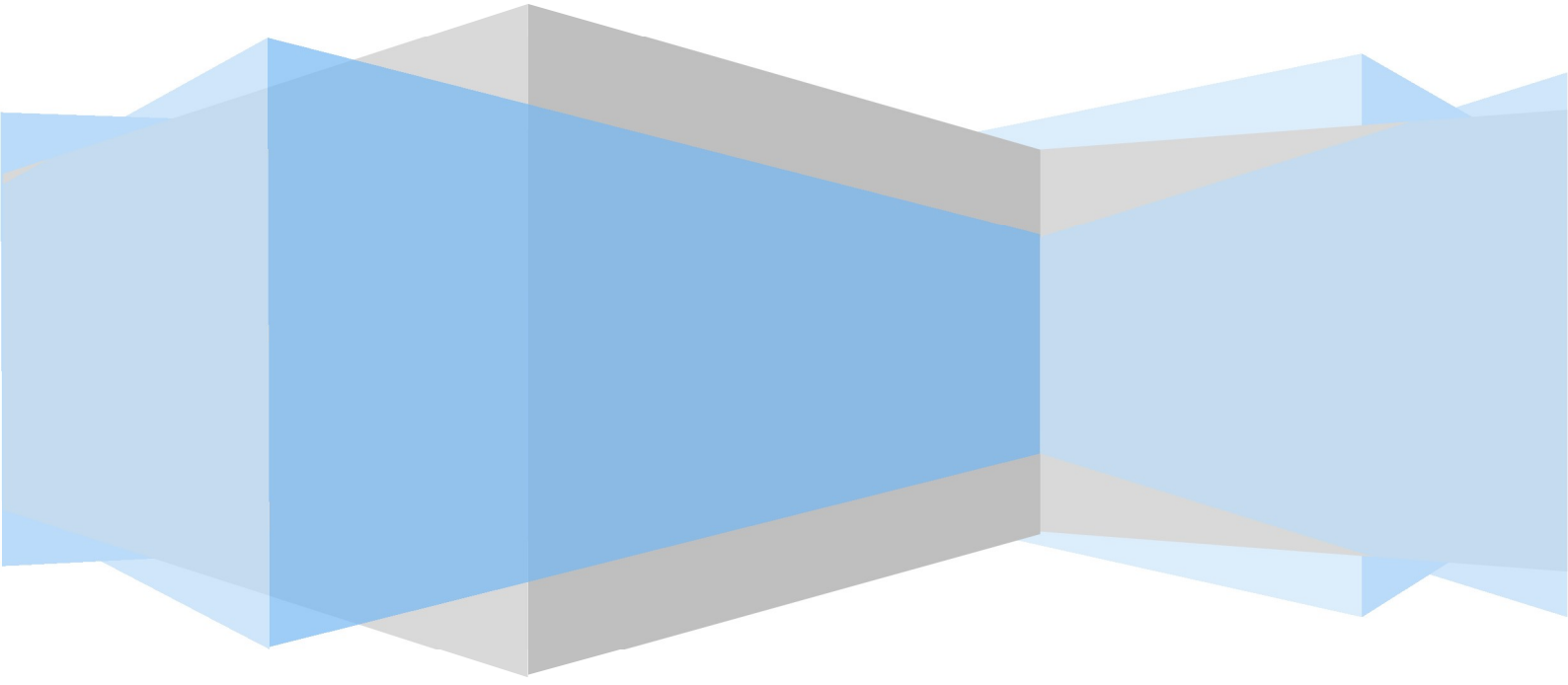
Bjelovar University of Applied Sciences

COURSE CATALOGUE

MECHATRONICS - academic year 2020/21



Catalogue of courses offered in English

GENERAL INFORMATION							
Course instructor	Igor Petrović, PhD, senior lecturer						
Course title	**Fundamentals of Electrical Engineering 1**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Compulsory						
Year	1st						
Semester	1st (WS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	30	22	8	30		60	150
ECTS credits and forms of instruction	ECTS student workload coefficient				5		
	Contact hours (L+PS+S)				L	PS	S
					30	30	

Expected learning outcomes

Upon completion of the course students will be able to:

1. define basic terms of electrostatics, such as electric charge, electric field and electric potential,
2. define basic terms of electric circuits, such as voltage, current, resistance, capacitance,
3. use the methods for solving electric circuits and electric networks,
4. find mutual connection between basic terms through the laws and theorems of electrical engineering, such as Coulomb's law, Ohm's law, network theorems,
5. measure the following quantities by using universal instruments: voltage, current, resistance, capacitance.

