

# SYLLABUS

## 1. Information about the program

1.1 Higher education institution	UNIVERSITY POLITEHNICA OF TIMISOARA
1.2 Faculty <sup>1</sup> / Department <sup>2</sup>	ELECTRONICS, TELECOMUNICATON AND INFORMATION TECHNOLOGIES/COM
1.3 Field of study (name/code <sup>3</sup> )	ELECTRONIC ENGINEERING, TELECOMMUNICATION 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 <sup>4</sup>	Communications Systems						
2.2 Coordinator (holder) of course activities	Assoc-prof. Corina BOTOCA						
2.3 Coordinator (holder) of applied activities <sup>5</sup>	Assoc-prof. Corina BOTOCA, assoc-prof. Cristina STOLOJESCU-CRIȘAN						
2.4 Year of study <sup>6</sup>	3	2.5 Semester	5	2.6 Type of evaluation	E	2.7 Regime of discipline <sup>7</sup>	DS

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

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	0/2/8/0
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			0,6/4
		hours of individual study after manual, course support, bibliography and notes			1,5
		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			8,9/6
		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 <sup>9</sup>	7.14				
3.8* Total hours /semester	100				
3.9 Number of credits	4				

## 4. Prerequisites (where applicable)

4.1 Curriculum	• Mathematics I-IV, Signal Processing, Year II sem2, Physics, Electronic devices,
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<sup>1</sup> The name of the faculty which manages the educational curriculum to which the discipline belongs

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

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

<sup>4</sup> 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).

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

<sup>6</sup> Year of studies in which the discipline is provided in the curriculum.

<sup>7</sup> 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).

<sup>8</sup> 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.

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

	Computer Networks Architecture, Year II sem 2
4.2 Competencies	<ul style="list-style-type: none"> <li>• Skills in using mathematical tool from Signal Processing</li> </ul>

### 5. Conditions (where applicable)

5.1 of the course	<ul style="list-style-type: none"> <li>• Course room with projector, Internet access</li> </ul>
5.2 to conduct practical activities	<ul style="list-style-type: none"> <li>• lab room with an adequate number of computers with Internet access</li> </ul>

### 6. Specific competencies acquired through this discipline

Specific competencies	<ul style="list-style-type: none"> <li>• Students will acquire a solid knowledge foundation concerning how data communications equipment operate, why, where, when certain types of equipment should be networked together, and the role of evolving communications technologies.</li> </ul>
Professional competencies ascribed to the specific competencies	<ul style="list-style-type: none"> <li>• Use of fundamentals in terms of devices, circuits, systems, instrumentation and electronics technology.</li> <li>• Design, implementation and service operation of data, voice, video multimedia, based on understanding and applying fundamental concepts in communications and information transmission.</li> <li>• Solving technological problems in fields of applied electronics.</li> </ul>
Transversal competencies ascribed to the specific competencies	<ul style="list-style-type: none"> <li>• Methodical analysis of field-related problems aimed at identifying acknowledged solutions, thus ensuring the accomplishment of professional tasks</li> <li>• 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.</li> </ul>

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

7.1 The general objective of the discipline	<ul style="list-style-type: none"> <li>• This course presents an overview of modern communications technologies and challenges in order to provide knowledge for understanding the current technological developments. The course provides the basic communications concepts. It is presented especially the physical level transmission, the real channels transmissi</li> </ul>
7.2 Specific objectives	<ul style="list-style-type: none"> <li>• Students will acquire a solid knowledge foundation concerning how data communications equipment operate, why, where, when certain types of equipment should be networked together, and the role of evolving communications technologies.</li> </ul>

### 8. Content <sup>10</sup>

8.1 Course	Number of hours	Teaching methods <sup>11</sup>
Introduction Definition of data communications and Communications Systems. Basics of network architectures. Processes involved in communication. Characteristics of modern communications networks and trends. Architectures. Technologies. Challenges	2	Topics presented in Powerpoint, conversation explanations, problems solving, interactive discussions with questions and answers, comparative analyses
Basic concepts of data communications. Basic parameters of a communication System. Elements of a communication system. Types of transmission, Multiplexing	2	
Transmission channels. Transmission media .Transmission	3	

<sup>10</sup> 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 "(\*)".

