

<b>Identification</b>	<b>Subject (code, title, credits)</b>	ETR385 Designing Radio Electronic Devices 6 ECTS	
	<b>Department</b>	Physics and Electronics	
	<b>Program</b>	Undergraduate, bachelor	
	<b>Term</b>	Spring, 2022	
	<b>Instructors</b>	Assoc.Prof., Hasanov Elchin	
	<b>E-mail:</b>	<a href="mailto:elgafgas@yahoo.com">elgafgas@yahoo.com</a>	
	<b>Phone:</b>	4217927 (255)	
	<b>Classroom/hours</b>	Saturday 17:10-20:10	
	<b>Office hours</b>	9:00 – 10:00	
<b>Prerequisites</b>	EENG 245 Basic Electronics		
<b>Language</b>	English		
<b>Compulsory/Elective</b>	Compulsory		
<b>Required textbooks and course materials</b>	<p><b>Core Textbook:</b> 1. Dogadin N.B. Fundamentals of Radioengineering, Moscow 2007</p> <p><b>Supplementary Textbooks:</b> 2.R.Z.Kazimzade and J.S.Asgerov Fundamentals of electro- and radioengineering Baku-2013 3.Davudov B., Dashdemirov K. Radiophysics Baku-2008 4.Gershunsky B.S. Fundamentals of electronics Moscow-1977 5.Khromoy B.P., Moiseev U.G. Electro- and Radio measurements.</p>		
<b>Course website</b>	Under preparation		
<b>Course outline</b>	<p>We're surrounded by signals. Visual, audio, mechanical, electrical; active, passive; physical events which convey information, alert us to the specific conditions, and deliver our energy. With prearranged signals, we know what has happened as soon as evidence of the signal occurs. Other signals carry information within them and need to be decoded and processed in order to learn what they mean. Still, other signals carry power and the only information we get is that our building is still receiving 120V AC.</p>		
<b>Course objectives</b>	<p>Study of the methodology for the development of designs of electronic equipment using a computer and computer-aided design tools. The course synthesizes and deepens the knowledge gained and based on its further development, allows solving the problems of designing radio-electronic means of the required reliability based on the wide use of unification, normalization and standardization of elements and units. The core of the course consists of the tasks of designing electronic equipment and methods for ensuring their reliability. To successfully study the course, the student needs to know modern layout methods, circuitry, the basics of probability theory and mathematical statistics, issues of heat and mass transfer, electromagnetic compatibility, the theory of mechanical vibrations. The course consolidates such general subject skills as the classification of problems in the theory of reliability of designing RES, modeling the processes of functioning of systems.</p>		
<b>Learning outcomes</b>	<p>Ultimately, students should know the following:</p> <ul style="list-style-type: none"> <li>- Classification and use of radio waves</li> <li>- What is the propagation of radio waves in free space</li> <li>- The structure of the troposphere and the propagation of radio waves in it</li> <li>- Composition and structure of the ionosphere</li> <li>- Concepts of medium, short and meter waves.</li> <li>- Decimeter, centimeter, millimeter waves and radio waves and their structure</li> </ul>		
<b>Teaching methods</b>	<b>Lecture</b>		X
	<b>Group discussion</b>		
	<b>Experiential exercise</b>		
	<b>Case analysis</b>		
	<b>Problem Solving</b>		X
	<b>Course paper</b>		
	<b>Others</b>		
<b>Evaluation</b>	<b>Methods</b>	<b>Date/deadlines</b>	<b>Percentage (%)</b>
	<b>Midterm Exam</b>		30

	<b>Participation</b>	At each lesson	5
	<b>Activity</b>	During the semester	5
	<b>Presentation</b>	At the end of the semester	15
	<b>Quizzes</b>	At each lesson	5
	<b>Final Exam</b>		40
	<b>Total</b>		100