Students' performance monitoring

Class attendance	**0.5**	Class participation		Seminar paper		Experimental work	**1**
Written exam	**2**	Oral exam	**1**	Essay		Research	
Project		Continuous assessment	**0.5**	Class report		Practical work	
Portfolio							

Students' obligations

2 preliminary exams
1 seminar paper
4 laboratory sessions

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION								
Course instructor	Tatjana Badrov, MSc, senior lecturer							
Course title	**Communication Skills**							
Programme of study	Undergraduate professional programme of study in Mechatronics							
Course status	Compulsory							
Year	1st							
Semester	1st (WS)							
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total	
		APS	LPS					
	15	30		15		30	90	
ECTS credits and forms of instruction	ECTS student workload coefficient				3			
	Contact hours (L+PS+S)				L	PS	S	
					15	30		

Expected learning outcomes

Upon completion of the course students will be able to:

1. recognise and describe basic concepts in the field of communication,
2. describe and demonstrate basic features of verbal, nonverbal and paraverbal messages, ,
3. identify and compare basic communication styles and apply an assertive I-message,
4. distinguish between three types of complaints and complaint resolving techniques,
5. demonstrate a balanced feedback,
6. Prepare and deliver a presentation on a given topic,
7. describe and demonstrate the basic elements of the negotiation process,
8. participate in a debate on a given topic.

Students' performance monitoring

Class attendance	**0.5**	Class participation	**0.5**	Seminar paper		Experimental work	
Written exam	**1**	Oral exam	**0.5**	Essay		Research	
Project		Continuous assessment	**0.5**	Class report		Practical work	
Portfolio							

Students' obligations

2 preliminary exams
3 homework assignments, one of which being the preparation for a presentation
10 written assignments/exercises

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Ivana Jurković, lecturer						
Course title	**Technical English 1**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Elective						
Year	1st						
Semester	1st (WS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	15	30				15	60
ECTS credits and forms of instruction	ECTS student workload coefficient				2		
	Contact hours (L+PS+S)				L	PS	S
					15	30	

Expected learning outcomes

Upon completion of the course students will be able to use the English language to:

1. describe technical functions and applications of products and the manner in which products function,
2. categorise technical materials and describe their properties and application,
3. describe the shape and features of components and assemblies as well as manufacturing techniques,
4. demonstrate mastery of simple grammatical structures.

Students' performance monitoring

Class attendance		Class participation	**0.5**	Seminar paper		Experimental work	
Written exam	**1**	Oral exam	**0.5**	Essay		Research	
Project		Continuous assessment		Class report		Practical work	
Portfolio							

Students' obligations

2 preliminary exams or the written exam
Oral exam

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Alan Mutka, PhD, lecturer						
Course title	**MATLAB**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Compulsory						
Year	1st						
Semester	2nd (SS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
			30			30	60
ECTS credits and forms of instruction	ECTS student workload coefficient				2		
	Contact hours (L+PS+S)				L	PS	S
					0	30	

Expected learning outcomes

Upon completion of the course students will be able to:

1. use the *Matlab* mathematical tool for matrix calculus, solving systems of equations, derivatives and integrals,
2. calculate and draw graphs of elementary mathematical functions,
3. use symbolic calculation,
4. use *Simulink* to simulate system behavior.

Students' performance monitoring

Class attendance	**1**	Class participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Continuous assessment	**1**	Class report		Practical work	
Portfolio							

Students' obligations

Continuous assessment.

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Igor Petrović, PhD, senior lecturer						
Course title	**Fundamentals of Electrical Engineering 2**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Compulsory						
Year	1st						
Semester	2nd (SS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	30	22	8	30		60	150
ECTS credits and forms of instruction	ECTS student workload coefficient				5		
	Contact hours (L+PS+S)				L	PS	S
					30	30	

Expected learning outcomes

Upon completion of the course students will be able to:

1. use the basic terms of electromagnetism, such as magnetic field, magnetic flux, magnetic induction, Faradey's Law and Lenz's Law,
2. get familiarised with the properties of alternate current and voltage,
3. use and apply the resonance of RLC elements in electrical networks,
4. use complex analysis in solving alternate electrical circuits and networks,
5. use the methods of solving alternate electrical networks.

