"Халықаралық ақпараттық технологиялар университеті" АҚ

АО "Международный университет информационных технологий"

Faculty of Computer technology and cybersecurity

Department of Cybersecurity

«APPROVED»
Dean of faculty
_____ Seilova N. A.
«____» _____ 2025

WORKING CURRICULUM OF THE DISCIPLINE (SYLLABUS)

Course: NET6202 Basics of routing, switching and wireless networks

Group of educational programs: B058-Information security

Educational program: 6B06301- Computer security, 6B06302-Hardware security, 6B06303-Network security

Year: 2 **Semester:** 4 **Number of academic credits**: 6 ECTS

Lectures:	_15_	hours
Practical work:	_15_	hours
Laboratory work:	_30_	hours
IWST:	_15_	hours
IWS:	_105_	hours
TOTAL:	_180_	hours
Cycle of discipline:	_____Basic_____ (General education/Basic/Major)	
Form of control:	_Test at Netacad.com_	

Almaty 2025

«IITU» JSC

The working curriculum of the discipline (syllabus) NET6202 Basics of routing, switching and wireless networks

has been developed on the basis of the educational program 6B06301- Computer security, 6B06302-Hardware security, 6B06303-Network security.

The working curriculum of the discipline (syllabus) has been reviewed at the meeting of Cybersecurity department.

Minutes №. 1 **dated «**26**»** August **2025**

Head of the Department _____ associate professor Yeskendirova D.M.
signature *full name*

Authors

_____ senior-lecturer Pyagay V.T.
signature *full name, title, degree*

_____ senior-lecturer Ongenbayeva Zh.Zh.
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_____ associate professor Cherikbayeva L.
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_____ senior-lecturer Baitenova S.
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_____ assistant Zhunait A.B.
signature *full name, title, degree*

The working curriculum of the discipline (syllabus) was approved at a meeting of the Faculty's Academic Quality Council.

Minutes № 7 **dated "**09**"** December **20**25

Agreed:

Head of the Department of the Educational and Methodological activities _____ **Ajibayeva A.**

Library _____ Seksenbayeva N.O.
(Full name and position)

1. General information	
Faculty	Faculty of Computer technology and cybersecurity
Code and name of the educational program (EP)	6B06301- Computer security, 6B06302-Hardware security, 6B06303-Network security
Program level (bachelor's, master's, PhD)	Bachelor
Year, semester	2, 4
Name of the discipline	NET6202 Basics of routing, switching and wireless networks
Cycle of the discipline	Basic
Number of academic credits	6
Prerequisites	NET6201 Computer Networking Basics
Postrequisites	NET6203 Security and automation of corporate networks
Lecturer	Pyagay Viktor Timofeevich, senior-lecturer, MSc. E-mail: v.pyagai@iitu.edu.kz Ongenbayeva Zhadyra Zhumabekovna, senior-lecturer, MSc. E-mail: zh.ongenbayeva@iitu.edu.kz Makilenov Shakirt Nurlubekuly, senior-lecturer, MSc. E-mail:sh.makilenov@iitu.edu.kz Cherikbayeva Lyailya Sharipovna, associate professor E-mail: l.cherikbayeva@iitu.edu.kz Baitenova Saltanat, senior-lecturer, E-mail: sbaitenova02@gmail.com Zhunait Askar Berdimuratuly, assistant, MSc, E-mail: a.zhunait@iitu.edu.kz --- Room #401b, 330-85-66 ext. 2039. Office hours: 10:00-12:00 while out of lesson schedule
Teachers who conduct practical or laboratory classes	Ongenbayeva Zh.Zh., senior-lecturer, M.Sc., zh. Ongenbayeva@iitu.edu.kz Yerniyaz B., assistant, M.Sc., , b.yerniyaz@iitu.edu.kz Batyrkhanova A., assistant, M.Sc., a.batyrkhanova@iitu.edu.kz Zhunait A.B., assistant, M.Sc., a.zhunait@iitu.edu.kz Ashirbayeva A.S., assistant, M.Sc., A.Ashirbayeva@iitu.edu.kz Beken M.K., assistant, m.beken@iitu.edu.kz Sungkarbekov Y.S., assistant, y.sungkarbekov@iitu.edu.kz Baikuvekov M.B., senior-lecturer, m.baikuvekov@iitu.edu.kz

2. Goals, objectives and learning outcomes of the course

The course goal is to learn the architecture, components, and operations of routers and switches in a small network, configuration of a router and a switch for basic functionality.

