

## 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>Computers and Information Technology</b>
1.5 Study cycle	<b>Bachelor</b>
1.6 Study programme / Qualification	<b>Information Engineering</b>

### 2. Information regarding the discipline

2.1 Name of the discipline (en) (ro)	<b>Rețele de Calculatoare Computer Networks</b>						
2.2 Course coordinator	Lect. Dr. Radu DRAGOȘ						
2.3 Seminar coordinator	Lect. Dr. Radu DRAGOȘ						
2.4. Year of study	<b>3</b>	2.5 Semester	<b>5</b>	2.6. Type of evaluation	<b>E</b>	2.7 Type of discipline	<b>Compulsory DD</b>
2.8 Code of the discipline	MLE5002						

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

3.1 Hours per week	4	Of which: 3.2 course	2	3.3 seminar/laboratory	2 LP 1 P
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					20
Additional documentation (in libraries, on electronic platforms, field documentation)					20
Preparation for seminars/labs, homework, papers, portfolios and essays					20
Tutorship					10
Evaluations					10
Other activities: .....					
3.7 Total individual study hours	80				
3.8 Total hours per semester	150				
3.9 Number of ECTS credits	6				

### 4. Prerequisites (if necessary)

4.1. curriculum	<ul style="list-style-type: none"> <li>Operating Systems, Computer System Architecture</li> </ul>
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4.2. competencies	<ul style="list-style-type: none"> <li>• Average programming skills in C/C++</li> </ul>
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## 5. Conditions (if necessary)

5.1. for the course	<ul style="list-style-type: none"> <li>•</li> </ul>
5.2. for the seminar /lab activities	<ul style="list-style-type: none"> <li>• Laboratory with computers connected to the Internet</li> <li>• Software: Cisco Packet Tracer</li> </ul>

## 6. Specific competencies acquired

Professional competencies	<ul style="list-style-type: none"> <li>• C2.1 Describing the structure and operation of hardware, software and communication components</li> <li>• C2.2 Explaining the role, interaction and operation of hardware, software and communication components</li> <li>• C2.3 Construction of hardware and software components of computing systems using design methods, languages, algorithms, data structures, protocols, and technologies</li> <li>• C2.4 Metric based evaluation of functional and non-functional characteristics of computing systems</li> <li>• C4.3 Developing specifications and designing information systems using specific methods and tools</li> <li>• C4.1 Identifying and describing technologies, programming environments and various concepts that are specific to programming engineering</li> <li>• C4.3 Developing specifications and designing information systems using specific methods and tools</li> <li>• C4.5 Developing, implementing and integrating software solutions</li> </ul>
Transversal competencies	<ul style="list-style-type: none"> <li>• CT1 Honorable, responsible, ethical behavior, in the spirit of the law, to ensure the professional reputation</li> <li>• CT3 Demonstrating initiative and pro-active behavior for updating professional, economical and organizational culture knowledge</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>• Be able to understand the fundamental principles and inner workings of a computer network and of Internet</li> </ul>
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> <li>• Learning the main aspects for designing and maintaining a computer network</li> <li>• Learning the basics of installing, configuring and maintaining an Internet server</li> <li>• Acquire the notions of communication protocol, using the main protocols used by the Internet, and the skills to design own protocols.</li> </ul>

