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)				Reţele de comunicaţii			
2.2 Course Lecturer				Conf. Dr. Bogdan Cosmin Mocanu			
2.3 Instructor for practical activities				Conf. Dr. Bogdan Cosmin Mocanu			
2.4 Year of studies	4	2.5 Semester	1	2.6. Evaluation type	E	2.7 Course regime	Ob
2.8 Course type		S	2.9 Course code	04.S.07.O.202		2.10 Tipul de notare	Nota

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

3.1 Number of hours per week	3.5	Out of which: 3.2 course	2	3.3 seminary/laboratory	1.5
3.4 Total hours in the curricula	49	Out of which: 3.5 course	28	3.6 seminary/laboratory	21
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.					40
Tutoring					6
Examinations					5
Other activities (if any):					0

3.7 Total hours of individual study	51.00
3.8 Total hours per semester	100
3.9 Number of ECTS credit points	4

4. Prerequisites (if applicable) (where applicable)

4.1 Curriculum	Completing and/or promoting the following disciplines: •Digital Signal Processing •Network Architectures and Internet •Information Transmission Technology
4.2 Results of learning	Basic knowledge of access and telecommunication networks architectures

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

5.1 Course	The course will take place in a room equipped with a video projector and a computer
5.2 Seminary/ Laboratory/Project	Mandatory attendance at laboratories (according to the UPB regulation for bachelor studies); The laboratory will take place in a room with specific equipment, which must include computers with OPNET application.

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 discipline aims to familiarize students with concepts regarding the telecommunication network architectures, access networks, switching systems, transport systems, circuits switching networks: PSTN, ISDN, GSM, packet switching networks: IP QoS multimedia networks, VoIP, QoS: IntServ and DiffServ mechanisms.

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	•Demonstrate basic knowledge of Communication Networks' domain; •Correlates and apply the knowledge gained to understand and solve specific problems of the Communication Networks. They will be able to correlate and apply the knowledge to design, implement, configure, and operate telecommunications equipment and protocols, fix and mobile communication networks and systems, network applications ans services. •It applies standardized methods and tools, specific to the field of communication networks, to carry out the evaluation and diagnosis process of a situation, depending on the identified/reported problems, and identifies solutions. •It argues and analyzes coherently and correctly the context of application of the basic knowledge of the Communication Networks' field, using key concepts of the discipline and the specific methodology. •Oral and written communication in English: students demonstrate understanding of the vocabulary related to the field of Communication Networks.
Transversal (General) Competences	•Works in a team and communicates effectively, coordinating efforts with others to solve problem situations of medium complexity. •Autonomy and critical thinking: the ability to think in scientific terms, search and analyze data independently, and draw and present conclusions / identify solutions. •Ability to analyze and synthesize: presents the acquired knowledge in a synthetic way, as a result of a process of systematic analysis. •Adaptation to new technologies and professional development, through continuous training using printed documentation sources, specialized software and electronic resources. •Respect the principles of academic ethics: correctly cite the bibliographic sources used in the documentation activity.

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.* •Lists and describes the components of a communications network. •Defines domain-specific notions: layered architectures, addressing, multiplexing, packet switching and circuit switching, routing, error, flow and congestion control, equipment types, Internet protocols and architecture, telecommunication networks architectures •Describes the relations and interactions between the components of a communication network. •Describes the main components of a TCP/IP communications network: the algorithms, the protocols, and the services. •Describes the basic configurations of Internet protocols and services. •Lists and describes the tools used to evaluate and diagnose a TCP/IP communications network.
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).* •Identifies and defines the functional requirements of a communications network. •Selects and groups information necessary to specify and design basic solutions for communications networks based on the TCP/IP stack. •Uses specific principles in order to design an elementary network based on the TCP/IP stack. •Implements and experimentally verifies identified solutions for an elementary network based on the TCP/IP stack. •Analyzes and compares solutions for communication networks. •Uses applications to emulate TCP/IP networks. •Works productively in a team.
Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* Select appropriate bibliographic sources and analyze them. Demonstrates responsiveness to new learning contexts. Demonstrates collaboration with other colleagues and teaching staff in carrying out teaching activities. Demonstrates autonomy in organizing the learning situation/context or the problem situation to be solved. Realizes the value of his contribution in the field of engineering to the identification of viable/sustainable solutions to solve problems in social and economic life. Demonstrates real-life situation management skills (time management, collaboration vs. conflict in solving a practical problem).

