

<b>General information</b>	Title and code of subject, number of credits	ETR 520 Microcontroller Electronic Devices and Systems ECTS 8	
	Department	Physics and Electronics	
	Program	Master	
	Academic semester	2024 fall	
	Lecturer	Doctor of philosophy (PhD) in Physics & Mathematics Shahmerdan Sh. Amirov	
	E-mail:	<a href="mailto:phys_med@mail.ru">phys_med@mail.ru</a>	
	Phone number:		
	Lecture room/Schedule	11 Mehseti Street, AZ1096 Baku, Azerbaijan (Neftchilar campus), room Lectures: Seminars:	
<b>Course language</b>	English		
<b>Type of the subject</b>	Major		
<b>Textbooks and additional materials</b>	Textbooks: 1. S. Vijayarghavan Microprocessors and microcontrollers 2. D.A.Patterson and J.H.Hennessy ‘ Computer organization and design. Hardware and software interface. ‘ Morgan Kaufmann Publishers 2011. 2. M.A.Mazidi, J.G.Mazidi, Rolin Mckinaly “ The 8051 Microcontroller and Embedded Systems: Using Asseby and C “ Pearson Education 2011/ 3. Sh.Sh. Amirov Lecure materials 4. R.M. Hajiyev Theoretical bases of electrical circuits 2011		
<b>Teaching methods</b>	Lecture		X
	Group discussions at seminars		X
<b>Assessment</b>	Components	Date/ Deadline	Percent (%)
	<b>Quiz</b>	During the semester	10
	<b>Activity</b>	At each lesson	5
	<b>Attendance</b>	During the semester	5
	<b>Presentation</b>	At the end of semester	10
	<b>Midterm exam</b>		30
	<b>Final exam</b>		40
	<b>Final</b>		100
<b>Course description</b>	This course introduces the binary system. Rules of binary addition and subtraction. Binary multiplication and division. Introduction. Definition. Types of microcontroller (bit-size based categorization, memory – based categorization, external memory microcontroller instruction-set based categorization, PIC, AVR and AMR microcontrollers. Microcontroller architecture (CPU-Controller’s processor unit, I/O-input-output unit, memory, timer counter ADC-analog to digital converter, DAC-digital to analog converter)		
<b>Course objectives</b>	The main objective of this course is to enable students to develop a basic familiarity with all the major electronic techniques in particular microcontrollers and microprocessors, a study decimal ,binary,octal etc number systems and arithmetic operations (addition,subtraction,multiplication and division) with them.		
<b>Learning outcomes</b>	What students should know by the end of the course: *Explain briefly the microcontroller based system using block-diagram. * list the types of microcontroller and examples of embedded microcontroller /embedded system. *describe feature and internal structure of a microcontroller PIC 16 F 877A * describe how an instruction is executed. .		
<b>Rules (Educational policy and behavior)</b>	<ul style="list-style-type: none"> <li>• <b>Lesson organization</b> General information on the subject will be provided for the students during lectures. Student’s knowledge on the previous topics will be evaluated and new topic will be explained by mins of visual aids during seminars. Student’s knowledge level will be tested orally and in written forms before midterm and final exams. Submission of the individual works by the end of course is obligatory.</li> <li>• <b>Effectiveness (pass/fail)</b> This course strictly follows the assessment policy conducted by the subject teaching faculty. Hence a student must score at least 60% to pass the course normally. In case of failure he will be forced to repeat the course in the next term or year.</li> <li>• <b>Plagiarism</b> Cheating or other forms of plagiarism during review surveys, midterms and final exams will result in disqualification. In this case a student will automatically receive zero “0” without further discussion.</li> </ul>		

	<ul style="list-style-type: none"> <li>• <b>Presentation</b> Topics for presentation are presented by instructor. Presentations must be prepared individually with volumes of 15-25 slides depending on the extension of topic. Diagrams and plots should be clearly seen. Formulas should be written accurately. Topic of presentation should be learned by student and made with clearly demonstration.</li> <li>• <b>Professional conduct directives</b> Students will behave professionally during class hours to create a conducive academic environment. Off course discussions and unethical behavior are strictly prohibited.</li> <li>• <b>Attendance</b> Participation of students at all classis is important. Students should inform dean’s office about missing lessons for particular reasons (illness, family issues and etc.). Students, missing more than 25% of lessons, are not allowed to take the exam.</li> <li>• <b>Quizzes.</b> Quizzes will be four times during semester. The time of quizzes will be announced in the classroom three weeks before. The quizzes will be related to the homework material.</li> <li>• <b>Activity</b> Students who are active in all seminar classes will be evaluated with 5 points, those who are active in 60% of seminars will be evaluated with 3 points.</li> </ul> <p><b>Lates</b> Those students who are late for lessons for more than 15 minutes are not allowed to participate at the lesson. Despite this, the student is allowed to take part in the second part of the lesson.</p> <p><b>Tests</b> Those students who have informed the teacher and the dean’s office about missing the test in advance for particular reasons, are allowed to take the test next week.</p> <p><b>Exams</b> All the issues related to the participation and admission to the exam are regulated by the faculty dean. Topics of midterm and final exams are provided for the students before the exams. The questions of midterm exam are not repeated in the final exam.</p> <p><b>Violation of the rules of the exams</b> Disrupting the test and taking copy during midterm and final exams is forbidden. Test papers of the student who do not follow these rules are canceled and the students are expelled from the test by getting 0 (zero).</p> <p><b>The rule for completing the course</b> In accordance with the University rules the overall success rate to complete the course should be 60% or above. The students who failed the exam would be to take this subject next semester or next year.</p> <p><b>Rules of conduct for Students</b> Disruption of the lesson and not following ethical norms during the lesson, as well as conduction of the discussions by the students without permission and using mobile phones is forbidden</p>
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This program reflects the comprehensive information about the subject and information about any changes will be provided in advance.

