Syllabus

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Automation and Computer Science
1.3 Departament	Automation
1.4 Field of study	Systems Engineering
1.5 Cycle of study	Bachelor of Science
1.6 Program of study/Qualification	Automation and Applied Informatics (English)
1.7 Form of education	Full time
1.8 Codul disciplinei	35.10

2. Data about the subject

2.1 Subject name	***Power Electronics***				
2.2 Course responsible/lecturer	Prof.dr.ing Festila Clement – clement.festila@aut.utcluj.ro Conf.dr.ing. Rusu-Both Roxana – roxana.both@aut.utcluj.ro				
2.3 Teachers in charge of applications	Conf.dr.ing. Rusu-Both Roxana – roxana.both@aut.utcluj.ro				
2.4 Year of study	3	2.5 Semester	1	2.6 Assessment *(E/C/V)*	E
2.7 Type of subject	*DF – fundamental, DD – in the field, DS – specialty, DC – complementary*				DS
	DI – compulsory, DO – elective, Dfac – optional				D0

3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	2	Seminar	0	Laboratory	1	Project	1
3.2 Number of hours per semester	56	of which:	course	28	Seminar	0	Laboratory	14	Project	14
3.3 Individual study										
(a) Manual, lecture material and notes, bibliography										28
(b) Supplementary study in the library, online and in the field										10
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										28
(d) Tutoring										
(e) Exams and tests										3
(f) Other activities:										

3.4 Total hours of individual study (sum of (3.3(a)…3.3(f)))	69
3.5 Total hours per semester (3.2+3.4)	125
3.6 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1 Curriculum	System Theory, Electronic devices and Circuits
4.2 Competence	• control principles torque / speed for DC and AC motors, control principles torque / speed for special electric motors, electrical circuits supply problem

5. Requirements (where appropriate)

5.1. For the course	N/A
5.2. For the applications	Attendance is mandatory

6. Specific competences

6.1 Professional competences	C4.1 Defining the requirements of applicable standards and of the methods of implementation, testing, operation and maintenance for the equipments used in the applications of automatic control and applied informatics based on the operation and design principles. C4.5 Development and implementation of technical projects for automatic systems and information systems, that include general purpose and dedicated equipments (digital and analogue), including computer networks
6.2 Cross competences	

7. Course objectives

7.1 General objective	Integration of the electronic equipment in a complex control loop
7.2 Specific objectives	•Knowing the structure, characteristic and function of specific circuits •Modeling of power electronic circuits

8. Contents

8.1 Lecture	No.hours	Teaching methods	Notes
The specific of power electronics	2	Teaching using laptop and projector, interactive course, debate	
Power electronics circuits used in automatic control closed loop	2		
Switching analysis of bipolar transistor	2		
Switching analysis of the MOSFET transistor	2		
Switching analysis of the thyristors and GTO devices	2		
Switching analysis of Triacs	2		
Switching analysis of IGBT transistor	2		
Switching analysis of MCT thyristors	2		
The structure, operating principles and design of solid state relays	2		
AC Voltage Controllers used as actuators in control systems	2		
DC Voltage Controllers: usage as actuator or regulated power supply	2		
Controlled rectifiers used as actuators in control systems	2		
Inverters used as actuators in control systems	2		
Case studies	2		
Bibliography 1. Festila, Cl. ş.a. – Power Electronics in Automation Control, Editura Mediamira, Cluj-Napoca, 2000. 2.WILLIAMS B.W., Power electronics : devices, drivers, applications and passive components, London, 1992 3.Mohan, N. ş..a. – Power Electronics, John Wiley, 1995 4.BOSE Bimal K., Modern power electronics and AC Drives, Upper Saddle River, New Jersey, 2001 5.TRZYNADLOWSKI Andrzej M., Introduction to modern power electronics, New York, 1998			

8.2 Aplications (laboratory)	No.hours	Teaching methods	Notes
L1. Work protection notions and laboratory presentation. Analysis of the bipolar transistor switching	2	Presentation of examples, demonstrations, discussions, practical applications	Mandatory attendance
L2. Analysis of power amplifiers in switching mode of operation	2		
L3. Integrated circuits for thyristors and triacs control	2		
L4. The analysis of solid state relays	2		
L5. The analysis of controlled rectifiers	2		
L6. The analysis of DC and AC voltage controllers	2		
L7. The analysis of J-15 Hittachi inverter for the control of asynchronous motor	2		
Bibliography 1. Festila, Cl. ş.a. – Power Electronics in Automation Control, Editura Mediamira, Cluj-Napoca, 2000. 2. WILLIAMS B.W., Power electronics : devices, drivers, applications and passive components, London, 1992 3. Mohan, N. ş..a. – Power Electronics, John Wiley, 1995 4. BOSE Bimal K., Modern power electronics and AC Drives, Upper Saddle River, New Jersey, 2001 5. TRZYNADLOWSKI Andrzej M., Introduction to modern power electronics, New York, 1998			

8.3 Aplications (project)	No.hours	Teaching methods	Notes
P1. Design and analysis of a line transformer	2	Presentation of examples, demonstrations, discussions, practical applications	Mandatory attendance
P2. Design and analysis of rectifier circuits	2		
P3. Design of the smoothing filter	2		
P4. Design of step-down power supply	2		
P5. Design of bipolar thyristor rectifier	2		
P6. Design of step-up power supply	2		
P7. Project presentation and Conclusions	2		
Bibliography 1. Festila, Cl. ş.a. – Power Electronics in Automation Control, Editura Mediamira, Cluj-Napoca, 2000.			

2.	WILLIAMS B.W., Power electronics : devices, drivers, applications and passive components, London, 1992
3.	Mohan, N. ş..a. – Power Electronics, John Wiley, 1995
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5.	TRZYNADLOWSKI Andrzej M., Introduction to modern power electronics, New York, 1998

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

Course content was discussed with representatives of prestigious companies in the field in Romania , Europe and USA and rated several times by government agencies in Romania
(CNEAA , ARACIS)

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Assessment of knowledge through a test based on the knowledge gained following participation in the course	Written exam	60%
Seminar			
Laboratory	Examination of the skills and knowledge acquired through the participation in the laboratory.	Practical assessment	20%
Project	Project presentation	Practical presentation	20%
Minimum standard of performance: Written exam grade > 5 and practical assessment grade > 5 and practical presentation grade > 5 N=0.6E+0.2*L+0.2P, N>5, E>5, L>5, P>5			

Date of filling in:		**Title Firstname NAME**	**Signature**
20.03.2023	Course	Prof. Eng. Clement FESTILA, PhD	
		Assoc. Prof. eng. Roxana BOTH, PhD	
	Applications	Assoc. Prof. eng. Roxana BOTH, PhD	

Date of approval by the Department Board Automatica

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Head of Departament Automatica
Prof.dr.ing. Honoriu VĂLEAN

Date of approval by the Faculty Council Automatica si Calculatoare

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Dean
Prof.dr.ing. Liviu Cristian MICLEA