SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Electrical Engineering
1.3	Department	Electrical Machines and Drives
1.4	Field of study	Electrical Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Electrical Systems
1.7	Form of education	Full time
1.8	Subject code	58.20

2. Data about the subject

2.1	Subject name			Automotive Systems			
2.2	Course responsible/lecturer			Prof. Daniel FODOREAN, PhD Eng.			
2.3	Teachers in charge of seminars			Prof. Daniel FODOREAN, PhD Eng.			
2.4 Year of study	IV	2.5 Semester	2	2.6 Assessment		C	
2.7 Subject category	Formative category					DS	
	Optionality					DO	

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3 Seminar	-	3.3 Laboratory	4	3.3 Project	-
3.4 Total hours in the curriculum	42	of which	3.5 Course	28	3.6 Seminar	-	3.6 Laboratory	28	3.6 Project	-

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	21
(b) Supplementary study in the library, online and in the field	21
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	21
(d) Tutoring	4
(e) Exams and tests	2
(f) Other activities	

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	69
3.9 Total hours per semester (3.4+3.8)	125
3.10 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	Electrical Systems, Electrical Machines and Drives, Automation
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	-
5.2	For the applications Laboratory	Mandatory

6. Specific competences

Professional competences	Systemic perspective of the fundamental aspects of configuration and operation of HV, PiHV, EV. To choose correctly, depending on the application, the component subsystems of HV, PiHV, EV. Systemic design of the electrical subsystems on board of the HV, PiHV, EV. Assess the impact of energy management of HV, PiHV, EV.
Cross competences	Apply the principles, norms and values of professional ethics in performing professional tasks efficiently and responsibly. Self-knowledge of the level of training and identification of the needs for professional development in order to further capitalized one's own activity.

7. Expected learning outcomes

Knowledge	The student/graduate describes, identifies, and analyzes electromagnetic and mechanical phenomena specific to electromechanical converters, electrical equipment, and electromechanical drives.
Abilities	The student/graduate explains and interprets the operating regimes of electrical equipment and electromechanical systems. The student/graduate identifies electromechanical systems based on their components, including their mathematical modeling, as well as their kinematic and dynamic description. The student/graduate designs electromechanical or electrical installations.
Responsibility and autonomy	The student/graduate applies this advanced knowledge to efficiently design and size electromechanical and electrical installations in compliance with applicable standards.

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

8.1	General objective	Development of skills in studying the electrical systems found on board of HV, PiHV, EV
8.2	Specific objectives	Training the design/characterization of electric systems on board of HV, PiHV, EV

9. Contents

9.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. Motivation, presentation of the main technological components on board of HV, PiHV, EV.	2		
2. The energy context (national and EU level) and the power consumption on board of HV, PiHV, EV.	2		
3. Configurations and characteristics of HV, PiHV & EVs.	2		
3. Configurations and characteristics of EVs.	2		
5. Propulsion of EV, HV and PiHV: with transmission, with	2		

no transmission, with magnetic transmission.		PC support, magnetic board, exercises and examples solved with students	Online and/or onsite
6. The storage unit on board of HV, PiHV, EV: batteries.	2		
7. The storage unit on board of HV, PiHV, EV: UC, FC.	2		
8. Electric system on board of EV, HV & PiHV: compressor.	2		
9. Electric system on board of EV, HV & PiHV: brake.	2		
10. Electric system on board of EV, HV & PiHV: steering.	2		
11. Electric system on board of EV, HV & PiHV: auxiliaries.	2		
12. Electric system on board of EV, HV & PiHV: media.	2		
13. Electric system on board of EV, HV & PiHV: driving sensors and communication systems.	2		
14. Charging the EVs: modes, conditions, limitations.	2		

Bibliography

- D. Fodorean, *State of the art of Magnetic Gears, their design and characteristics with respect to EV application*, INTECH book chapter (volume Electric Vehicles), 2016.
- D. Fodorean, F.Jurca, M.Ruba and D.C. Popa. *Motorization Variants for Light Electric Vehicles – design, magnetic, mechanical and thermal aspects*, AlmaMater, June 2013.
- J. larminie, J. Lowry, Electric Vehicle Technology Explained – 2nd edition, Wiley, 2013.
- A.E. Fuhs, *Hybrid vehicles and the future of personal transportation*, CRC Press 2008.
- D. Sandeep, Electric vehicle battery systems, Newness, 2002.

9.2. Laboratory Activity	Number of hours	Teaching methods	Notes
1. Study of the steering system of HV, PiHV, EV.	2	Support on using PC, Software, Equipment	
2. Study of the electrical system of an Electric Scooter	2		
3. Study of propulsion with magnetic transmission.	2		
4. Study of energy storage unit: battery.	2		
5. CAN system for charging/discharging system.	2		
6. Charging the battery of an EV: ac, dc, modes 1-3.	2		

Bibliography

- D. Fodorean: *Global Design and Optimization of a Permanent Magnet Synchronous Machine used for Light Electric Vehicle*, Intech, June 2011 – book chapter in: *Electric Vehicles – Modelling and Simulations*.
- C. Vogel, *Build Your Own Electric Motorcycle*, 2009.
- ***, dSPACE & ControlDesk: user guide, hardware installation and implementation.
- L. Szabo, D. Fodorean, *Simulation of electrical machine and drive assembly*, Mediamira, 2009.

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

The acquired skills will be necessary for employees working in the industrial (automotive) field.

11. Evaluation

Activity type	11.1 Assessment criteria	11.2 Assessment methods	11.3 Weight in the final grade
11.4 Course	Involvement in solving the written exercises	EXAM	90%
11.5 Laboratory	Involvement in solving developing the laboratory setup and tests	Validation of the laboratory activity.	10%
11.6 Minimum standard of performance			
5 (five)			

Date of filling in:		**Title Surname Name**	**Signature**
January 2026	Lecturer	Prof. Daniel FODOREAN	
	Teachers in charge of application	Prof. Daniel FODOREAN	

Date of approval in the department ……. January 2026	Head of department Prof. Eng. MICU Dan Doru, PhD.
Date of approval in the faculty …… February 2026	Dean Assoc.Prof. Andrei CZIKER, PhD Eng.