SYLLABUS

1. Program information

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Electronics, Telecommunications and information Technology
1.3 Department	Communications
1.4 Field of study	Electronic Engineering, Telecommunications and Information Technologies
1.5 Cycle of study	Bachelor of Science
1.6 Study program / Qualification	Telecommunications Technologies and Systems/ Engineer
1.7 Form of education	IF – full-time education

2. Course information

2.1 Course title	Telephony			Course code	TST-E36.00
2.2 Course coordinator	*Assistant Professor Zsuzsanna Ilona SUTA, Ph.D.* *Zsuzsanna.Suta@com.utcluj.ro*				
2.3 Laboratory coordinator	*Assistant Professor Zsuzsanna Ilona SUTA, Ph.D.* *Zsuzsanna.Suta@com.utcluj.ro*				
2.4 Year of study	3	2.5 Semester	6	2.6 Type of assessment	E
2.7 Course status	Formative category				DS
	Optionality				DOB

3. Estimated total time

3.1 Hours per week	4	of which:	3.2 Lecture	2	3.3 Seminar	-	3.3 Laboratory	2	3.3 Project	-	3.3 Practical training	-
3.4 Hours per semester	56	of which:	3.5 Lecture	28	3.6 Seminar	-	3.6 Laboratory	28	3.6 Project	-	3.3 Practical training	-

3.7 Time distribution (hours per semester) for individual study and assessment:	
(a) Assessment	3
(b) Study using textbook, course materials, bibliography, and notes	10
(c) Additional documentation in the library, on specialized electronic platforms, and in the field	0
(d) Preparation for seminars/laboratories, assignments, reports, portfolios and essays	3
(e) Tutoring	3
(f) Other activities	-

3.8 Total hours of individual study and assessment (sum of (3.7(a)...3.7(f))	19
3.9 Total hours per semester (3.4+3.8)	75
3.10 Number of credits	3

4. Prerequisites (where applicable)

4.1 curriculum	N/A
4.2 competencies	N/A

5. Requirements (where applicable)

5.1. for the development of the lecture	Cluj-Napoca, Video projector, Greenboard
5.2. for the development of the seminar/ laboratory/ project	Cluj-Napoca, Observator 2, Laboratory 509, Computers, telephone exchange and telephone equipment (voice and data), specific clamping and connection equipment.

6. Specific competencies acquired

Professional competencies	**C4. Design, implementation and operation of data, voice, video and multimedia services. This is based on the understanding and the application of fundamental concepts in telecommunications and transmission of information.** C4.3 Explanation and interpretation of the main requirements and specific approach techniques for data, voice, video, multimedia transmissions. C4.4 Use of the main specific parameters in evaluations based on the concept of quality of service in communications. C4.6 Passing an examination regarding the main characteristics of the usual communication services. **C5. Selecting, installing, configuring and operating fixed or mobile telecommunications equipment. Equipping a site with usual telecommunications networks.** C5.1 Defining the principles of the main technologies for fixed and mobile telecommunications, through various transmission media. C5.2 Explanation and interpretation of the technologies and of fundamental protocols for integrated fixed and mobile communications systems. C5.3 Installation, configuration and exploitation of communications networks. C5.6 Solving installation and maintenance problems for a communications system with low/medium complexity. **C6. Solving specific problems of the broadband communications networks: propagation in different environments, circuits and equipment for high frequencies (microwaves and optical).** C6.4 Use of the main quality parameters and measurement techniques specific to the propagation and transmission media.
Transversal competencie	N/A

7. Expected learning outcomes

Knowledge	**K4.** The student/ graduate describes, identifies, summarizes concepts and elementary methods of signal acquisition, analysis and processing, implemented in systems with general-purpose processors or signal processors and their application in concrete problems.

