**KAZAKH NATIONAL UNIVERSITY NAMED AFTER AL-FARABI**

**Physics and Technology Faculty**

**Department of Solid State and Nonlinear Physics**

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|  |  **AFFIRM****Dean of the faculty**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **А.Е. Davletov****"\_\_\_\_\_\_"\_\_\_\_\_\_\_\_ 2020y.** |

**EDUCATIONAL-METHODICAL COMPLEX OF DISCIPLINE**

**RET4312 - " radio Receiving and transmitting devices and communication systems»**

 Specialty " 5B071900-radio engineering, electronics and telecommunications»

 Educational program in basic disciplines " radio engineering»

Course – 3

Semester – 6

Amount of the Credits – 3

**Almaty 2020y.**

Educational-methodical complex of the discipline was made by сandidate of physical and mathematical sciences. Baideldinov U.S.

Based on the working curriculum on the specialty:

5В071900 – «Radioengineering, Electronics and Telecommunications»

Considered and recommended at the meeting of the department

from «\_27\_\_ » \_\_\_\_06\_\_\_\_\_\_\_ 20 20, protocol № 10

Head chair \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ М.К.Ibraimov

 (sign)

Recommended by the methodical bureau of the faculty

from «\_27\_\_ » \_\_\_\_06\_\_\_\_\_\_\_ 2020, protocol № 10

Chairperson
method department of the faculty\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Gabdullina А.Т.

 (sign)

**Syllabus**

**Fall semester2020 school year**

**Academicinformation about the course**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Discipline’s code | Discipline’s title | Type | Amount of hours per week | Amount of credits | ECTS |
| Lect. | Pract. | Lab. |
| RET4312 | " radio Receiving and transmitting devices and communication systems» | БК | 1 | 1 | 1 | 3 | 5 |
| Lecturer | BaideldinovU. S.Candidate of Physical and Mathematical Sciences, Senior lecturer. | Office hours414 | Scheduled |
| e-mail | Baideldinov57@mail.ru |  |  |
| Telephone number | 8 777 377 86 57 | Auditory | 414 |

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| Academic presentation of the course | **Type of training course:**The course is designed to learn the basics of radio information transmission systems. And also to acquaint the student with the electronic devices necessary for implementation of radio engineering systems of transmissions of information of radio transmitters and radio receivers. Learn the principles of data transmission and data reception. **Purpose of the course**:to form a comprehensive understanding of the fundamental principles underlying radio systems of information transmission and reception.**As a result of studying the discipline the student will be able to:**1. to analyze the main forms of information exchange in systems, physical principles of operation and the main technical characteristics of radio transmitting and radio receiving systems of radio electronics;2. to carry out modeling, theoretical and experimental research of newly developed units and devices, using modern methods of analysis and synthesis; 3.to compare modern and perspective directions of development of telecommunication and information networks and systems, radio engineering systems;4. know the physical principles of antenna-feeder devices, the basics of trajectory measurements;5. have an idea about the methods and methods of information transmission and RRV, optical signal processing methods;6. apply antenna devices in various electronic devices. |
| Prerequisites | The study of "Receiving / transmitting radio and communication systems" is based on the knowledge of the fundamental laws of physics and mathematics courses, Fundamentals of radio electronics and telecommunications-1 and Fundamentals of radio electronics and telecommunications-2, the theory of transmission of electromagnetic waves . |
| Prerequisites | Further study of modern systems of transmission and reception of information such as; radar, satellite communication system, satellite earth sensing system and global navigation system. |
| Literature and resources | **Literature**1. N. N. Fomin et al. radio Receivers. - Moscow: Hotline-Telecom, 2005. - 472 p.: Il. 2.Shakhgildyan. Radio transmitting devices (Basic methods and characteristics). - M.: Ecotrends,2005. - 392 p.: Il. 3.Kartashevsky V. G.. Communication network.: Mosca, 2001. – 311 p.: Il. 4. Radio engineering systems: a textbook for students. universities / [ed. YM. Kazarinov, Yu. A. Kolomensky, V. M. Kutuzov et al.]; under the editorship of Yu. M. Kazarinova. - Moscow: Akademiya, 2008. - 592c.5. Belov, V. M. information Theory: a course of lectures: a textbook for universities. - Moscow: Hotline-Telecom, 2012. - 143 p.6. Nikolsky B. A. Fundamentals of radio systems. - Samara, SGAU, 2013. -469 PP.**Internet resources:** 1.Electronic Journal " Radio Engineering»**Available online:** Additional training material on the discipline "radio-Technical information transmission systems", guidelines for practical and laboratory classes, tasks for the implementation of SRS will be available on your page on the website univer.kaznu.kz. in the umcd section. |
| Academic policy of the course in the context of university moral and ethical values | **Rules of academic conduct:** Mandatory attendance at classes, inadmissibility of lateness. Absence and lateness to classes without prior warning of the teacher are estimated at 0 points.Mandatory compliance with deadlines and delivery of tasks (SRS, boundary, control, project, etc.), projects, exams. In case of violation of deadlines, the completed task is evaluated taking into account the deduction of penalty points.**Academicvalue:**Academic honesty and integrity: independence of all tasks; inadmissibility of plagiarism, forgery, use of Cribs, cheating at all stages of knowledge control, cheating of the teacher and disrespectful attitude to him. (KazNU student honor code). Students with disabilities can receive counseling by e-mail or telephone. |
| Evaluation and attestation policy | **Criteria-basedevaluation:** evaluation of learning outcomes in relation to descriptors (checking the formation of competencies at the boundary control and exams). Homework - 10%, SRS-50%, Exams-40%, TOTAL-100%**Summativeevaluation:**assessment of the presence and activity of the work in the audience; assessment of the completed task, SRS (project )The final score will be calculated according to the formula Below are the minimum percentages: 95% - 100%: A 90% - 94%: A- 85% - 89%: B+ 80% - 84%: B 75% - 79%: B- 70% - 74%: C+ 65% - 69%: C 60% - 64%: C- 55% - 59%: D+ 50% - 54%: D-0% -49%: F |

