

SYLLABUS

General information	Title and code of subject, number of credits	ETR582 Theory of reception, processing and transmission of images 3 credits/6 ECTS	
	Department	Physics and Electronics	
	Program	Bachelor	
	Academic semester	2022 spring	
	Lecturer	Associate Professor, PhD Sevda N. Garibova	
	E-mail:	sevdaqaribova@khazar.org	
	Phone number:		
	Lecture room/Schedule	11 Mehseti Street, AZ1096 Baku, Azerbaijan (Neftchilar campus), room Lectures:	
	Consultations		
Course language	English		
Type of the subject	Major		
Textbooks and additional materials	<p>Textbooks:</p> <ol style="list-style-type: none"> Rafel C.Gonzalez, Richard E. Woods. <i>Digital image processing</i>, New Jersey,2002. Cantatore, Angela; Muller, Pavel. <i>Introduction to computed tomography</i>.Kgs. Lynghy: DTU Mechanical Engineering, (2011). <p>Additional materials:</p> <p>Harrison H. Barrett, William Swindell. <i>The theory of image formation, detection, and processing</i>. USA (1996).</p>		
Teaching methods	Lecture		X
	Group discussions		X
Assessment	Components	Date/ Deadline	Percent (%)
	Presentation	By the end of the semester, students will have to present a presentation on a relevant topic given by their teacher	10
	Active participation and discussion	At each lesson	10
	Assignment and quizzes	3 quizzes during the semester	10
	Attendance		
	Midterm exam		30
	Final exam		40
	Final		100
Course outline	<p>Modern technology is developing so rapidly that there is always a need to improve science and techniques. Image reflects and transfer information about the investigated object, therefore, the study of methods of image processing is very important. In this course studied the various methods of digital image processing, analysis of the stages of obtaining and areas of application in detail. The differences between simple and digital images, their advantages are studied in the course, the wide uses of the digital image and their different methods of obtaining shows that modern life is impossible without a digital image processing. The main source of imaging is not only visible light, but also waves of invisible regions, sound waves, which are widely used in medicine, geological exploration of oil and gas, weather forecasting, astronomical research and etc. Therefore, the course describes in detail the nature of electromagnetic waves, how an image is digitized, which energies are used to obtain an image of an object that is invisible to us, in distant galaxies, and how an image of an organ is obtained. There are studied the x-ray and gamma ray imaging, imaging in ultraviolet and radio bands, ultrasonic imaging, about CAT, SEM, TEM, MRT, imaging sensors, angiography.</p>		
Course objectives	<p>Students will be analyze image processing by the components and fundamental steps, study elements of visual perception and structure of the human eye, sampling and quantization process of digitizing, will understand the base of the image formation by using sensors, perception, reception, processing and transmission of images by modern and high technology.</p>		
Learning	At the end of the course the students:		

outcomes	<ul style="list-style-type: none"> - will study the basic digital image technology, how digital image processing, analysis and understanding; - will be able to analyze the various digital imaging methods, advantages and wide uses of digital image information; - will be able to apply basic principles of digital image processing, reception and transmission by the theoretical information and practical methods; - will develop the worldview and the knowledge, skills acquired from the subject help them in their successful specialization in the future.
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>Lates Those students who are late for lessons for more than 15 minutes are allowed to participate at the lesson while writing is absent.</p> <p>Tests Those students who have informed the teacher and the dean's office about missing the test in advance for particular reasons, are allowed to take the test 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 exam are not repeated in the final exam.</p> <p>Violation of the rules of the exams Disrupting the test and taking copy during midterm and final exams is forbidden. Test papers of the student who do not follow these rules are canceled and the students are expelled from the test 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>

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	10.02 12.02	Introduction to image processing, digital image processing, Examples of fields that use digital image processing <i>Oral questions. Homework- file formats of digital image</i>	[1] pages 1-6
2	17.02 19.02	Gamma- and X -ray imaging. <i>Testing. Discussion</i>	[1] pages 8-10
3	24.02 26.02	Imaging in the ultraviolet band, visible and infrared bands. Image Enhancement in the Frequency Domain <i>Quizze 1</i>	[1] pages 11-18
4	03.03 05.03	Imaging in microwave and radio bands. Image Enhancement in the Spatial Domain <i>Testing. Homework- uses various resolution in image processing</i>	[1] pages 18-20
5	10.03 12.03	Examples in which other imaging modalities are used. Infrasound and ultrasound, Color Image Processing <i>Test for the activity point</i>	[1] pages 20-25
6	17.03	Fundamental steps in digital image processing	[1] pages 25-28

	19.03	<i>Testing and discussion. Homework – using fundamental steps of digital imaging take any image form.</i>	
7	26.03 31.03	Components of an image processing system <i>Quizze 2. Homework- using components of imaging take any image form</i>	[1] 28-30
8	02.04 07.04	Elements of visual perception, structure of the human eye <i>Preparation to midterm exam</i>	[1] 34-37
9	09.04 14.04	Image formation in the eye. Brightness Adaptation and Discrimination. Lenses, imaging by the lenses MIDTERM EXAM	[1] 37-40
10	16.04 21.04	Light and the electromagnetic spectrum, nature and properties of the light <i>Submit individual presentation work</i>	[1] pages 42-45
11	23.04 28.04	Image sensing and acquisition, image formation by using sensors, light sensors <i>Quizze 3</i>	[1] pages 45-50
12	30.04 05.05	Image sampling and quantization. Color Image Processing <i>Submit individual presentation work</i>	[1] pages 52-56
13	07.05 12.05	Spatial and Gray –level resolution. Image restoration <i>Submit individual presentation work</i>	[1] pages 57-62
14	14.05 19.05	Computed tomography, CT technology <i>Submit individual presentation of the student project</i>	[2] pages 12-22
15	21.05 26.05	Non-destructive testing <i>Final exam material discussing</i>	[2] pages 4-10
		Final Exam	