The objectives of the course are to

- learn the architecture, components, and operations of routers and switches in a small network;
- learn how to configure a switch for basic functionality, virtual LANs, DHCP;
- learn how to configure a router for basic functionality, inter-VLAN routing, implement distance-vector protocols, static routes, DHCP;
- learn how to verify and troubleshoot routers and switches and resolve common issues configurations in both IPv4 and IPv6 networks.

Learning outcomes of the course:

Students who sre successfully completed the course will be able to:

1. Configure and troubleshoot basic operations of a small switched network.
2. Configure and troubleshoot VLANs and inter-VLAN routing.
3. Configure and verify Etherchannel protocols.
4. Configure and troubleshoot basic LAN security issues.
5. Configure and verify DHCPv4 and DHCPv6.
6. Configure and verify static routing and default routing.
7. Configure and verify Wireless LANs
8. Apply basic data protection technologies in computer systems and networks
9. General network utilities for inspecting network operations and analyzing data traffic
10. Initial settings on a network device

Competencies: Competencies formed as a result of mastering the discipline:
Critical thinking and analitycal skills,
Professional skills – see Learning outcomes,
ICT competence

3. Course description

Course Description: This course focuses on the principles of switched networks, switching and routing concepts. It begins with a basic switch configuration and VLAN implementation, including security issues. Then it continues with a basic routing configurations and implementation of inter-VLAN routing. The course also covers dynamic assignment of IP addresses in the network, calculation of summary routes with IPv4 and IPv6, mapping the Internet, principles of documenting the network and wireless networks including Wireless LAN controllers. In the end the course includes routing protocols and static and default routes for IPv4 and IPv6.

4. Teaching methods

Teaching methods:

Interactive Content: The course utilizes rich multimedia, including videos, interactive activities, and quizzes, to engage students and accommodate different learning styles. This helps reinforce concepts and improve knowledge retention.

Hands-on Labs: A core component of the course is hands-on experience with real networking equipment. These labs allow students to apply theoretical knowledge, develop problem-solving skills, and practice configuring devices.

Packet Tracer Simulations: Cisco's Packet Tracer is a network simulation tool that allows students to build, configure, and troubleshoot virtual networks in a safe environment. It's used for both guided activities and independent practice, helping students develop critical thinking and complex problem-solving abilities.

Instructor-Facilitated Learning: While the curriculum is standardized, it is designed to be facilitated by an instructor. This allows teachers to provide context, supplement the curriculum with additional materials, and align the instruction with local needs and goals.

Assessments: The course includes both formative and summative assessments. Quizzes and interactive checks are embedded throughout the modules to provide immediate feedback on student progress. Comprehensive final exams and hands-on skills tests evaluate mastery of the course material.

5. Course policy

Attendance Policy: If the absence rate is more than 20%, the student will automatically receive an F. Students are responsible for tracking their own attendance to avoid this penalty.

Deadline and Submission Policies:

Deadline Policy: Student assignments must be submitted before the deadline specified by the instructor in the LMS during Laboratory and Practical Classes.

Late Submission Policy: Late submission is not accepted at all.

Resubmission Policy: Resubmission is not accepted unless the special order of university dean department is provided.

Respect for Differences of Opinion.

The students and the instructor are engaged in respectful dialogue, even when they disagree.
Constructive disagreement: Students are expected to challenge ideas, not individuals.
Active listening: All participants should listen to understand different perspectives.
Inclusive language: Personal attacks, harassment, or derogatory remarks are prohibited.
Confidentiality: Personal information is not shared in class and kept confidentially.
All students should be respected and treated safely.

Communication and Ethics of Interaction

This includes:
Professionalism: Using appropriate language and tone in all written and verbal communication.
Promptness: Expecting students to check their email regularly and for instructors to respond within a specified timeframe (e.g., 24-48 hours on weekdays).
Privacy: Sharing personal information about classmates or the instructor without permission are not allowed.

Inclusion and Individual Needs Policy

The instructor and university confirm thier dedication to create an inclusive classroom where all students including those with disabilities are valued and welcomed.
If students need special assistance and/or help on attenting the classes, they should contact the university dean department and register their specific needs with appropriate documents.
However, the students must communicate their needs with the instructor in a timely manner, usually at the beginning of the semester, so that necessary actions can be arranged.

