

SYLLABUS

General information	Title and code of subject, number of credits	ETR 220 Fundamentals of electrical engineering 8 ECTS	
	Department	Physics and Electronics	
	Program	Bachelor	
	Academic semester	2024 fall	
	Lecturer	Ph. D. Elvin Alizade	
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	Lecture room/Schedule	11 Mehseti Street, AZ1096 Baku, Azerbaijan (Neftchilar campus), room	
	Consultations		
Prerequisites	MATH 101		
Course language	English		
Type of the subject	Major		
Textbooks and additional materials	<p>Textbooks:</p> <ol style="list-style-type: none"> Electrical Engineering: Principles and Applications, Allan R. Hambley, Pearson, 7th Edition 2021 Electronics Fundamentals Circuits, Devices and Applications, Thomas L. Floyd, David L. Buchla 8th Edition, Pearson, 2014 <p>Optional Reference Texts:</p> <ol style="list-style-type: none"> Fundamentals of Electrical Engineering, Giorgio Rizzoni, 2nd Edition, McGraw-Hill, 2022. Principles and Applications of Electrical Engineering, Giorgio Rizzoni and James Kearns, 7th Edition, McGraw-Hill, 2022. Electrical Engineering: Principles and Applications by William Hayt Jr., Jack Kemmerly, and Steven Durbin, McGraw-Hill, 2021 		
Teaching methods	Lecture		15
	Group discussions at seminars		15
Assessment	Components	Date/ Deadline	Percent (%)
	Lab work	During the semester	10
	Quizzes	During the semester	20
	Attendance	At each lesson	5
	Midterm exam		30
	Final exam		30
	Final		100
Course description	<p>This course is designed to provide students with a solid foundation in the principles and concepts of electrical engineering. It covers the fundamental topics related to electric circuits, electromagnetic fields, semiconductor devices and logic circuits. Moreover, along this course students will be introduced Multisim schematic capture and simulation software that make easier to design and analyses electrical circuits. The course emphasizes practical applications and problem-solving techniques.</p>		
Course objectives	<p>The purpose of the "Fundamentals of Electrical Engineering" subject is to provide students studying at the bachelor's level in "Electrical and Electronics Engineering" with the analysis and calculation of stable and variable electric circuits, the analysis and calculation of electric and magnetic fields, the application of the electromagnetic field in electrical and electronic engineering. This course mainly covers topics related to direct current circuits. In general, the course consists of the following sections. The first section covers the basic concepts and basic laws of electrical circuits. The second section analyzes the working principles of filters. The third part studies electronic components such as diodes, capacitors, inductors, transistors and operational amplifiers and their applications. The final section discusses magnetically coupled circuits, electrical machines, and logic circuits. In addition, throughout this course, students will be introduced to Multiuse, a schematic capture and simulation program that facilitates the design and analysis of electrical circuits.</p>		
Learning outcomes	<p>Upon completing this course on Electrical Engineering Fundamentals, students should be able to achieve the following learning outcomes:</p> <ul style="list-style-type: none"> Understand the fundamental concepts of electrical engineering, including units, charge, current, voltage, power, and energy. Apply circuit analysis techniques using Ohm's law, Kirchhoff's laws, and nodal/mesh analysis 		

	<p>for solving electrical circuits.</p> <ul style="list-style-type: none"> Analyze electric fields, capacitance, and the behavior of capacitors in circuits. Evaluate magnetic fields, electromagnetism, and the operation of electromagnetic devices. Study inductors, mutual inductance, and transformers. Analyze alternating current and voltage, including AC generators and motors. Design and analyze filters, including low-pass, high-pass, and band-pass filters. Understand the behavior and applications of diodes, BJTs, and operational amplifiers. Apply knowledge of logic circuits and Boolean algebra in digital circuit analysis. Develop problem-solving and critical thinking skills relevant to electrical engineering. Apply learned principles to real-world engineering challenges and ensure electrical safety considerations.
Rules (Educational policy and behavior)	<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 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.</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 exams are not repeated in the final exam.</p> <p>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).</p> <p>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>Quizzes 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.</p> <p>Lab work Will be held 8 times during the semester.</p> <p>Attendance Students who attend the whole classes will get 5 marks. for two absence student loses 1 mark.</p> <p>Activity Students who will be active during discussion of past lessons will be awarded with one activity mark.</p>

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.		<i>Basic Concepts:</i> Systems of units. Charge and current, Voltage, Power and energy, Circuit elements, Applications, Electrical safety. <i>Questions and Exercises</i>	[1],[2]
2.		<i>Basic Laws:</i> Ohm's law. Nodes, branches, and loops. Kirchhoff's laws. Series resistors and voltage division. Parallel resistors and current division. Nodal and Mesh Analysis. <i>Questions and Exercises</i>	[1],[2]

3.		<i>Electric Field and Capacitance:</i> Electric field, Capacitors and dielectrics, Capacitor circuits, Energy stored in electric fields. <i>Questions and Exercises, Quiz 1</i>	[1],[2]
4.		<i>Magnetic Field and Electromagnetic devices:</i> Magnetic field, Electromagnetism, Electromagnetic Devices, Electromagnetic Induction, DC Generators, DC Motors. <i>Questions and Exercises</i>	[1],[2]
5.		<i>Inductor and transformers:</i> Inductors and inductance, Inductor circuits, Mutual inductance, Energy stored in magnetic fields, Transformers. <i>Questions and Exercises</i>	[1],[2]
6.		<i>Alternating Current And Voltage:</i> The Sinusoidal Waveform, Voltage and Current Values of Sine Waves, Angular Measurement of a Sine Wave, The Sine Wave Formula, Analysis of AC Circuits, Alternators (AC Generators), AC Motors. <i>Questions and Exercises</i>	[1],[2]
7.		<i>Filters:</i> First-Order Filters, Transfer Functions, Low-Pass Filters, High-Pass Filters, Second-Order Filters, Band-Pass Filters, Band-Stop Filters. <i>Questions and Exercises, Quiz 2</i>	[1],[2]
8.		<i>Semiconductor Devices and Circuits:</i> Diodes and applications. Half-wave rectifiers. Full-wave rectifiers. <i>Questions and Exercises</i>	[1],[2]
9.		<i>Semiconductor Devices and Circuits:</i> The Zener diode. Zener diode applications. The varactor diode. Optical diodes. <i>Questions and Exercises</i>	[1],[2]
10.		Mid term exam	
11.		<i>Semiconductor Devices and Circuits:</i> Bipolar junction transistors, BJT amplifiers. Operational amplifiers. <i>Questions and Exercises.</i>	[1],[2]
12.		<i>Semiconductor Devices and Circuits:</i> Bipolar junction transistors. BJT amplifiers. <i>Questions and Exercises. Quiz 3</i>	[1],[2]
13.		<i>Semiconductor Devices and Circuits:</i> Operational amplifier. Operational amplifier circuits. <i>Questions and Exercises.</i>	[1],[2]
14.		<i>Semiconductor Devices and Circuits:</i> Operational amplifier. Operational amplifier circuits. <i>Questions and Exercises.</i>	[1],[2]
15.		<i>Logic Circuits:</i> Number systems. Boolean algebra. Boolean logic gates. <i>Questions and Exercises, Quiz 4</i>	[2]
		Final Exam	

