**SYLLABUS**

**Fall semester 2022-2023 academic years**

**on the educational program “Radio engineering, electronics and telecommunications”**

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| **Discipline’s code** | **Discipline’s title** | **Independent work of students (IWS)** | **Number of credits** | | | | | **Number of credits** | **Independent work of student with teacher (IWST)** |
| **Lectures (L)** | **Practical training (PT)** | | **Laboratory (Lab)** | |
| 4305 | Digital encoding and transmission of information | 98 | 15 | 1 | | 30 | | 5 | 7 |
| **Academic course information** | | | | | | | | | |
| **Form of education** | **Type of course** | **Types of lectures** | | | **Types of practical training** | | **Form of final control**  Writing | | |
| The lecture is offline.  Practical lesson - offline | Theoretical | Problematic, analytical | | | Problrm solving, writing codes | |
| Lecturer | Turlykozhayeva Dana Abdikumarovna | | | | | | Writing | | |
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| **Aim of course** | **Expected Learning Outcomes (LO)\***  As a result of studying the discipline the undergraduate will be able to: | **Indicators of LO achievement (ID)**  (for each LO at least 2 indicators) |
| Learn the basic principles of network security and monitoring | 1. General principles of discrete data transfer;  compression methods and classification of switching methods; | 1.1 Types of characteristics of communication networks and methods of their determination;  1.2 Spectral analysis of signals in communication networks;  1.3 Frequency response, bandwidth and attenuation; network capacity; network bandwidth and the relationship between bandwidth. |
| 2. Application of methods of representation of binary and zeros using pulse or sinusoidal signals in communication networks of different physical nature; | 2.1 Application of discrete data transfer methods at the physical level;  2.2 Knowledge of the requirements for digital coding methods;  2.3 Knowledge of the requirements for logical coding methods. |
| 3. Methods for detecting and correcting errors; | 3.1 Know how to transmit asynchronous and synchronous information;  3.2 Reading the penetration detection system (IDS) tools. |
| 4. Prioritize network security solutions that address many threats in networks. | 4.1 Knowledge of cryptanalysis methods and the need for cryptanalysis; knowledge of cryptographic hash functions;  4.2 Application of cryptanalysis methods of classical and modern algorithms of information protection. |
| 5. Ability to work with radio frequency measuring instruments and computer simulation programs. | 5.1 To know the basic measuring instruments of different ranges, additional instruments and be able to use them as much as possible  5.2 Knowledge and ability to use basic software packages for modeling cryptanalysis  5.3 To understand the construction of simple algorithms |
| **Prerequisites** | IKT2104 Information and Communication Technologies,  M1202 Mathematics, ORT2212 Fundamentals of Radio Engineering and Telecommunications, TCS3218 Digital Communication Technology | |
| **Post requisites** | Graduate work | |
