SYLLABUS

1. Information regarding the programme

1.1 Higher education	Babeş Bolyai University	
institution		
1.2 Faculty	Faculty of Mathematics and Computer Science	
1.3 Department	Department of Computer Science	
1.4 Field of study	Computer Science	
1.5 Study cycle	Bachelor	
1.6 Study programme /	Computer Science	
Qualification		

2. Information regarding the discipline

2.1 Name of the discipline Specialised Protocols in Computer Networks									
2.2 Course coordinator PhD. Assoc. Prof. Adrian Sergiu DARABANT									
2.3 Seminar coordinator				PhD. Assoc. Prof. Adrian Sergiu DARABANT					
2.4. Year of	3	2.5	5	5 2.6. Type of C 2.7 Type of Optional					
study		Semester		evaluation discipline					

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	4	Of which: 3.2 course	2	3.3	1 lab+
				seminar/laboratory	1pr
3.4 Total hours in the curriculum	56	Of which: 3.5 course	28	3.6	28
				seminar/laboratory	
Time allotment:					
Learning using manual, course support, bibliography, course notes					
Additional documentation (in libraries, on electronic platforms, field documentation)					
Preparation for seminars/labs, homework, papers, portofolios and essays					10
Tutorship					4
Evaluations					10
Other activities:					-

3.7 Total individual study hours	44
3.8 Total hours per semester	100
3.9 Number of ECTS credits	4

4. Prerequisites (if necessary)

4.1. curriculum	Computer Networks, Operating Systems, Computer System Architecture	
4.2. competencies	 Good knowledge of TCP/IP, basis of network security, data encryption algorithms. 	

5. Conditions (if necessary)

5.1. for the course	•	Classroom with network and Internet access and to laboratory
		equipment.

5.2.	for the seminar /lab
activ	vities

• Laboratory with Internet connected computers; Linux and Windows servers and desktops, routers, switches, wireless access points;

6. Specific competencies acquired

 C6.2 Identification and explanation of basic architectures for systems and compunetworks management. C6.4 Performance, response time and resource consumption measurements; established and enforcing access rights. 					
C6.5 Implementation of computer networking projects.					
CT1 Applying organized and efficient work rules, responsible attitude towards so	cientific/				
teaching domains in order to obtain a creative exploitation of own potential, whil	e				
respecting the principles and rules of professional ethics					
Sal					
CT3 Use of effective methods and techniques for learning, information, research a capacity to exploit knowledge, to adapt to a dynamic society and communication Romanian language and in a foreign language	and				
CT3 Use of effective methods and techniques for learning, information, research and capacity to exploit knowledge, to adapt to a dynamic society and communication in					
Romanian language and in a foreign language					

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	 Acquire advanced practical knowledge and experience with network security policies, VOIP communication, Virtual Private Networks, intrusion detection, firewalls
7.2 Specific objective of the	• Ability to define and implement network security policies (firewalls,
discipline	packet filtering, authentication)
	 Ability to implement network tunnels and various network
	interconnection strategies using data encryption and entity
	authentication;
	Ability to implement VOIP technologies on heterogeneous networks
	and interconnection VOIP access points with public telephony
	providers (PSTN)
	 Acquire practical knowledge about network penetration techniques
	 Understand and contain the limitations of various security
	mechanisms in wired and wireless networks;

8. Content

8.1 Course	Teaching methods	Remarks
1. IP Layer security. Linux firewalls. Netfilter.	Exposure: description,	
	explanation, examples	
2. Windows firewalls. Implementing network	Exposure: description,	
security policies using Windows and Unix	explanation, examples,	
firewalls.		
3. Proxy servers and helper protocols. Squid,	Exposure: description,	
Microsoft ISA, SOCKS	explanation, examples,	
	debate, dialogue	
4. Virtual Private Networks, tunneling:	Exposure: description,	
architecture and technologies. Principles and	explanation, examples,	
practice.	discussion of case	
	studies	