<b>Policy</b>	<p><b>Methods of Assessment and Evaluation</b></p> <p><b>Quizzes:</b> During the semester in Problems Solving sessions there will be 20-minute written quizzes (5 in total) to evaluate whether assigned readings are completed. No make-up quizzes will be given. Quizzes missed due to a serious illness, or a family emergency will be dealt with on a case-by-case basis.</p> <p><b>Exams:</b> There will be an in-class mid-term exam and a final exam. An in-class mid-term exam will be worth 30% of the total grade. The final exam will be worth 40% of the total grade as well. The mid-term and approximately one-half to two-thirds of the final are not cumulative other than the fact that some of the material will be dependent on previous material. The last portion (one-third to one-half) of the final exam will be cumulative. No make-up exams will be given. If you have a serious conflict with an exam time, you must discuss it with the instructor and take the exam early. Exams missed due to a serious illness or a family emergency (these must be documented) will be dealt with on a case-by-case basis.</p> <p>For exams students will be allowed to bring an electronic calculator. No other materials or devices (including mobile phones) may be used during the exams.</p> <p><b>Pass/Fail:</b> Khazar University uses 100 points grading system with 60 point passing grade for bachelor students. In case of failure, student will be required to repeat the course the following term or year.</p> <p><b>Attendance /Activity</b></p> <p>Every student is expected to attend every class, to arrive on time, to stay until the end of class, and to participate with high quality discussion. Those having legitimate reasons for absence (illness, family bereavement etc) are required to inform the instructor. Generally, <b>25 %</b> unauthorized absence marks will lead to the student's expulsion from the Course.</p> <p>If student is late to the class for more than five (5) minutes, then he/she may not be allowed to enter and disturb the class. For successful completion of the course, the students shall take an active part during classes, raising questions and participating in-group discussions.</p> <p><b>Professional Behavior Guidelines:</b> The student shall behave in the way to create favorable academic and professional environment during the class hours. Unauthorized discussions and unethical behavior are strictly prohibited.</p> <p><b>Honesty Issues:</b> All Khazar University students are bound by honor to maintain the highest level of academic integrity. By virtue of membership in the Khazar University community, every student accepts the responsibility to know the rules of academic honesty, to always abide by them, and to encourage all others to do the same. Cheating or other plagiarism during the mid-term and final examinations will lead to paper cancellation. In this case, the student will automatically get zero (0), without any considerations. Students are supposed to read about the topics before they are discussed in lectures. It is not necessary that students study them carefully, but at least they should get the "smell of it". This should make it much easier for students to follow the lectures and find them more interesting.</p>		
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<b>Tentative Schedule</b>			
<b>Week</b>	<b>Date/Day (tentative)</b>	<b>Topics</b>	<b>Textbook/Assignments</b>
1	14.02.22	Introduction. Basic radio-engineering signals. Classifying signals. Harmonic signal. Pulsed signal. Spectral description of a signal. Discretization the signals. Examination knowledges of students individually on the material of respective lecture. Analysis the lecture material in details. Solving problems.	[1], Chapter 1 [2], Chapters 2
2	21.02.22	Modulation. Spectral analysis of periodic and nonperiodic signals. Signal energetic spectrum. Signals with discrete spectrum Calculating circuit at stationary regime. Analysis the transition processes in radio-engineering devices. Seminar 2 Examination knowledges of students individually on the material of respective lecture. Analysis the lecture material in details. Solving problems.	[1], Chapter 2 [3], Chapters 2