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.)*

Starting from the analysis of the learning characteristics of students and from their specific needs, the teaching process will explore both expository (lecture, exposition) and conversational-interactive teaching methods, based on various types of learning models: learning through discovery - facilitated by the direct and indirect exploration of reality (experiment, demonstration, modelling) and action-based learning - such as exercise, practical activities and problem solving. Within the teaching activity the lectures will be based on Power Point presentations or different videos that will be made available to students. Each course will start with the recapitulation of the chapters already completed, with a focus on the notions presented in the last course. The presentations use various images and schematics so that the information presented is easy to understand and to assimilate. This discipline covers information and practical activities are designed to support the students during the learning efforts in order to develop optimal relationships of collaboration and communication in a climate conducive to learning through discovery.

10. Contents

COURSE		
Chapter	**Content**	**No. hours**
1	The general architecture of a telecommunication network: Types of telecommunication networks, The evolution of a telecommunication network.	2
2	Circuits switching networks. The automatic digital telephonic network EWSD Siemens.	5
3	Signaling systems used in a circuits switching network.	2
4	Access networks: ISDN, HDSL, ADSL, VDSL	4
5	Packet switching networks. Internet: general consideration.	2
6	Mobile communication networks: from 1G to 4G.	4
7	Voice trough Internet: VoIP.	3
8	Mechanisms to ensure the quality of networks.	2
9	Integrated services for the priority treatment of packets through IP networks: IntServ, DiffServ.	4
	Total:	28
Bibliography:		

LABORATORY		
Crt. no.	**Content**	**No. hours**
1	EWSD Siemens System. Treating the local calls in a telephonic network.	3
2	The SN switching systems used in circuits switching networks.	3
3	Simulation of an intranet network using Opnet.	3
4	Simulation of VoIP network using the Opnet environment. Evaluation of the coding schemes.	3
5	Simulation of an Internet network that transfers two types of traffic: data and voice. Using of QoS mechanisms: IntServ and resource reservation RSVP.	3
6	Simulation of a VoIP network. Classes of services: Best Effort for data traffic and Interactive Voice for voice traffic.	3
7	Discussing the homework and the final laboratory colloquium.	3

	Total:	21
Bibliography:		

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; Knowledge of how to apply the theory to specific problems	Final evaluation test as multiple choice questionnaires, with the possibility of improving the final mark through oral verification.	50%
	Knowledge of fundamental theoretical concepts; Knowledge of how to apply the theory to specific problems	Homework which aims to increase students' analysis and synthesis capacity over a specific subject in the area of telecommunication networks.	20%
11.5 Seminary/laboratory/project	Knowledge of how to design a communication network	Final laboratory colloquium - The theoretical part is verified based on a multiple choice test	10%
	Knowledge on how to implement the design of a network using the simulation environment Opnet. Demonstrate the ability to analyze the measurements.		20%
11.6 Passing conditions			
•Getting 50% of the total score. •Attending at least four laboratory works			

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 communication networks discipline treats numerous problems that students of the faculty of Electronics, Telecommunications and Information Technology can encounter after graduation, with their entering in the working force. Thus, this discipline offers a favorable environment to become familiar with the specific issues of telecommunication networks as: analysis of the architecture and components of a network, functional organization, signaling protocols, selection criterions for different communication networks architectures depending on the required application (narrowband and broad band, real time or tolerant to delays...), examples of network configuration and the analysis of the measurements realized using the test equipments mounted in real networks. For this reason, at the present time, the industry requires qualified telecommunication engineers, with a solid background in electronics, systems and information technology that are able to keep track with the development rate of the domain. In this way we provide the future engineers with adequate competences, very competitive scientific training and modern technologies that

allow them to be quickly hired in a modern and international environment. The course is perfectly adapted to the University “Politehnica” of Bucharest policy, respecting from one side the subject content and structure and on the other side the international opening offered to students.

Date	Course lecturer	Instructor(s) for practical activities
25.09.2025	Conf. Dr. Bogdan Cosmin Mocanu	Conf. Dr. Bogdan Cosmin Mocanu

Date of department approval	Head of department
26.09.2025	Conf. Dr. Serban Georgica Obreja

Date of approval in the Faculty Council	Dean
26.09.2025	Prof. Dr. Mihnea Udrea