Students' performance monitoring

Class attendance	**0.5**	Class participation		Seminar paper		Experimental work	**1**
Written exam	**2**	Oral exam	**1**	Essay		Research	
Project		Continuous assessment	**0.5**	Class report		Practical work	
Portfolio							

Students' obligations

2 preliminary exams
1 seminar paper
4 laboratory sessions

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Alan Mutka, PhD, lecturer						
Course title	**Fundamentals of Programming**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Compulsory						
Year	1st						
Semester	2nd (SS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	20	0	30	15	0	25	90
ECTS credits and forms of instruction	ECTS student workload coefficient				3		
	Contact hours (L+PS+S)				L	PS	S
					15	30	

Expected learning outcomes

Upon completion of the course students will be able to:

1. program in C,
2. create simple programs,
3. use the development environment for program development in the programming language C,
4. use defined functions and create own functions.

Students' performance monitoring

Class attendance	**0.25**	Class participation		Seminar paper		Experimental work	**1**
Written exam	**0.75**	Oral exam	**0.5**	Essay		Research	
Project		Continuous assessment	**0.5**	Class report		Practical work	
Portfolio							

1.1. Students' obligations

2 preliminary exams
4 homework assignments
4 short, unannounced tests

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Ivana Jurković, lecturer						
Course title	**Technical English 2**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Elective						
Year	1st						
Semester	2nd (SS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	15	30				15	60
ECTS credits and forms of instruction	ECTS student workload coefficient				2		
	Contact hours (L+PS+S)				L	PS	S
					15	30	

Expected learning outcomes

Upon completion of the course students will be able to use the English language to:

1. describe the position of components in assemblies, technical drawings, design procedure and dimensions, precision and tolerances in the preparation of technical documentation,
2. describe technical problems and malfunctions as well as their causes and possible solutions,
3. discuss about technical requirements and describe project feasibility, improvements and redesigns,
4. demonstrate mastery of simple grammatical structures.

Students' performance monitoring

Class attendance		Class participation	**0.5**	Seminar paper		Experimental work	
Written exam	**1**	Oral exam	**0.5**	Essay		Research	
Project		Continuous assessment		Class report		Practical work	
Portfolio							

Students' obligations

2 preliminary exams or the written exam
Oral exam

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Alan Mutka, PhD, lecturer Stjepan Golubić, MSc, senior lecturer						
Course title	**Sensors**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Compulsory						
Year	2nd						
Semester	3rd (WS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	30	12	18	30		90	180
ECTS credits and forms of instruction	ECTS student workload coefficient				6		
	Contact hours (L+PS+S)				L	PS	S
					30	30	

Expected learning outcomes

Upon completion of this course students will be able to:

1. recognise the characteristics of sensors,
2. understand measuring methods and procedures of non-electrical and electrical sizes,
3. understand signal processing in a sensor,
4. select an optimal sensor for a mechatronic system,
5. connect a sensor to electronic devices.

Students' performance monitoring

Class attendance	**0.5**	Class participation		Seminar paper		Experimental work	**1.5**
Written exam	**1.5**	Oral exam	**1.5**	Essay		Research	
Project		Continuous assessment	**.**	Class report		Practical work	
Portfolio							

Students' obligations

2 preliminary exams
5 homework assignments
6 laboratory sessions

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Alan Mutka, PhD, lecturer						
Course title	**Digital Techniques**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Compulsory						
Year	2nd						
Semester	3rd (WS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	30	16	14	30		90	180
ECTS credits and forms of instruction	ECTS student workload coefficient				6		
	Contact hours (L+PS+S)				L	PS	S
					30	30	

Expected learning outcomes

Upon completion of the course students will be able to:

1. perform conversions between different number systems,
2. minimise and realise complex logical functions using logic circuits,
3. draw and explain basic logic circuits in semiconductor technology,
4. draw and explain complex combinational modules,
5. draw and explain types of bistables, registers and counters,
6. draw and explain operation of AD and DA conversion circuits.

Students' performance monitoring

Class attendance	**0.5**	Class participation		Seminar paper		Experimental work	**1.5**
Written exam	**1.5**	Oral exam	**1.5**	Essay		Research	
Project		Continuous assessment	**1**	Class report		Practical work	
Portfolio							

Students' obligations

2 preliminary exams
5 homework assignments

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Zoran Vrhovski, senior lecturer						
Course title	**Signals and Systems**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Compulsory						
Year	2nd						
Semester	3rd (WS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	30	24	6	30		60	150
ECTS credits and forms of instruction	ECTS student workload coefficient				5		
	Contact hours (L+PS+S)				L	PS	S
					30	30	

Expected learning outcomes

Upon completion of the course students will be able to:

1. identify types of signals and systems,
2. solve differential equations using the direct method and the Laplace transform,
3. solve difference equations using the direct method and Z-transform,
4. calculate the Fourier series of a periodic signal,
5. calculate the Fourier transform of signals,
6. use *Matlab* and *Simulink* for analysis of signals and systems.

