

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Electrical Engineering
1.3	Department	Power Systems and Management
1.4	Field of study	Energy Engineering
1.5	Cycle of study	Master of Science
1.6	Program of study/ Qualification	Modern Power Systems
1.7	Form of education	Full time
1.8	Subject code	16.00

2. Data about the subject

2.1	Subject name	Electric Power Quality			
2.2	Course responsible/ lecturer	Assoc. Prof. Eng. Horia BELEIU, PhD.			
2.3	Teachers in charge of Seminars/ Laboratory/ Project	Assoc. Prof. Eng. Horia BELEIU, PhD.			
2.4 Year of study	2	2.5 Semester	1	2.6 Type of assessment (<i>E – exam, C – colloquium, V – verification</i>)	Exam
2.7 Subject category	<i>DF – fundamental, DD – in the field, DS – specialty, DC – complementary</i>				DA
	<i>DI – compulsory, DO – elective, Dfac – optional</i>				DI

3. Estimated total time

3.1 Number of hours per week:	3	of which	3.2 Course	2	3.3 Seminar	-	3.3 Laboratory	1	3.3 Project	-
3.2 Total hours per semester	42	of which	3.5 Course	28	3.6 Seminar	-	3.6 Laboratory	14	3.6 Project	-
3.7 Individual study:										
(a) Manual, lecture material and notes, bibliography										40
(b) Supplementary study in the library, online and in the field										5
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										30
(d) Tutoring										3
(e) Exams and tests										5
(f) Other activities										-
3.8 Total hours of individual study <i>[sum (3.7(a) to 3.7(f))]</i>					83					
3.9 Total hours per semester <i>[sum of 3.4 and 3.8]</i>					125					
3.10 Number of credit points					5					

4. Prerequisites (where applicable)

4.1	Curriculum	
4.2	Competences	

5. Requirements (where appropriate)

5.1	For the course	
5.2	For the applications	

6. Specific competences

Professional competences	Knowledge in Basic Electrical Engineering; Generation, Transmission, and Distribution of Electrical Energy; Power Electronics; Applications of Electrical Energy After completing the course, students will be able to: - Use dedicated software for analyzing aspects of power quality; - Utilize equipment for monitoring power quality; - Perform statistical processing and interpretation of data related to power quality; - Size equipment for maintaining power quality. After completing the course, students will also be able to: - Use computers and data acquisition systems for monitoring power quality; - Operate various types of power meters.
Cross competences	The appropriate quantitative assessment of the magnitudes for maintaining network voltage within permissible limits. Evaluation of the operation of protections in energy transmission and distribution systems. Analysis of reactive power compensation methods, whether they operate with delays or quickly, in steps or continuously.

7. Expected learning outcomes

On completion of the discipline, the student will be able to demonstrate:

Knowledge	Has in-depth knowledge of the architectures, functions and current trends of modern power systems and smart grids. Critically understands the integration of distributed resources, operational flexibility and the impact of digital technologies on the energy system. Correlates advanced domain knowledge with sustainability, resilience and energy efficiency objectives.
Skills	Analyses operating regimes and formulates technically substantiated solutions for the configuration and operation of power systems. Integrates technical, operational and economic data for evaluating system development alternatives. Applies interdisciplinary approaches for optimising operation and modernising energy infrastructure.
Responsibility and autonomy	Manages complex and unpredictable work or study situations requiring strategic decisions. Autonomously grounds professional solutions and assumes their technical and organisational implications. Contributes responsibly to the development of professional practices and to the coordination of activities within technical teams.

8. Discipline objectives (based on specific competencies acquired)

8.1 General objective	Understanding and acquiring knowledge about aspects related to the power quality (PQ).
8.2 Specific objectives	The system of PQ indicators; Analytical bases; statistical processing (mean values, deviations); The LabVIEW environment, development of virtual instrumentation applications for PQ aspects.

9. Contents

9.1. Course (Lectures)		Number of hours	Teaching methods	Additional remarks
1	Defining the System of Power Quality Indicators, Statistical Values of Power Quality Indicators	2	Exposition, discussions	Microsoft Teams
2	Frequency Indicators. Indicators of the Effective Voltage Variation. Slow Voltage Variations	2		
3	Indicators of Voltage Fluctuations, Flicker Dose	2		
4	Flicker Severity. Indicators for Voltage Dips and Short-Duration Overvoltages	2		
5	Indicators for Voltage Impulses. Harmonic Regime, Discrete Fourier Transform Development	2		

6	Requirements for Assisted Analysis Programs. Alias Phenomenon	2		
7	Characteristics and Results of Assisted Analysis	2		
8	Indicators of Harmonic Regime	2		
9	Asymmetric Regime	2		
10	Power Quality Control	2		
11	Power Quality Disturbances	2		
12	Effects of Poor Power Quality	2		
13	Power Quality Maintenance			
14	Statistics in Power Systems			
Bibliography				
Virgil Maier, Sorin G. Pavel, Horia G. Beleiu – Calitatea Energiei Electrice. Editura: UPPRESS Cluj-Napoca, 2012, ISBN 978-973-662-784-2.				
9.2. Applications - Seminar /Laboratory/Project		Number of hours	Teaching methods	Additional remarks
1	Virtual Instrumentation and the LabVIEW Environment	2	Explanations, applications	Microsoft Teams, LabVIEW
2	Virtual Instruments for PQ Indicators	2		
3	PQ Monitoring through Virtual Instrumentation	2		
4	Analysis of Slow Voltage Variations	2		
5	Three-Phase Electronic Meter	2		
6	Continuous Fourier Analysis	2		
7	Discrete Fourier Analysis	2		
Bibliography				
Sorin G. Pavel, Virgil Maier, Horia G. Beleiu – Aplicații privind Calitatea Energiei Electrice. Editura: UTPRESS Cluj-Napoca, 2012, ISBN 978-973-662-785-9.				

10. Alignment of course content with expectations of the epistemic community, professional associations, and representative employers in the field

The content of the discipline covers an important part of what constitutes the expectations of customers and stakeholders regarding the PQ.

11. Assessment

Activity type	10.1 Assessment criteria	10.2 Assessment methods	11.3 Weight in the final grade (%)
11.4 Course	The exam consists of a multiple-choice test with 10 to 20 questions.	Multiple-choice test	75%
11.5 Laboratory	Checks during the course, in laboratories, with the recording of voluntary or requested interventions.	Checks throughout the semester	25%
10.5 Project	-	-	-

11.6 Minimum standard of performance:
Passing grade.

Date of completion	Lecturers	Title/ Surname/ Name:	Signature
September 2024	Course	Assoc. Prof. Eng. Horia BELEIU, PhD.	
	Applications Seminar/ Laboratory/ Project	Assoc. Prof. Eng. Horia BELEIU, PhD.	

Date of approval in the council of the Department of Power Engineering and Management

September 2024

Head of Department:

Assoc. Prof. Eng. Horia G. BELEIU, PhD

Date of approval in the Faculty of Electrical Engineering Council

September 2024

Dean:

Assoc. Prof. Eng. Andrei C. CZIKER, PhD