

Faculty «Computer Technology and Cyber Security»  
Department of “Radio engineering, electronics and telecommunications”

APPROVED BY  
Vice-rector for academic affairs,  
International Information  
Technology University JSC



*T. Umarov*  
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B059 Communications and communications technology  
6B06202 Radioengineering information transmission systems

## CATALOGUE OF ELECTIVE DISCIPLINES

2021

2021

The catalogue of elective disciplines for the specialty/AP 6B06202 Radioengineering information transmission systems is developed on the basis of the working curriculum of the specialty/AP.

The catalogue of elective disciplines was discussed at a meeting of the department «Radio Engineering, Electronics and Telecommunications»

minutes No. 8 from "26" 03.2021.


Head of Department

  
signature

Bakhtiyarova Y.A. associate professor

Full name, position, degree

CED compiler

  
signature

Kamal R.D. lecturer

Full name, position, degree

The catalogue of elective disciplines was approved at a meeting of the Academic Council of "International Information Technology University" JSC minutes No. 4 from "20" 03 2021.

Director of Academic Affairs

  
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Mustafina A.K.

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## 1 TERMS AND ABBREVIATIONS

1.1 Academic program is a single set of basic characteristics of education, including goals, results and content of training, the organization of educational process, ways and methods for their implementation and criteria for assessing learning outcomes.

The content of academic program of higher education consists of three cycles of disciplines - general education disciplines (hereinafter - GED), basic disciplines (hereinafter - BD) and core disciplines (hereinafter - CD).

The cycle of GED includes disciplines of the compulsory component (hereinafter - CC), the university component (hereinafter - UC) and (or) the component of choice (hereinafter - COC). BD and CD include disciplines of UC and COC.

1.2 Catalogue of elective disciplines (CED) is a systematic annotated list of all COC disciplines, for the entire training period, containing a brief description indicating the purpose of study, a summary of main sections and expected learning outcomes. CED reflects the prerequisites and postrequisites of each academic discipline. It should provide the students with the possibility of an alternative choice of elective disciplines for the formation of an individual educational trajectory.

On the basis of academic program and CED, the students develop individual curricula with the help of advisers.

1.3 Individual curriculum (IC) is a curriculum formed by the students independently with the help of an adviser for each academic year on the basis of the academic program, the catalogue of elective disciplines or modules;

IC defines an individual educational trajectory of each student separately. It includes disciplines and types of educational activities (internship, experimental research, forms of final certification) of the compulsory component (CC), the university component (UC) and the component of choice (COC).

1.4 Advisor is a teacher who performs the functions of an academic mentor of a student (according to the appropriate academic program), and assists in choosing a learning path (creating an individual curriculum) and mastering the academic program during the training period.

1.5 The university component is a list of compulsory educational disciplines determined by the university independently for the mastering of the academic program.

1.6 The component of choice is a list of academic disciplines and the corresponding minimum amounts of academic credits offered by the university and independently chosen by students in any academic period, taking into account their prerequisites and postrequisites.

1.7 Elective disciplines are educational disciplines that are a part of the university component and the component of choice in the framework of established academic credits, introduced by organizations of education reflecting the individual preparation of students and taking into account the specifics of socio-economic development, the needs of a particular region and established scientific schools.

1.8 Postrequisites are the disciplines and (or) modules and other types of academic work, the study of which requires knowledge, skills and competencies acquired at the end of the study of this discipline and (or) modules;

1.9 Prerequisites are the disciplines and (or) modules and other types of educational work containing knowledge, abilities, skills and competencies necessary for the mastering of the studied discipline and (or) modules;

1.10 Competencies are the ability of the practical use of acquired knowledge and skills in professional activities.

Cycle of discipline	Code of discipline	Name of discipline	Sem	Number of credits	Prerequisites
<b>3 Course</b>					
Elective discipline -1	EEC 6621	Antenna-feeder devices and radio wave propagation	5	6	Theory of Electromagnetic Waves Transmission
Elective discipline -2	EEC 6612	Radio transmitter devices	6	7	BCT
<b>4 Course</b>					
Elective discipline -3	EEC 6609	Radio receivers	7	4	Theory of Electrical Communication
Elective discipline -4	EEC 6618	Satellite telecommunication systems	7	6	Wireless technology
Elective discipline -5	EEC 6620	Radio frequency spectrum management	7	4	Theory of Electrical Communication
Elective discipline -6	EEC 6614	Electromagnetic compatibility of radio electronic devices	8	5	Radio frequency spectrum management

