S Y L L A B U S

General information	**Title and code of subject, number of credits**	**ETR582 Theory of reception, processing and transmission of images – 6 ECTS credits**	
	Department	Physics and Electronics	
	Program	Bachelor	
	Academic semester	2020 Spring	
	Lecturer	Associate Professor, PhD in physical Sciences Sevda N. Garibova	
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	Phone number:		
	Lecture room/Schedule	11 Mehseti Street, AZ1096 Baku, Azerbaijan (Neftchilar campus), room	
	Consultations	Friday – 11:00-12:00	
Prerequisites	EENG 245 – Basic Electronics		
Course language	English		
Type of the subject	Major		
Textbooks and additional materials	***Textbooks*:** 1. Rafel C.Gonzalez, Richard E. Woods. *Digital image processing,* New Jersey,2002. 2. Cantatore, Angela: Muller, Pavel. *Introduction to computed tomography*.Kgs. Lynghy: DTU Mechanical Engineering, (2011). ***Additional materials:*** Harrison H. Barrett, William Swindell. *The theory of image formation, detection, and processing*. USA (1996).		
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	5
	Quizzes	3 quizzes during the semester	10
	Attendance	At each lesson	5
	Midterm exam		30
	Final exam		40
	Final		**100**
Course description	The modern world of technology is developing at such a rapid pace that it always requires improvements in science and technology. This course has a unique opportunity to use various sources and complex applications and closely related various fields of application, without which real life is impossible. In modern science, the picture reflects and transfer information, and therefore, the study of methods of image processing are important. Therefore, in this course we will study these methods in detail. The modern sciences of digital image processing carries information about object not only in visible light spectrum, also gives full information about the objects that are in the invisible region. For this purpose to obtain and processing of digital image are used various source of energy. Such energy sources which used for the image reception are the x-ray, gamma ray, ultraviolet, radio waves, sound, ultrasound and other types of waves. According to the various light sources for the image processing in various field used one of the following method CAT, SEM, TEM, MRT.		
Course objectives	The subject of reception, processing and transmission of images allows student to study an analyze the components of an image processing system, elements of visual perception, structure of the human eye, study basic concepts in sampling and quantization of digital image. At the end of course the students will be able analyse the image processing with high energy sources invisible spectrum and will understand the base of the image formation, perception, reception, processing and transmission of images by modern high technology.		
Learning outcomes	At the end of the course the students should be understand which type of energy sources used for imaging, will be describe the method obtaining of light and processing for imaging, will be study		

	sound wave, energy spectrum, image reception, digital image, electromagnetic waves, resolution of image, spatial and Gray – level resolution, x-ray imaging, gamma ray, radar, sensors in image processing, tomography, components of image processing, picture elements, quantization and sampling of digital image.
Rules (Educational policy and behavior)	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 oraly and in written forms before midterm and final exams. Submission of the individual works by the end of course is obligatory. 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. 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. 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. 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). 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. 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.

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	***11.02*** ***13.02***	Introduction to image processing, digital image processing, Examples of fields that use digital image processing *Free discussing of image processing*	[1] pages 1-6
2	***18.02*** ***20.02***	Gamma- and X -ray imaging *Discussing material*	[1] pages 8-10
3	***25.02*** ***27.02***	Imaging in the ultraviolet band, visible and infrared bands. Image Enhancement in the Frequency Domain *Quiz 1*	[1] pages 11-18
4	***03.03*** ***05.03***	Imaging in microwave and radio bands. Image Enhancement in the Spatial Domain *Test for the activity point*	[1] pages 18-20
5	***10.03*** ***12.03***	Examples in which other imaging modalities are used. Color Image Processing *Test for the activity point*	[1] pages 20-25
6	***17.03*** ***19.03***	Fundamental steps in digital image processing *Dicsussing and preparation to quizze*	[1] pages 25-28
7	***31.03*** ***02.04***	Components of an image processing system ***Quiz 2***	[1] 28-30
8	***07.04*** ***09.04***	Elements of visual perception, structure of the human eye *Preparation to midterm exam*	[1] 34-37

9	***14.04*** ***16.04***	Image formation in the eye.Brightness Adaptation and Discrimination ***MIDTERM EXAM***	[1] 37-40
10	***21.04*** ***23.04***	Light and the electromagnetic spectrum *Presentation of student project*	[1] pages 42-45
11	***28.04*** ***30.04***	Image sensing and acquisition, image fromation by using sensors *Quiz 3*	[1] pages 45-50
12	***05.05*** ***07.05***	Image sampling and quantization. Color Image Processing *Presentation of the student project*	[1] pages 52-56
13	***12.05*** ***14.05***	Spatial and Gray –level resolution. Image restoration *Presentation of student project*	[1] pages 57-62
14	***19.05*** ***21.05***	Computed tomography, CT technology *Presentation of the student project*	[2] pages 12-22
15	***27.05*** ***29.05***	Non-destructive testing *Final exam material discussing*	[2] pages 4-10
		Final Exam