	60	Total:	100%	100																											
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	3.10 Specific features related with taking the course	<p>If a student collects 50% of the points of each outcome, he / she directly takes the exam, provided that he / she has done practical work (exercises). A student cannot access the exam period if he / she has not achieved min. 60% correct answers. Practical work-exercises are made according to the instructions published on the Merlin system and are submitted by posting on the Merlin. Checking the completed exercises is done in the exercise classes after prior preparation with the teacher. During the semester, the student is required to perform five exercises independently. Practical work (completed exercises) is taught until the last week of lectures. During the exam, it is possible to orally check the knowledge from practical work (exercises).</p> <p>If a student does not achieve a sufficient number of points on the midterm exam, he / she cannot take the next midterm exam.</p> <p>Once achieved points in intermediate exams for each learning outcome are no longer deleted unless the student decides to correct the result for each learning</p>																																																													

	<p>outcome, whereby the points won until then are deleted and newly achieved points for that learning outcome are entered.</p> <p>The final grade is obtained on the exam period and is the sum of points earned during classes.</p> <p>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 exercises before taking the exam.</p>										
3.11 Students obligations	<p>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.</p> <p>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.</p>										
3.12 Written assignments											
3.13 Required reading	<table border="1"> <tr> <td>1.</td> <td>Slobodan Ribarić: Arhitektura mikroprocesora, Tehnička knjiga, Zagreb, 1982.</td> </tr> <tr> <td>2.</td> <td>M. Kukec, I.Šumiga, Ž. Knok, N. Breslauer: Razvoj programske podrške za mikroupravljače Microchip-PIC16-upute za laboratorijske vježbe, Čakovec 2016.</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>	1.	Slobodan Ribarić: Arhitektura mikroprocesora, Tehnička knjiga, Zagreb, 1982.	2.	M. Kukec, I.Šumiga, Ž. Knok, N. Breslauer: Razvoj programske podrške za mikroupravljače Microchip-PIC16-upute za laboratorijske vježbe, Čakovec 2016.						
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3.14 Additional reading	<table border="1"> <tr> <td>1.</td> <td>Slobodan Ribarić: Napredne arhitekture mikroprocesora, Element, Zagreb, 1997.</td> </tr> <tr> <td>2.</td> <td>Atmel Corporation : 8-bit AVR Microcontroller with 32K Bytes In-System Programmable Flash, San Jose , 2016</td> </tr> <tr> <td>3.</td> <td>Atmel Corporation : AVR Instruction Set Manual, San Jose , 2016</td> </tr> <tr> <td>4.</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>	1.	Slobodan Ribarić: Napredne arhitekture mikroprocesora, Element, Zagreb, 1997.	2.	Atmel Corporation : 8-bit AVR Microcontroller with 32K Bytes In-System Programmable Flash, San Jose , 2016	3.	Atmel Corporation : AVR Instruction Set Manual, San Jose , 2016	4.			
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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 also possible to ask questions by e-mail, which will be answered in 48 hours at the latest. It is desirable for students to come as often as possible for any possible questions during the teacher's office hours.										
4.3 Information about the course	It is the obligation of each student to be regularly informed about the course. All notifications about the classes or possible postponement of classes will be										

	posted on the bulletin board and on the website of the Polytechnic at least 24 hours in advance.
4.4 Course contribution to the study program	Select the appropriate programming language and technology when solving programming tasks. Apply the acquired learning skills, basic knowledge of the profession and problem solving necessary for continuing studies at a higher level.

