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	Electrotechnics and Measurements
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		Exam	
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	2	3.3 Project	-
3.4 Total hours in the curriculum	56	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	32
(b) Supplementary study in the library, online and in the field	27
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	4
(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. Discipline objectives (as results from the *key competences gained*)

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

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. Motivation, presentation of the main technological components on board of HV, PiHV, EV.	2	PC support, magnetic board, exercises and examples solved with students	Online and/or onsite
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 no transmission, with magnetic transmission.	2		
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.			
8.2. Laboratory Activity	Number of hours	Teaching methods	Notes
1. Study of the steering system of HV, PiHV, EV.	4	Support on using PC, Software, Equipment	
2. Study of the electrical system of an Electric Scooter	4		
3. Study of propulsion with magnetic transmission.	4		
4. Study of energy storage unit: battery.	4		
5. CAN system for charging/discharging system.	4		
6. Charging the battery of an EV: ac, dc, modes 1-3.	4		

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.

9. 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.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Involvement in solving the written exercises	EXAM	90%
10.5 Laboratory	Involvement in solving developing the laboratory setup and tests	Validation of the laboratory activity.	10%
10.6 Minimum standard of performance			
5 (five)			

Date of filling in:		**Title Surname Name**	**Signature**
August 2024	Lecturer	Prof. Daniel FODOREAN	
	Teachers in charge of application	Prof. Daniel FODOREAN	

Date of approval in the department ……..

____September 2024 _____

Head of Department:
Prof. Eng. MICU Dan Doru, PhD

Date of approval in the faculty ……

___September 2024 ____

Dean
Assoc.Prof. Andrei CZIKER, PhD Eng.