

<b>General information</b>	<b>Title and code of subject, number of credits</b>	EENG 245 Basic Electronics, 8 ECTS	
	<b>Department</b>	Physics and Electronics	
	<b>Program</b>	Bachelor	
	<b>Academic semester</b>	2023 spring	
	<b>Lecturer</b>	Master of Science (Electronics Engineering) Sabuhi Ganiyev	
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	<b>Phone number:</b>	+994 77 520 73 50	
	<b>Lecture room/Schedule</b>	11 Mehseti Street, AZ1096 Baku, Azerbaijan (Neftchilar campus), room	
	<b>Consultations</b>	Saturday 13:00 – 14:00	
<b>Course language</b>	English		
<b>Type of the subject</b>	Major		
<b>Textbooks and additional materials</b>	<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. Fundamentals of electric circuits, Charles K. Alexander, Matthew N. O. Sadiku, 5th Edition, 2013</li> <li>2. Electronic devices: conventional current version, Thomas L. Floyd, 10th Edition, 2018 (required).</li> <li>3. Electrical Engineering: Principles and Applications, Allan R. Hambley, 6th Edition, 2014</li> <li>4. Basic Electronics: Devices, Circuits and System, K. Parmar, 2021</li> </ol> <p>Optional Reference Texts:</p> <ol style="list-style-type: none"> <li>5. Grob's Basic Electronics, Schultz, Mitchel E., and Bernard Grob. 11th ed. New York, NY: McGraw-Hill, 2011.</li> </ol> <p>Additional Resource Texts:</p> <ol style="list-style-type: none"> <li>6. Principles and Applications of Electrical Engineering, Giorgio Rizzoni, 5th Edition, 2014</li> </ol> <p><b>Auxiliary Web sources:</b></p> <p><a href="https://www.youtube.com/watch?v=ZRLXDiiUv8Q&amp;list=PLSQI0a2vh4HCLqA-rhMi_Z_WnBkD3wUka">https://www.youtube.com/watch?v=ZRLXDiiUv8Q&amp;list=PLSQI0a2vh4HCLqA-rhMi_Z_WnBkD3wUka</a></p> <p><a href="https://www.youtube.com/watch?v=VfXGWWyJPmQ">https://www.youtube.com/watch?v=VfXGWWyJPmQ</a></p> <p><a href="https://www.youtube.com/watch?v=iOSbNTYrc1s">https://www.youtube.com/watch?v=iOSbNTYrc1s</a></p> <p><a href="https://www.youtube.com/watch?v=P54hVuje4Dg">https://www.youtube.com/watch?v=P54hVuje4Dg</a></p> <p><a href="https://www.youtube.com/watch?v=58PzPrjGsG8">https://www.youtube.com/watch?v=58PzPrjGsG8</a></p> <p><a href="https://www.youtube.com/watch?v=paDs-Hnmklo">https://www.youtube.com/watch?v=paDs-Hnmklo</a></p> <p><a href="https://www.youtube.com/watch?v=Rgl4OAm9tnU">https://www.youtube.com/watch?v=Rgl4OAm9tnU</a></p>		
<b>Teaching methods</b>	<b>Lecture</b>		15
	<b>Group discussions at seminars</b>		15
<b>Assessment</b>	<b>Components</b>	<b>Date/ Deadline</b>	<b>Percent (%)</b>
	<b>Active participation</b>	At each lesson	5
	<b>Quizzes</b>	During the semester	20
	<b>Attendance</b>	At each lesson	5
	<b>Midterm exam</b>		30
	<b>Final exam</b>		40
	<b>Final</b>		<b>100</b>
<b>Course description</b>	The purpose of this course is to teach underground students the fundamentals of electronics. This course mainly covers topics that are related to direct current circuits. Generally, the course consists of three sections. The first section covers basic concepts and basic laws of electric circuits. The second part studies electronic components such as diodes, capacitors, inductors, transistors, thyristors, operational amplifier and their application. The third section analyzes operation principles of oscillators and active filters. Moreover, along this course students will be introduced Multisim schematic capture and simulation software that make easier to design and analyze electrical circuits.		
<b>Course objectives</b>	The main objectives of this course is to introduce the main concepts electronics, and to teach fundamentals of electronic circuit design.		
<b>Learning outcomes</b>	<p>Learning outcomes:</p> <ul style="list-style-type: none"> <li>• Students will know basic concepts of electric circuits.</li> <li>• Students will know basic laws of electric circuits.</li> <li>• Students will know fundamentals of electronic circuit design.</li> <li>• Students will know operation principles of resistors, diodes, capacitors, inductors, transistors, thyristors, amplifiers, active filters and oscillators.</li> <li>• Students will be able to design and analyze of electric circuits using Multisim software.</li> </ul>		