**Calendar for the implementation of the content of the training course:**

|  |  |  |  |
| --- | --- | --- | --- |
| Week/date | Nameof the theme(lectures, practical lessons, IWS) | Amount of hours | Maximum score |
| **1** | Lecture1. Introduction. Content: content and objectives of the discipline. Its features and connection with other disciplines. The importance of the development of radio transmitters and radio receivers in scientific and technological progress. A brief historical overview of the development of radio devices. Purpose and classification of radio transmitting devices. Generator with external excitation. | **1** | **2** |
| Practical lesson 1. Structure and General characteristics of the radio transmitting device. Draw yourself with an explanation of the structures and ranges of the generator with external excitation. | **1** | 6 |
|  | Laboratory work №1: the study of the LC auto generator | **1** | 6 |
|  | SRSP 1. Analysis of the features of the main modes of operation of generator. |  |  |
| **2** | Lek.2. Modes of operation of the generator oscillations of the first and second kind. Harmonic analysis of output current pulses Generator's. The power supply circuit of the generator. | **1** | **2** |
| Practical lesson 2.Disassemble: Features of the main modes of operation generator. The regime of linear amplification.The amplification modes with a cutoff the output current. | **1** | **6** |
|  | Laboratory work №1: the study of the RC auto generator | **1** | 6 |
|  | SRSP 2. Analysis of linear mode gain. |  |  |
| **3** | Lecture 3. Modes of operation of the generator on tension. Addition of power generators. Transmitter output stages | **1** | **2** |
| Practical lesson 3. To disassemble: Load characteristics of HBV.The dynamic characteristics of HBV. Undervoltage, critical and overvoltage modes. | **1** | **6** |
|  | Laboratory work №3: self-Oscillating LC circuit under external influence | **1** | 6 |
|  | SRSP 3. Analysis of amplification modes with a cutoff the output current |  |  |
| **4** | Lecture 4. Frequency multipliers. Self-oscillators. Modes of self-excitation of oscillators | **1** | **2** |
| Practical lesson 4. Disassemble: the Purpose of frequency multipliers. The principle of obtaining the frequency multiplication mode. Schematic diagrams of transistor frequency multipliers. Determining the selection of the cutoff angle at different multiplication factors. Frequency multiplication invaricap. | **1** | **6** |
|  | Laboratory work №4: single-band modulation study | **1** | 6 |
|  | SRSP 4. Analysis of energy indicators of the main modes of operation of gwv |  |  |
| **5** | Lecture 5. Causes of frequency instability and parametric methods of its stabilization. Quartzfrequencystabilization. Schemesofquartzoscillators | **1** | **2** |
| Practical lesson 5. Disassemble: Causes of instability of the generated frequency. Parametricmethodsoffrequencystabilization.Disadvantages of parametric frequency stabilization. Quartzanditsproperties. | **1** | **6** |
| Laboratory work №5: a Study of the frequency synthesizer | **1** | 6 |
| SRSP 5. Features of gwv power supply schemes depending on the operating frequency |  |  |
| **1 Boundarycontrol** |  | **60+40** |
| **Module II** |  |  |
| **6** | Lecture 6. Purpose, structure and technical characteristics of radio receivers. Theinputcircuitoftheradio | **1** | **2** |
|  | Practical lesson 6 Structure and principle of operation of radio receivers | **1** | **6** |