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	Learning outcomes	Course outcome
1.-2.	Introduction to the course content, Microcomputers. 'On-line' and 'Off-line' systems	<ul style="list-style-type: none"> • Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion) • Group learning • Case study • Field classes... 	Distinguish 'On-line' and 'Off-line' systems	O1
3.-4.	Computer building components (sensors, analog signal processing, multiplexers).	Direct teaching (lecture, instruction, pp presentation)	Distinguish the building components of a computer	O1
5.-6.	Computer building components (AD, YES, interface, executive members).	Direct teaching (lecture, instruction, pp presentation)	Distinguish the building components of a computer	O1
7.-8.	Microprocessor architecture. CISC, RISC.	Direct teaching (lecture, instruction, pp presentation)	Distinguish between CISC and RISC architectures	O2
9.-10.	Microprocessor instructions, execution phases, microcode.	Direct teaching (lecture, instruction, pp presentation)	Apply the stages of execution of instructions	O1,O2
11.-12.	Microprocessor instructions, execution phases, microcode.	Direct teaching (lecture, instruction, pp presentation)	Apply the stages of execution of instructions	O1,O2
13.-14.	Atmel Atmega328p microcontroller architecture (clock, special purpose registers, input / output ports, time set, interrupt system). Development environment for the design of microcontroller systems (Atmel Studio 7.0).	Direct teaching (lecture, instruction, pp presentation)	Explain the basic parts of microprocessor architecture	O2
15.-16.	Mid-term exam 1			O1-O2

17.-18.	Atmel Atmega328p Microcontroller Instructions	Direct teaching (lecture, instruction, pp presentation)	List and show the application of basic instructions	O3
19.-20.	The process of creating, writing assembler code, translating it into executable form. Development cycle, logical design of the program	Direct teaching (lecture, instruction, pp presentation)	Explain the process of writing assembler code	O3
21.-22.	Programming of input / output circuits	Direct teaching (lecture, instruction, pp presentation)	Explain the role of input / output circuits	O3
23.-24.	Writing program macros	Direct teaching (lecture, instruction, pp presentation)	Apply macros	O3
25.-26.	Examples of software solving of arithmetic and logical operations	Direct teaching (lecture, instruction, pp presentation)	Use examples to solve tasks	O3,O4
27.-28.	Use of interrupts and timing	Direct teaching (lecture, instruction, pp presentation)	Explain the role of interrupts and timing in program writing	O4
29.-30.	Mid-term exam 2			O3-O4
EXERCISES/ SEMINARS				
Hours	Topic and description	Method <ul style="list-style-type: none"> • Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion) • Group learning • Case study • Field classes... 	Learning outcomes	Course outcome
1.-3.	Atmel Atmega328p microcontroller architecture (clock, special purpose registers, input / output ports, time set, interrupt system).	Direct teaching (lecture, instruction, pp presentation)	Explain the structure of microcontrollers	O2
4.- 6.	Development environment for the design of microcontroller systems (Atmel Studio 7.0)	Guided task, code examples	Apply basic types of commands when creating a program	O2
7.-10.	Atmel Atmega328p Microcontroller Instructions	Guided task, code examples	Use basic instructions	O3
11.-13.	Atmel Atmega328p Microcontroller Instructions	Independent preparation of the exercise	Use the MPLAB development environment	O1,O2
14.-16	The process of creating, writing assembler code, translating it into executable form	Guided task, code examples	Explain the process of writing a program	O3
16.-18.	Programming of input / output circuits	Guided task, code examples	Get acquainted with programming commands	O3

			input / output circuits	
19.-21.	Programming of input / output circuits	Independent preparation of the exercise	Use programming commands input / output circuits	O3
22.-24.	Writing program macros	Guided task, code examples	Get to know the macros of the program	O3
25.-27.	Writing program macros	Independent preparation of the exercise	Use program macros	O3
28.-30.	Examples of software solving of arithmetic and logical operations	Guided task, code examples	Familiar with writing a program with arithmetic and logical operations	O3
31.-33.	Examples of software solving of arithmetic and logical operations	Independent preparation of the exercise	Use program writing with arithmetic and logical operations	O3
34.-36.	Using a timeline	Guided task, code examples	Get to know the writing program using a timeline	O4
37.-39.	Using a timeline	Independent preparation of the exercise	Use program writing using a timeline	O4
40.-42.	Use interrupts	Guided task, code examples	Get to know the writing program using interrupts	O4
43.-45.	Use interrupts	Independent preparation of the exercise	Use program writing using interrupts	O4