<b>Description of discipline</b>	
Code of discipline	EEC 6621
Name of the discipline	Antenna feeder devices and radio wave propagation
Number of credits	6
Course, semester	3 year, 5 semester
Name of the Department	«Radio engineering, electronics and telecommunications»
The author of the course	Manatuly A., Kamal R.
Prerequisites	"Mathematics", "Physics", "Theory of electrical circuits", "Fundamentals of radio circuits and signals", "Theory of transmission of electromagnetic waves."
Post-requisites	"Mobile communication systems", "Radio engineering devices"
The purpose of studying the discipline	The study of the purpose, design and properties of antenna-feeder devices, their operation, as well as the characteristics of the propagation of radio waves and their impact on the operation of radio lines for various purposes.
Brief description of the course (main sections)	The course explores the features of the propagation of radio waves in various conditions, the propagation of waves along guide feeder systems and their radiation by antenna devices; main technical characteristics of guide feeder structures, antenna systems of various frequency ranges. Methods of calculation and design of antenna systems taking into account the parameters of the radio channel.
Expected result	As a result of studying the course, students will be able to: <ul style="list-style-type: none"> <li>- to reproduce: basic concepts, definitions, laws of signal conversion in antenna-feeder devices</li> <li>- to name and record the purpose, types and main types of antenna devices, their operating principles, design, operational characteristics, electrical parameters; physical processes that occur during the propagation of radio waves of different ranges in real conditions.</li> <li>- to select and analyze: for a given frequency range, determine the most appropriate type of radio line and the parameters of antenna-feeder devices.</li> <li>- to use theoretical knowledge in laboratory research.</li> <li>- to calculate the energy balance, select the required type of antenna and antenna power scheme for radio relay and space communication systems, calculate and measure the characteristics of the antennas, calculate the field strength by various methods in radio lines, taking into account the phenomena that affect their quality indicators; design of antenna feeder devices.</li> <li>- to evaluate the results obtained, the main time, frequency and energy parameters of antenna systems and field strengths at the receiving point.</li> <li>- to apply analytical and numerical methods for the analysis of antenna systems for 4 different communication systems and frequency ranges, including using modern software.</li> </ul>

<b>Description of Elective Discipline</b>	
Code of discipline	EEC 6612
Name of the discipline	Radio transmitting devices
Number of credits	7
Course, semester	3 course, 6 semester
Name of the Department	«Radio engineering, electronics and telecommunications»
The author of the course	Bakhtiyarova E.A.
Prerequisites	BCT
Post-requisites	Diploma project
The purpose of studying the discipline	The purpose of this discipline is to study the basic laws of information transfer in the field of operation, tuning, maintenance and repair of radio devices used in various systems of radio electronics and telecommunications. The educational goal of the discipline is the formation of students' scientific, creative approach to the development of telecommunication technologies.
Brief description of the course (main sections)	The material of this training complex is based on the study of the fundamental design issues of radio transmitting and receiving devices. Lectures are based on a consistent systematic oral presentation by the teacher of educational material representing a logically complete whole. Each lecture is accompanied by a presentation containing a brief theoretical material and illustrative material. A number of sections and questions of the discipline are submitted for independent study by the student, including under the guidance and supervision of a teacher.
Expected result	<p>Using literature and reference books, calculate the parameters of the modes of devices for generating and generating radio signals, select the necessary electronic devices, calculate circuit elements of radio transmitting devices; put into practice the methods of analysis and calculation of the main functional units of RPU; to develop and justify structural radio receiving nodes and devices; choose the element base and carry out the circuit design of the developed radio receiving nodes and devices.</p> <p>To understand the structural diagrams of typical signal transmitters, the requirements of electromagnetic compatibility, the design of radio transmitting devices, the distortion of continuous and discrete signals during the passage of the radio path of the receiver, the types of interference to the radio reception and methods for increasing the noise immunity of information reception, the features of radio receivers for various purposes, in application computer technology and automation programs for designing and optimizing operating modes of receiving equipment with tems of radio communication, radio broadcasting and television.</p>

<b>Description of discipline</b>	
Code of discipline	EEC 6609

Name of discipline	Radio receivers
Number of credits (ESTS)	4
Course, semester	4 Course, 7 semester
Department	RET
Course author (s)	Bakhtiyarova Y.A.
Prerequisites	Theory of Electrical Communication
Postrequisites	Diploma project
The aim of study of a discipline	The purpose of this discipline is to study the foundations of the construction and operation of radio receiving systems for various purposes, the classification of radio receiving systems, the study of methods for calculating the main characteristics of radio receiving systems, the principles of functioning of radio receiving systems. main nodes and blocks of mobile and base stations used in coding systems and types of modulation of HF oscillations.
Brief course description (main sections)	The material of this educational-methodical complex is based on the study of the fundamental issues of the construction and operation of radio engineering systems for various purposes. Lectures are based on a consistent systematic oral presentation by the teacher of educational material. Each lecture is accompanied by a presentation containing a brief theoretical material and illustrative material. A number of sections and questions of the discipline are submitted for independent study by the student, including under the guidance and supervision of a teacher.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	As a result of studying the discipline, the student must: <ul style="list-style-type: none"> <li>- know the physical foundations, principles of operation, methods of construction, operation and use of various types of ReS;</li> <li>- be able to analyze the structure of the system and assess the degree of complexity of the equipment;</li> <li>- to have an idea of modern ReS and the prospects for their development.</li> </ul>

<b>Description of discipline</b>	
Code of discipline	EEC 6618
Name of the discipline	Satellite communications systems

