UNIVERZITY OF PRIZREN
FACULTY OF COMPUTER SCIENCE

PROGRAM: TIT

Curriculum – SYLLABUS									
Level of studies		BACHELOR		***Program***	TIT	***Academic year***		2018/2019	
SUBJECT		**Microcontrollers**							
Year	**II – nd**	***Status Of the subject***	Obligatory	***Code***		***ECTS credits***		6	
Semester	**IV - th**								
Teaching weeks		15		***Hours teaching***	**30**	***Lectures***		***Exercises***	
						2		2	
Teaching Methodology		Lectures, exercises, seminar papers, consultations, tests.							
Consultation		One hour / week							
The teacher		Dr. Agon Kokaj		***E-mail:***	agon.koka@gmail.com				
				Tel.:	049-198-169				
Assistant		Dr. Agon Kokaj		***E-mail:***	agon.koka@gmail.com				
				Tel.:	049-198-169				

Study goal and table of content	**Benefits of student**
The objectives of the course are to provide Undergraduate students of Information Technologies and Telecommunication students with a practical, working knowledge of modern sensor technologies and interfaces. The course offers an overview of the basic sensor technology areas with examples drawn from existing products and includes a series of laboratory exercises. Course content will include some sensor operational principles, some basic electronics, and many specific examples of sensors available from suppliers today. At the end of the course, I hope students will understand how many sensors work, what issues limit the use of sensors for measurements, and how to select sensors for specific applications.	The Outcomes of the course is to get a basic knowledge of electronics. Students should be able to characterize and analyze simple circuits. The students should know the components and fundamental electronic circuits, Analog and Digital conversions, interfaces which are very often applied in electronic systems and they know the performance characteristics and the limiting factors of operations. The students get familiar with different principles of sensors and the typical range of application. The student gets detailed insight into measurement of non-electric quantities different principles of electro-mechanical sensors are presented. Furthermore interface-circuits, bus-systems and analog to digital converters as well as measures for the compensation of interfering effects (e.g. non-linearity or temperature dependencies) will be demonstrated. By means of examples (e.g. traffic guidance systems) the principles and limiting factors will be shown in a practical way.

Methodology for the implementation of educational topics:
This is a combined course with lectures, discussions, conversations, practical work, exercises, workshops, seminars, task in which subjects are presented by professor of course and assistant in the laboratory.
Conditions for realization of educational topics:

• Adequate literature, table, computer, projector and other necessary IT tools for learning and exercises.

Ways of assessing of the student (in %) :	Evaluation in%	Final grade
A seminar paper	10.00 %	51-60% - grade 6 61-70 7 71-80 8 81-90 9 91-100 10
Colloquia	30.00 %	
Final test	60.00 %	
Final Exam included three evaluation criteria;	10 + 30 + 60	
Total	**100.00 %**	

Obligations of student:

Lectures	Exercises
The student must be regular lectures and exercises, to use all possibilities for learning the knowledge required to use literature and wider, to be active and keep regulations on higher education in ethics and courtesy for cooperation.	The student must be active and reflective exercises and knowledge readiness initiatives, ideas and demonstration of knowledge gained in lectures.

Student workload for Subject

Activities	Hour/ weeks	Days/Weeks	Total
Lectures	2	15	30
Laboratory exercises	2	15	30
Contacts with teachers / consultations	1	5	5
Practical work	1	2	2
Projects, presentations, etc.	1	2	2
Own study time	4	15	60
Preparation for final exam	3	5	15
Time spent in the assessment (tests, final exam, etc.)	2	3	6
Notice: 1 ECTS credits= 25 hour commitment, e.g. if the subject has 6 ECTS credits student must have 150 hours during the semester commitment.		**Total load:**	**150**

Week	Lectures Topic	Hour	Exercises Topic	Hour
1	Introduction and Architecture of Microcontroller 8051 Microcontroller Hardware, Pin Configuration, Introduction to Assembly Language Programming Concepts, Data types and directives, Flag bits and the PSW registers. Data Transfer, Logical & Arithmetic Instructions of 8051 I/O Port and Addressing Modes of 8051 I/O bit manipulation Programming, Immediate and Register addressing modes, Accessing memory using various addressing modes, Bit Addresses for I/O and RAM	2	Introduction and Architecture of Microcontroller 8051 Microcontroller Hardware, Pin Configuration, Introduction to Assembly Language Programming Concepts, Data types and directives, Flag bits and the PSW registers. Data Transfer, Logical & Arithmetic Instructions of 8051 I/O Port and Addressing Modes of 8051 I/O bit manipulation Programming, Immediate and Register addressing modes, Accessing memory using various addressing modes, Bit Addresses for I/O and RAM	2
2	Interrupts Programming in Assembly and C of 8051, 8051 Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupt, Programming the Serial Communication, Interrupt Programming in C. Interfacing LCD and KEYBOARD to 8051 LCD Interfacing, Keyboard Interfacing ADC, DAC and SENSOR Interfacing to 8051 Parallel and Serial ADC, Interfacing DAC, Sensor Interfacing.	2	Interrupts Programming in Assembly and C of 8051, 8051 Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupt, Programming the Serial Communication, Interrupt Programming in C. Interfacing LCD and KEYBOARD to 8051 LCD Interfacing, Keyboard Interfacing ADC, DAC and SENSOR Interfacing to 8051	2