Exemption from Physical Activity (in the discipline "Physical Education")

This policy is not applicable to the currect course.

6. Academic Integrity

- Plagiarism and other violations policy

Academic misconduct, such as plagiarism and cheating can cause severe consequences, which can range from F-grade on the assignment to expulsion from the course or the institution. The references to the resources used should be properly citated and outlined.

- Code of academic integrity

The students mus complete their assignments individually unless an instructor explicitly permits collaboration, students also must assume that all work should be completed independently. It is the student's responsibility to ask for clarification if they are unsure.

Falsifying any official documents to get an extension on a deadline and/or Impersonating another student or having someone else take an exam for you and/or Manipulating grades or records will be considered as a serious disciplinary issue and cause the F-grade and course exemption.

- Use of AI - conditions must be written (use of AI is permitted only within the limits defined by the teacher)

The use of Artificial Intelligence (AI) tools, such as ChatGPT, Google Gemini, and similar generative AI applications, is **permitted only within the specific limits defined by the instructor** for each assignment. This policy is designed to ensure that you use these tools as a supplement to your own critical thinking and learning, not as a replacement for it.

- **When AI Use is Permitted:** You may be allowed to use AI for tasks such as brainstorming ideas, summarizing a complex text, or generating an initial draft outline.

Any assignment where AI use is permitted will explicitly state this, along with the specific boundaries for its use. For example, an assignment might instruct you to "Use an AI tool to brainstorm five potential research questions, and then write a one-paragraph reflection on which question you chose and why." In such cases, you must cite the AI tool in your work.

- **When AI Use is Prohibited:** The use of AI to generate an entire assignment, including essays, lab reports, or code, is strictly **prohibited**. Submitting work that is wholly or substantially generated by an AI tool without proper citation is considered a form of academic misconduct, specifically plagiarism. This includes copy-pasting text from an AI output without editing or citing it.
- **Your Responsibility and Citation:** You are ultimately responsible for the accuracy, originality, and integrity of all work you submit. Using an AI tool does not absolve you of this responsibility. When an AI tool is used as permitted, you must **document your use**. This can be done by including a short note in your submission or a citation on a works cited page, such as: "Text generated by ChatGPT, a large language model trained by OpenAI, 2024."
- **Consequences of Misuse:** Misuse of AI tools—specifically, using them in ways not explicitly permitted by the instructor—will be treated as a violation of the **Academic Conduct and Ethics Policy**. This may result in a failing grade for the assignment or for the course, depending on the severity of the violation.

7. Literature

Basic literature:

1. Tannenbaum A..Computer Networks: tutorial, Pearson, 2021. - 922 p.

2. Introduction to Networks Companion Guide (CCNAv7), San Jose; Singapur; The Netherlands: Cisco Press, 2021. - 700 p.

3. Matthew N., Sadiku O. Fundamentals of Computer Networks, USA: Springer, 2022. - 174 p.

4. Newman M. E. J. Networks. An lntroduction - New York: Oxford University press, 2010. - 772 p.

5. Ramamoorthy, V. Fundamentals of Computer Networks, LAP LAMBERT Academic Publishing, 2020. - 210 p.

Supplementary literature:

1. CCNAv7: Introduction to Networks. On-line e-book at www.netacad.com

2. CCNAv7: Introduction to Networks. Student Packet Tracer Manual.

3. CCNAv7: Introduction to Networks. Student Lab Manual.

Online resources:

All Cisco resources above are available on http://www.netacad.com

8. Forms of control and assessment

№	Type of work	Form of control	Evaluation criteria
1.	Lab/Practical assessment	Packet Tracer Lab and Practical questions and tasks	Score of Simulation laboratory and answers
2.	Mid-term	MCQ in netacad	Test score

		Packet Tracer assignment	Score of Simulation assignment
3.	End-of-term	MCQ in netacad Packet Tracer assignment	Test score Score of Simulation assignment
4.	Types of Independent Student Work	ISW material is included in the MCQ tests and oral defenses.	Test score Score of Simulation assignment Answers during oral defense
5.	Final assessment	MCQ in netacad	Test score