Number of credits	6
Course, semester	Course 4, semester 7
Name of the Department	«Radio engineering, electronics and telecommunications»
The author of the course	Kulakayev A.Y
Prerequisites	Wireless technology
Post-requisites	Diploma project
The purpose of studying the discipline	Familiarization of students with modern directions in the development of satellite communication systems, with the principles of satellite communication systems, with signal processing methods, with the influence of external and internal interference on the accuracy of determining coordinates, as well as with the principles of operation of radio receiving nodes, units and devices and understand the physical processes that occur in them, using in practice the methods of analysis and calculation of the main functional units of radio receivers and radio transmitting devices, to carry out modeling, theoretical and experimental erimentalnoe study of newly developed devices, their modernization with the help of modern methods and tools for analysis and synthesis, to acquire skills in making settings and adjustments transceiver equipment during installation and maintenance of satellite communication systems.
Brief description of the course (main sections)	In this course, students will study the classification and construction of satellite communication systems, the main characteristics of satellites orbits, coverage areas and service areas, types of orbits and the specifics of using a geostationary orbit, the features of the construction and operation of space and earth stations.
Expected result	<p>To have an idea:</p> <ul style="list-style-type: none"> <li>- On modern and promising areas of development of satellite equipment;</li> <li>- on the characteristics of modern modulation methods and digital signal processing used in satellite equipment;</li> <li>- on the frequency ranges allocated for the operation of radio communication systems for various purposes;</li> <li>- On the operating conditions of satellite communications networks;</li> <li>- on the applied methods of calculation and design of satellite systems;</li> <li>- on the areas of use of satellite systems;</li> <li>- on the issues of electromagnetic compatibility of various radio communication and broadcasting systems;</li> </ul> <p>To know:</p> <ul style="list-style-type: none"> <li>- the physical nature of the phenomena that occur during signal processing in satellite equipment and during signal propagation;</li> <li>- high-frequency electronic devices used in transceiver-satellite equipment;</li> <li>- block diagram of satellite stations for various purposes, especially the antenna systems used in these systems;</li> <li>- methods of forming streams of transmitted information;</li> <li>- Features of satellite radio communication and broadcasting systems, methods of calculating energy characteristics;</li> </ul>



	<ul style="list-style-type: none"><li>- basic requirements for electromagnetic compatibility of satellite radio communication and broadcasting systems.</li></ul> be able to: <ul style="list-style-type: none"><li>- using technical literature and reference books, carry out the design of satellite systems for various purposes;</li><li>- choose the characteristics of the equipment to create a satellite transmission system;</li><li>- carry out energy calculations of satellite link parameters.</li></ul>
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<b>Description of discipline</b>	
Code of discipline	EEC 6620

Name of the discipline	RF spectrum management
Number of credits	4
Course, semester	Course 4, semester 7
Name of the Department	«Radio engineering, electronics and telecommunications»
The author of the course	Aitmagambetov A.Z.
Prerequisites	Theory of Electrical Communication
Post-requisites	Diploma project
The purpose of studying the discipline	The study of the main issues on the regulation of the use of the radio frequency spectrum.
Brief description of the course (main sections)	This discipline is devoted to the management of the use of the radio frequency spectrum (RFS). The regulatory documents of the Republic of Kazakhstan and the International Telecommunication Union in the field of the use of RFS are considered. We study the methods of managing PSD at the national and international levels, the structure of government, methods of increasing the effectiveness of using PSD.
Expected result	As a result of studying the course, students will be able to: <ul style="list-style-type: none"> <li>• describe and classify the main processes for controlling the radio-frequency spectrum at the national and international levels;</li> <li>• use the regulatory documents of the International Telecommunication Union, RCC and the communication administration of Kazakhstan in the design, implementation and operation of radio systems and networks for various purposes;</li> <li>• own methods for ensuring electromagnetic compatibility of existing and implemented radio systems and networks;</li> <li>• use the acquired knowledge in the development and implementation of new generation wireless systems and telecommunication networks.</li> </ul>

<b>Description of discipline</b>	
Code of discipline	EEC 6614
Name of the discipline	Electromagnetic compatibility of radio electronic devices
Number of credits	5

Course, semester	Course 4, semester 8
Name of the Department	«Radio engineering, electronics and telecommunications»
The author of the course	Aitmagambetov A.Z.
Prerequisites	RF spectrum management
Post-requisites	Diploma project
The purpose of studying the discipline	The purpose of this discipline is to study methods for increasing the efficiency of using the radio frequency spectrum for the development of radio engineering and telecommunication systems and networks.
Brief description of the course (main sections)	The regulatory documents of the national and international level, the Radio Regulations of the International Telecommunication Union are considered. Methods of ensuring electromagnetic compatibility of electronic equipment, the use of new frequency ranges for new generation radio communication systems are being studied.
Expected result	As a result of studying the course, students will be able to: <ul style="list-style-type: none"> <li>• Classify the ranges of the radio frequency spectrum in order to increase the efficiency of use for radio engineering systems and wireless telecommunication networks;</li> <li>• use theoretical knowledge in the field of radio engineering and the use of various frequency ranges for the effective use of RFS;</li> <li>• own methods to increase the efficiency of using RFS;</li> <li>• use the acquired knowledge in the planning, development and implementation of radio systems and networks for various purposes.</li> </ul>