| **Information resources** | **Literature:**   1. Акулиничев, Ю. П. Теория и техника передачи информации: Учебное пособие [Электронный ресурс] / Ю. П. Акулиничев, А. С. Бернгардт. — Томск: ТУСУР, 2012. — 210 с. — Режим доступа: https://edu.tusur.ru/publications/1750 2. Прокис Дж. Цифровая связь : пер. с англ. / Дж. Прокис ; под ред. Д. Д. Кловского. — М. : Радио и связь, 2000. — 800 с 3. Гаранин М. В. Системы и сети передачи информации : учеб. пособие для вузов / М. В. Гаранин, В. И. Журавлев, С. В. Кунегин. — М. : Радио и связь, 2001.   — 336 с.   1. Акулиничев, Ю. П. Радиотехнические системы передачи информации: Учебное пособие [Электронный ресурс] / Ю. П. Акулиничев, А. С. Бернгардт. — Томск: ТУСУР, 2015. — 196 с. — Режим доступа: <https://edu.tusur.ru/publications/5851> 2. Цимбал В. П. Задачник по теории информации и кодированию / В. П. Цимбал. — Киев : Вища школа, 1976. — 276 с.   **Онлайн қолжетімді:** Үй тапсырмасы мен СӨЖ бойынша қосымша оқу материалы univer.kaznu.kz сайтындағы UMKD бөлімінде парақшаңызда қолжетімді болады.  **Интернет-ресурстар**  https://sites.google.com/site/peredacadiskretnyhdannyh/home - Основы передачи дискретных данных  <https://scask.ru/o_book_code.php?id=30>– [Коды с малой плотностью проверок](https://scask.ru/o_book_code.php) [на четность](https://scask.ru/o_book_code.php)  <http://www.4stud.info/networking/network-security.html> Желі қауіпсіздігінің негіздері. Желі қорғау объектісі ретінде  <https://www.fortinet.com/ru/solutions/enterprise-midsize-business/network-security>  - Желінің қауіпсіздігін анықтау және түсіндіру <https://www.owasp.org/index.php/Main_Page>- осалдықтардың деректер базасы. <https://intuit.ru/studies/courses/102/102/lecture/2971>- INTUIT желілік қауіпсіздік  бойынша дәрістер | |
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| **Academic policy of the course in the context of university moral and ethical values** | **Academic Behavior Rules:**  All students are required to register for the MOOC. The deadlines for completing the modules of the online course must be strictly observed in accordance with the schedule for studying the discipline. Leave in case of current MOOC or SPOC courses. f points! The deadline for each task is indicated in the calendar (schedule) for the implementation of the  **ATTENTION!** Failure to meet deadlines results in loss o content of the training course, as well as in the MOOC. Leave in case of current MOOC or SPOC courses.  **Academic values:**  - Practical trainings/laboratories, IWS should be independent, creative.  - Plagiarism, forgery, cheating at all stages of control are unacceptable.  - Students with disabilities can receive counseling at e-mail Abdikumarovna.d@gmail.com |
| **Evaluation and attestation policy** | **Criteria-based evaluation:**  assessment of learning outcomes in relation to descriptors (verification of the formation of competencies in midterm control and exams).  **Summative evaluation:** assessment of work activity in an audience (at a webinar); assessment of the completed task.  Below are the minimum grades by percentage:  95% - 100%: А 90% - 94%: А-  85% - 89%: В+ 80% - 84%: В 75% - 79%: В-  70% - 74%: С+ 65% - 69%: С 60% - 64%: С-  55% - 59%: D+ 50% - 54%: D- 0% -49%: F |

