Universitatea Naţională de Ştiinţă şi Tehnologie Politehnica Bucureşti
Facultatea de Electronică, Telecomunicaţii şi
Tehnologia Informaţiei

COURSE DESCRIPTION

1. Program identification information

1.1 Higher education institution	**National University of Science and Technology Politehnica Bucharest**
1.2 Faculty	**Electronics, Telecommunications and Information Technology**
1.3 Department	**Telecommunications**
1.4 Domain of studies	Electronic Engineering, Telecommunications and Information Technology
1.5 Cycle of studies	Bachelor/Undergraduate
1.6 Programme of studies	Technologies and Telecommunications Systems

2. Date despre disciplină

2.1 Course name (ro) (en)				Arhitecturi de reţea şi Internet Network Architectures and Internet			
2.2 Course Lecturer				Conf. Dr. Radu Badea			
2.3 Instructor for practical activities				Conf. Dr. Radu Badea			
2.4 Year of studies	3	2.5 Semester	2	2.6. Evaluation type	E	2.7 Course regime	Ob
2.8 Course type		D	2.9 Course code	04.D.06.O.212		2.10 Tipul de notare	Nota

3. Total estimated time (hours per semester for academic activities)

3.1 Number of hours per week	3	Out of which: 3.2 course	2	3.3 seminary/laboratory	1
3.4 Total hours in the curricula	42	Out of which: 3.5 course	28	3.6 seminary/laboratory	14
Distribution of time:					hours
Study according to the manual, course support, bibliography and hand notes Supplemental documentation (library, electronic access resources, in the field, etc) Preparation for practical activities, homework, essays, portfolios, etc.					32
Tutoring					0
Examinations					4
Other activities (if any):					0

3.7 Total hours of individual study	33.00
3.8 Total hours per semester	75
3.9 Number of ECTS credit points	3

4. Prerequisites (if applicable) (where applicable)

4.1 Curriculum	Data Structures and Algorithms; Object-Oriented Programming; Microprocessors Architectures; Microcontrollers.
4.2 Results of learning	General knowledge of telecommunications systems, algorithms and programming languages.

5. Necessary conditions for the optimal development of teaching activities (where applicable)

5.1 Course	The course will be held based on computer-aided modern display techniques (video projector or LCD Screen)
5.2 Seminary/ Laboratory/Project	Laboratory is based on a specific infrastructure including a PC network and simulation software like Cisco Packet Tracer, GNS3, Wireshark, etc.

6. General objective *(Reffering to the teachers' intentions for students and to what the students will be thought during the course. It offers an idea on the position of course in the scientific domain, as well as the role it has for the study programme. The course topics, the justification of including the course in the currcula of the study programme, etc. will be described in a general manner)*

The main aim of this course is to introduce students to the basic computer networking protocols and architectural elements. Concepts like routing, computer networks, protocols, forwarding, client-server architectures, network address translation, etc. will be presented and discussed during course classes and practical laboratories. Outcome should be a basic understanding of core networking notions

7. Competences *(Proven capacity to use knowledge, aptitudes and personal, social and/or methodological abilities in work or study situations and for personal and proffesional growth. They refflect the empolyers requirements.)*

Specific Competences	Working with scientific foundations, engineering and computer science: - Recognize and describe their concepts of calculability, complexity, modeling and programming paradigms of computing and communications; - Using theories and specific tools (algorithms, charts, models, protocols etc.) to explain the structure and operation of systems hardware, software and communications
Transversal (General) Competences	The thorough analysis of the daily issues and the ability to the identify the problems for which well-known solutions are already available, thus solving the professional tasks

8. Learning outcomes *(Synthetic descriptions for what a student will be capable of doing or showing at the completion of a course. The learning outcomes reflect the student's acomplishments and to a lesser extent the teachers' intentions. The learning outcomes inform the students of what is expected from them with respect to performance and to obtain the desired grades and ECTS points. They are defined in concise terms, using verbs similar to the examples below and indicate what will be required for evaluation. The learning outcomes will be formulated so that the correlation with the competences defined in section 7 is highlighted.)*

Knowledge	*The result of knowledge aquisition through learning. The knowledge represents the totality of facts, priciples, theories and practices for a given work or study field. They can be theoretical and/or factual.* TCP / IP stack of protocols allows heterogeneous computer systems to communicate via interconnected networks using gateways and routers. This course will describe the Internet architecture, IP addressing, subnets and protocols, transport-level services (UDP, TCP, sockets, ports), applications (client-server, e-mail, remote login (TELNET), file transfer (FTP), Web, network management (SNMP), some security features.

