

SYLLABUS

1. Information about the program

1.1 Higher education institution	UNIVERSITY POLITEHNICA OF TIMISOARA
1.2 Faculty ¹ / Department ²	ELECTRONICS, TELECOMUNICATON AND INFORMATION TECHNOLOGIES/COMMUNICATIONS
1.3 Field of study (name/code ³)	ELECTRONIC ENGINEERING, TELECOMUNICATION AND INFORMATION TECHNOLOGIES
1.4 Study cycle	License
1.5 Study program (name/code/qualification)	TST-ENG/20/20/10/100/10/TST-ENG

2. Information about the discipline

2.1 Name of discipline/ formative category ⁴	Integrated Digital Networks/DS						
2.2 Coordinator (holder) of course activities	S.I. dr. ing. Daniel Popa						
2.3 Coordinator (holder) of applied activities ⁵	S.I. dr. ing. Daniel Popa						
2.4 Year of study ⁶	4	2.5 Semester	7	2.6 Type of evaluation	E	2.7 Regime of discipline ⁷	DI

3. Total estimated time – hours / semester: direct teaching activities (fully assisted or partly assisted) and individual training activities (unassisted)⁸

3.1 Number of fully assisted hours / week	4 of which:	3.2 course	2	3.3 seminar / laboratory / project	0/2/0
3.1* Total number of fully assisted hours / semester	56 of which:	3.2* course	28	3.3* seminar / laboratory / project	0/28/0
3.4 Number of hours partially assisted / week	of which:	3.5 training		3.6 hours for diploma project elaboration	
3.4* Total number of hours partially assisted / semester	of which:	3.5* training		3.6* hours for diploma project elaboration	
3.7 Number of hours of unassisted activities / week	3.14 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			0.6
		hours of individual study after manual, course support, bibliography and notes			5
		training seminars / laboratories, homework and papers, portfolios and essays			1
3.7* Number of hours of unassisted activities / semester	44 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			9
		hours of individual study after manual, course support, bibliography and notes			21
		training seminars / laboratories, homework and papers, portfolios and essays			14
3.8 Total hours / week ⁹	7.14				
3.8* Total hours /semester	100				
3.9 Number of credits	4				

4. Prerequisites (where applicable)

¹ The name of the faculty which manages the educational curriculum to which the discipline belongs

² The name of the department entrusted with the discipline, and to which the course coordinator/holder belongs.

³ The code provided in HG - on the approval of the Nomenclature of fields and specializations / study programs, annually updated.

⁴ Discipline falls under the educational curriculum in one of the following formative disciplines: Basic Discipline (DF), Domain Discipline (DD), Specialist Discipline (DS) or Complementary Discipline (DC).

⁵ Application activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).

⁶ Year of studies in which the discipline is provided in the curriculum.

⁷ Discipline may have one of the following regimes: imposed discipline (DI) or compulsory discipline (DOb)-for the other fundamental fields of studies offered by UPT, optional discipline (DO) or optional discipline (Df).

⁸ The number of hours in the headings 3.1 *, 3.2 *, ..., 3.8 * is obtained by multiplying by 14 (weeks) the number of hours in headings 3.1, 3.2, ..., 3.8. The information in sections 3.1, 3.4 and 3.7 is the verification keys used by ARACIS as: (3.1) + (3.4) ≥ 28 hours / wk. and (3.8) ≤ 40 hours / wk.

⁹ The total number of hours / week is obtained by summing up the number of hours in points 3.1, 3.4 and 3.7.

4.1 Curriculum	• Digital telephony
4.2 Competencies	•

5. Conditions (where applicable)

5.1 of the course	• Videoproiector
5.2 to conduct practical activities	• Videoproiector, Echipamente 4G și 5G, calculatoare

6. Specific competencies acquired through this discipline

Specific competencies	<ul style="list-style-type: none"> • Knowledge of main principles and techniques used in modern communication systems • Understanding standardized models used in mobile communications field and using them in practical applications • Solving problems by integrating multiple information sources
Professional competencies ascribed to the specific competencies	<ul style="list-style-type: none"> • Application of basic methods for signal acquisition and processing. • Design, implementation and service operation of data, voice, video multimedia, based on understanding and applying fundamental concepts in communications and information transmission. • Selection, installation, configuration and operation of fixed and mobile equipment and equipping the site with common telecommunication networks.
Transversal competencies ascribed to the specific competencies	<ul style="list-style-type: none"> • Methodical analysis of field-related problems aimed at identifying acknowledged solutions, thus ensuring the accomplishment of professional tasks. • Adaptation to new technologies, professional and personal development through continuous training, using printed documentation sources, specialized software and electronic resources in Romanian and at least one foreign language.