Students' performance monitoring

Class attendance	**0.3**	Class participation		Seminar paper		Experimental work	**0.2**
Written exam	**1.25**	Oral exam	**1.25**	Essay		Research	
Project		Continuous assessment	**1**	Class report		Practical work	**1**
Portfolio							

Students' obligations

2 preliminary exams
5 homework assignments
project work

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Ivana Jurković, lecturer						
Course title	**Technical English 3**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Elective						
Year	2nd						
Semester	3rd (WS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	15	30				15	60
ECTS credits and forms of instruction	ECTS student workload coefficient				2		
	Contact hours (L+PS+S)				L	PS	S
					15	30	

Expected learning outcomes

Upon completion of the course students will be able to use the English language to:

1. describe procedures of occupational health and safety,
2. describe the differences between regulations and standards and name examples,
3. describe automated systems, measurable parameters, readings and approximate values,
4. describe tests, experiments and anticipated outcomes,
5. demonstrate mastery of simple grammatical structures.

Students' performance monitoring

Class attendance		Class participation	**0.5**	Seminar paper		Experimental work	
Written exam	**1**	Oral exam	**0.5**	Essay		Research	
Project		Continuous assessment		Class report		Practical work	
Portfolio							

Students' obligations

2 preliminary exams or the written exam
Oral exam

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Zoran Vrhovski, senior lecturer						
Course title	**Microcomputers**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Compulsory						
Year	2nd						
Semester	4th (SS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	15		30	15		60	120
ECTS credits and forms of instruction	ECTS student workload coefficient				4		
	Contact hours (L+PS+S)				L	PS	S
					15	30	

Expected learning outcomes

Upon completion of the course students will be able to:

1. assess when microcomputers may be used and when it is feasible to use them,
2. connect a sensor and an actuator to a microcomputer and present, i.e. send data to them,
3. connect various modules to a microcomputer,
4. create a microcomputer system (electronics + programming a microcomputer in Atmel Studio 6.0),
5. connect a microcomputer system to a PC.

Students' performance monitoring

Class attendance	**0.25**	Class participation		Seminar paper		Experimental work	**1**
Written exam	**0.5**	Oral exam	**0.5**	Essay		Research	
Project		Continuous assessment		Class report		Practical work	**1.75**
Portfolio							

Students' obligations

10 laboratory sessions
project work

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Zoran Vrhovski, senior lecturer						
Course title	**Automatic Control**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Compulsory						
Year	2nd						
Semester	4th (SS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	30	24	6	30		90	180
ECTS credits and forms of instruction	ECTS student workload coefficient				6		
	Contact hours (L+PS+S)				L	PS	S
					30	30	

Expected learning outcomes

Upon completion of the course students will be able to:

1. name and identify types of systems and describe linear control systems using differential equations and transfer function,
2. determine the type of dynamic member based on the transfer function of the system and system response, and critically comment on the system response quality,
3. use blocks that are represented by transfer functions of basic dynamic members to represent a complex linear system,
4. draw the Bode's and Nyquist's system diagram and determine the stability of a system,
5. adjust parameters of a regulator by using the Ziegler-Nichols method and the technical optimum methods,
6. apply system discretion methods on a continuous system,
7. apply Matlab & SIMULINK for designing and simulating simple systems.

Students' performance monitoring

Class attendance	**0.3**	Class participation		Seminar paper		Experimental work	**0.2**
Written exam	**1.25**	Oral exam	**1.25**	Essay		Research	
Project		Continuous assessment	**1**	Class report		Practical work	**1**
Portfolio							

Students' obligations

2 preliminary exams
5 homework assignments
project work

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Igor Petrović, PhD, senior lecturer						
Course title	**Electromechanical and Electronic Converters**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Compulsory						
Year	2nd						
Semester	4th (SS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	30	10	5	30		45	120
ECTS credits and forms of instruction	ECTS student workload coefficient				4		
	Contact hours (L+PS+S)				L	PS	S
					30	15	

Expected learning outcomes

Upon completion of the course students will be able to:

1. calculate magnetic state and load of a metal object,
2. select and use an electrical machine according to its electrical and mechanical load,
3. determine and use the work mode of an electrical machine,
4. select the regulation methods of a machine's operating point,
5. calculate electrical parameters of electronic converters according to the set demands.

