

The syllabus of the discipline

## *Internet of Things*

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<b>Field name</b>	<b>Detailed content, comments</b>
Name of the faculty	Faculty of Infocommunications
Level of higher education	Second (master's)
Code and name of the specialty	172 Telecommunications and radio engineering
Type and name of educational program	EPP "Information and Network Engineering"
Name of the discipline	Internet of Things
Number of ECTS credits	3
Discipline structure (distribution by types and hours of study)	44 hours - 22 lectures, 16 hours - 4 laboratory classes, 8 hours - 4 consultations, 52 hours - homework, <b>type of control:</b> credit
Schedule (terms) of studying the discipline	1st year, II semester
Prerequisites for studying the discipline	Basic concepts of academic disciplines: Higher Mathematics; Telecommunication theory; Telecommunication and information networks
Competences, knowledge, skills, understanding, which is acquired by the applicant in higher education in the learning process	The discipline is used to form the following competencies: to have the terminology, basic skills of programming end devices, basic skills in connecting end devices to the network, basic skills in creating software solutions for processing and storing data using cloud technologies.
The quality of the educational process	Educational-methodical and material-technical resource provision of the educational program, within the framework of which the discipline is studied, meets the licensing requirements and accreditation conditions of the educational activity of the university. Annual monitoring and revision of the curriculum of the discipline in accordance with the requirements and recommendations of the Ministry of Education and Science, state certification of acquired competencies of graduates, standards of cooperation with employers to ensure a competitive level of training. Adherence to the principles of academic integrity ( <a href="https://lib.nure.ua/plagiat">https://lib.nure.ua/plagiat</a> ). Contains public information on the requirements, competencies, level of education within the current educational program.

## Description and content of the discipline

According to the qualification requirements for higher education in the specialty 172 "Telecommunications and Radio Engineering" the purpose of the discipline is to study a new concept of communication networks - the Internet of Things, and implement this concept in practice. The discipline "Internet of Things" should provide a foundation for the training of future professionals in the field of fundamentally new communication networks, as well as create the necessary basis for successful mastery of the following special disciplines of the curriculum. It should promote the development of creative abilities of students, the ability to formulate and solve problems to be studied, the ability to creatively apply and improve their knowledge.

### Content

#### **Content module 1. General principles of interaction and technology basis**

Topic 1. Introduction. Basic concepts of IoT.

Topic 2. IoT architecture and hardware.

Topic 3. Methods of information transfer in IoT.

Topic 4. Networking protocols.

Topic 5. Data processing in IoT. Semantic Web.

#### **Content module 2. Tools for implementing the Internet of Things**

Topic 1. The main characteristics of Big Data (Big Data).

Topic 2. The use of cloud technologies and service-oriented IoT architectures.

Topic 3. Principles of creating user applications.

Topic 4. IoT services, applications and business models.

Topic 5. Security in IoT.

Topic 6. Practical implementations.

### Learning outcomes of higher education

As a result of studying the discipline, students must:

**know:** the principles of organization and functioning of the Internet of Things, the history of origin and development, the main factors of development, existing technologies in the field, the main trends and directions in the field of the Internet of Things;

**be able to:** work with microcontrollers and main debug boards (Arduino and Raspberry Pi), understand existing IoT technologies and apply them to specific scenarios, design integrated IoT systems (including end devices, network connection, data exchange, cloud platforms, data analysis);

**have competances:** terminological apparatus, basic skills of programming end devices, basic skills in connecting end devices to the network, basic skills in creating software solutions for processing and storing data using cloud technologies.

### **Assessment system according to each task for passing the test / exam**

To evaluate the student's work during the semester final Qsem rating is calculated as the sum of ratings by different types classes and assessments for control measures.

Type of lesson / control measure	Rating
Lectures №1-3	$(1...2) \times 3 = 3...6$
Lb №1-2	$(10...14) \times 2 = 20...28$
Checkpoint 1	<b>23...34</b>
Lectures №4-7	$(1...2) \times 4 = 4...8$
Lb -43-4	$(10...14) \times 2 = 20...28$
Individual Task	13...30
Checkpoint 2	<b>37...66</b>
<b>Total for the semester</b>	<b>60...100</b>

Each laboratory work is evaluated at 14 points (2 points for work, 2 points for preparation for the lesson, 10 points for defense). As a type of control, individual homework is provided, which is estimated at 30 points. The maximum rating during the semester is 100 points.