5. IP-IP tunnels. PPTP/GRE VPN tunnels. L2TP tunnels. Implementation of Windows-Windows and Linux-Windows tunnels.	Exposure: description, explanation, examples, proofs
6. Openvpn –bridged and routed architectures.SSH vpn, Cloud VPN, Tungle VPN, Hamachi, Social VPN, Wireguard,etc	Exposure: description, explanation, examples,
7. IPSec. Tunnel mode and Transport mode IPSec. Windows/Linux IPSec implementations.	Exposure: description, explanation, discussion of case studies
8. Network intrusion or TCP/IP feature? TCP and UDP firewall hole punching. STUN. Skype, Hamachi.	Exposure: description, explanation, examples
9. VOIP technologies. The SIP protocol. H323. Softphones. Asterisk: the digital PBX telephony platform.	Exposure: description, explanation, examples, discussion of case studies
10. Anonymity networks and hiding techniques. The Thor network.	Exposure: description, explanation, examples, debate
11. P2P protocols: Bittorrent, eMule, eDonkey.	Exposure: description, explanation, examples, discussion of case studies
12. Symmetric and public key encryption. Digital Certificates and Certificate Authorities. Digital signatures.	Exposure: description, explanation, examples, discussion of case studies
13. IPv6. Network intrusion and abusing.	Exposure: description, explanation, examples, discussion of case studies
14. QoS and traffic shaping.	Exposure: description, examples, discussion of case studies,

Bibliography

- 1) W. Richard Stevens TCP/IP Illustrated, Vol I: The Protocols, Addison Wesley, ISBN 0-201-63346-0
- 2) Gary R. Wright and W. Richard Stevens TCP/IP Illustrated, Vol II: The Implementation Addison Wesley, ISBN 0-201-63354-X
- 3) James F. Kurose and Keith W. Ross Computer Networking, A top-down approach featuring the Internet. Addison Wesley, 2001.
- 4) Douglas E. Comer and David L. Stevens Internetworking with TCP/IP, Vol II: Design, Implementation, and Internals. Prentice Hall.
- 5) William Stallings Computer Networking with Internet Protocols and Technology Prentice Hall 2004.
- 6) Forouzan, B.A. TCP/IP Protocol Suite second ed (2003) Mc Graw-Hill
- 7) Hassan, M. and Jain, R. High Performance TCP/IP Networking Concepts, Issues, and Solutions. Pearson Prentice Hall 2004.

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Network security layer. Implementation of	Explanation, dialogue,	
netfilter/iptables and Windows firewalls. Tests in	case studies, example,	
a simulated network.	proofs	
2. Proxy servers and VPN technologies. IP-IP,	Dialogue, debate, case	
PPTP, openvpn, Social VPN, SSH VPN	studies	
3. IPSec Windows/Linux	Dialogue, debate, case	
	studies, examples, proofs	

4. Asterisk/Trixbox VOIP telephony. Multimedia	Dialogue, debate, case
streaming.	studies, examples
5. Firewall Hole punching. Skype, Hamachi. Wake	Dialogue, debate, case
on LAN.	studies, examples
6. The Thor network. WPA and WEP security	Dialogue, debate, case
cracking.	studies, examples
7. P2P: Bittorent, EMule.	Dialogue, debate, case
	studies, examples

Bibliography

- 1. W. Richard Stevens TCP/IP Illustrated, Vol I: The Protocols, Addison Wesley, ISBN 0-201-63346-0
- 2. Gary R. Wright and W. Richard Stevens TCP/IP Illustrated, Vol II: The Implementation Addison Wesley, ISBN 0-201-63354-X
- 3. James F. Kurose and Keith W. Ross Computer Networking, A top-down approach featuring the Internet. Addison Wesley, 2001.
- 4. Cisco Networking Academy Classes, http://cisco.netacad.net

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

- The course respects the IEEE and ACM Curriculla Recommendations for Computer Science studies;
- The course exists in the studying program of all major universities in Romania and abroad;
- The content of the course covers the most important aspects necessary for a network engineer/architect in a network specialized company.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)	
10.4 Course	know the applied technologies taught during the course;problem solving	Colloquium, subject presentation	50%	
10.5 Seminar/lab activities	- be able to implement course concepts and presented technologies	-Project presentation at the end of the semester	50%	
10.6 Minimum performance standards At least grade 5 (from a scale of 1 to 10) at both presentation and laboratory project				

Date :	Signature of course coord	linator	Signature of	seminar coor	dınator

26.04.2023	Assoc Prof PhD Adrian Sergiu DARABAN	Assoc. Prof. PhD Adrian Sergiu DARABANT
Date of appr	oval Signa	ture of the head of department