9. **System for evaluating student performance in a discipline:**
Each type of academic work is assessed on a 100-point scale in accordance with the table.
Example

Period	Assignments	Score
1st attestation	Laboratory works	100
	Practical classes	100
	ISW assignments	100
	Mid-term	100
2nd attestation	Laboratory works	100
	Practical classes	100
	ISW assignments	100
	End-of-term	100
	Exam	
TOTAL	**0,3*1АТ+0,3*2АТ+0,4*Ex.**	

10. **Course schedule**

Week/ date	Course topics	References	Lectures (h/w)	Practical sessions (h/w)	Lab. sessions (h/w)	IWST (h/w)	IWS (h/w)
1.	Basic device configuration	1	1	1	2	1	7
2.	Switching concepts	1	1	1	2	1	7
3.	VLANs	1, 2	1	1	2	1	7
4.	Inter-VLAN routing	1	1	1	2	1	7
5.	STP concepts	1, 2	1	1	2	1	7

6.	STP operations	1	1	1	2	1	7
7.	EtherChannel	1, 2	1	1	2	1	7
8.	DHCPv4, SLAAC and DHCPv6	1	1	1	2	1	7
9.	FHRP concepts	1	1	1	2	1	7
10.	LAN security concepts	1	1	1	2	1	7
11.	Switch security configuration	1, 2	1	1	2	1	7
12.	Routing concepts	1	1	1	2	1	7
13.	IP static routing	1	1	1	2	1	7
14.	Troubleshoot static and default routes	1	1	1	2	1	7
15.	WLAN concepts and configuration	1	1	1	2	1	7
Total hours:			**15**	**15**	**30**	**15**	**105**

11. List of topics/assignments for laboratory classes

№	Topic Title	Number of hours	References	Form of reporting	Deadline
1.	Basic Switch\Router Settings Configuration	2	1	Completed work in pdf format	Week 1
2.	Implement a Small Network and investigate switch operation	2	1	Successfull console connection	Week 2
3.	Investigate a VLAN Implementation	2	1	Completed work in Packet Tracer (PT)	Week 3
4.	Implement VLANs and Trunking	2	1	Completed work in pdf format	Week 4
5.	Investigate STP Loop Prevention	2	1	Successful interception of the network Traffic	Week 5
6.	Implement EtherChannel	2	1	Completed work in PT	Week 6
7.	Configure DHCPv4	2	1	Completed work in pdf format	Week 7
8.	Configure HSRP	2	1	Completed work in pdf format	Week 8
9.	Switch Security Configuration	2	1	Completed work in pdf format	Week 9
10.	Configure a Wireless Network	2	1	Completed work in pdf format and PT file	Week 10

11.	Configure a WPA2 Enterprise WLAN on the WLC	2	1	Completed work in pdf format and PT file	Week 11
12.	IPv4 and IPv6 Static and Default Routes configuration	2	1	Completed work in pdf format and PT file	Week 12
13.	Static and Default Routes Troubleshooting	2	1	Completed work in pdf format and PT file	Week 13
14.	Skill Integration Challenge Summary	2	1	Completed work in PT	Week 14
15.	Troubleshooting Challenge Summary	2	1	Completed work in PT	Week 15

12. List of topics/assignments for practical classes

№	Topic Title	Number of hours	References	Form of reporting	Deadline
1.	Basic Switch Configuration	1	1	-	Week 1
2.	VLAN Configuration	1	1	PT file	Week 2
3.	Investigate a VLAN Implementation	1	1	PT file	Week 3
4.	Configure Router-on-a-Stick Inter-VLAN Routing	1	1	PT file	Week 4
5.	Investigate STP Loop Prevention	1	1	PT file	Week 5
6.	Configure Layer 3 Switching and Inter-VLAN Routing	1	1	PT file	Week 6
7.	Configure EtherChannel	1	1	PT file	Week 7
8.	Configure DHCPv4	1	1	Pdf and PT files	Week 8
9.	Implement Port Security	1	1	PT file	Week 9
10.	Configure a Basic WLAN on the WLC	1	1	Pdf and PT files	Week 10
11.	Troubleshoot WLAN Issues	1	1	PT file	Week 11
12.	Configure IPv4 and IPv6 Static and Default Routes	1	1	Pdf and PT files	Week 12
13.	Troubleshoot Static and Default Routes	1	1	PT file	Week 13
14.	Multiuser - Implement Services	1	1	Pdf and PT files	Week 14
15.	Configuring Secure Passwords and SSH	1	1	Pdf and PT files	Week 15

13. List of topics/assignments for student's independent work

Proper organization of students' independent work is the key to the formation of skills in mastering, learning, assimilation and systematization of acquired knowledge, ensuring a high level of academic performance in the learning process.