## 8. Content

8.1 Course	Teaching methods	Remarks
1. Introduction in computer networks. Definition. Network examples.	Exposure, explanation, examples	
2. The concept of protocol. Protocol stacks. The OSI and TCP/IP models.	Exposure, explanation, examples	
3. The socket() interface. TCP sockets. Iterative and concurrent servers.	Exposure, explanation, examples	
4. UDP sockets. Differences between TCP and UDP	Exposure, explanation, examples	
5. Network topologies. Physical and Data-Link layers.	Exposure, explanation, examples	
6. IP addressing. Network classes. Network masks. Gateway. Protocols ARP, RARP, DHCP.	Exposure, explanation, examples	
7. Subnetworking and address spaces.	Exposure, explanation, examples	
8. Routing. Routing protocols.	Exposure, explanation, examples	
9. Private and public IP addresses. Network address translation (NAT).	Exposure, explanation, examples	
10. Problems regarding network security. Packet filtering (firewalls)	Exposure, explanation, examples	
11. Application layer. Main protocols: HTTP, FTP, DNS, SMTP, POP3, IMAP The architecture web client-proxy-server.	Exposure, explanation, examples	
12. The domain name system (DNS). The electronic mail system.	Exposure, explanation, examples	
13. Packet encapsulation, tunnelling VPN, virtual local networks VLAN.	Exposure, explanation, examples	
14. Recap	Exposure, explanation, examples	
<b>Bibliography</b> <ol style="list-style-type: none"> <li>Andrew S. Tanenbaum, Rețele de calculatoare, ediția a 4-a, editura Byblos, 2004</li> <li>James F. Kurose, Keith W. Ross, Computer Networking: A Top-Down Approach (6th Edition), Pearson, 2012</li> <li>Larry L. Peterson, Bruce S. Davie, Computer Networks, Fifth Edition: A Systems Approach, Morgan Kaufmann, 2011</li> <li>William Stallings, Data and Computer Communications, 10th Edition, Pearson, 2013</li> <li>Documentațiile standard RFC ale protocoalelor studiate, <a href="http://www.faqs.org/rfcs">http://www.faqs.org/rfcs</a></li> </ol>		
8.2 Laboratory	Teaching methods	Remarks
1. TCP sockets communication	Debate, dialog, examples	
2. Concurrent servers. Communication using heterogeneous programming languages and operating systems	Debate, dialog, examples	
3. UDP sockets communication.	Debate, dialog, examples	
4. Introducing Cisco Packet Tracer	Debate, dialog, examples	
5. Cisco Packet Tracer: LANs, IP addressing, network masks, ping	Debate, dialog, examples	

6. Cisco Packet Tracer: setting up default gateway, interconnecting multiple networks, static routing, traceroute	Debate, dialog, examples	
7. Cisco Packet Tracer: DHCP server configuration	Debate, dialog, examples	
8. Wireless networks. Securing wireless networks. Cisco Packet Tracer: configuring wireless AP	Debate, dialog, examples	
9. Cisco Packet Tracer: using private IP addresses and configuring NAT	Debate, dialog, examples	
10. Packet filtering in Internet. Examples using computers and routers.	Debate, dialog, examples	
11. Configuring DNS on a real machine. Cisco Packet Tracer: configuring and enabling DNS	Debate, dialog, examples	
12. Web servers. Proxy servers in Internet. Usability and advantages. Email systems. Configuring SMTP and IMAP clients.	Debate, dialog, examples	
13. Cisco Packet Tracer: using dynamic routing algorithms.	Debate, dialog, examples	
14. Tunneling mechanisms for VPN. Cisco Packet Tracer: VLANs.	Debate, dialog, examples	

#### Bibliography

1. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff: *Unix Network Programming, Volume 1: The Sockets Networking API (3rd Edition)*, Addison-Wesley Professional, 2003  
Cisco Networking Academy Classes, <https://www.netacad.com/>

8.3 Project	Teaching methods	Remarks
1. Pick a project theme.	Debate, dialog, examples	
2. Network configuration. LANs, IP addressing, network masks.	Debate, dialog, examples	
3. Setting up default gateway. DHCP servers.	Debate, dialog, examples	
4. Wireless networks. NAT	Debate, dialog, examples	
5. DNS.	Debate, dialog, examples	
6. Web servers. Proxy servers in Internet. Configuring SMTP and IMAP clients.	Debate, dialog, examples	
7. Dynamic routing algorithms. Tunneling mechanisms for VPN.	Debate, dialog, examples	

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1. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff: *Unix Network Programming, Volume 1: The Sockets Networking API (3rd Edition)*, Addison-Wesley Professional, 2003  
Cisco Networking Academy Classes, <https://www.netacad.com/>

**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 Curricula 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	Understanding the main theoretical aspects presented. Solving specific problems.	Written exam	1/3
10.5 Seminar/lab activities	Using in practice the main aspects presented, in order to solve laboratory tasks.	Periodic evaluation during the labs.	1/3
Project	Project presentation		1/3
10.6 Minimum performance standards			
➤ At least grade 5 (from a scale of 1 to 10) at both written exam and laboratory assessments.			

Date

Mai 2022

Signature of course coordinator

Lect. Dr. Radu DRAGOȘ



Signature of seminar coordinator

Lect. Dr. Radu DRAGOȘ



Date of approval

24.05.2022

Signature of the head of department

Prof. dr. Laura Dioșan

