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 Measuremens
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	EMCS

2. Data about the subject

2.1	Subject name			Static power converters			
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	III	2.5 Semester	2	2.6 Assessment	Exam		Grade
2.7 Subject category	Formative category						YES
	Optionality						DS

3. Estimated total time

3.1 Number of hours per week	5	of which	3.2 Course	2	3.3 Seminar	-	3.3 Laboratory	2	3.3 Project	1
3.4 Total hours in the curriculum	70	of which	3.5 Course	28	3.6 Seminar	-	3.6 Laboratory	42	3.6 Project	-

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	30
(b) Supplementary study in the library, online and in the field	11
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	9
(d) Tutoring	3
(e) Exams and tests	2
(f) Other activities	

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	55
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	Electromechanics, Power Electronics, Automation
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	Active involvement
5.2	For the applications Laboratory	Mandatory

6. Specific competences

Professional competences	Theory of electrical and magnetic circuits, electro-mechanical. Development of mathematical models for the simulation of electromechanical systems: power supplies, converters, rotary electric machines. Work with software (Matlab / Simulink) and hardware (dSPACE control boards), programmable source, static converter, electric machine - including position interface.
Cross competences	Electrotechnics Power electronics Mechanics Signal processing

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

7.1	General objective	Modelling of electromechanical conversion systems.
7.2	Specific objectives	Ability to develop their own mathematical model for the components of an electromechanical system and their numerical implementation.

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. Motivation. The purpose, types and result of the implementation of the electromechanical conversion.	2	PC support, magnetic board, exercises and examples solved with students	
2. Laws & theorems used in electromechanical conversion.	2		
3. Case study for modelling for a real system (scooter).	2		
4. Mechanical modelling according to various type of loads	2		
5. Modelling techniques in electromechanical conversion.	2		
6. Electromechanical conversion modelling in dc systems.	2		
7. Electromechanical conversion modelling in ac systems.	2		
8. Modelling of ac energy supply and equipment.	2		
9. Modelling of dc energy supply and equipment.	2		
10. Modelling of control techniques for EMS conversion.	2		
11. Modelling of regulators used in EMS conversion.	2		
12. Modelling of dc & ac energy power sources.	2		
13. Concept of real time electromechanical conversion systems.	2		
14. Electromechanical conversion system: study case.	2		

Bibliography

- 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.
- L. Szabo, D. Fodorean, *Simulation of electrical machine and drive assembly*, Mediamira, 2009.
- D. Sandeep, *Electric vehicle battery systems*, Newness, 2002.

8.2. Laboratory Activity	Number of hours	Teaching methods	Notes
1. Introduction to Matlab (recap): basic applications.	7		

2. Introduction to Simulink (recap): basic application.	7	Support on using PC, Software, Equipment	
3. Simulation of dc machine (DCM) operation.	7		
4. Simulation of the operation of single / double alternating rectifiers and chopper to supply a DCM	7		
5. Simulation of the operation of the induction machine with rotor in the cage, fed from the network.	3		
6. Modelling of the synchronous machine with PM and its associated inverter.	4		
7. Implement real-time control using models developed for a given electromechanical system.	7		

Bibliography

- L. Szabo, D. Fodorean, *Simulation of electrical machine and drive assembly*, Mediamira, 2009.
- ***, dSPACE & ControlDesk: user guide, hardware installation and implementation.

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, PhD Eng.	
	Teachers in charge of application	Prof. Daniel FODOREAN, PhD Eng.	

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.