

## SYLLABUS

### 1. Information regarding the programme

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

### 2. Information regarding the discipline

2.1 Name of the discipline	<b>Specialized Protocols in Computer Networks</b>						
2.2 Course coordinator	PhD. Assoc. Prof. Adrian Sergiu DARABANT						
2.3 Seminar coordinator	PhD. Assoc. Prof. Adrian Sergiu DARABANT						
2.4. Year of study	<b>3</b>	2.5 Semester	<b>5</b>	2.6. Type of evaluation	<b>C</b>	2.7 Type of discipline	<b>Optional</b>
2.8 Code of discipline	<b>MLE5033</b>						

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

3.1 Hours per week	5	Of which: 3.2 course	2	3.3 seminar/laboratory	1 lab+ 2 pr
3.4 Total hours in the curriculum	70	Of which: 3.5 course	28	3.6 seminar/laboratory	42
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					10
Additional documentation (in libraries, on electronic platforms, field documentation)					4
Preparation for seminars/labs, homework, papers, portofolios and essays					4
Tutorship					2
Evaluations					10
Other activities: .....					-
3.7 Total individual study hours	30				
3.8 Total hours per semester	100				
3.9 Number of ECTS credits	4				

### 4. Prerequisites (if necessary)

4.1. curriculum	<ul style="list-style-type: none"> <li>Computer Networks, Operating Systems, Computer System Architecture</li> </ul>	
4.2. competencies	<ul style="list-style-type: none"> <li>Good knowledge of TCP/IP, basis of network security, data encryption algorithms.</li> </ul>	

## 5. Conditions (if necessary)

5.1. for the course	<ul style="list-style-type: none"> <li>Classroom with network and Internet access and to laboratory equipment.</li> </ul>
5.2. for the seminar /lab activities	<ul style="list-style-type: none"> <li>Laboratory with Internet connected computers; Linux and Windows servers and desktops, routers, switches, wireless access points;</li> </ul>

## 6. Specific competencies acquired

<b>Professional competencies</b>	<ul style="list-style-type: none"> <li>C6.2 Identification and explanation of basic and advanced architectures for systems and computer networks management.</li> <li>C6.4 Performance, response time and resource consumption measurements; establishing and enforcing access rights.</li> <li>C6.5 Implementation of computer networking projects.</li> </ul>
<b>Transversal competencies</b>	<ul style="list-style-type: none"> <li>CT1 Applying organized and efficient work rules, responsible attitude towards scientific/teaching domains in order to obtain a creative exploitation of own potential, while respecting the principles and rules of professional ethics</li> <li>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</li> </ul>

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

7.1 General objective of the discipline	<ul style="list-style-type: none"> <li>Acquire advanced practical knowledge and experience with network security policies, VOIP communication, Virtual Private Networks, intrusion detection, firewalls</li> </ul>
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> <li>Ability to define and implement network security policies (firewalls, packet filtering, authentication)</li> <li>Ability to implement network tunnels and various network interconnection strategies using data encryption and entity authentication.</li> <li>Ability to implement VOIP technologies on heterogeneous networks and interconnection VOIP access points with public telephony providers (PSTN)</li> <li>Acquire practical knowledge about network penetration techniques.</li> <li>Understand and contain the limitations of various security mechanisms in wired and wireless networks;</li> </ul>

## 8. Content

8.1 Course	Teaching methods	Remarks
1. IP Layer security. Linux firewalls. Netfilter.	Exposure, conversation, explanation, didactical demonstration	
2. Windows firewalls. Implementing network security policies using Windows and Unix firewalls.	Exposure, conversation, explanation, didactical demonstration	
3. Proxy servers and helper protocols. Squid, Microsoft ISA, SOCKS	Exposure, conversation, explanation, didactical demonstration	
4. Virtual Private Networks, tunneling architecture and technologies. Principles and practice.	Exposure, conversation, explanation, didactical demonstration	

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

### **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 netfilter/iptables and Windows firewalls. Tests in a simulated network.	Dialogue, debate, case studies, examples, proofs	
2. Proxy servers and VPN technologies. IP-IP, PPTP, openvpn, Social VPN, SSH VPN	Dialogue, debate, case studies, examples, proofs	
3. IPSec Windows/Linux	Dialogue, debate, case studies, examples, proofs	
4. Asterisk/Trixbox VOIP telephony. Multimedia streaming.	Dialogue, debate, case studies, examples, proofs	
5. Firewall Hole punching. Skype, Hamachi. Wake on LAN.	Dialogue, debate, case studies, examples, proofs	

