SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of 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 in Science
1.6	Program of study/Qualification	Advanced Techniques in Automotive Engineering
1.7	Form of education	Full time
1.8	Subject code	16.20

2. Data about the subject

2.1	Subject name			Basics of Autonomous Driving			
2.2	Subject area			Automotive engineering			
2.3	Course responsible/lecturer			Associate Professor PhD Eng. Nicolae CORDOS - nicolae.cordos@auto.utcluj.ro			
2.4	Teachers in charge of seminars			Associate Professor PhD Eng Nicolae CORDOS- nicolae.cordos@auto.utcluj.ro			
2.5 Year of study	II	2.6 Semester	I	2.7 Assessment	E	2.8 Subject category	DA/DO

Estimated total time

3.1 Number of hours per week	3	3.2 of which, course:	2	3.3 seminar / **laboratory / project**	0/1/0
3.4 Total hours in the curriculum	42	3.5 of which, course:	28	3.6 seminar / **laboratory** :	14
Individual study					hours
Manual, lecture material and notes, bibliography					45
Supplementary study in the library, online and in the field					20
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					11
Tutoring					5
Exams and tests					2
Other activities					-

3.7	Total hours of individual study	83
3.8	Total hours per semester	125
3.9	Number of credit points	5

3. Pre-requisites (where appropriate)

4.1	Curriculum	General knowledge of mathematics, physics, mechanics
4.2	Competence	Computer use knowledge

4. Requirements (where appropriate)

5.1	For the course	Course room, laptop, video projector

5.2	For the applications	Attendance (present 100%) and performing (completion / promotion) the applications activities condition the admission to the final evaluation of the discipline.

5. Specific competences

Professional competences	• Identification, definition and using of the specific concepts for ADAS; • Using the study principles and the graphical tools for describing the ADAS; • Description of the dynamic phenomena specific to a rational exploitation of the vehicles ADAS • Develop of the models from the field of engineering automotive; • Implementation of the study strategies of the ADAS depending on their exploitation conditions.
Cross competences	• Responsibly execution of the complex professional duties in conditions of restricted autonomy and qualified assistance - *Autonomy and responsibility* • Awareness of the need for continuous training; efficient use of the resources and the learning techniques for personal and professional development - *Personal and professional development*

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

7.1	General objective	• Development of professional skills in the field of automotive engineering
7.2	Specific objectives	• knowledge, understanding concepts, theories and methods of modeling of the vehicles ADAS; Their proper use in the professional communication • Use the basic knowledge for the application and interpretation of various types of concepts, situations, processes etc. (In wider contexts) associated to the ADAS - Explanation and Interpretation • Development of professional projects using innovative principles and methods, quantitative and qualitative, consecrated in the field of the motor vehicle engineering - Creativity and Innovation

7. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Fundamentals of Driver Assistance Development. Fundamentals of Machine Vision	Exposure (explanation, description), presentation, analysis, advantages, disadvantages, applicability, conversation, demonstration,	2 hours
2.	Technical Sensor Characteristics for Driver Assistance Systems		2 hours
3.	Vehicle Dynamics Sensors for DAS. Technical Sensor Characteristics for Driver Assistance Systems		2 hours
4.	Lateral Guidance Assistance.Lane Change Assistance		2 hours
5.	Longitudinal Guidance of vehicle		2 hours
6.	Adaptive Cruise Control		2 hours
7.	Automotive RADAR		2 hours
8.	Automotive LIDAR		2 hours
9.	Automotive Camera		2 hours

10.	Ultrasonic Sensor .Parking Assistance Sensors. Active Parking	illustration, guidance etc.	2 hours
11.	Data Fusion of Environment-Perception Sensors for ADAS		2 hours
12.	Human Information Processing. Driver Characteristics and the Limits of Human Performance Capacity		2 hours
13.	Requirements for Driver Assistance Systems. Type Approval Regulations.Euro NCAP Requirements		2 hours
14.	Effect on the Characteristics of Driver Assistance Systems. AUTOSAR Mechanisms for Functional Safety (ISO 26262)		2 hours

