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
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]			Information Transmission Theory/DD				
2.2 Coordinator (holder) of course activities			Radu LUCACIU				
2.3 Coordinator (holder) of applied activities[5]			Radu LUCACIU				
2.4 Year of study[6]	3	**2.5** Semester	5	**2.6** Type of evaluation	D	**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	1/1/0
3.1* Total number of fully assisted hours / semester	56 of which:	**3.2*** course	28	**3.3*** seminar / laboratory / project	14/14/0
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	1.36 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			0.3
		hours of individual study after manual, course support, bibliography and notes			0.26
		training seminars / laboratories, homework and papers, portfolios and essays			0.8
3.7* Number of hours of unassisted activities / semester	19 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			4.2
		hours of individual study after manual, course support, bibliography and notes			3.64
		training seminars / laboratories, homework and papers, portfolios and essays			11.2
3.8 Total hours / week [9]	5.36				
3.8* Total hours /semester	75				
3.9 Number of credits	3				

4. **Prerequisites** (where applicable)

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[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	• Algebra and geometry; Mathematical analysis; Signal and systems; Digital circuits
4.2 Competencies	• Probability theory, Elements of finit field theory

5. Conditions (where applicable)

5.1 of the course	• Video projector, Internet connection, blackboard
5.2 to conduct practical activities	• Computers, blackboard

6. Specific competencies acquired through this discipline

Specific competencies	• Modeling of information sources • Modeling the transmission channel • Coding and Decoding • Binary signal detection from noisy channels. Parameter estimation
Professional competencies ascribed to the specific competencies	• Use of fundamentals in terms of devices, circuits, systems, instrumentation and electronics technology. • Application of basic methods for signal acquisition and processing. • Application of knowledge, concepts and basic methods related to computer system architecture, microprocessors, microcontrolers, programming languages and techniques. • Design, implementation and service operation of data, voice, video multimedia, based on understanding and applying fundamental concepts in communications and information transmission. •
Transversal competencies ascribed to the specific competencies	• 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	• Learning of basic knowledges in information theory and coding.
7.2 Specific objectives	• The student acquires knowledge about: modeling of information sources, informational modeling of the binary channel and analog channel, coding and compression of information sources, the issue of channel coding, the main protective codes. He/she will gain an understanding of the nature of information as well as how information is represented and communicated.

8. Content [10]

8.1 Course	Number of hours	Teaching methods [11]
Information definition,discrete information source without memory	2	Presentation at the right pace, presentation of numerical examples when appropriate, asking questions and stimulating answers; PowerPoint
The coding of information sources	2	
Discrete channels for information transmission	2	
Coding for noisy channels	2	
Simple coding for error detection and correction	2	
Group coding.Hamming and Reed Muller coding	2	
Cyclic codes. The Golay code	2	

[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.).

BCH codes	2	presentation accompanied by examples on the blackboard
Reed-Solomon codes	2	
Convolutional codes. Coding	2	
Convolutional codes. Decoding	2	
Binary signal detection from noisy channels. Signal parameter estimation	2	
Line codes Digital transmition systems	2 2	

Bibliography [12] A. Mihaescu,*Teoria statistica a transmisiunii informaţiei*, Litografia UPT , Timişoara 1994
A. Mihaescu, H. Balta, R. Lucaciu, *Teoria informaţiei şi a codării, curs*, Ed. Politehnica, litografie, Timişoara 2009
H. Balta, M. Kovaci, R. Lucaciu, *Culegere de probleme Teoria informației și a codării*, Editura Artpress, 2012
M.E. Borda, *Teoria informaţiei şi a codării. Fundamente şi aplicaţii*, Ed. Dacia, Cluj-Napoca, 1999
S.M. Moser, Po-Ning Chen, *A student's guide to coding and information theory*, Cambridge University Press, Cambridge 2012
Todd, K. Moon, *Error correction coding*, Wiley, 1999.
Al. Spătaru, *Fondements de la theorie de la transmission de l'information*, Presses Polytehniques Romandes, Lausanne, 1987
Al. Spătaru, *Teoria Transmiterii Informaţiei*, Ed. Didactică şi Pedagogică, Bucureşti, 1983 .

8.2 Applied activities [13]	Number of hours	Teaching methods
Laboratory works. Themes: 1. Binary coding of information sources. The Shannon-Fanno algorithm 2. Binary coding of information sources. The static Huffman algorithm 3. The Hamming code 4. One error corection cyclic code 5. BCH and Reed-Solomon code 6. The convolutional code. Viterbi decoding algorithm 7. Binary signal detection from noisy channels	2 hours per topic	To acquire knowledge: - the laboratory sheets are read -explanations are followed on the blackboard - examples are made with dedicated programs - knowledge testing is carried out
Seminars. Themes: 1. Discrete sources, channels and binary coding 2. The Hamming code 3. Cyclic codes 4. Elements of finite field theory. Galois fields GF(2^k) 5. BCH and Reed-Solomon codes 6. The convolutional code. Polynomial coding, state diagram, trellis diagram 7. Binary signal detection from noisy channels	2 hours per topic	

Bibliography [14] 1. H. Balta, R. Lucaciu, M. Kovaci, *Information theory and coding. Practical works*, Editura Politehnica, Timisoara, ISBN: 978-606-35-0262-0, 131 pag., 2021
2. H. Balta, M. Kovaci, R. Lucaciu, *Teoria informației și a codării teste grilă*, Editura Politehnica, Timisoara, ISBN: 978-606-35-0119-7, 2016.
3. H. Balta, M. Kovaci, R. Lucaciu, *Teoria informației și a codării aplicaţii practice*, Editura Artpress, ISBN: 978-973-108-588-3, 2014.
4. H. Balta, M. Kovaci, R. Lucaciu, *Culegere de probleme Teoria informației și a codării*, Editura Artpress, ISBN: 978-973-108-467-1, 2012.

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

[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.

- Similar courses are taught at technical universities around the world:
- Standford University USA – Information Theory
- MIT USA – Information Theory
- TELECOM Bretagne France – Channel coding & Information theory
- ENSSAT Lannion, France – Digital Communication

10. Evaluation

Type of activity	**10.1** Evaluation criteria [15]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	Theoretical knowledge of the course principal items. The abilty and speed of understanding or of finding solutions	Two distributed written exams, with two theachers. Each of the two exams lasts an hour and a half; each of them represent half of the course	2/3
10.5 Applied activities	**S:** Knowledge of the seminar pincipal items. Calculation abilities. The abilty and speed of understanding or of finding solutions.	Assessment of knowledge is carried out through tests. The seminar grade is the average of the test grades	1/6
	L: The degree of involvement of the student in carrying out the laboratory work. Attendance is required for all lab.	Assessment of knowledge is carried out through tests. The lab grade is the average of the test grades. The final grade for the practical activities is the average of the grades obtained at seminar and lab.	1/6
	P[16]**:**		
	Pr:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified [17])			
• The minimum volume of knowledge required for the promotion of the discipline is 0.5 of the volume of knowledge taught. Grade 5 for the two components of the final grade (exam and practical activities)			

Date of completion	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
15.06.2023		
Head of Department (signature)	**Date of approval in the Faculty Council** [18]	**Dean (signature)**
	14.09.2023	

[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.

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