SYLLABUS

1. Data about the program of study

1.1 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 Program of study/Qualification	Telecommunications Technologies and Systems/Engineer
1.7 Form of education	Full time
1.8 Subject code	TST-E36.00

2. Data about the subject

2.1 Subject name	Telephony					
2.2 Subject area	Theoretical area: Methodological area: Area of analysis:					
2.3 Course responsible/lecturer	Associate Professor Zsolt Alfred POLGAR, Ph.D. Zsolt.Polgar@com.utcluj.ro					
2.4 Teachers in charge of applications	Associate Professor Zsolt Alfred POLGAR, Ph.D. Zsolt.Polgar@com.utcluj.ro Assistant Professor Zsuzsanna Ilona SUTA, Ph.D. Zsuzsanna.Suta@com.utcluj.ro					
2.5 Year of study	III	2.6 Semester	6	2.7 Assessment	E	2.8 Subject category	DS/DI

3. Estimated total time

3.1 Number of hours per week	4	of which, 3.2 course	2	3.3 laboratory	2
3.4 Total hours in the curriculum	56	of which, 3.5 course	28	3.6 laboratory	28

Individual study	hours
Manual, lecture material and notes, bibliography	10
Supplementary study in the library, online and in the field	0
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	3
Tutoring	3
Exams and tests	3
Other activities	0

3.7 Total hours of individual study	19
3.8 Total hours per semester	75
3.9 Number of credit points	3

4. Pre-requisites (where appropriate)

4.1 Curriculum	NA
4.2 Competence	NA

5. Requirements (where appropriate)

5.1. For the course	Video projector, blackboard
5.2. For the applications	Computers, telephone exchange and telephone equipment (voice and data), specific clamping and connection equipment.

6. Specific competences

Professional Competences	**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 exploiting of communications networks. C5.6 Solving an installation and maintenance problem for a communications system with low/medium complexity. **C6. Solving specific problems of the broadband communications networks: propagation in different environment, 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.
Cross Competences	N A

7. Discipline objectives (as results from the key competences gained)

7.1 General objective	Developing competences concerning the configuration, testing and design of fixed telephone networks.
7.2 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 the 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.

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
1. Fixed digital telephone networks. General aspects. Access techniques.	Presentation, discussions, exemplification, problem presentation, case study	NA
2. Voice coding techniques used in fixed digital telephone networks.		
3. The primary PCM multiplex. Line interfaces of the PCM multiplexers.		
4. CAS and CCS signaling techniques. The SS7 signaling system.		
5. The SS7 protocol stack and CCS signaling mechanisms.		
6. Special functions for telephone calls.		
7. The echo in telephony. Echo control techniques.		
8. Narrow band ISDN. Reference model and access techniques.		
9. DSL digital access techniques.		
10. New generation of DSL digital access techniques.		
11. The PDH digital multiplexing hierarchy. The justification processes.		
12. The digital regenerator. The jitter in digital telephone systems.		
13. The synchronous digital multiplexing mechanism. The SDH hierarchy.		
14. The SDH multiplexing strategy. Pointers and operations with pointers.		

Bibliography:
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 rețelele de telecomunicații*, Ed. Albastră, Cluj Napoca, 1997.
4. K. Feher, *Comunicații digitale avansate, vol. 1*, Ed. Tehnică București, 1993.
5. J. C. Bellamy, *Digital Telephony. Third Edition*, John Wiley & Son, 2000.

On-line references:
http://users.utcluj.ro/~dtl/TF/index_tf.html

8.2 Laboratory	Teaching methods	Notes
1. The architecture of a telephone network. Access network architectures and operations, remote power feeding of telephone terminals, duplexing techniques.	Simulations, experiments, practical exercises, team work	NA
2. Subscriber loop signaling. Measurement of signals on the subscriber loop.		
3. Analog and digital telephone devices. Block diagrams and connection to the line. Connection equipment and crimping tools used in telephone networks.		
4. Digital encoding of analog signals. A/D and D/A conversions.		
5. PCM coding of the voice signal using uniform and non-uniform quantization.		
6. Delta coding of the voice signal.		
7. Definition of the level and attenuation in telephone networks.		

8. PABX exchanges. Block diagrams, interfaces/ports, configuration/management softwares.		
9. Special functions of PABX exchanges. Testing and configuration. System phone devices.		
10. Trunk connections between PABX exchanges. Special PABX functions for trunk connections.		
11. Telecommunication cables. Internal structure and parameters. Techniques for measuring the parameters of the cables.		
12. Data transmissions in the telephone frequency band. AT commands for dial-up modems. Configuration of FAX and automatic answering machines.		
13. ADSL access techniques. Configuration and testing of ADSL modems and DSLAM access multiplexers.		
14. Lab recovery and finalization of laboratory activity.		
Bibliography: 1. Z. I. Kiss, Z. A. Polgar, *Telefonie. Teorie si aplicatii*, Ed. U.T.Press, Cluj Napoca, 2016. 2. L. Pană, *Metodologie și aparatură de măsură a liniilor metalice locale utilizate pentru transmisiuni digitale în tehnologia ADSL*, INSCC București, 2000. 3. L. Pană, *Tehnologii de acces și sisteme de transmisiuni digitale pe linii bifilare din rețelele locale*, INSCC București, 1998. On-line references: http://users.utcluj.ro/~dtl/TF/index_tf.html		

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The discipline content and the acquired skills are in agreement with the expectations of the professionals. 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).

10. Evaluations

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10. Weight in the final grade
10.4 Course	The level of acquired theoretical knowledge and practical skills	- Written exam (theory and problems)	E, 70%
10.5 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 based on laboratory activity and mini-project.	T, 15% P, 15%

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10.6 Minimum standard of performance

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

Date of filling in: 27.09.2021	Responsible	Title First Name Last Name	Signature
	Course	Associate Professor Zsolt Alfred POLGAR, Ph.D.	
	Applications	Associate Professor Zsolt Alfred POLGAR, Ph.D.	
		Assistant Professor Zsuzsanna Ilona SUTA, Ph.D.	

Date of approval in the Department of Communications 27.09.2021	Head of Communications Department Prof. Virgil DOBROTA, Ph.D.
Date of approval in the Council of Faculty of Electronics, Telecommunications and Information Technology 27.09.2021	Dean Prof. Gabriel OLTEAN, Ph.D.