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| <b>General information</b>                | <b>Title and code of subject, number of credits</b>  | ETR 510 Optoelectronic devices transmitting and processing information 8 ECTS |                    |
|   | <b>Department</b>  | Physics and Electronics   |                    |
|   | <b>Program</b>   | Master  |                    |
|   | <b>Academic semester</b>   | 2023 Fall   |                    |
|   | <b>Lecturer</b>  | PhD, dosent,<br>Hasanov Elchin  |                    |
|   | <b>E-mail:</b>   | elgafgas@yahoo.com  |                    |
|   | <b>Phone number:</b>   | +994 50 5287740   |                    |
|   | <b>Lecture room/Schedule</b>   | 11 Mehseti Street, AZ1096 Baku, Azerbaijan (Neftchilar campus), room          |                    |
|   | <b>Consultations</b>   | II, 15:00 – 16:00   |                    |
|   | <b>Office hours</b>  | Sunday 09-00  |                    |
| <b>Prerequisites</b>                      |  |   |                    |
| <b>Course language</b>                    | English  |   |                    |
| <b>Type of the subject</b>                | Major  |   |                    |
| <b>Textbooks and additional materials</b> | <b>List of used literature</b><br>1. P. Norton, J. Goodman “Personal computer: hardware and software organization”, trans. from English, St. Petersburg: BHV - St. Petersburg, 1999.<br>2. M. Guk “ABM PC hardware. Encyclopedia. ”- St. Petersburg: Peter Kom, 1998.<br>3. V. Chepurna “Information storage devices.” - St. Petersburg: BHV - St. Petersburg, 1998.<br><b>Internet resources:</b><br>4. www.km.ru - section “Encyclopedia of a personal computer<br>5. <a href="http://zstu.edu.ua/base/home/rpf/lib/periph/hole/Spr/cdrom.htm">http://zstu.edu.ua/base/home/rpf/lib/periph/hole/Spr/cdrom.htm</a> – ZGTU, Department of Radio Electronics  |   |                    |
| <b>Teaching methods</b>                   | <b>Lecture</b>   | +   |                    |
|   | <b>Group discussions at seminars</b>   | +   |                    |
| <b>Assessment</b>                         | <b>Components</b>  | <b>Date/ Deadline</b>   | <b>Percent (%)</b> |
|   | <b>Tests</b>   | During the semester   | 5                  |
|   | <b>Active participation</b>  | At each lesson  | 10                 |
|   | <b>Quizzes</b>   | During the semester   | 15                 |
|   | <b>Attendance</b>  | During the semester   | 5                  |
|   | <b>Midterm exam</b>  |   | 30                 |
|   | <b>Final exam</b>  |   | 35                 |
|   | <b>Final</b>   |   | <b>100</b>         |
| <b>Course description</b>                 | Optoelectronics is one of the most developed areas in functional microelectronics, since optical and photoelectric phenomena are well studied, and technical means based on these phenomena have been used in electronics for a long time (photocells, photomultipliers, photodiodes, phototransistors, etc.).   |   |                    |
| <b>Course objectives</b>                  | Optoelectronic devices have found their application in personal electronics, in computers. Since the creation of the first computer, the question arose of the need to store data. From the beginning, data was stored on punched cards and punched tapes, then magnetic media appeared.<br>But with the development of technologies to produce microprocessors, the performance of computers is also growing. At the same time, software products for computers (especially games and databases) became more complex and, accordingly, increased in volume, and their delivery on floppy disks turned out to be excessively expensive and unreliable. Therefore, magnetic media have been replaced by optical devices for storing data on a CD-ROM (Compact Disk, Read-Only Memory) CD. |   |                    |
| <b>Learning outcomes</b>                  | The student must know the following:<br>1. A semiconductor laser generates a low-power infrared beam that hits a reflective mirror.<br>2. The servomotor, on command of the built-in microprocessor, shifts the movable carriage with a reflective mirror to the desired track on the CD.<br>3. The beam reflected from the disk is focused by a lens located under the disk, reflected from the mirror and hits the separating prism.<br>4. The separating prism directs the reflected beam to another focusing lens.<br>5. This lens directs the reflected beam to a photosensor, which converts light energy into electrical impulses.  |   |                    |