7. Objectives of the discipline (based on the grid of specific competencies acquired - pct.6)

7.1 The general objective of the discipline	• Introducing real-time mobile communication systems that integrate multiple services (voice, video, data) and defining communications standards and methods specific to 4G and 5G cellular networks
7.2 Specific objectives	•

8. Content¹⁰

8.1 Course	Number of hours	Teaching methods ¹¹
Evolution of cellular mobile communications networks	2	A certain subject is first introduced at the course: the theoretical principle is explained, then, if possible, numerical examples are discussed interactively. Individual study is stimulated by proposing homeworks with particular data. There are multiple
LTE architecture	2	
LTE radio interface	8	
Connecting the mobile terminal to the network	4	
Mobility	4	
Scheduling	2	
Power control	2	
5G-NR	4	

¹⁰ It details all the didactic activities foreseen in the curriculum (lectures and seminar themes, the list of laboratory works, the content of the stages of project preparation, the theme of each practice stage). The titles of the laboratory work carried out on the stands shall be accompanied by the notation "(*)".

¹¹ Presentation of the teaching methods will include the use of new technologies (e-mail, personalized web page, electronic resources etc.).

		types of support materials. Lecture notes are available on the intranet and virtual campus.

Bibliography¹² 1. Cox C., An introduction to LTE, 2nd ed., Wiley, 2014
2. 5G NR, the next generation wireless access technology, 2nd ed., Elsevier, 2021

8.2 Applied activities ¹³	Number of hours	Teaching methods
Introduction, LTE architecture, hardware and software components of the LTE network in the laboratory	6	
Connecting the mobile terminal to the network	2	
Mobility	4	
Radio interface	4	
Spectrum optimization	2	
Scheduling	2	
Analysis of statistical traffic data	4	
RF sharing between 4G and 5G	4	

Bibliography¹⁴ 1. D. Popa, Digital Telephony – laboratory applications, Editura Politehnica, Timisoara, 2017
2. Nokia Documentation

9. Corroboration of the content of the discipline with the expectations of the main representatives of the epistemic community, professional associations and employers in the field afferent to the program

<ul style="list-style-type: none"> The contents of the discipline was agreed by important local employers (Nokia, Continental, Lasting)
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10. Evaluation

Type of activity	10.1 Evaluation criteria ¹⁵	10.2 Evaluation methods	10.3 Share of the final grade
10.4 Course	Gaining knowledge related to the discipline, understanding technologies / methods presented	Homeworks (3-4 during the semester) Written examination	5% 60%
10.5 Applied activities	S:		
	L: level of familiarity with the various topics presented	Continuous assessment, written and oral examination	35%
	P¹⁶:		
	Pr:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified¹⁷)			
<ul style="list-style-type: none"> The minimum mark in order to pass the examination is 5, corresponding to basic understanding of the theoretical aspects of the 			

¹² At least one title must belong to the discipline team and at least one title should refer to a reference work for discipline, national and international circulation, existing in the UPT library.

¹³ Types of application activities are those specified in footnote 5. If the discipline contains several types of applicative activities then they are sequentially in the lines of the table below. The type of activity will be in a distinct line as: "Seminar:", "Laboratory:", "Project:" and / or "Practice/training".

¹⁴ At least one title must belong to the discipline team.

¹⁵ Syllabus must contain the procedure for assessing the discipline, specifying the criteria, methods and forms of assessment, as well as specifying the weightings assigned to them in the final grade. The evaluation criteria shall be formulated separately for each activity foreseen in the curriculum (course, seminar, laboratory, project). They will also refer to the forms of verification (homework, papers, etc.)

¹⁶ In the case where the project is not a distinct discipline, this section also specifies how the outcome of the project evaluation makes the admission of the student conditional on the final assessment within the discipline.

¹⁷ It will not explain how the promotion mark is awarded.

course and the ability to apply them in practical applications. The written exam contains 6-8 subjects with 3-4 requirements, of which some verify the understanding of theoretical aspects and others verify if the student is able to apply the theoretical knowledge in practical applications with specific data

Date of completion

30.06.2023

**Course coordinator
(signature)**

**Coordinator of applied activities
(signature)**

**Head of Department
(signature)**

Date of approval in the Faculty Council ¹⁸

14.09.2023

**Dean
(signature)**

¹⁸ The endorsement is preceded by the discussion of the board's view of the study program on the discipline record.