

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	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	2	2.5 Semester	4	2.6. Type of evaluation	E	2.7 Type of discipline	Compulsory

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	
3.4 Total hours in the curriculum	56	Of which: 3.5 course	28	3.6 seminar/laboratory	28	
Time allotment:						hours
Learning using manual, course support, bibliography, course notes						15
Additional documentation (in libraries, on electronic platforms, field documentation)						15
Preparation for seminars/labs, homework, papers, portfolios and essays						15
Tutorship						9
Evaluations						15
Other activities:						-
3.7 Total individual study hours						69
3.8 Total hours per semester						125
3.9 Number of ECTS credits						5

4. Prerequisites (if necessary)

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

5. Conditions (if necessary)

5.1. for the course	<ul style="list-style-type: none"> Classroom with network and Internet access and to laboratory equipment.
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5.2. for the seminar /lab activities	<ul style="list-style-type: none"> Laboratory with Internet connected computers; Linux and Windows;
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6. Specific competencies acquired

Professional competencies	C6. Design and administration of computer networks
Transversal competencies	<p>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</p> <p>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</p>

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

7.1 General objective of the discipline	<ul style="list-style-type: none"> Be able to understand the fundamental principles and inner workings of a computer network and of Internet
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> Learning the underlying concepts and principles of modern computer networks with emphasis on protocols, architectures, and implementation issues; Learning to program networking applications using TCP/IP Learning and understand the layered Internet protocols architecture Have all the basis knowledge about TCP/IP – theoretical aspects and programming communicating applications

8. Content

8.1 Course	Teaching methods	Remarks
1. Computer Networks Introduction. Definition. Examples. Network Topologies.	Exposure: description, explanation,	
2. The socket programming API. Network programming using TCP and UDP.	Exposure: description, explanation, examples,	
3. Protocols: definition. Protocol layers. The OSI reference model. The TCP/IP layered model.	Exposure: description, explanation, examples, debate, dialogue	
4. The functions and services of the IP layer. Structure of an IP datagram. IP addressing (classfull). Datagram check summing. The ARP protocol.	Exposure: description, explanation, examples, discussion of case studies	
5. The concept of Subnetworks and Supernetworks. CIDR. Network masks.	Exposure: description, explanation, examples, proofs	
6. The UDP protocol and services. The structure of an UDP datagram UDP ports and processes.	Exposure: description, explanation, examples,	

7. The TCP protocol. Structure of a TCP segment. Principles of TCP data transmission.	Exposure: description, explanation, discussion of case studies	
8. The TCP Sliding Window mechanism. Flow Control. Congestion avoidance.	Exposure: description, explanation, examples	
9. Broadcast and multicast communication. The ICMP protocol. Error and network state signaling.	Exposure: description, explanation, examples, discussion of case studies	
10. The application layer. HTTP, SMTP, FTP	Exposure: description, explanation, examples, debate	
11. The Internet Domain Name System. The DNS protocol.	Exposure: description, explanation, examples, discussion of case studies	
12. Network routing. Distance based and link state based routing algorithms. Routing protocols: RIP, BGP, OSPF.	Exposure: description, explanation, examples, discussion of case studies	
13. The physical layer. Transmission media. Characteristics, fiber networks, wireless networks.	Exposure: description, explanation, examples, discussion of case studies	
14. Error detection and correction.	Exposure: description, examples, discussion of case studies,	

Bibliography

1. J. Kurose, K. Ross, Computer Networking: A Top Down Approach, Addison-Wesley, rev2,3,4 2002-2007.
2. Douglas E. Comer, Internetworking with TCP/IP
 - a. Vol 1- Principles, Protocols, and Architecture
 - b. Vol 3- Client-Server Programming and Applications
3. G.R.Wright, R. Stevens, TCP/IP Illustrated – vol 1,2, Addison Wesley.
4. Matt Naugle, Illustrated TCP/IP – A Graphic Guide to protocol suite, John Willey & Sons, 1999.
5. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, UNIX® Network Programming Volume 1, Third Edition: The Sockets Networking API
6. Peterson, Larry - Davie, Bruce: Computer Networks: A Systems Approach. Morgan Kaufman, (3rd ed.), 2003.
7. Stallings, William: Data and Computer Communications. Prentice Hall, (6th ed.), 2000.
8. Tanenbaum, Andrew S.: Computer Networks. Prentice Hall, (4th ed.), 2003.

8.2 Seminar / laboratory	Teaching methods	Remarks
1. TCP programming. The problem is composed of two parts: <ol style="list-style-type: none"> a. A protocol design/definition b. Implementation of the defined protocol 	Explanation, dialogue, case studies, example, proofs	
2. Implementation of the protocol described previously.	Dialogue, debate, case studies	
3. UDP programming. Use UDP to develop a specified problem. Case studies: large datagrams, fragmentation, peering sendto with recvfrom.	Dialogue, debate, case studies, examples, proofs	
4. Network transmission debugging – tcpdump	Dialogue, debate, case studies, examples	
5. UDP broadcast implementation of a distributed date/time synchronization protocol in a computer network	Dialogue, debate, case studies, examples	
6. Network transmission debugging – using Wireshark	Dialogue, debate, case studies, examples	
7. Simulation of the TCP protocol using unreliable UDP.	Dialogue, debate, case studies, examples	

8. Simulation of network loss and transmission unpredictability for the TCP implementation using UDP. Analyze the possible flaws of the proposed protocol.	Explanation, dialogue, case studies	
9. Network testing: ping, traceroute, route	Explanation, dialogue, case studies, examples	
10. Implementation of a multicast UDP application respecting a given protocol.	Explanation, dialogue, case studies, examples	
11. Wireless networks: configuration and security.	Testing data, discussion, evaluation	
12. Network equipment: switches, routers, cabling. Configuration	Explanation, dialogue, case studies	
13. Implementation of a reduced functionality DNS resolver.	discussion, evaluation	
14. Network security, intrusion, protection mechanisms. Typical attack scenarios.	Explanation, dialogue, case studies	
Bibliography		
1. Douglas E. Comer, Internetworking with TCP/IP - Vol 3- Client-Server Programming and Applications		
2. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, UNIX® Network Programming Volume 1, Third Edition: The Sockets Networking API		
3. 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

<ul style="list-style-type: none"> • 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.
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10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	- know the basic principle of the domain; - apply the course concepts - problem solving	Written exam	50%
10.5 Seminar/lab activities	- be able to implement course concepts and algorithms -For each week of delayed lab presentation the student loses 1 point from the lab grade	-Continuous evaluation of laboratory works	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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