SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	**Babeş Bolyai University**
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 / Qualification	**Computer Science**

2. Information regarding the discipline

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

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

3.1 Hours per week	3	Of which: 3.2 course	2	3.3 seminar/laboratory	1
3.4 Total hours in the curriculum	42	Of which: 3.5 course	28	3.6 seminar/laboratory	14
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					18
Additional documentation (in libraries, on electronic platforms, field documentation)					20
Preparation for seminars/labs, homework, papers, portfolios and essays					30
Tutorship					10
Evaluations					30
Other activities:					-

3.7 Total individual study hours	108
3.8 Total hours per semester	150
3.9 Number of ECTS credits	6

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 equipement.

5.2. for the seminar /lab activities	• Laboratory with Internet connected computers; Linux and Windows servers and desktops, routers, switches, wireless access points;

6. Specific competencies acquired

Professional competencies	• Good programming skills in high-level languages • Ability to design and administer computer networks • Ability to install, configure and maintain a network infrastructure • Ability to implement various VPN infrastructures; • Ability to implement VOIP telephony • Understand and apply network security policies;
Transversal competencies	• Ability to permanently learn, understand and apply the most recent scientific results in the field of Computer Science. • Ability to work independently and/or in a team in order to solve problems in defined professional contexts • Ability to use specific scientific terms and communicate in English

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 discipline	• Ability to define and implement network security policies (firewalls, 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 security policies using Windows and Unix firewalls.	Exposure: description, explanation, examples,	
3. Proxy servers and helper protocols. Squid, Microsoft ISA, SOCKS	Exposure: description, explanation, examples, debate, dialogue	
4. Virtual Private Networks, tunneling: architecture and technologies. Principles and practice.	Exposure: description, explanation, examples, 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. IPSec. Tunnel mode and Transport mode	Exposure: description,	

IPSec. Windows/Linux IPSec implementations.	explanation, examples,	
7. Openvpn –bridged and routed architectures.SSH vpn, Cloud VPN, Tungle VPN , Hamachi, Social VPN, etc	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) 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 netfilter/iptables and Windows firewalls. Tests in a simulated network.	Explanation, dialogue, case studies, example, proofs	
2. Proxy servers and VPN technologies. IP-IP, PPTP, openvpn, Social VPN, SSH VPN	Dialogue, debate, case studies	
3. IPSec Windows/Linux	Dialogue, debate, case studies, examples, proofs	
4. Asterisk/Trixbox VOIP telephony. Multimedia streaming.	Dialogue, debate, case studies, examples	
5. Firewall Hole punching. Skype, Hamachi. Wake on LAN.	Dialogue, debate, case studies, examples	
6. The Thor network. WPA and WEP security cracking.	Dialogue, debate, case 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 coordinator Signature of seminar coordinator

..... Lect PhD. Adrian Sergiu DARABANT Lect.PhD. Adrian Sergiu DARABANT

Date of approval Signature of the head of department

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