№	Topic/Assignment title	Number of hours	References	Form of reporting	Deadline
1.	Cisco IOS navigation and help system	7	Basic [1][2] Supplementary [2][3]	PT file	Week 1
2.	Network cabling standards and media types	7	Basic [1][2] Supplementary [2][3]	PT file	Week 2
3.	MAC address table operation and frame forwarding	7	Basic [1][2] Supplementary [2][3]	PT file	Week 3
4.	VLAN design best practices	7	Basic [1][2] Supplementary [2][3]	PT file	Week 4
5.	IEEE 802.1Q trunking and native VLAN concepts	7	Basic [1][2] Supplementary [2][3]	PT file	Week 5
6.	Inter-VLAN routing methods comparison	7	Basic [1][2] Supplementary [2][3]	PT file	Week 6
7.	Spanning Tree Protocol variants overview	7	Basic [1][2] Supplementary [2][3]	PT file	Week 7
8.	STP root bridge selection principles	7	Basic [1][2] Supplementary [2][3]	PT file	Week 8
9.	EtherChannel load balancing mechanisms	7	Basic [1][2] Supplementary [2][3]	PT file	Week 9
10.	IPv4 addressing and subnet planning	7	Basic [1][2] Supplementary [2][3]	PT file	Week 10
11.	DHCPv4, SLAAC, and DHCPv6 comparison	7	Basic [1][2] Supplementary [2][3]	PT file	Week 11
12.	First Hop Redundancy Protocols overview	7	Basic [1][2] Supplementary [1][2][3]	PT file	Week 12
13.	Common Layer 2 network attacks	7	Basic [1][2] Supplementary [1][2][3]	PT file	Week 13
14.	Wireless LAN security models	7	Basic [1][2] Supplementary [1][2][3]	PT file	Week 14
15.	Static versus dynamic routing concepts	7	Basic [1][2] Supplementary [1][2][3]	PT file	Week 15

14. Assessment criteria

The point-rating letter system for assessing the educational achievements of students with their interpretation in the traditional grading scale:

Letter system assessment	The digital equivalent of points	Percentage content	Traditional system assessment	General description of grading criteria
A	4,0	95-100	Excellent	The student has knowledge of the subject in the full scope of the curriculum, understands the discipline deeply enough; shows a high level of knowledge that exceeds the volume provided by the syllabus, gives an exhaustive answer
A-	3,67	90-94		The student has knowledge of the subject in the full scope of the curriculum, understands the discipline deeply enough; gives an exhaustive answer
B+	3,33	85-89	Good	The student shows a complete, well-founded knowledge of the subject, but the answers did not always highlight the main idea, rational methods of calculation were not always used; the answers were mostly brief and sometimes unclear.
B	3,0	80-84		
B-	2,67	75-79		
C+	2,33	70-74		
C	2,0	65-69	Satisfactory	The student demonstrates sufficient knowledge of the subject, but without proper depth and justification, the answers are unclear and without proper logical sequence.
C-	1,67	60-64		
D+	1,33	55-59		
D	1,0	50-54		
FX	0,5	25-49	Unsatisfactory	The student demonstrates insufficient knowledge of the subject, positive answers were not given to individual questions.
F	0	0-24		The student demonstrates a very low level of knowledge of the subject.

15. Assessment and evaluation materials (exam questions)

- List of pissible exam questions on lecture topics is given in netacad platform. The real questions are hidden from the students
- Form of assessment (exam): online testing on netacad platform, comprehensive.

– A sample examination ticket/test/project assignment, indicating the assessment criteria (required).

Why would a Layer 2 switch need an IP address?

- to enable the switch to send broadcast frames to attached PCs
- to enable the switch to function as a default gateway
- to enable the switch to be managed remotely
- to enable the switch to receive frames from attached PCs

16. Introducing students to the syllabus

I have read and agree with the requirements of the discipline «Computer Networking Basics».

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