Identification	**Subject (Code, title, credits)**	EENG245, Basics of Electronics (Electronics Eng), 8 ECTS
	Department	Physics and Electronics
	Program	Undergraduate
	Term	Spring 2026
	Instructor	Nijat Hajiyev
	E-mail:	hajiyev.nijat@khazar.org
	Phone:	
	Classroom/hours	11 Mehseti str. (Neftchilar campus)
	Office hours	
Prerequisites	-	
Language	English	
Compulsory/ Electi ve	Elective	
Required textbooks and course materials	Textbooks: [1] - Malvino, A. P., and D. J. Bates, *Electronic Principles*, 8th ed., McGraw-Hill, 2015. [2] - Horowitz, P., and W. Hill, *The Art of Electronics*, 3rd ed., Cambridge University Press, 2015. [3] - Electronics Fundamentals Circuits Devices and Applications – D.M. Buchla and T.L. Floyd-2014	
Course description	This course introduces the fundamental concepts and components of basic electronics. The course covers electrical quantities, circuit elements, DC and AC circuit analysis, semiconductor fundamentals, diode circuits, basic transistor operation, and introductory amplifier concepts. Emphasis is placed on understanding how electronic components work and how they are used in simple electronic circuits. Students gain practical experience with basic measurement instruments such as multimeters and power supplies, and learn to read circuit schematics, perform basic calculations, and build simple electronic circuits. By the end of the course, students are able to analyze and implement basic electronic circuits that form the foundation for more advanced electronics and analog circuit courses.	
Course objectives	• To develop a fundamental understanding of basic electronic components and circuit elements. • To introduce students to the principles and operation of semiconductor devices such as diodes and transistors. • To teach students how to analyze and understand simple electronic circuits using basic theoretical methods. • To enhance practical skills in building, testing, and measuring basic electronic circuits using standard laboratory instruments.	

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<tr><td>Learning outcomes</td><td colspan="3">

Understand the basic principles of electronics, including voltage, current, resistance, power, and energy.
Analyze simple electronic circuits using Ohm’s Law, Kirchhoff’s laws, and basic circuit theorems.
Identify and explain the function of fundamental electronic components such as resistors, capacitors, inductors, diodes, and transistors.
Build, test, and troubleshoot basic electronic circuits in a laboratory environment.
Understand the behavior of analog and digital signals and their role in electronic systems.
Apply theoretical knowledge to solve practical electronics problems and interpret circuit behavior.
Recognize the applications of basic electronics in real-world devices and systems.

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<tr><td rowspan="4">Teaching methods</td><td colspan="2">Case analysis</td><td>x</td></tr>
<tr><td colspan="2">Group discussion</td><td>x</td></tr>
<tr><td colspan="2">Lecture</td><td>x</td></tr>
<tr><td colspan="2">Simulation</td><td>x</td></tr>
<tr><td rowspan="8">Evaluation Criteria</td><td>Methods</td><td>Date/deadlines</td><td>Percentage (%)</td></tr>
<tr><td>Midterm Exam</td><td></td><td>30</td></tr>
<tr><td>Attendance</td><td>At each lesson</td><td>5</td></tr>
<tr><td>Quiz</td><td>2 quizzes during the semester</td><td>10</td></tr>
<tr><td>Practical Assignments</td><td>2 lab works after midterm</td><td>10</td></tr>
<tr><td>Activity</td><td>At each lesson</td><td>5</td></tr>
<tr><td>Final Exam</td><td></td><td>40</td></tr>
<tr><td>Total</td><td></td><td>100</td></tr>
<tr><td>Policy</td><td colspan="3">

Preparation for class
The structure of this course makes your individual study and preparation outside the class extremely important. The lecture material will focus on the major points introduced in the text. Reading the assigned chapters and having some familiarity with them before class will greatly assist your understanding of the lecture. After the lecture, you should study your notes and work on relevant problems and cases from the end of the chapter and sample exam questions.
Withdrawal (pass/fail)
This course strictly follows the grading policy of the School of Science and Engineering. Thus, a student is expected to achieve a mark of at least 60% to pass. In case of failure, he/she will be required to repeat the course the following term or year.
Cheating/plagiarism
Cheating or other plagiarism during the Quizzes, Midterm, and Final Examinations will lead to paper cancellation. In this case, the student will automatically get zero (0) without consideration.
Professional behavior guidelines
The students shall behave in a way to create a favorable academic and professional environment during class hours. Unauthorized discussions

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	and unethical behavior are strictly prohibited. ▪ **Attendance** Students who attend the whole classes will get 5 marks. for three absence student loses 1 mark. ▪ **Practical Assignments** There will be 2 lab works after midterm. Students are required to design, implement, and test basic electronic circuits related to the topics covered in the course. Assessment is based on correct circuit implementation, proper use of laboratory instruments, accuracy of measurements, analysis of results, and successful demonstration of circuit functionality. The laboratory work evaluates students' understanding of fundamental electronic principles and their ability to apply theory in practical experiments. ▪ **Quizzes** There will be 2 quizzes during the semester. The quiz will be announced in the classroom two weeks before and will relate to homework. ▪ **Activity** Students who will be active during the discussion of past lessons and who will solve homework problems in a class will be awarded one activity mark.

Tentative Schedule			
Weeks	Date/Day	Topics	Reference to textbooks
1.		Introduction to electronics: The Atom. Systems of units. Charge and current. Voltage. Power and energy. Circuit elements. Ohm's law. Nodes, branches, and loops. Kirchhoff's laws. Series resistors and voltage division. Parallel resistors and current division.	[1] p3
2.		Materials Used in Electronics. Current in Semiconductors. N-Type and P-Type Semiconductors. The PN Junction.	[1] p29
3.		Diodes and applications: Diode operation. Voltage-current (V-I) characteristics of a diode. Diode models. Half-wave rectifiers. Full-wave rectifiers.	[1] p87
4.		Diodes and applications: the LED. the zener diode. Zener diode applications. The varactor diode. Optical diodes.	[1] p140
5.		Capacitor and inductors: Capacitors. Series and parallel capacitors. Inductors. Series and parallel inductors. Practical inductors Mutual inductance. Applications	[2] p18
6.		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.	[1] p190

7.		***Quiz.***	
8.		BJT amplifiers: Amplifier operation. Transistor AC models. The common-emitter amplifier. The common-collector amplifier. The common-base amplifier.	[1] p282
9.		**Midterm exam**	
10.		Field Effect Transistors: The JFET. JFET characteristics and parameters. JFET biasing. The Ohmic region. The MOSFET. MOSFET Characteristics and Parameters. MOSFET Biasing.	[1] p416
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)	[1] p526
12.		The operational amplifier: Introduction to operational amplifiers. Op-amp input modes and parameters. Negative feedback. Op-amps with negative feedback.	[1] p668
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.	[1] p790
14.		Oscillators: The Oscillator. Feedback Oscillators. Oscillators with RC Feedback Circuits. Oscillators with LC Feedback Circuits. Relaxation Oscillator	[1] p902
15.		Solving additional problems and ambiguities of students about the course	
	TBC	Final exam	

This syllabus is a guide for the course and any modifications to it will be announced in advance.