COURSE DESCRIPTION

1. Program Information

1.1 Higher Education Institution	Universitatea Tehnică din Cluj-Napoca
1.2 Faculty	Automation and Computer Science
1.3 Department	Automation
1.4 Field of Study	Systems Engineering
1.5 Study Cycle	Bachelor's Degree
1.6 Study Program / Qualification	Automation and Applied Informatics
1.7 Form of Education	FT – Full-time education

2. Course Information

2.1 Course Title	**Data Transmission**				Course Code	**43.00**
2.2 Course Instructor	*S.*l. dr.ing.Radu Dan - *Dan.Radu@aut.utcluj.ro*					
2.3 Seminar / Lab / Project / Practice Instructor	Conf.dr.ing. Avram Camelia- *Camelia.Avram@aut.utcluj.ro* *S.*l. dr.ing. Domuta Claudiu – *domuta.claudiu@aut.utcluj.ro*					
2.4 Year of Study	3	2.5 Semester	2	2.6 Evaluation Type		Examination
2.7 Course Status	*DF – fundamental, DS – specialty, DC – complementary*					DS
	DOB – compulsory, DOP – elective, DFA – optional					DI

3. Estimated Total Time

3.1 Number of hours per week	4	of which:	3.2 Course	2	3.3 Seminar	0	3.3 Laboratory	2	3.3 Project	0
3.4 Total hours in the teaching plan	56	of which:	3.5 Course	28	3.6 Seminar	0	3.6 Laboratory	28	3.6 Project	0

3.7 Time distribution (hours per semester) for:	
(a) Manual, lecture material and notes, bibliography	3
(b) Supplementary study in the library, online and in the field	11
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	3
(d) Tutoring	1
(e) Exams and tests	1
(f) Other activities:	0
3.8 Total hours individual study hours (sum of (3.3(a)...3.3(f)))	19
3.9 Total hours per semester (3.2+3.4)	75
3.10 Number of credits points	3

4. Prerequisites (where applicable)

4.1 Curriculum prerequisites	Electronic Circuits Systems Theory
4.2 Competence prerequisites	Computer Programming

5. Conditions (where applicable)

5.1. Lecture delivery conditions	Lecture room – blackboard, computer, video projector, and other equipment as needed
5.2. Seminar / laboratory / project delivery conditions	Laboratory – computers and specific equipment

6. Specific Competences Acquired

Professional Competences	C2 Operating with fundamental concepts from computer science, information technology and communications C2.1 Describing the operation and structure of computer systems, communication networks and their applications in systems engineering, using knowledge of programming languages, environments and technologies, software engineering, and specific tools (algorithms, diagrams, models, protocols, etc.) C3 Applying the fundamentals of automation, methods for modelling, simulation, identification and process analysis, and computer-aided design techniques. C3.1 Identifying fundamental concepts of systems theory, automatic control engineering, basic principles of modelling and simulation, and process analysis methods, in order to explain core problems in the field. C3.4 Evaluating the performance of automatic systems, strengths and weaknesses (SWOT analysis) of projects, consistency of methods and theoretical foundations.

Transversal Competences	Ability to integrate scientific, technological and engineering knowledge in the design and implementation of communication systems Ability to think analytically, decomposing complex networks into components, interpreting data and objectively evaluating information flows, thus facilitating root-cause identification, technical problem-solving and decision optimisation

7. Expected Learning Outcomes

Knowledge	The student demonstrates knowledge of: • concepts and principles of data communications theory; • hardware and software architectures used in communication systems; • fundamental methods for the design and configuration of communication networks.
Skills	The student will be able to: • use mathematical models of signal propagation, channel characteristics and communication system components for network analysis; • use mathematical models and formal tools for evaluating software application and communication system performance; • synthesise and interpret data and test results; • compare design, optimisation and implementation alternatives for communications technology applications based on formal criteria; • use dedicated software environments for the design and simulation of communication systems; • communicate and collaborate effectively in multidisciplinary teams; • prepare reports and presentations.
Responsibility and Autonomy	The student will: • manage professional projects; • be able to work effectively in teams; • be able to assume responsibility for the quality of implemented solutions.

8. Course Objectives (derived from the specific competences grid)

8.1 General objective of the course	Acquisition of fundamental knowledge for the design and implementation of communication systems integrated into monitoring and control structures
8.2 Specific objectives	1. Knowledge and understanding of basic principles, techniques, models and algorithms used in data communication networks 2. Acquisition of foundational knowledge required for the design and implementation of communication systems

9. Contents

9.1 Lecture	**Nr. hours**	**Teaching Methods**	**Notes**
Introduction to digital communication systems	2	Interactive lectures; traditional and modern teaching methods	
Signals: characteristics, sources of attenuation and distortion, digital processing	2		
Digital modulation	2		
Transmission media	2		
Synchronous and asynchronous data transmission	2		
Communication networks: architectures, protocols, reference models	2		
Satellite communications	2		
Error-detecting and error-correcting codes	4		
Data compression	2		
Elements of cryptography	2		
Quantum cryptography	4		
Integration of artificial intelligence into communication network functions and architectures	2		

9.2 Seminar / laboratory / project / practice	**Nr. hours**	**Teaching Methods**	**Notes**
Transmission media	2	Interactive methods, example presentations,	Attendance mandatory
Digital modulation	2		
Baseband codes	2		

9.2 Seminar / laboratory / project / practice	Nr. hours	Teaching Methods	Notes
Hamming code	2	practical applications, discussions	
Cyclic codes	2		
Data compression	2		
Introduction to the Android operating system	2		
Implementation of monitoring and control applications using the Android operating system	6		
Radio communication systems for monitoring and control	4		
Information security – encryption techniques	2		
Colloquium	2		

10. Correlation of Course Content with Expectations of the Epistemic Community, Professional Associations and Representative Employers

The course content is in line with current trends, research and applications in the field, and includes topics and applications of contemporary interest.

11. Assessment

Activity Type	11.1 Assessment Criteria	11.2 Assessment Methods (and form: continuous / summative)	11.3 Weight in Final Grade
11.4 Lecture	Assessment of knowledge acquisition and ability to apply it to domain-specific problems	Comprehensive knowledge assessment – written examination (summative)	80%
11.5 Seminar / Laboratory / Project / Practice	Assessment of problem-solving skills, ability to structure information and synthesise results	Verification of knowledge, results obtained and assignments for each lab session. Knowledge assessment at the end of the laboratory activity.	10% 10%
11.6 Minimum Performance Standard N= 0.8E+ 0.2L Minimum performance standard: Laboratory grade L> 5 and final examination grade E> 5			

Completion date:	Instructors		Signature
	Lecture	S.l.dr.ing. Dan RADU	
	Lab / Practice	Conf.dr.ing. Camelia AVRAM	
		S.l.dr.ing. Claudiu DOMUTA	

Date of approval by the Department Council …….

Department Head

Prof.dr.ing. Honoriu VALEAN

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Date of approval by the Faculty Council ……

Dean,

Prof.dr.ing.Vlad MURESAN

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