S Y L L A B U S

General information	**Title and code of subject, number of credits**	**ETR 490 Optical communication Engineering -** (6 ECTS credits)	
	Department	Physics and Electronics	
	Program	Bachelor	
	Academic semester	2021 spring	
	Lecturer	Doctor of philosophy (PhD), associate professor, Farida Tatardar	
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	Lecture room/Schedule	11 Mehseti Street, AZ1096 Baku, Azerbaijan (Neftchilar campus) room	
Course language	English		
Prerequisites	EENG 225 – Basic Electronics		
Type of the subject	Elective		
Textbooks and additional materials	1. John M. Senior assisted by M. YousifJamro, Optical Fiber Communications Principles and Practice, Third edition,2009. 2. Djordjevic, Ivan B, Advanced Optical and Wireless Communications Systems,2018 3. *Govind P. Agrawal*. Fiber optic communication systems,2002 4. *Harry J. R. Dutton*. Understanding Optical Communications, International Technical Support Organization,2000 5. Mrs.AnithaPatibandla, Associate Professor Mr.M.AnanthaGuptha, Assistant Professor Ms.M.Nagma, Assistant Professor. FIBER OPTICAL COMMUNICATIONS/2019-20 **Course website** https://eceagmr.files.wordpress.com/2014/09/optical-fiber-communications-principles-and-pr.pdf https://www.springer.com/us/book/9783319631509 www.McGraw-Hill.ru https://mrcet.com/downloads/digital_notes/ECE/III%20Year/FIBER%20OPTICAL%20COMMUNICATIONS.pdf		
Teaching methods	**Lecture**		+
	Group discussions at seminars		+
Assessment	**Components**	**Date/ Deadline**	**Percent (%)**
	Assignment and quizzes	During the semester	10
	Active participation	At each lesson	5
	Individual research papers and presentations	During the semester	10
	Attendance	At the end of the semester	5
	Midterm exam		30
	Final exam		40
	Total		**100**
Course description	This course containsthe fundamental topics of optical communications engineering. Nowadays optical communication technics are using in many coaxial and twisted pair cables in telecommunication networks, because the information transfer rate in this systemis much higher than in other cable systems. It includesadvantages of optical fiber communication, types of optical fiber cables, transmission characteristics of optical fibers, optical sources: the laser, the light-emitting diode (LEDs), optical detectors, and optical amplifiers.The fiber optic techniques apply now in the computer networks, in the nets distribution systems, in the medicine etc. Simulation of optical communication by means of different mechanisms will be integral part of this course. We will learn in the first section the theory of multimode and single-mode fibers. Next, we have to learn the technological features, including manufacturing, cabling, and connecting of the fiber cables. The second section of our course contains the various schemes and components used in the fiber optic systems.		
Course objectives	Optical communications engineering is one of the essential and fast growing fields in the engineering community. Therefore an education of this topic has a tremendous interest for undergraduate students. The course is essential in order to understand the examples of optical communications theory of multimode and single-mode fibers, cabling, and connecting. The different generations of the optical transmission systemdesign are explained, and applications		

	to optical networks and fiber optic sensors, also the most recent developments in switched networks, high bit-rate systems, and the radio over fiber are detailed. The course covers the concepts of optical fiber communications, and optical networks.
Learning outcomes	What students should know at the end of this course: The main materials of the course are the lectures. An important aspect of the lectures on the Optical communication is that it uses real and computer physical experiments, educational films, and model computer programs. Theoretical materials of the course require sophisticated mathematical apparatus and various problem-solving methods. The lectures providedifferenthomework for students in order to reinforce the material they receive during the course.
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 orally 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 is 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 does 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.

Week	Dates (planned	Subject topics	Textbook/ Assignments
1	***10.02.21***	***Introduction to optical communication*** *Historical development*	[1] / pages 1-10/
2	***15.02.21***	***Optical fiber waveguides***	[1] / pages 12-82/
	17.02.21	*Single-mode fibers, Photonic crystal fibers*	
3	***22.02.21***	***Transmission characteristics of optical fibers***	[1] / pages 86-163/
	24.02.21	*Linear scattering losses, Nonlinear scattering losses, Fiber bend loss, dispersion, Polarization.*	
4	***01.03.21***	***Optical fibers and cables***	[1] / pages 169-207/

	03.03.21	*Vapor-phase deposition techniques, Optical fibers, Cable design.*	
5			[1] / pages 217-287/
	10.03.21	***Optical fiber connections: joints, couplers and isolators*** *Fiber splices, Fiber connectors, Optical isolators and circulators*	
6	***15.03.21***	***Optical sources 1: the laser***	[1]/pages 294-386/
	17.03.21	*Optical emission from semiconductors, The semiconductor injection laser.*	
7	***29.03.21***	***Optical sources 2: the light-emitting diode***	[1]/pages 396-439/
	31.03.21	*LED structures, LED characteristics, Modulation.*	
8	***05.04.21***	***Optical detectors***	[1]/pages 444-496/
	07.04.21	*Introduction, Device types, Optical detection principles, Absorption, Semiconductor photodiodes without internal gain, The p–n photodiode, The p–i–n photodiode, Phototransistors*	
9	***12.04.21***	***Mid term exam***	
10	***19.04.21***	***Direct detection receiver performance considerations***	[1]/pages 502-545/
	21.04.21	*Noise, Thermal noise, Dark current noise, Quantum noise, Digital signaling quantum noise, Analog transmission quantum noise, Receiver noise*	
11	***26.04.21***	***Optical amplification, wavelength conversion and regeneration***	[1]/pages 549-600/
	28.04.21	*Optical amplifiers, Semiconductor optical amplifiers, Fiber and waveguide amplifiers.*	
12	***03.05.21***	***Integrated optics and photonics***	[1]/pages 606-665/
	05.05.21	*Integrated optics and photonics technologies,* ***Optoelectronic integration, Photonic integrated circuits, Optical computation.***	
13	***10.05.21***	***Optical fiber systems 1: intensity modulation/direct detection***	[1]/pages 673 – 811/
	12.05.21	***The optical receiver circuit,*** *the optical transmitter circuit, digital system and analog system, Multiplexing strategies.*	
14	***17.05.21***	***Optical fiber systems 2: coherent and phase modulated***	[1]/pages 823-897/
	19.05.21	*Modulation formats, Phase shift keying, Polarization shift keying, Demodulation schemes, Receiver sensitivities*	
15	***24.05.21***	***Optical fiber measurements***	[1]/pages /905 – 1041/
	26.05.21	***Optical networks,*** *Optical switching networks, Optical Ethernet.*	
		Final Exam