Bibliography

[1]. Winner, Hermann, et al., eds. Handbook of driver assistance systems. Amsterdam, The Netherlands:: Springer International Publishing, 2014..
[2] Hermann Winner, Stephan Hakuli, Felix Lotz, and Christina Singer. 2015. Handbook of Driver Assistance Systems: Basic Information, Components and Systems for Active Safety and Comfort (1st. ed.). Springer Publishing Company, Incorporated.
[3] ISO 15622 (2010) Adaptive cruise control – performance requirements and test procedures
[4] ISO 26262 (2012) Road vehicles – functional safety
[5]. Daniel Watzenig, Martin Horn, Automated Driving , 2017, ISBN 978-3-319-31895-0 (eBook), Springer Publishing Company, Incorporated.
[8]. Automotive System Dynamics and Control, Masato Abe, Yu Fan, China Machine Press, 2012.

8.2. Applications/Seminars		Teaching methods	Notes
1.	Identify the specific elements of ADAS on a vehicle that contains different sensors.	Problem solving, exercise, algorithmic, conversation, explanation, description, demonstration, illustration, guidance etc.	2 hours
2.	Classification of ADAS sensors according to their behavior when the vehicle is in motion		2 hours
3.	Construction of a vehicle model with ADAS in modeling / simulation programs		2 hours
4.	Radar sensor modeling and simulation		2 hours
5.	Camera and camera sensor modeling and simulation		2 hours
6.	Lidar sensor modeling and simulation		2 hours
7.	Modeling / Simulation of a complete ADAS system on a vehicle. Data Fusion of Environment-Perception Sensors		2 hours

[1]. Winner, Hermann, et al., eds. Handbook of driver assistance systems. Amsterdam, The Netherlands:: Springer International Publishing, 2014..
[2] Hermann Winner, Stephan Hakuli, Felix Lotz, and Christina Singer. 2015. Handbook of Driver Assistance Systems: Basic Information, Components and Systems for Active Safety and Comfort (1st. ed.). Springer Publishing Company, Incorporated.
[3] ISO 15622 (2010) Adaptive cruise control – performance requirements and test procedures
[4] ISO 26262 (2012) Road vehicles – functional safety
[5]. Daniel Watzenig, Martin Horn, Automated Driving , 2017, ISBN 978-3-319-31895-0 (eBook), Springer Publishing Company, Incorporated.
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8.3. Project

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

The gained skills will be required to the employees who work in the field of the motor vehicle engineering. In the training of the competences are taking into account the employers options recommended for the higher education institutions for training the graduates (ability to use the time efficiently, empowering team work, ability to learn quickly, the ability to coordinate teams, new opportunities in the field the interest of the company, ability to use the computer simulation, ability to adapt to new situations, etc.) and the priorities recommended by the employers in the field for training the graduates (creativity and capacity for innovation, ability to negotiate, critical and self-critical analysis ability, knowledge of other areas).

9. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Frequency and behaviour in activities. The given marks to the final examination	Written assessment	50%
Applications and project	- Ability to work with assimilated knowledge; - Ability to apply in practice;	Active participation at applications.	50%
10.4 Minimum standard of performance			
- calculation and graphic representation of some vehicle components at the performance level; - elaboration of physical-mathematical models for their use in the study of vehicle ADAS; - Presentation of the project correctly and completely - Qualified - each subject in the test has to be solved - minimum score 5 (five)			

Date of filling in:		**Title Surname Name**	**Signature**
10.06.2024	Lecture	Associate Professor PhD Eng. Nicolae Cordos	
	Teachers in charge of application	Associate Professor PhD Eng. Nicolae Cordos	

Date of approval in the department ART
26.06.2024
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Head of department
Prof.PhD.Eng. Barabás István

Date of approval in the faculty ARMM
28.06.2024
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Dean
Prof.PhD.Eng. Filip Nicolae