As a form of final control in the discipline of "Internet of Things" is used offset.

### **Qualitative evaluation criteria in the national scale and ECTS**

**Satisfactory, D, E (60-74).** Show the required minimum of theoretical knowledge. Know the ways and methods of solving practical problems and be able to use them in practice.

**Good, C (75-89).** Firmly know a minimum of theoretical knowledge. Demonstrate the ability to solve a practical problem and justify all stages of the proposed solution.

**Excellent, A, B (90-100).** Show complete knowledge of basic and additional theoretical material. Unmistakably solve a practical problem, explain and justify the chosen method of solution.

### Assessment scale: national and ECTS

The sum of points for all types of educational activities	ECTS assessment	Score on a national scale	
		for exam, course project (work), practice	for offset
90 – 100	<b>A</b>	perfectly	credited
82-89	<b>B</b>	fine	
74-81	<b>C</b>		
64-73	<b>D</b>	satisfactorily	
60-63	<b>E</b>		
35-59	<b>FX</b>	unsatisfactory with the possibility of reassembly	not credited with the possibility of re-assembly
0-34	<b>F</b>	unsatisfactory with mandatory re-examination	not credited with compulsory re-study of the discipline

### Methodical support

#### Basic literature

1. Rosliakov, A.V. Ynternet veshchei: uchebnoe posobyе/ A.V. Rosliakov, S.V. Vaniashyn, A.Iu. Hrebeshkov. – Samara: PHUTY, 2015. – 200 s.
2. Kucheriavyi A.E., Prokopev A.V., Kucheriavyi E.A. Samoorhanyzuiushchyesia sety: uchebnoe posobyе. – SPb.: Liubavych, 2011. – 309 s.
3. Holdshstein B.S., Sokolov N.A., Yanovskyi H.H. Sety sviazy: uchebnyk dlia vuzov. – SPb.: BKhV, 2010.
4. Ynternet veshchei. Yssledovaniya y oblast pryumeneniya: monohrafiya/ E.P. Zaramenskykh, Y.E. Artemev. – M.: NYTs YNFRA-M, 2015. – 200 s

#### Supporting literature

5. Kucheriavyi A. E. Ynternet Veshchei// Электросвiаз. – 2013. – № 1.
6. Bohorodytskaia Y.A. M2M – новые vozmozhnosity dlia razvytyia sotovoho byznesa/ Y.A. Bohorodytskaia // Электросвiаз. – 2012. – №1. – S. 38-39.
7. Holdshstein, B.S. Sety sviazy post-NGN/ B.S. Holdshstein, A.E.Kucheriavyi. – SPb.: BKhV-Peterburh, 2013. – 160 s.
8. Rekomendatsiya MSЭ-T Y.3001. Budushchye sety: tselevыe ustanovky y tsely proektyrovaniya, 2011 [Elektronnyi resurs]. – 26 s.

9. ETSI TS 102 690 «Machine-to-Machine communications (M2M); Functional architecture» [Elektronnyi resurs], V1.1.1. – 2011. – 280 r.
10. ISO/IEC 18092:2004. Information technology – Telecommunications and information exchange between systems – Near Field Communication – Interface and Protocol (NFCIP-1) [Elektronnyi resurs].

#### Methodical instructions for different types of classes

8. Metodychni vказivky do laboratornykh robit z dystsypliny «Internet of Things» dlia studentiv usikh form navchannia spetsialnosti 172 «Telekomunikatsii ta radiotekhnika», spetsializatsiia: Informatsiini merezhi zviazku/ Uporiad. V.O. Vlasova. – Kharkiv: KhNURE, 2017. [Elektronne vydannia]
9. Metodychni vказivky do samostiinoi roboty z dystsypliny «Internet of Things» dlia studentiv usikh form navchannia spetsialnosti 172 «Telekomunikatsii ta radiotekhnika», spetsializatsiia: Informatsiini merezhi zviazku / Uporiad. V.O. Vlasova. – Kharkiv: KhNURE, 2017. [Elektronne vydannia]

#### Information support

1. Cisco Packet Tracer 7 software.
2. Arduino Software Development Environment (IDE).