Skills	**S13.** The student/graduate uses specific methods and tools for the characterization of signals in the time domain and in the frequency domain, performs the acquisition, analysis and digital processing of analog signals. **S14.** The student/ graduate designs, measures, evaluates the performance, diagnoses and troubleshoots functional blocks of low/medium complexity for digital signal analysis and processing, using dedicated simulation environments (Matlab, Python, etc.). **S15.** Develop and plan ICT networks, such as a wide area network and a local area network, that connect equipment via wired or wireless connections and allow them to exchange data and assess their capacity requirements.
Responsibility and autonomy	**R9.** The student/ graduate demonstrates initiative and takes action to update their professional, economic, and organizational culture knowledge.

8. Course objectives (based on the grid of specific competencies acquired)

8.1 General objective of the course	Developing competences concerning the configuration, testing and design of fixed telephone networks.
8.2 Specific objectives	1. Understanding the theoretical concepts specific to fixed telephone network architectures, digital multiplexing techniques and signal processing used in telephone networks. 2. Obtaining knowledge and developing the abilities necessary for designing telephone networks. 3. Developing skills and abilities necessary for configuring voice and data equipment used in fixed telephone networks.

9. Contents

9.1 Lecture	**No. of hours**	**Teaching methods**	**Remarks**
1. Fixed digital telephone networks. General aspects. Access techniques.	2	Presentation, discussions, exemplification, problem presentation, case study	N/A
2. Voice coding techniques used in fixed digital telephone networks.	2		
3. Primary PCM multiplex. Line interfaces of the PCM multiplexers.	2		
4. CAS and CCS signaling techniques. The SS7 signaling system.	2		
5. The SS7 protocol stack and CCS signaling mechanisms.	2		
6. Special functions for telephone calls.	2		
7. Echo in telephony systems. Echo control techniques.	2		
8. Narrow band ISDN. Reference model and access techniques.	2		
9. DSL digital access techniques.	2		
10. New generation of DSL digital access techniques.	2		

9.1 Lecture	No. of hours	Teaching methods	Remarks
11. PDH digital multiplexing hierarchy. The justification processes.	2		
12. 12. The digital regenerator. The jitter in digital telephone systems.	2		
13. 13. The synchronous digital multiplexing mechanism. The SDH hierarchy.	2		
14. 14. The SDH multiplexing strategy. Pointers and operations with pointers.	2		

References:

1. Z. Polgar,*Telefonie digitală. Tehnici de acces. Parametri. Sisteme*, Ed. Risoprint, Cluj-Napoca, 2006, ISBN: 973-751-143-3.
2. Z. I. Kiss, Z. A. Polgar, *Telefonie. Teorie si aplicatii*, Ed. U.T.Press, Cluj Napoca, 2016.
3. S. Zăhan, *Telefonia digitală în reţelele de telecomunicaţii*, Ed. Albastră, Cluj Napoca, 1997.
4. K. Feher, *Comunicaţii digitale avansate, vol. 1*, Ed. Tehnică Bucureşti, 1993.
5. J. C. Bellamy, *Digital Telephony. Third Edition*, John Wiley & Son, 2000.

On-line references:

Online references:

6. Z. Suta, *Telephony – Course slides*, Technical University of Cluj-Napoca, 2026, https://users.utcluj.ro/~dtl/TF/index_tf.htm

9.2 Laboratory	No. of hours	Teaching methods	Remarks
1. The architecture of a telephone network. Access network architectures and operations, remote power feeding of telephone terminals, duplexing techniques.	2	Simulations, experiments, practical exercises, teamwork	N/A
2. Subscriber loop signaling. Measurement of signals on the subscriber loop.	2		
3. Analog and digital telephone devices. Block diagrams and connection to the line. Connection equipment and crimping tools used in telephone networks.	2		
4. Digital encoding of analog signals. A/D and D/A conversions.	2		
5. PCM coding of the voice signal using uniform and non-uniform quantization.	2		
6. Delta coding of the voice signal.	2		
7. Definition of the level and attenuation in telephone networks.	2		
8. PABX exchanges. Block diagrams, interfaces/ports, configuration/management software.	2		
9. Special functions of PABX exchanges. Testing and configuration. System phone devices.	2		