**CALENDAR (SCHEDULE) THE IMPLEMENTATION OF THE COURSE CONTENT:**

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| week | Topic name | Number of hours | Max.  score |
| **Module 1** | | | |
| 1 | **Lec 1.** Introduction. Mathematical models of signals and interference. Information and signals. Digital signals | 1 |  |
| 1 | **Sem 1.** Signals and noise analytical and  methods of geometric representation | 1 | 15 |
| 1 | **Lab 1.** Compression algorithms in python | 9 | 5 |
| 2 | **Lec 2.** Signal transformations. Model of information transfer system. Elements of converters. Conversion of non-electrical signals to electrical signals | 1 |  |
| 2 | **Sem 2.** Encryption tables. Substitution ciphers. Double replacement. | 1 | 15 |
| 2 | **Lab 2.** General compression algorithms | 2 | 5 |
| 2 | **IWST 1.** General compression algorithms |  |  |
| 3 | **Lec 3.** Time quantization of a continuous signal. Modulation of a pulse carrier with an analog signal. Analog-to-digital and digital-to-analog conversion | 1 |  |
| 3 | **Sem 3.** Analog-to-digital and digital-to-analog conversion | 1 | 10 |
| 3 | **Lab 3.** Compression algorithms with IMPLICIT rather than EXPLICIT probability models | 2 | 5 |
| 3 | **SIW 1.** Types of antenna |  |  |
| 4 | **Lec 4.** Linear digital filtering and character sequence generation. Modulation of a harmonic carrier with a digital signal. | 1 |  |
| 4 | **Sem 4.** Correlation detection and matching filtering. | 1 | 20 |
| 4 | **Lab 4.** Compressing and Unzipping Files with Python | 2 | 5 |
|  | **IWST 2.** Coding in python |  |  |
| 5 | **Lec 5.** Cryptographic security mechanisms. Basic tasks and concepts of cryptography. Principles of cryptographic protection of information. | 1 |  |
| 5 | **Sem 5.** Elements of number theory. GCD and comparison (case-task method). Fermat's and Euler's theorems for solving cryptographic problems. | 1 | 20 |
| 5 | **Lab 5.** Coding in python | 2 | 5` |
| **Module 2** | | | |
| 6 | **Lec 6.** Symmetric and asymmetric encryption in information security problems. | 1 |  |
| 6 | **Sem 6.** A cryptosystem without key transfer. Solving problems in a cryptosystem without key transfer | 1 | 15 |
| 6 | **Lab 6.** General compression algorithms in Python | 2 | 5 |
| 7 | **Lec 7.** The principle of creation of public key encryption systems | 1 |  |
| 7 | **Sem 7.** RSA Public-key information security algorithm. | 1 | 20 |
| 7 | **Lab 7.** General compression algorithms in Python | 2 | 5 |
| 7 | **IWST 3.** General compression algorithms |  |  |
|  | **LEVEL CONTROL 1** |  | **100** |
| 8 | **Lec 8.** Hash functions. | 1 |  |
| 8 | **Sem 8.** Digital signature algorithms. | 1 | 10 |
| 8 | **Lab 8.** General compression algorithms in Python | 2 | 5 |
| 8 | **IWS 2.** Reflection coefficients S11 and VSWR core wave |  |  |
| 9 | **Lec 9.** Channel segmentation of networks. Using VLAN technology to create subnets. VLAN typical network topology used. | 1 |  |
| 9 | **Sem 9.** Digital signature algorithms. | 1 | 15 |
| 9 | **Lab 9.** General compression algorithms in Python | 2 | 5 |
| 10 | **Lec 10.** Port-based VLANs | 1 |  |
| 10 | **Sem 10.** IEEE 802.1 Standard | 1 | 20 |
| 10 | **Lab 10.** General compression algorithms in Python | 2 | 5 |
| 10 | **IWST 4.** General compression algorithms |  | 5 |
|  | **Module 3** |  |  |
| 11 | **Lec 11** Brandmauer technologies. Basic concepts of network technologies (protocol stack, TCP connection states).  Brandmauer classification | 1 |  |
| 11 | **Sem 11.** Brandmauer management basics. | 1 | 18 |
| 11 | **Lab 11.** General compression algorithms in Python | 2 | 5 |
| 12 | **Lec 12.** Tunnel technologies. Communication level protocols. IPSec protocol family. | 1 |  |
| 12 | **Sem 12.** GRE Protocol | 1 | 17 |
| 12 | **Lab 12.** General compression algorithms in Python | 2 | 5 |
| 12 | **IWST 5.** General compression algorithms |  |  |
| 13 | **Lec 13.**  SSL/TLS protocol. | 1 |  |
| 13 | **Sem 13.** SIEM: IBM QRadar, McAfee ESM, Cisco MARS systems analysis | 1 | 15 |
| 13 | **Lab 13.** General compression algorithms in Python | 2 | 5 |
| 13 | **IWS 3.** General compression algorithms |  |  |
| 14 | **Lec 14** Intrusion detection and prevention systems (IDPS). The main purpose of the IDPS. IDPS classification methods | 1 |  |
| 14 | **Sem 14.** Intrusion detection and prevention systems (IDPS).  Anti-virus scanning. | 1 | 10 |
| 14 | **Lab 14.** General compression algorithms in Python | 2 | 5 |
|  | **IWST 6.** Signal generators |  |  |
| 15 | **Lec 15.** Priority of movement and creation of alternative routes. Creating alternative internet access routes | 1 |  |
| 15 | **Sem 15.** Generating traffic using IDP | 1 | 10 |
| 15 | **Lab 15.** General compression algorithms in Python | 2 | 5 |
| 15 | **IWST 7.** Basic in antenna-feeder devices |  |  |
|  | LEVEL CONTROL 2 |  | **100** |

Dean \_ Beisen N. A.\_\_

Head of Department \_Ibraimov M. K.\_\_

Lecturer \_Turlykozhayeva D. A.\_\_

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