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)				Ingineria traficului			
2.2 Course Lecturer				Prof. Dr. Grazziela Sevastita Niculescu			
2.3 Instructor for practical activities				Prof. Dr. Grazziela Sevastita Niculescu			
2.4 Year of studies	4	2.5 Semester	II	2.6. Evaluation type	V	2.7 Course regime	Op
2.8 Course type	S	2.9 Course code	04.S.08.A.225			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	2.00	3.3 seminary/laboratory	1
3.4 Total hours in the curricula	42.00	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.	30
Tutoring	0
Examinations	3
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	It's not necessary
4.2 Results of learning	It's not necessary

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 video projector and computer.
5.2 Seminary/ Laboratory/Project	The laboratory will take place in a room equipped with a video projector and computers.

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)*

This discipline is studied within the specialization "Telecommunication networks and software" and aims to familiarize students with the main approaches, models and explanatory theories of traffic-generating sources, traffic switching in communication nodes, its transfer throughout the networks on the optimal routes between sources and destinations and the planning of the telecommunications network in accordance with international QoS recommendations.

All of these contribute to providing students with an overview of the methodological and procedural benchmarks related to the field of telecommunications traffic engineering.

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	Demonstrates basic knowledge of networks and telecommunications traffic Correlates theoretical and practical knowledge Apply knowledge in practice Apply methods and tools specific to the field, to carry out the evaluation and diagnosis process of a situation, depending on the identified problems and identify solutions to solve them. It argues and analyzes coherently and correctly the context of application of the basic knowledge of the field, using key concepts of traffic engineering and the specific methodology. Oral and written communication in Romanian and English: uses the scientific vocabulary specific to the field, in order to communicate effectively, in writing and orally, and demonstrates understanding of the vocabulary related to the field
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 and identify solutions. Ability to analyze and synthesize: presents the acquired knowledge in a synthetic way, as a result of a process of systematic analysis. Respect the principles of academic ethics: correctly cite the bibliographic sources used in the documentation activity. Puts elements of emotional intelligence into practice in the appropriate social-emotional management of professional situations, demonstrating self-control and objectivity in decision-making or stressful situations.

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.* Know the most important stages that marked the development of the field. Correctly defines domain-specific notions. Describes and classifies domain-specific processes and structuresIt highlights interaction relationships of the components and consequences of some malfunctions
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).* **Selects** and groups relevant information in a given context. **Reasonably uses specific principles** in order to improve the processing performance of the traffic in communication networks. **Elaborate** a scientific text. **Verify** identified solutions experimentally and through analytical modeling. **Solve** practical applications. **Adequately** interpret causal relationships. **Analyze** and compare different network topologies and routing algorithms **Formulates** conclusions based on the analyzes carried out
Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* • Select appropriate bibliographic sources and analyze them. • Respect the principles of academic ethics, correctly citing the bibliographic sources used. • 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 • Demonstrates social responsibility through active involvement in student social life/involvement in academic community events • Promotes new solutions related to the specialized field to improve the quality of social life. • 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 (social responsibility). • Apply principles of professional ethics/deontology in the analysis of the technological impact of the proposed solutions in the specialized field on the environment.

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 students' learning characteristics and their specific needs, the teaching process will explore both expository (lecture, exposition) and conversational-interactive teaching methods, based on discovery learning models, facilitated by exploration direct and indirect of reality (experiment, demonstration, modeling), but also on action-based methods, such as exercise and problem solving.

In the teaching activity, lectures will be used, based on some Power Point presentations that will be made available to the students. Each course will begin with the recapitulation of the notions presented in the previous lectures and which allow the development of the issues of the current course.

Presentations use images and diagrams so that the information presented is easy to understand and assimilate.

It will be considered the practice of active listening and assertive communication skills, as well as feedback construction mechanisms, as ways of regulating behavior in various situations and adapting the pedagogical approach to the students' learning needs.

Teamwork skills will be practiced to solve different learning tasks.

10. Contents

LABORATORY		
Crt. no.	**Content**	**No. hours**
1	M x N connection networks with queues on inputs – evaluation of transit time by modeling for different values of offered traffic	3
2	Queuing traffic processing systems – performance analysis and optimal sizing for various QoS constraints (losses, transit time, queue size)	12
3	Open networks with M/M/1 systems with return routes (Jackson) – evaluation of performance indicators for a topology imposed on variations of ingress traffic and return rates	4
4	Knowledge assessment colloquium	4
	Total:	14
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 notions and how to apply them to solve specific problems	Verification along the way	60 %
11.5 Seminary/laboratory/project	Performance evaluation of processing systems and networks	Verification along the way	40 %
11.6 Passing conditions			
The study regulations are applicable in this sense, namely: • Obtaining 50% of the total score related to the activity during the semester.			

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)

Through the activities carried out, students develop skills to offer solutions to problems and propose ideas to improve the situation in the field of implementation and exploitation of telecommunications systems and networks as a whole.

In the development of the content of the discipline, knowledge / aspects / phenomena described by specialized literature and own published research were taken into account.

Through the activities related to this discipline, the development of the graduate's skills to manage practical situations that he may face in real life is considered in order to increase his contribution to the improvement of the socio-economic environment

Date	Course lecturer	Instructor(s) for practical activities
10.10.2024	Prof. Dr. Grazziela Sevastita Niculescu	Prof. Dr. Grazziela Sevastita Niculescu

Date of department approval	Head of department
	Ass. Prof. Ph. D. Eng. Serban OBREJA

Date of approval in the Faculty Council	Dean
25.10.2024	Prof. Dr. Mihnea Udrea