Identification	**Subject (Code, title, credits)**	ETR231, Analog Electronics, 6 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/ Elective	Compulsory	
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.	
Course description	This course introduces the fundamental principles of analog electronics with emphasis on radiotechnical applications. The course covers analog signal concepts, diode circuits, bipolar junction transistors (BJTs), MOSFETs, operational amplifiers, oscillators, and basic modulation techniques. Both theoretical analysis and practical circuit implementation are emphasized. Students gain hands-on experience with measurement instruments such as multimeters, function generators, and oscilloscopes, and learn to analyze amplifier performance, frequency response, and signal behavior in real electronic systems. The course also focuses on practical design considerations, measurement accuracy, noise sources, and troubleshooting techniques. By the end of the course, students are able to design, analyze, and evaluate basic analog electronic circuits commonly used in radiotechnical systems.	
Course objectives	• To develop a foundational understanding of analog signals and analog electronic circuits used in radiotechnical systems. • To introduce students to the operating principles and characteristics of diodes, BJTs, MOSFETs, and operational amplifiers. • To teach students how to analyze and design basic analog amplifiers, filters, and oscillators. • To enhance practical skills in measuring, visualizing, and analyzing analog signals using standard laboratory instruments. • To familiarize students with basic modulation techniques and the application of analog circuits in radio-frequency systems.	
Learning outcomes	Upon completion of this course, students will be able to: • Understand and analyze analog signals and fundamental analog electronic circuits used in radiotechnical systems. • Explain the operation and practical applications of diodes, BJTs, MOSFETs, and operational amplifiers. • Design and evaluate basic analog amplifier, filter, and oscillator circuits.	

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Apply amplitude modulation and signal detection principles in simple radio-frequency systems.
Perform accurate measurements, analyze circuit performance, and troubleshoot analog electronic systems using standard laboratory instruments.

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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 thefollowing 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 professionalenvironment during class hours. Unauthorized discussions 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 a practical analog electronic project. Assessment is based on circuit design correctness, functionality, measurement and analysis of results, and a brief project report and/or demonstration. The project must reflect the application of electronic analog principles

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	covered in the course. ▪ **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 lesson will be awarded one activity mark.

Tentative Schedule			
Weeks	Date/Day	Topics	Reference to textbooks
1.		Introduction to analog signals and analog electronic systems. DC and AC signal concepts.	[2] p13
2.		Ideal and non-ideal behavior of electronic components. Signal generation and visualization techniques.	[1] p6 [2] p55
3.		Basic electrical measurements using multimeters and oscilloscopes.	[1] p20
4.		PN junction diodes and diode types (signal, Zener, Schottky). Diode V–I characteristics.	[1] p76
5.		Diode applications in rectification and voltage regulation. Diode-based AM signal detection.	[1] p88
6.		Bipolar Junction Transistors (BJT): structure, operation, and operating regions.	[1] p190
7.		**Midterm exam.**	
8.		BJT amplifier configurations (CE, CB, CC). Small-signal amplification and preamplifier applications.	[1] p329
9.		MOSFET fundamentals and comparison with BJTs. Input impedance and buffering concepts.amplifier behavior.	[1] p472
10.		Common-source and common-drain MOSFET amplifiers. Practical amplifier behavior.	[1] p508
11.		Amplifier gain, bandwidth, frequency response, and decibel representation	[1] p569
12.		Operational amplifier principles. Inverting and non-inverting op-amp configurations and applications.	[1] p680
13.		Feedback concepts in analog circuits. RC and LC oscillator principles and frequency generation.	[1] p905
14.		Fundamentals of amplitude modulation (AM). AM modulation, envelope detection, measurement issues, and mini-project realization.	[2] p969
15.		Course review. Integration of analog electronic circuits. evaluation of laboratory projects.	
	TBC	Final exam	

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