	Motor Control : RELAY, PWM, DC, AND STEPEER MOTORS Relays and Opt isolator, Stepper Motor Interfacing, DC Motor Interfacing and PWM		Parallel and Serial ADC, Interfacing DAC, Sensor Interfacing. Motor Control : RELAY, PWM, DC, AND STEPEER MOTORS Relays and Opt isolator, Stepper Motor Interfacing, DC Motor Interfacing and PWM	
3	Introduction and Architecture of PIC Microcontroller Hardware (modified Harvard architecture microcontrollers), semi-RISC Pin Configuration, Programming Concepts, Data types and directives, Flag bits and the PSW registers. Data Transfer, Logical & Arithmetic Instructions of 8051 I/O Port and Addressing Modes of 8051 I/O bit manipulation Programming, Immediate and Register addressing modes, Accessing memory using various addressing modes, Bit Addresses for I/O and RAM	2	Introduction and Architecture of PIC Microcontroller Hardware (modified Harvard architecture microcontrollers), semi-RISC Pin Configuration, Programming Concepts, Data types and directives, Flag bits and the PSW registers. Data Transfer, Logical & Arithmetic Instructions of 8051 I/O Port and Addressing Modes of 8051 I/O bit manipulation Programming, Immediate and Register addressing modes, Accessing memory using various addressing modes, Bit Addresses for I/O and RAM	2
4	PIC Interrupts Programming in Assembly and C. pic Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupt, Programming the Serial Communication, Interrupt Programming in C. Interfacing LCD and KEYBOARD to 8051 LCD Interfacing, Keyboard Interfacing ADC, DAC and SENSOR Interfacing to PIC Parallel and Serial ADC, Interfacing DAC, Sensor Interfacing. Motor Control : RELAY, PWM, DC, AND STEPEER MOTORS Relays and Opt isolator, Stepper Motor Interfacing, DC Motor Interfacing and PWM	2	PIC Interrupts Programming in Assembly and C. pic Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupt, Programming the Serial Communication, Interrupt Programming in C. Interfacing LCD and KEYBOARD to 8051 LCD Interfacing, Keyboard Interfacing ADC, DAC and SENSOR Interfacing to PIC Parallel and Serial ADC, Interfacing DAC, Sensor Interfacing. Motor Control : RELAY, PWM, DC, AND STEPEER MOTORS Relays and Opt isolator, Stepper Motor Interfacing, DC Motor Interfacing and PWM	2
5	Preparations for the first term examination	2	Preparations for the first term examination	2
6	Introduction to AVR 8-bit microcontrollers Getting started with Arduino. Introduction to Arduino Hardware features and Software environment. Setup your computer to use Arduino Getting started with Arduino IDE Making first simple programs in C++ Working with LED-s Blinking of LEDs Fading of LED. Circling of LEDs. Blinking of EVEN and ODD states of LEDs. Traffic light system. Simple sounders, ultrasonic, Infrared pressure and temperature sensors.	2	Introduction to AVR 8-bit microcontrollers Getting started with Arduino. Introduction to Arduino Hardware features and Software environment. Setup your computer to use Arduino Getting started with Arduino IDE Making first simple programs in C++ Working with LED-s Blinking of LEDs Fading of LED. Circling of LEDs. Blinking of EVEN and ODD states of LEDs. Traffic light system. Simple sounders, ultrasonic, Infrared pressure and temperature sensors.	2
7	Digital inputs: Making first simple programs in C++ Controlling LED using push button Switching ON a relay Analog inputs: Making first simple programs in C++	2	Digital inputs: Making first simple programs in C++ Controlling LED using push button Switching ON a relay Analog inputs: Making first simple programs in C++	2