9.2 Laboratory	No. of hours	Teaching methods	Remarks
10. Trunk connections between PABX exchanges. Special PABX functions for trunk connections.	2		
11. Telecommunications cables. Internal structure and parameters. Techniques for measuring the parameters of the cables.	2		
12. Data transmissions in the telephone frequency band. AT commands for dial-up modems. Configuration of FAX and automatic answering machines.	2		
13. ADSL access techniques. Configuration and testing of ADSL modems and DSLAM access multiplexers.	2		
14. Lab recovery and finalization of laboratory activity.	2		

References:

1. Z. I. Kiss, Z. A. Polgar, *Telefonie. Teorie si aplicatii*, Ed. U.T.Press, Cluj Napoca, 2016.
2. L. Pană, *Metodologie şi aparatură de măsură a liniilor metalice locale utilizate pentru transmisiuni digitale în tehnologia ADSL*, INSCC Bucureşti, 2000.
3. L. Pană, *Tehnologii de acces şi sisteme de transmisiuni digitale pe linii bifilare din reţelele locale*, INSCC Bucureşti, 1998.

Online references:

4. Z. Suta, *Telephony – Laboratory work*, Technical University of Cluj-Napoca, 2026, https://users.utcluj.ro/~dtl/TF/index_tf.htm

10. Alignment of the course contents with the expectations of the epistemic community, professional associations, and representative employers in the field related to the program

The discipline content and the acquired skills are in agreement with the expectations of the professional Competences acquired will be used in the following COR occupations (Electronics Engineer; Telecommunications Engineer; Electronics Design Engineer; System and Computer Design Engineer; Communications Design Engineer) or in the new occupations proposed to be included in COR (Sale Support Engineer; Multimedia Applications Developer; Network Engineer; Communications Systems Test Engineer; Project Manager; Traffic Engineer; Communications Systems Consultant).

11. Assessment

Activity type	11.1 Assessment criteria	11.2 Assessment methods and type of assessment: continuous/ summative)	11.3 Weight in final grade
11.4 Course	The level of acquired theoretical knowledge and practical skills	- Written exam (theory and problems)	E, 70%
11.5 Laboratory	The level of acquired knowledge and abilities	- Two multiple choice (T) tests to assess the knowledge acquired during laboratory activities. - Mini-project (P): oral and practical presentation	T, 15% P, 15%

		based on laboratory activity and mini-project.	

11.6 Minimum performance standard

Qualitative point of view

Minimal theoretical and practical knowledge:

- ✓ Knowledge of the architecture of a fixed voice and data network.
- ✓ Knowledge of the basic signal processing and mechanisms characteristic of voice and data transmissions.

Minimal acquired competences:

- ✓ To be able to perform basic configurations of PABX telephone exchanges and of dial-up and xDSL data equipment.
- ✓ To be able to evaluate the quality of voice and data services offered in fixed networks.
- ✓ To be able to achieve a minimal design of fixed telephone and data networks.

Quantitative point of view

- ✓ Exam and laboratory marks should be at least 5.
- ✓ Final mark = 0.7E+0.15T+0.15P

Completion date:	**Course coordinators**	**teaching rank, title First name LAST NAME**	**Signature**
16.06.2026	Course	*Assistant Professor Zsuzsanna Ilona SUTA, Ph.D. Zsuzsanna.Suta@com.utcluj.ro*	
	Applications	*Assistant Professor Zsuzsanna Ilona SUTA, Ph.D. Zsuzsanna.Suta@com.utcluj.ro*	

Approval of the Head of the Department coordinating the course, only if this differs from the department organizing the study program	Head of Department

Date of approval by the Council of the Communications Department 19.06.2026	Head of Communications Department Prof. Virgil DOBROTA, Ph.D.
Date of approval by the Council of the Faculty of Electronics, Telecommunications and Information Technology 30.06.2026	Dean, Prof. Ovidiu-Aurel POP, Ph.D.