Week	Dates (planned)	Subject topics	Textbook/ Assignments
1	16.09.24	Lecture №1 Binary system. Rules of binary addition and Subtraction. Binary multiplication and division.)	[1] p. 4-28 [3]
		Seminar №1 Practices and problem solving on the topic.	[1] p.2-2
2	19.09.24	Lecture №2. Binary- to decimal conversion. Decimal to binary conversion.	[1] p.30-80 [3]
		Seminar №2: Practices and problem solving on the topic	[1] p.
3	26.09.24	Lecture №3. Introduction. Definition. Types of microcontrollers (bit-size based categorization, memory –based categorization, external memory microcontroller instruction-set based categorization, PIC, AVR and AMR microcontrollers. Khazar-MCU-3	[1] p.82-127 [3]
		<b>Seminar №3:</b> Practices and problem solving on the topic	[1] p.
4	03.10.24	Lecture №4 Microcontroller architecture (CPU-Controller’s processor unit, I/O-input-output unit, memory, timer counter ADC-analog to digital converter, DAC-digital to analog converter ) (Khazar-MCU-3)	[1] p. 128-174 [3]

		<b>Seminar №4:</b> Practices and problem solving on the topic	[3] p.
5	10.10.24	Lecture №5. Diagrammatic representation for the microcontroller. Advantages and disadvantages of microcontroller. (Khazar-MCU-3	[1] p.175-215 [3]
		<b>Seminar №5:</b> Practices and problem solving on the topic	[1] p.
6	17.10.24	Lecture №6. Introduction to Microprocessor and Microcomputer Architecture	[1] p.216-252 [3]
		<b>Seminar №6:</b> . Practices and problem solving on the topic	[1] p.
7	24.10.24	<b>Lecture №7.</b> 8051 Microcontroller Applications; Block Diagram, features Embedded Systems Interfacing with 8051(Relay, PWM Generator, DC Motor and Stepper Motor) (Khazar –MCU-2)	[1] p.370-411 [3]
		<b>Seminar №7:</b> Practices and problem solving on the topic	[1] p.
8	31.10.24	Lecture №8. Embedded system. Examples to embedded system (Consumer electronic DVD player, hi-fi, TV, air-conditioner, washing machine , medical monitoring devices EKG, blood pump, blood pressure meter, security system alarm, remote sueveliance, smart card reader, personal computing keyboard, printer, USB hub, automotive ignition control, ABS(anti-lock brake system, automatic transmission, communications handphone, modem,radio,radar, satellite etc.	[1] p.613-647 [3]
		<b>Seminar №8:</b> Practices and problem solving on the topic	[1] p.
9	07.11.24	<b>Mid term exam</b>	
10	14.11. 24	Lecture №9. Microconroller vc Microprocessor. Input and output devices (sensors). Provision interface hardware from software. Memory mapped I/O .	[1] p.2-2 [3]
		<b>Seminar №9</b> Practices and problem solving on the topic	[1] p.
11	21.11.24	Lecture №10. Microcontroller 8051 family (8048, 8049, 8050). Memory mapping of microcontroller 8051. Advantages of microcontroller over microprocessor.	[2] p. [3]
		<b>Seminar №10:</b> . Practices and problem solving on the topic	[2] p.
12	28.11.24	Lecture №11. Integrated Circuit. Central Processing Unit. Graphics processing units.	[2] p.
		<b>Seminar №11:</b> Practices and problem solving on the topic	
13	05.12.24	Lecture №12. Arithmetic-logic unit. Processor registers. Fetching, decoding, execution.	[2] p
		<b>Seminar №12:</b> Practices and problem solving on the topic	[2] p.
14	12.12.24	Lecture №13. Electric circuit. Main and virtual Memory. Flash memory .Multi-level cell. ROM,PROM, EPROM and EEPROM	[2] p.
		<b>Seminar №13:</b> <i>Practices and problem solving on the topic</i>	[2] p.
15	19.12.24	Lecture №14. Power Analysis. Instantaneous and average power. Power in circuits. Power factor. Active reactive power. Maximum power transformation.	[2] p.
		<b>Seminar №14</b> <i>Practices and problem solving on the topic</i>	[2] p.
16		Lecture №15. Input-Output channels. Hardware. Operating System Peripheral equipment.	[2] p.
		<b>Seminar №15:</b> . <i>Practices and problem solving on the topic</i>	[2] p.
		<b>Final Exam</b>	