<b>Rules (Educational policy and behavior)</b>	<p>Lesson organization 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.</p> <p>Attendance Participation of students at all classes 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.</p> <p>Lates 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>Quizzes Those students who have informed the teacher and the dean's office about missing the quiz in advance for particular reasons, are allowed to take the quiz next week.</p> <p>Exams 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. Violation of the rules of the exams Disrupting the quiz and taking copy during midterm and final exams is forbidden. Quiz papers of the student who do not follow these rules are canceled and the students are expelled from the quiz by getting 0 (zero). The rule for completing the course 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>Rules of conduct for Students 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> <p><b>Quizzes</b></p> <ul style="list-style-type: none"> <li>▪ Quizzes will be held 4 times during the semester The quizzes will be announced in the classroom two weeks before. Quiz is from homework problems. The homework problems will be selected from questions and problems in the end of each chapter. The No. of homework problems will be announced after finishing each chapter.</li> </ul> <ul style="list-style-type: none"> <li>• <b>Attendance</b> Students who attend the whole classes will get 5 marks. for two absence student loses 1 mark.</li> <li>• <b>Activity</b> Students who will be active during discussion of past lessons will be awarded with one activity mark.</li> </ul>
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Week	Dates (planned)	Subject topics	Textbook/ Assignments
1		<i>Introduction to electronics:</i> The Atom. Materials Used in Electronics. Current in Semiconductors. N-Type and P-Type Semiconductors. The PN Junction. <i>Questions and Exercises</i>	[2] p. 19-37
2		<i>Basic Concepts and Law:</i> Systems of units. Charge and current. Voltage. Power and energy. Circuit elements. Ohm's law. Nodes, branches, and loops. Kirchoff's laws. Series resistors and voltage division. Parallel resistors and current division. <i>Questions and Exercises</i>	[1] p. 4-20 [1] p.30-52 [1] p. 24-28 [1] p. 67-81
3		<i>Diodes and applications:</i> Diode operation. Voltage-current ( <i>V-I</i> ) characteristics of a diode. Diode models. Half-wave rectifiers. Full-wave rectifiers. <i>Questions and Exercises</i>	[2] p. 43-69 [2] p. 76-85
4		<i>Diodes and applications:</i> the zener diode. Zener diode applications. The varactor diode. Optical diodes.	[2] p. 121-158 [2] p. 174-178

5		Capacitor and inductors: Capacitors. Series and parallel capacitors. Inductors. Series and parallel inductors. Practical inductors Mutual inductance. Applications.	[1] p. 216-240 [3] p. 124-148
		<b>Quiz 1(Lec1-Lec4)</b>	
6		<b>Public holiday</b>	
7		Bipolar junction transistor: Bipolar Junction Transistor (BJT) structure. Basic BJT operation. BJT characteristics and parameters. The BJT as an amplifier. The BJT as a switch. The phototransistor. The DC operating point. Voltage-divider bias. Other bias methods. Questions and Exercises	[2] p. 179-205 [2] p. 226-230
8		BJT amplifiers: Amplifier operation. Transistor AC models. The common-emitter amplifier. The common-collector amplifier. The common-base amplifier. Quiz 2(Lec5-Lec6)	[2] p. 274-302 [2] p. 312-316
9		<b>Mid term exam</b>	
10		Field Effect Transistors: The JFET. JFET characteristics and parameters. JFET biasing. The Ohmic region. The MOSFET. MOSFET Characteristics and Parameters. MOSFET Biasing. Questions and Exercises.	[2] p. 383-425 [2] p. 426-427
11		Thyristors: The Four-Layer Diode. The Silicon-Controlled Rectifier (SCR) SCR Applications. The Diac and Triac. The Silicon-Controlled Switch (SCS). The Unijunction Transistor (UJT) Questions and Exercises.	[2] p. 571-593 [2] p. 604-607
12		The operational amplifier: Introduction to operational amplifiers. Op-amp input modes and parameters. Negative feedback. Op-amps with negative feedback. Effects of negative feedback on Op-amp. Impedances. Bias current and offset voltage. Open-loop frequency and phase responses. Closed-loop frequency response. Comparators. Summing Amplifiers. Integrators and Differentiators. Quiz 3(Lec9-Lec10)	[2] p. 609-641 [2] p. 674-689 [2] p. 718-622
13		Basic filter responses: Filter response characteristics. Active low-pass filters. Active high-pass filters. Active band-pass filters. Active band-stop filters. Filter response measurements. Questions and Exercises	[2] p. 772-776 [2] p. 780-795
14		Voltage regulators: Voltage Regulation. Basic Linear Series Regulators. Basic Linear Shunt Regulator. Basic Switching Regulators Questions and Exercises	[2] p. 860-882
15		Recap of all covered material Quiz 4(Lec11-Lec13)	
		<b>Final Exam</b>	

