

Identification	Subject	ETR 330 Electrical and electronic devices 6 ECTS
	Department	Physics and Electronics
	Program (Undergraduate, Graduate)	Undergraduate
	Term	Fall 2026
	Instructor	Asim Mammadov
	Email:	Asimmammadov@yahoo.com Asim.mammadov@khazar.org
	Classroom/hours	11 Mehseti Street, AZ1096 Baku, Azerbaijan (Neftchilar campus), Wednesday, 18:40-20:00,20:10-21:40
Prerequisites	None	
Language	English	
Compulsory/Elective	Compulsory	
Textbooks and course materials	Textbooks: 1. Electrical Engineering: Principles and Applications — Allan R. Hambley, 7th Edition, 2023 2. Electronic Devices and Circuit Theory — Robert L. Boylestad, Louis Nashelsky, 11th Edition, 2013 Optional Reference Texts: 3. Fundamentals of Electrical Engineering, Giorgio Rizzoni, 2nd Edition, McGraw-Hill, 2022. 4. Principles and Applications of Electrical Engineering, Giorgio Rizzoni and James Kearns, 7th Edition, McGraw-Hill, 2022. 5. A Textbook of Electrical Technology — B. L. Theraja, A. K. Theraja, 23rd Edition, 2006	
Course description	This course provides fundamental knowledge of electrical and electronic devices, their operating principles, characteristics, applications, and practical use in electrical and automation systems. The course covers essential electrical components and electronic devices, including resistors, capacitors, inductors, transformers, diodes, rectifiers, transistors, operational amplifiers, sensors, switches, relays, contactors, and semiconductor devices. Students will study the basic principles of electrical and electronic circuits, component characteristics, circuit behavior, power supplies, signal conditioning, amplification, switching, and protection systems. Particular attention is given to understanding device datasheets, selecting appropriate components, interpreting circuit diagrams, and analyzing common electrical and electronic circuits.	
Course objectives	The course aims to provide students with fundamental theoretical and practical knowledge of Electrical and Electronic Engineering, with particular emphasis on electrical and electronic devices, their operating principles, characteristics, construction, and applications. It focuses on developing students' ability to understand and analyze electrical and electronic circuits and to work with commonly used electrical and electronic components and devices. Students will study passive and active components, transformers, electrical machines, diodes, rectifiers, transistors, operational amplifiers, semiconductor devices, switches, relays, contactors, and power electronic devices. The course also develops skills in electrical measurements, circuit analysis, interpretation of circuit diagrams and technical specifications, device selection,	

	troubleshooting, and fault diagnosis, while emphasizing electrical safety and practical engineering applications.		
Learning Outcomes	Upon successful completion of the course, students will be able to: • Explain the fundamental principles, operating mechanisms, and key characteristics of modern electrical and electronic devices. • Analyze electrical and electronic circuits and evaluate the behavior of their components under different operating conditions. • Apply engineering principles to the operation and application of passive, active, semiconductor, and power electronic devices. • Evaluate and select appropriate electrical and electronic components based on technical specifications, electrical ratings, performance requirements, and operating conditions. • Perform and interpret basic electrical and electronic measurements using appropriate measuring instruments and techniques. • Interpret circuit diagrams, datasheets, characteristic curves, and technical documentation of electrical and electronic devices. • Identify and diagnose common faults in electrical and electronic circuits using systematic troubleshooting methods. • Apply electrical and electronic engineering knowledge to practical problems while considering reliability, efficiency, safety, and proper engineering practice.		
Teaching methods	Case analysis		☒
	Group discussion		x
	Lecture		☒
	Simulation		x
Evaluation Criteria	Methods	Date/deadlines	Percentage (%)
	Midterm Exam	TBA	30
	Quizzes	4 times during the semester	20
	Practical Assignments	-	
	Activity	During the semester	5
	Attendance	At each lesson	5
	Final Exam	TBA	40
	Total		100
Class Policy	General information on the subject will be provided for the students during lectures. Students' knowledge on the previous topics will be evaluated, and new topics will be explained by means 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 work by the end of course is obligatory Attendance Participation of students at all classes is important. Students should inform dean's office about missing lessons for reasons (illness, family issues and etc.). Students missing more than 25% of lessons are not allowed to take the exam. Students are required to attend at least 75% of the total classes (lectures and seminars).		