	Controlling of LEDs using a potentiometer Connecting analogue sensors Changing the brightness of LEDs using potentiometers.		Controlling of LEDs using a potentiometer Connecting analogue sensors Changing the brightness of LEDs using potentiometers	
8	LCD displays: Wiring of LCD screen with Arduino. Displaying a message in LCD screen. Screen navigation on LCD. Turn ON a LED by entering the password. Knowing the status of the LED. Scrolling of text. Displaying room temperature using LM 35 temperature sensor Seven segment display: Simple automatic countdown and count up (FOR loop) Increment or decrement a number by using push button.	2	LCD displays: Wiring of LCD screen with Arduino. Displaying a message in LCD screen. Screen navigation on LCD. Turn ON a LED by entering the password. Knowing the status of the LED. Scrolling of text. Displaying room temperature using LM 35 temperature sensor Seven segment display: Simple automatic countdown and count up (FOR loop) Increment or decrement a number by using push button.	2
9	Controlling a DC motor, PWM. Stepper Motors: Conecting Unipolar Stepper Motor Conecting Bipolar Stepper Motor Servo motors: Controlling Servo Motor Indexing of Servo motor Direction control of Servo Motor Servo Motor based Projects.	2	Controlling a DC motor, PWM. Stepper Motors: Conecting Unipolar Stepper Motor Conecting Bipolar Stepper Motor Servo motors: Controlling Servo Motor Indexing of Servo motor Direction control of Servo Motor Servo Motor based Projects	2
10	Getting started with Lego Mind storm NXT 2.0 platform. Introduction to Hardware features and Software environment. Setup your computer to use Lego Mind storm NXT 2.0 Lego and MATLAB/Simulink.	2	Getting started with Lego Mind storm NXT 2.0 platform. Introduction to Hardware features and Software environment. Setup your computer to use Lego Mind storm NXT 2.0 Lego and MATLAB/Simulink.	2
11	Working with Programming Blocks: Move, Sound, and Display Understanding Sensors Using the Touch, Color, and Rotation Sensors Using Data Hubs and Data Wires Using Data Blocks and Using Data Wires with Loops and Switches.	2	Working with Programming Blocks: Move, Sound, and Display Understanding Sensors Using the Touch, Color, and Rotation Sensors Using Data Hubs and Data Wires Using Data Blocks and Using Data Wires with Loops and Switches.	2
12	Using Variables and Constants on the NXT 2.0 The Autonomous Robotic Arm Sort Bricks by Color and Size Transferring Programs to the NXT with USB or Bluetooth.	2	Using Variables and Constants on the NXT 2.0 The Autonomous Robotic Arm Sort Bricks by Color and Size Transferring Programs to the NXT with USB or Bluetooth.	2
13	Making Obstacle avoidance Robot using NXT 2.0 Connecting NXT 2.0 with MATLAB and Simulink Simulation of Making Obstacle avoidance Robot using Simulink Testing the simulink results.	2	Making Obstacle avoidance Robot using NXT 2.0 Connecting NXT 2.0 with MATLAB and Simulink Simulation of Making Obstacle avoidance Robot using Simulink Testing the simulink results.	2
14	Mid term examination	2	Mid term examination	2

15	Consultations regarding the final exam	2	Consultations regarding the final exam	2

LITERATURE:

Basic Literature:

Course slides are provided by instructor.

1. Sensors and signal conditioning, Ramon Pallas-Areny, Wiley, Spring 2011.
2. Ian Sinclair - Sensors and Transducers, Third Edition, Plant a Tree, 2001.
3. Ekbert Hering - Heinrich Steinhart u.a. – Taschenbuch der Mechatronik, Fachbuchverlag Leipzig, 2005.
4. W. Bolton – Mechatronics – Electronic Control Systems in Mechanical and Electrical Engineering, 3rd Edition, Pearson, Prentice Hall, 2003.

6. SIEMENS: Magnetic Sensors. Application Notes 10.98.
7. Analog Devices: Sensorseminar Autumn-Winter 1999.
5. www.sensorsmag.com
8. http://www.analog.com/Analog_Root/static/techSupport/designTools/interactiveTools/sdtutorial/sdtutorial.html .

Additional Literature:

1. Arbnor Pajaziti: “Mikrokontrollerët”, Ligjërata të autorizuara, 2019.

NOTICE:

- In general presentations of lectures will be made through Power Point system, table, use of materials and computer software and the Internet.
- Also, the professor will be provided additional materials (papers, publications, national bulletins and sound research findings and final).
- In the absence of the possibility that practical work is organized every week, in cooperation with the management of the University, this activity will be organized on certain days, organizations, companies, farms, processing manufacturing unit.
- During each session, will be organized conversations with students.

Notice for the student:

- The students are required to be regular in the lectures and exercises.
- The contribution of the students in the form of conversation with the students will be evaluated.
- Arrival time at lectures and exercises is mandatory.