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|  | 6. Signals from the photosensor are decoded by the built-in microprocessor and transferred to the computer as data.   |
| <b>Rules (Educational policy and behavior)</b> | <ul style="list-style-type: none"> <li>▪ <b>Preparation for the lesson.</b><br/>This course makes your study and preparation outside of the classroom essential. Lectures are based on what is presented in the text. A visual explanation will greatly help your understanding of the lecture. After the lecture, you should study your notes and work through the relevant tasks and cases from the end of the chapter and the sample exam questions.</li> <li>• <b>Withdrawal (pass/fail)</b><br/>This course strictly follows grading policy of the School of Humanities, Education and Social sciences. Thus, a student is normally expected to achieve a mark of at least 60% to pass. In case of failure, he/she will be required to repeat the course the following term or year.</li> <li>▪ <b>Cheating/plagiarism</b><br/>Plagiarism during midterm and final exams will result in the cancellation of the work. In this case, the student automatically gets zero (0), without any reasoning.</li> <li>▪ <b>Rules of professional conduct</b><br/>Students must behave appropriately for the university to create an appropriate aura during their studies. Unauthorized discussions and unethical behavior are strictly prohibited.</li> <li>▪ <b>Attendance</b><br/>Students who attend the whole class will get 5 marks. For three absences, a student loses 1 mark.</li> <li>• <b>Quizzes</b><br/>There will be a quiz per two weeks. The quizzes will be announced in the classroom two weeks before and will relate to homework.</li> <li>• <b>Activity</b><br/>Students who will be active during discussion of past lessons will be awarded with one activity mark.</li> </ul> |

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    | 17/09/23        | Optoelectronic storage devices. -Destination.                        | [1] p.709-741         |
|      |                 | Problem solving.   |                       |
| 2    | 24/09/23        | Types and characteristics: CD-ROM DRIVE DEVICE                       | [1] p.750-773         |
|      |                 | Data transfer rate.  | [1] p-780-795         |
|      |                 | Problem solving  |                       |
| 3    | 01/10/23        | Problem solving.   |                       |
|      |                 | Optoelectronics - development prospects.                             | [1] p.800-815         |
| 4    | 08/10/23        | Holographic storage device. Theory and principle of physical action. | [1] p.815-838         |
|      |                 | Problem solving.   |                       |
| 5    | 15/10/23        | Optoelectronics. Semiconductor light emitting structures             |                       |
|      |                 | Problem solving.   |                       |
| 6    | 17.10/23        | Calculation and design of the LED Design Examples                    | [1] p.846-872         |
|      |                 | Problem solving.   |                       |

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| 7  | 24/10./23 | Optoelectronics In discrete execution; micro execution  | [1]p.881-900,   |
|    |           | Problem solving   |                 |
| 8  | 31/10/23  | Physical and technological foundations of optoelectronics   | [1] p.957-984   |
|    |           | Problem solving.  |                 |
| 9  |           | <b>Mid term exam</b>  |                 |
| 10 | 07/11/23  | Fiber Optic Sensors Measured physical quantity Used physical phenomenon, property                         | [1] p.916-947   |
|    |           | Problem solving   |                 |
| 11 | 14/11/23  | Laser optoelectronic devices Typical structure of an electronic meter                                     | [4]p. 73-96     |
|    |           | Problem solving   |                 |
| 12 | 21/11/23  | Machine memory Information and memory Accumulation of information.  | [1] p.1061-1085 |
|    |           | Problem solving   |                 |
| 13 | 28/11/23  | Main characteristics, classification, and hierarchy of memory   | [3]p.555-611    |
|    |           | Problem solving.  |                 |
| 14 | 05/12/23  | Magnetic storage devices Magnetic recording   | [1] page 9-6    |
|    |           | Problem solving   | [1] page 10-6   |
| 15 | 17. 12/23 | Memory in cognitive psychology<br>Computer metaphor in the study of the structural organization of memory | [1] page 11-6   |