	Students who miss more than 25% of the classes are not allowed to take the final exam. Attendance contributes 5% to the final grade. For every two absences, 1 point is deducted from the attendance mark. 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. 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 exams 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 students 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 Generative AI Policy The use of Generative Artificial Intelligence (GAI) tools is partially permitted in this course. Students may use GAI tools for learning purposes, such as obtaining explanations of course concepts, organizing information, generating practice questions, and supporting their understanding of the course material. GAI tools may not be used to complete or generate answers for quizzes, midterm examinations, final examinations, or other assessed work unless explicitly authorized by the instructor. Students are responsible for the accuracy of any information obtained through GAI tools and must ensure that their submitted work reflects their own understanding, analysis, and intellectual contribution. Any use of GAI in accordance with the permitted purposes should be appropriately acknowledged by the student. The content of an assignment, essay, report, term paper, or project must not be produced in whole or in substantial part through generative artificial intelligence. Although the use of GAI as a supportive tool may be permitted, the main content and ideas must reflect the student's own intellectual effort. Professional behavior guidelines Students are expected to conduct themselves in a manner that fosters a constructive academic and professional environment during instructional hours. Unauthorized discourse and unethical behavior are strictly prohibited. Attendance Students who maintain full attendance for the duration of the course will be awarded 5 marks. Conversely, for every three absences recorded, the student will incur a deduction of 1 mark. Quizzes Four quizzes will be administered throughout the semester, with formal announcements made in class two weeks prior to the assessment date. The
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		content of each quiz is based on assigned homework problems, which are curated from the questions and problems at the end of each chapter. Activity Students who demonstrate active engagement during the review of previous lessons and proficiently solve problems during seminar sessions will be awarded one activity mark. Assessment will be based on students’ participation and performance in laboratory work and practical activities.	
Tentative Schedule			
Week	Date/Day (tentative)	Topics	Textbook/Assignments
1	16-09-2026	<i>Introduction to Electrical and Electronic Devices</i> : Electrical vs. electronic devices, basic electrical quantities, voltage, current, power, energy, AC/DC, device ratings and specifications	[1],[2]
2	23-09-2026	Passive Electrical Components Resistors, capacitors, inductors; construction, operating principles, characteristics, applications, series and parallel connections	[1],[2]
3	30-09-2026	<i>Electrical Measuring Devices</i> : Multimeter, ammeter, voltmeter, wattmeter measuring principles, accuracy, errors and safety measurement practices	[1],[2]
4	07-09-2026	<i>Transformers</i> : Construction and operating principle, electromagnetic induction, step-up/step-down transformers, turns ratio, losses, efficiency and applications	[1],[2]
5	14-10-2026	<i>Electrical Machines I</i> : DC machines, DC motors and generators, construction, operating principle, characteristics and applications	[3]
6	21-10-2026	<i>Electrical Machines II</i> : AC machines, induction motors, synchronous machines, construction, operating principles, characteristics and applications	[1],[2]
7	28-10-2026	<i>Switching and Protection Devices</i> : Switches, push buttons, fuses, circuit breakers, overload relays, contactors, relays and basic protection principles	[1],[4]
	TBC	Midterm exam	
8	04-11-2026	<i>Diodes and Semiconductor Devices</i> : Semiconductor fundamentals, PN junction, diode characteristics, Zener diode, LED, photodiode and basic applications	[1],[2]
9	11-11-2026	<i>Rectifiers and Power Supplies</i> : Half-wave and full-wave rectifiers, bridge rectifier, filters, voltage regulation, linear power supplies and SMPS fundamentals	[1],[3]
10	18-11-2026	<i>Transistors</i> : BJT and MOSFET, construction, operating regions, transistor as a switch and amplifier, characteristics and applications	[1],[4]
11	25-11-2026	<i>Operational Amplifiers</i> : Ideal op-amp concept, inverting and non-inverting amplifiers, voltage follower, summing amplifier, comparator and practical applications	[1],[3]
12	02-12-2026	<i>Digital Electronic Devices</i> : Logic gates, Boolean algebra, combinational logic, flip-flops, counters and basic digital electronic devices	[1],[2]

13	09-12-2026	<i>Power Electronic Devices</i> : SCR, TRIAC, DIAC, MOSFET and IGBT; switching principles, power control and typical applications	[1],[2]
14	16-12-2026	<i>Electronic Control and Signal Devices</i> : Sensors, switches, signal conditioning, isolation, analog/digital signals, ADC/DAC fundamentals and interface concepts	[1],[3]
15	23-12-2026	<i>Troubleshooting and Fault Diagnosis</i> : Common electrical/electronic faults, systematic troubleshooting, measurement-based diagnosis, component testing, fault identification and preventive practices	[4]
		Final exam	

