SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Automotive Engineering, Mechatronics and Mechanics
1.3	Department	Automotive Engineering and Transportation
1.4	Field of study	Automotive Engineering
1.5	Cycle of study	Master's in Science
1.6	Program of study/Qualification	Tehnici Avansate în Ingineria Autovehiculelor (Advanced Techniques in Automotive Engineering) - în limba engleză
1.7	Form of education	Full time
1.8	Subject code	04.00

2. Data about the subject

2.1	Subject name			Communication BUS Architecture			
2.2	Subject area			Vehicle Network Architecture			
2.3	Course responsible/lecturer			Associate Professor PhD Iclodean Călin calin.iclodean@auto.utcluj.ro			
2.4	Teachers in charge of seminars			Associate Professor PhD Iclodean Călin calin.iclodean@auto.utcluj.ro			
2.5 Year of study	I	2.6 Semester	1	2.7 Assessment	E	2.8 Subject category	DS/DI

3. Estimated total time

3.1 Number of hours per week	3	3.2 of which, course:	1	3.3 applications:	2
3.4 Total hours in the curriculum	100	3.5 of which, course:	14	3.6 applications:	28
Individual study					hours
Manual, lecture material and notes, bibliography					24
Supplementary study in the library, online and in the field					24
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					8
Tutoring					-
Exams and tests					2
Other activities					-

3.7	Total hours of individual study	58
3.8	Total hours per semester	100
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	-
4.2	Competence	General knowledge in the fields of automotive, electronics and computer science.

5. Requirements (where appropriate)

5.1	For the course	-
5.2	For the applications	Attending (100% attendance) and performing (promoting) the activities from the laboratory applications condition the admission to the final form of evaluation of the discipline.

6. Specific competences

Professional competences	Knowledge of the principles and theory regarding the communication networks used in the automotive industry, as the demonstration of theoretical and practical knowledge regarding the operation of the main types of communication networks: LIN, CAN, FlexRay and MOST. Knowledge of some typologies of architectures for the communication networks used in the construction of vehicles and the deepening of the main physical and virtual models used in the development and validation of these communication networks. Knowledge of possible faults and the way, respectively of the repair procedures. Identification of the types of signals and data packets generated and transmitted using communication networks: LIN, CAN, FlexRay and MOST.
Cross competences	Use of advanced software applications in modeling and simulating the operation of the main types of communication networks: LIN, CAN, FlexRay and MOST developed in physical and virtual environments. Execution of professional tasks according to the specified requirements following a pre-established work plan under qualified guidance. Completion of homework and projects imposed on time and at a high-quality standard. Integration within a working group, assuming specific roles and achieving good communication within the team. Achieving personal and professional development, efficiently using own resources and modern study tools.

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

7.1	General objective	The general objective is to accumulate knowledge in the field of development, modeling, and simulation of the operation of the main types of communication networks: LIN, CAN, FlexRay and MOST.
7.2	Specific objectives	Assessment and analysis of requirements for new technologies integrated in vehicles in order to implement the main types of communication networks: LIN, CAN, FlexRay and MOST.

8. Contents

8.1. Lecture (Syllabus)	Methods	Notes
1. Vehicular communications networks. Basic concepts and characteristics	Exposure, conversation, exemplification, orientation, etc. Use of technical and visual means.	2 hours
2. LIN (Local Interconnect Network) architecture and protocol		2 hours
3. CAN (Controller Area Network) hardware architecture and node structure		2 hours
4. CAN (Controller Area Network) communication protocol and messages structure		2 hours
5. FlexRay hardware architecture and communication protocol		2 hours
6. FlexRay data frame structure. Static and dynamic segments		2 hours
7. MOST (Media Oriented System Transport) hardware architecture and communication protocol		2 hours
8.2. Applications/Seminars	Methods	Notes
1. Define the project (1) in the computer simulation application	Exercices, conversations, description, modeling, etc. Use	2 hours
2. Development of a virtual model in a computer simulation application		2 hours
3. Connecting the elements and the nodes in the virtual model		2 hours
4. Defining the initial data of the simulated system and inserting it into the virtual model components		2 hours

5. Defining the characteristics of the simulation process for the virtual model	of technical and visual means.	2 hours
6. Running computer simulations, collecting and saving the results for project (1)		2 hours
7. Visualization, analysis, and interpretation of the most relevant results for project (1)		2 hours
8. Define the project (2) in the computer simulation application		2 hours
9. Development of a virtual model in a computer simulation application		2 hours
10. Connecting the elements and the nodes in the virtual model		2 hours
11. Defining the initial data of the simulated system and inserting it into the virtual model components		2 hours
12. Defining the characteristics of the simulation process for the virtual model		2 hours
13. Running computer simulations, collecting and saving the results for project (2)		2 hours
14. Visualization, analysis, and interpretation of the most relevant results for project (2)		2 hours

Bibliography

1. Bosch Automotive Electrics and Automotive Electronics Systems and Components (link).
2. Bosch Automotive Mechatronics, Automotive Networking, Electronics (link).
3. Bosch Diesel Engine Management, Systems and Components (link).
4. Bosch Gasoline Engine Management Systems and Components (link).
5. Bosch Fundamentals of Automotive and Engine Technology, Standard Drives (link).
6. Iclodean Autonomous Vehicles for Public Transportation (link).
7. Iclodean Introducere în sistemele automobilelor (link).
8. Iclodean Metode de Simulare a Sistemelor de Propulsie prin Aplicații Numerice (link).
9. Iclodean Rețele de Comunicație pentru Autovehicule (link).
10. Iclodean Interconectarea sistemelor virtuale de ... control pentru autovehicule (link).
11. Isermann Automotive Control Modeling and Control of Vehicles (link).
12. Burnete Motoare cu Ardere Internă si termodinamică. Noțiuni fundamentale (link).
13. Varga Electric and Plug-In Hybrid Vehicles Advanced Simulation Methodologies (link).
14. Varga Electric and Hybrid Buses for Urban Transport Energy Efficiency Strategies (link).
15. AUTOSAR Standard Classic Platform (link).
16. AUTOSAR Standard Adaptive Platform (link).
17. AUTOSAR Application Interface (link).
18. Automotive SPICE Process Reference/Assessment Model (link).

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

In the training of skills, the options of employers recommended to higher education institutions for the training of graduates are taken into account (ability to use time efficiently, ability to work in a team, ability to learn quickly, ability to coordinate teams, new opportunities in the interest company, the ability to use the computer and the Internet, the ability to adapt to new situations, etc.) and the priorities recommended by employers in training graduates (creativity and ability to innovate, the ability to negotiate, the ability to critically analyze, the ability to learn quickly , knowledge from other fields). The content of the discipline is in accordance with the study materials and methods that are used at other universities in the country and abroad.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The degree of assimilation of the notions presented during the course. Correctness of acquired knowledge.	Written evaluation.	60%
10.5 Applications	Ability to operate with assimilated knowledge.	Checking applications.	40%
10.6 Minimum standard of performance: final grade 5.			

Date of filling in:		**Title Surname Name**	**Signature**
24.06.2025	Lecturer	Associate Professor PhD Iclodean Călin	
	Teachers in charge of application	Associate Professor PhD Iclodean Călin	

Date of approval in the department ART
24.06.2025
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Head of department
Prof.dr.ing. Barabás István

Date of approval in the faculty ARMM
25.06.2025
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Dean
Prof.dr.ing. Filip Nicolae