3	28.02.22	Searching methods, the radio-engineering circuits. Linear circuits. Computation the circuits in a steady regime. Analyzing transition processes. Examination knowledges of students individually on the material of respective lecture. Analysis the lecture material in details. Solving problems.	[1], Chapter 3. [4], Chapter 4,
4	06.03.22	Electronic devices, their components. Operational principles of lamps. Diode, Triode, Tetrode, Pentode. Cathode ray tube with electrostatic and magnetic fields controlling. Electronic-vacuum devices used in TV receivers. Examination knowledges of students individually on the material of respective lecture. Analysis the lecture material in details. Solving problems.	[1], Chapter 4 [2], Chapter 5
5	13.03.22	P-n junction in semiconductors (s/c). Properties of p-n junction under external electric field. S/c resistors- Thermoreceptors. Photoresistors. Varistors. S/c diodes- Rectifying diode. Pulse diode. Tunnel diode. Photodiode. Light diode. Seminar 5 Examination knowledges of students individually on the material of respective lecture. Analysis the lecture material in details. Solving problems.	[1], Chapter 5 [3], Chapters 6
6	27.03.22	S/c triode (bipolar transistor). Circuits with common emitter and base. Static and dynamic characteristics of transistors. Amplifying parameters of bipolar transistors. Temperature and frequency response of bipolar transistor. Transistor as a switch Seminar 6 Examination knowledges of students individually on the material of respective lecture. Analysis the lecture material in details. Solving problems.	[1], Chapter 6 [3], Chapters 7
7	03.04.22	Field effect transistor. Transistor with a single junction. Four-layer s/c devices. Thyristor. Examination knowledges of students individually on the material of respective lecture. Analysis the lecture material in details. Solving problems.	[1], Chapter 7 [2], Chapter 8
8	10.04.22	Amplifiers of electrical oscillations. Basic characteristics of amplifiers. Amplifying cascades with bipolar transistor. Amplifying cascades with field transistor. Double cascade wider band amplifier with RC- connection. Negative Feedback in amplifiers. Voltage amplifier of narrower band. Examination knowledges of students individually on the material of respective lecture. Analysis the lecture material in details. Solving problems.	[1], Chapter 8 [2], Chapter 9
9	17.04.22	<b>Midterm exam</b>	
10	24.04.22	Amplifiers of direct current. Differential amplifiers. Operational amplifiers. Power amplifiers. Oscillatory circuits and selective amplifiers. Induced oscillations in series (voltage resonance) and parallel (current resonance) oscillatory circuits. Bound oscillatory circuits. Selective amplifiers. Examination knowledges of students individually on the material of respective lecture. Analysis the lecture material in details. Solving problems.	[1], Chapter 9 [2], Chapter 10
11	01.05.22	Generators of harmonic oscillations. Excitation of harmonic electrical signals. LC-autogenerators. RC-autogenerators. Frequency stabilizing for the oscillations generated in autogenerators. Examination knowledges of students individually on the material of respective lecture. Analysis the lecture material in details.	[1], Chapter 10 [2], Chapter 12

		Solving problems.	
12	08.05.22	<p>Communication channel. Characteristics of communication channel. Structural network of radio link. Conversion of signal spectrum. Amplitude modulated signal. Frequency modulated signal. Other types of modulation. Conversion of electrical oscillations Detecting of the amplitude modulated oscillations. Schemes of detectors. Conversion of frequency.</p> <p>Examination knowledges of students individually on the material of respective lecture. Analysis the lecture material in details.</p> <p>Solving problems.</p>	<p>[1], Chapter 11 [2], Chapter 11</p>
13	15.05.20	<p>Radio-receiving equipment. Technical characteristics and classification of radio-receiving equipment. Detecting of amplitude modulated signal. Detecting of frequency modulated signal.</p> <p>Basic elements of pulse and digital technique. Characteristics and parameters. Electronic switch. Simple formatters of pulsed signals. Differentiating and integrating circuits. Elements of logic. Triggers. Registers. Multivibrators. Blocking generator. Generators of linearly varying voltage.</p> <p>Examination knowledges of students individually on the material of respective lecture. Analysis the lecture material in details.</p> <p>Solving problems.</p>	<p>[1], Chapter 12 [2], Chapter 13</p>
14	22.05.22	<p>Rectifying circuits. Half -wave rectification of one phase alternating current. Full-wave rectification of one phase alternating current. Rectification of triple phase alternating current. Smoothing filters.</p> <p>Examination knowledges of students individually on the material of respective lecture. Analysis the lecture material in details.</p> <p>Solving problems.</p>	<p>[1], Chapter13 [2], Chapter 14</p>
15	29.05.22	<p>Antennas and propagation of waves. Classification and basic factors of aerials. Mirror-parabolic antennas. Propagating properties of longer, average , short and ultra short waves.</p> <p>Examination knowledges of students individually on the material of respective lecture. Analysis the lecture material in details.</p> <p>Solving problems.</p>	<p>[1], Chapter 14 [2], Chapter 15</p>
		Final Exam	