Students' performance monitoring

Class attendance	**0.5**	Class participation		Seminar paper		Experimental work	**1**
Written exam	**1.5**	Oral exam	**1**	Essay		Research	
Project		Continuous assessment		Class report		Practical work	
Portfolio							

Students' obligations

2 preliminary exams
5 laboratory sessions

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Zoran Vrhovski, senior lecturer						
Course title	**Computer Control and Process Management**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Compulsory						
Year	3rd						
Semester	5th (WS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	30	9	21	30		60	150
ECTS credits and forms of instruction	ECTS student workload coefficient				5		
	Contact hours (L+PS+S)				L	PS	S
					30	30	

Expected learning outcomes

Upon completion of the course students will be able to:

1. assess where PLC s are used and when it is cost-efficient to use them,
2. determine required sensors and actuators in industrial application,
3. do programming of PLCs using CODESYS platforms and IEC 61131-3 standards,
4. automate simple processes,
5. make a SCADA system for simple plants.

Students' performance monitoring

Class attendance	**0.3**	Class participation		Seminar paper		Experimental work	**0.7**
Written exam	**1.5**	Oral exam	**1**	Essay		Research	
Project		Continuous assessment		Class report		Practical work	**1.5**
Portfolio							

Students' obligations

2 preliminary exams
7 laboratory sessions
project work

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Alan Mutka, PhD, lecturer						
Course title	**LabVIEW Graphical Programming**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Compulsory						
Year	3rd						
Semester	5th (WS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	30		30	30	20	40	150
ECTS credits and forms of instruction	ECTS student workload coefficient				5		
	Contact hours (L+PS+S)				L	PS	S
					30	30	

Expected learning outcomes

Upon completion of the course students will be able to:

1. do graphical programming in the *LabVIEW* environment,
2. tell the similarity/difference between the graphical and textual approach to programming,
3. create their own virtual instrument (VI) for a specific problem,
4. integrate the computer and the *LabVIEW* environment in the process of data collection, measurement and presentation on a computer,
5. design a program application for measurement using a graphical programming language,
6. identify possible uses of the computer as a measuring instrument,
7. connect the computer to external measuring devices.

Students' performance monitoring

Class attendance	**1.25**	Class participation		Seminar paper		Experimental work	**1**
Written exam	**0.75**	Oral exam	**0.5**	Essay		Research	
Project		Continuous assessment	**0.5**	Class report		Practical work	**1**
Portfolio							

Students' obligations

2 preliminary exams
5 homework assignments
project work

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Igor Petrović, PhD, senior lecturer						
Course title	**Automation of Machines and Devices 1**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Elective						
Year	3rd						
Semester	5th (WS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	15		30	15	10	50	120
ECTS credits and forms of instruction	ECTS student workload coefficient				4		
	Contact hours (L+PS+S)				L	PS	S
					15	30	

Expected learning outcomes

Upon completion of the course students will be able to:

1. use the basic level of automation using contemporary industrial technologies,
2. use active and passive elements as components of the control system, and integrate them into a control system,
3. select control system elements according to the requirements of the process,
4. determine significant features of technical documentation of a automated system, and create the documentation for a realistic industrial plant,
5. select the configuration of a simple PLC device without HMI for plant control,
6. make a programme in a software until the commissioning phase.

Students' performance monitoring

Class attendance	**0.5**	Class participation		Seminar paper	**1**	Experimental work	**1.5**
Written exam		Oral exam	**1**	Essay		Research	
Project		Continuous assessment		Class report		Practical work	
Portfolio							

Students' obligations

Class participation in laboratory sessions in compulsory for all enrolled students
Project presentation and seminar paper

Possibility of course instruction in a foreign language

English

GENERAL INFORMATION							
Course instructor	Course instructors						
Course title	**Final thesis**						
Programme of study	Undergraduate professional programme of study in Mechatronics						
Course status	Compulsory						
Year	3rd						
Semester	6th (SS)						
Calculation of ECTS credits	Lectures	Practical sessions		Preparation for practical sessions	Seminar paper	Self-study	Total
		APS	LPS				
	1				270		270
ECTS credits and forms of instruction	ECTS student workload coefficient				9		
	Contact hours (L+PS+S)				L	PS	S
							270

Expected learning outcomes

Upon completion of the course students will be able to:

1. independently and professionally cover a topic in the area of mechatronics using theoretical and practical knowledge acquired during their studies,
2. document a professionally covered topic in the area of mechatronics,
3. present a professionally covered topic in the area of mechatronics.

Students' performance monitoring

Class attendance		Class participation		Seminar paper	**3**	Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Continuous assessment		Class report		Practical work	**6**
Portfolio							

Students' obligations

Final thesis
Presentation of the final thesis

Possibility of course instruction in a foreign language

English