Skills	*The capacity to apply the knowledge and use the know-how for completing tasks and solving problems. The skills are described as being cognitive (requiring the use of logical, intuitive and creative thinking) or practical (implying manual dexterity and the use of methods, materials, tools and intrumentation).* Main theoretical and practical developments concerning communications networks and Internet concepts, techniques, and systems. Also, the students develop skills for software development, using different languages, standards, and designing instruments. The students will be able to understand, debug and deploy basic networking applications as a first step towards more advanced theoretical and practical abilities.
Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* Improve self-learning abilities Increase the overall capacity for filtering information and selecting bibliographical sources First step towards new and emerging technologies Improve logical and cognitive abilities in relation with multiple software tools utilisation

9. Teaching techniques *(Student centric techniques will be considered. The means for students to participate in defining their own study path, the identification of eventual fallbacks and the remedial measures that will be adopted in those cases will be described.)*

Oral communication methods and video projector slide-based course support. Course materials are: bibliographic books, lecture notes and presentations, proposed and solved problems slides and other sources. Completing materials are Youtube presentations and online tutorials.

Applicative teaching will be performed through simulation of communication techniques assisted by multimedia aids. Different simulation and packet capture software applications will be used (like Cisco Packet Tracer, GNS3, Wireshark, etc.) The lab curriculum presenting the works will be available on the course Microsoft Teams channel and/or Moodle platform. For software development, IDEs like Visual Studio Code or Java NetBeans could also be used, depending on locally (laboratory) available resources. Also, it is envisaged to promote collaboration among students by asking them to develop mini-projects in small 2…3 person teams

10. Contents

COURSE		
Chapter	**Content**	**No. hours**
1	Network and device architectures	4
2	Network layer; Internet Protocol v4	4
3	Routing in packet switched networks	6
4	Internet Protocol v6, Future Internet	4
5	Transport layer protocols (TCP/UDP)	4
6	Switching Fabric and Error Mitigation	2
7	Upper Layer (Client-Server models)	4
	Total:	28

Bibliography:
https://ctipub.sharepoint.com/:f:/s/04-ELECTRONICA-L-A3-S2-ARIn-G-2021/EoBZPTaxzFxAsRURWa8sQqIBfP8MEfBI4QC6RBb7QLlX3w?e=0oSbEm

1) Tanenbaum A. S., *Computer Networks* – 6th edition, Pearson; 2021, ISBN-10: 1292374063.
2) James F. Kurose, Keith W. Ross; *COMPUTER NETWORKING A Top-Down Approach*; Pearson/Addison-Wesley 2013 ISBN-13: 978-0-13-285620-1; ISBN-10: 0-13-285620-4
3) Behrouz A. Forouzan; *TCP/IP Protocol Suite*; McGraw-Hill Forouzan Networking Series;McGraw-Hill 2010; ISBN 978-0-07-337604-2

LABORATORY

Crt. no.	Content	No. hours
1	Comparison of several network topologies using switches and hubs; interfaces configuration; PING testing	2
2	Interconnecting networks with switches. ARP evaluation	2
3	TCP, UDP, IP packet transfer, capture and analysis. Network Sockets Programming	5
4	Interconnecting networks with routers. A general router configuration	3
5	Network Address Translation testing and simulation	2
	Total:	14

Bibliography:
https://ctipub.sharepoint.com/:f:/s/04-ELECTRONICA-L-A3-S2-ARIn-G-2021/EoBZPTaxzFxAsRURWa8sQqIBfP8MEfBI4QC6RBb7QLlX3w?e=0oSbEm

1) Tanenbaum A. S., *Computer Networks* – 6th edition, Pearson; 2021, ISBN-10: 1292374063.
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11. Evaluation

Activity type	11.1 Evaluation criteria	11.2 Evaluation methods	11.3 Percentage of final grade
11.4 Course	- knowledge of fundamental theoretical concepts; - theory application to the data transmissions techniques and systems; - differentiated analysis of technical and theoretical methods.	Oral evaluation tests and/or written examinations. Topics cover all the material taught till each test time.	80%

11.5 Seminary/laboratory/project	- knowledge of fundamental theoretical and practical concepts taught; - ability to apply the theory to solve problems related to data transmissions techniques. - presence and activity of students through laboratory hours.	Networks design, implementation and troubleshooting tests (individual test for each student, using the computer). Tests include both theoretical and practical aspects.	20%
11.6 Passing conditions			
For each test: obtaining at least 50% of total awarded points for that test. If there will be several, separate tests, obtaining either at least 50% for each test or 60% as average for all tests combined.			

12. Corroborate the content of the course with the expectations of representatives of employers and representative professional associations in the field of the program, as well as with the current state of knowledge in the scientific field approached and practices in higher education institutions in the European Higher Education Area (EHEA)

The course topics aim to assimilate the basics of concepts, design methods, implementation, and testing of computer networks. Knowledge transmitted ensure the training of computer networks future specialists, being useful to all those who will work in the IT&C companies or academic and research institutions in the field.

Date	Course lecturer	Instructor(s) for practical activities
21.09.2026	Conf. Dr. Radu Badea	Conf. Dr. Radu Badea

Date of department approval	Head of department
22.09.2026	Conf. Dr. Serban Georgica Obreja

Date of approval in the Faculty Council	Dean
22.09.2026	Prof. Dr. Mihnea Udrea

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