|  | Laboratory work №6: Study of a frequency-modulated oscillator | **1** | 6 |
|  | SRSP 6. Block diagrams and indicators of the radio path of the receiver |  |  |
| **7** | Lecture 7. Amplifiers of radio signals. | **1** | **2** |
| Practical lesson 7. Schemes of resonance amplifiers on non-reciprocal elements; | **1** | **6** |
| Laboratory work №7:Amplitude Detector Study | **1** | 6 |
| SRSP 7. Methods of increasing the stability of resonant amplifiers;Resonant amplifier in the frequency range; |  |  |
| **8** | Lecture 8. Frequency converters and parametric amplifiers. | **1** | **2** |
| Practical lesson 8. Analysis of the generalized equivalent circuit of the resonant amplifier | **1** | **6** |
|  | Laboratory work №8:Frequency Conversion Study | **1** | 6 |
|  | SRSP 8 Diode detection of radio pulses.  |  |  |
| **9** | Lecture 9. Detectors of radio signals. | **1** | **2** |
| Practical lesson 9. Diode detection OF am oscillations. | **1** | **6** |
| Laboratory work №9:Study of receiver AGC systems | **1** | 6 |
| SRSP 9 Digital amplitude limiters |  |  |
| **10** | Lecture 10. Heterodyne tract, adjustment and indication in the radio receiving devices. | **1** | **2** |
| Practical lesson 10. Varieties of amplitude detectors. | **1** | **6** |
|  | Laboratory work №10:Studying the principle of operation of a superheterodyne receiver of AM signals | **1** | 6 |
|  | SRSP 10 Peak detector |  |  |
|  | **MIDTERM** |  | **60+40** |
|  | **Module III** |  |  |
| **11** | Lecture 11. Radio receivers with digital signal processing. | **1** | **2** |
| Practical lesson 11. Characteristics of digital signal processing; | **1** | **6** |
| Laboratory work №11:HRO study | **1** | 6 |
| SRSP 11. Receiver on matched filters and examples of its engineering implementation. |  |  |
| **12** | Lecture 12. Electromagnetic interference in radio receivers. | **1** | **2** |
| Practical lesson 12. The process of signal conversion in digital processing; | **1** | **6** |
|  | Laboratory work №12:Investigation of frequency detectors | **1** | 6 |
|  | SRSP 12. Digitalgenerators. |  |  |
| **13** | Lecture 13. Diversityreception. | **1** | **2** |
| Practical lesson 13. The formation of channels of diversity reception | **1** | **6** |
| Laboratory work №13:Research of a low-level radio transmitter | **1** | 6 |
| SRSP 13. Methods of combining signals with diversity reception |  |  |
| **14** | Lecture 14.Cellular network. Trunking networks. | **1** | **2** |
| Practical lesson 14. Planning of mobile communication networks. | **1** | **6** |
|  | Laboratory work №14:The study of mobile radio stations such as "Len-V" | **1** | 6 |
|  | SRSP 14. Selection and synthesis of mobile networks |  |  |
| **15** | Lecture 15. Radio relay and satellite communication networks. | **1** | **2** |
| Practical lesson 15. Implementation and planning of radio relay networks. | **1** | **6** |
|  | Laboratory work №15:A study of trunked radio stations and comparisons with cellular mobile communications | **1** | 6 |
|  | SRSP 15. Integration of all types of radio communication. |  |  |
|  | **2 Boundarycontrol** | **100** | **60+40** |
|  | **Exam** |  | **100** |
|  | **Overall** |  | **100** |

Teacher\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Baideldinov U.S.

Head of the department\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_М.К.Ibraimov

Chairperson method department

of the faculty \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_G. T. Gabdullina