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

impairments: attenuation, delay distortion, thermal noise, noise figure, impulse noise, multipath. Transmission impairments cancelation. Channel bandwidth and capacity. Nyquist-Hartley theorem. Shannon theorem		
Digital signals encoding Transmission types. Digital signals. Key terms. Objectives of the digital encoding. Digital encoding techniques: RZ, NRZ, Manchester, Manchester differential, AMI, block coding, 4B/5B, HDB3, B8ZS. Scramblers	3	
Baseband transmissions Inter-Symbol Interference (ISI). Nyquist's first theorem. Partial-response systems. Performance improvement: adaptive filtering, eye-diagram, equalization, BER curves	4	
Linear modulation Amplitude modulation principles. Types of amplitude modulation. Demodulation of the amplitude modulated signals .Errors in amplitude modulation. ASK modems	4	
Frequency modulation Data transmission chain using FM. Frequency modulation: mathematical approach Demodulation of the FSK signals Error probability for the FSK modulation, FSK modems	3	
Phase modulation Modulation and demodulation description, errors, PSK modem	3	
Synchronization. Types. Slippage. Synchronous systems. Asynchronous systems. Step by step synchronous systems modems	2	
Interfaces . Serial interface. Parallel interface. Examples	1	
Orthogonal Frequency division multiplexing. Carriers orthogonality. OFDM principle. Equipment. Advantages and challenges	1	
Bibliography <sup>12</sup> Bibliography 10 1. Corina Botoca, Communications Systems -Data Communications, Course notes. Power point presentations <a href="http://intranet.etc.upt.ro">http://intranet.etc.upt.ro</a> 2. Corina Botoca, Cristina Stolojescu Crişan ,Seminar – Data Communications, <a href="https://intranet.etc.upt.ro/~DATA_COM/">https://intranet.etc.upt.ro/~DATA_COM/</a> , <a href="https://cv.upt.ro/course/view.php?id=3241">https://cv.upt.ro/course/view.php?id=3241</a> 3. William Stallings, Data and Computer Communications (8th Edition), Prentice Hall, Inc, 2009; 4. Gilbert Held Understanding Data Communications: From Fundamentals to Networking. Third Edition, John Wiley & Sons Ltd, 2000,5. Andrew Tannenbaum, Computer Networks, Prentice Hall, Inc, 2003, 6. William Stallings Wireless communications and networks, Pearson Prentice Hall, Inc.2005		
<b>8.2 Applied activities <sup>13</sup></b>	<b>Number of hours</b>	<b>Teaching methods</b>
1 . Fundamental of signals.	2	conversation
2.Basic parameters of communication signals.	4	explanations, problems solving, interactive discussions with questions and answers
3.Digital encoding of the baseband signal	2	
4. Baseband transmissions (BB), without Inter Symbol Interference ISI.	4	
5. Baseband transmissions (BB), with controlled Inter-Symbol Interference ISI Baseband transmissions (BB), without Inter Symbol Interference ISI.	6	
6.Amplitude modulation	4	
7.Frequency modulation and phase modulation	6	
Bibliography <sup>14</sup> Bibliography 12 1. Corina Botoca, Cristina Stolojescu Crişan, Data Communications, Laboratory works <a href="https://intranet.etc.upt.ro/~DATA_COM/">https://intranet.etc.upt.ro/~DATA_COM/</a> , <a href="https://cv.upt.ro/course/view.php?id=3241">https://cv.upt.ro/course/view.php?id=3241</a> , Corina Botoca, Data Communications, Course notes. Power point presentations <a href="http://intranet.etc.upt.ro">http://intranet.etc.upt.ro</a>		

**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**

<sup>12</sup> 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.

<sup>13</sup> 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".

<sup>14</sup> At least one title must belong to the discipline team.

- Discipline satisfies the criterium of international compatibility. It covers topics approached by similar disciplines from prestigious universities in Europe and USA, as follows: 1. Massachusetts Institute of Technology, Data Communications, <http://ocw.mit.edu/> 2. Harvard University Extension school in Cambridge, Massachusetts, <http://extension.harvard>; 3. University of New Mexico – course Data Communications, <http://www.unm.edu/> 4. Carnegie Mellon University USA – Data Communications
- The topics of the discipline corresponds to the expectations of the industry employers, as resulted in discussions with them

## 10. Evaluation

Type of activity	10.1 Evaluation criteria <sup>15</sup>	10.2 Evaluation methods	10.3 Share of the final grade
10.4 Course	Knowledge on all topics of the course. Ability in problems solving	Written examination	50%
10.5 Applied activities	<b>S:</b>		
	<b>L:</b> Knowledge acquiring on all topics of laboratory, Serosity and implication in lab activity	Continuous evaluation at lab classes, two scheduled tests	50%
	<b>P<sup>16</sup>:</b>		
	<b>Pr:</b>		
<b>10.6</b> Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified <sup>17</sup> )			
<ul style="list-style-type: none"> <li>• The amount of knowledge to pass is 0,5 from the topics of the course, evaluated with 5 for the written examination and with 5 for laboratory activity</li> </ul>			

**Date of completion**

20.06.2023

**Course coordinator  
(signature)**

**Coordinator of applied activities  
(signature)**

**Head of Department  
(signature)**

**Date of approval in the Faculty Council <sup>18</sup>**

14.09.2023

**Dean  
(signature)**

<sup>15</sup> 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.)

<sup>16</sup> 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.

<sup>17</sup> It will not explain how the promotion mark is awarded.

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