

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 Engineering 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 - Cluj-Napoca in English language
1.7	Form of education	Full time
1.8	Subject code	9

2. Data about the subject

2.1	Subject name			Nuclear Power Plants	
2.2	Course responsible/ lecturer			Assoc. Prof. Eng. Andrei C. Cziker, PhD	
2.3	Teachers in charge of Seminars/ Laboratory/ Project			Assoc. Prof. Eng. Andrei C. Cziker, PhD	
2.4 Year of study	2	2.5 Semester	2	2.6 Type of assessment (<i>E – exam, C – colloquium, V – verification</i>)	E
2.7 Subject category	<i>DF – fundamental, DD – in the field, DS – specialty, DC – complementary</i>				DS
	<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	0	3.3 Laboratory	1	3.3 Project	
3.2 Total hours per semester	42	of which	3.5 Course	28	3.6 Seminar	0	3.6 Laboratory	14	3.6 Project	
3.7 Individual study:										
(a) Manual, lecture material and notes, bibliography									20	
(b) Supplementary study in the library, online and in the field									15	
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays									10	
(d) Tutoring									10	
(e) Exams and tests									3	
(f) Other activities									0	
3.8 Total hours of individual study					58					
3.9 Total hours per semester					100					
3.10 Number of credit points					4					

4. Prerequisites (where applicable)

4.1	Curriculum	Physics, Fundamentals of Nuclear Theory
4.2	Competences	Know basic principles of physics; To know basic concepts related to the production of electricity.

5. Requirements (where appropriate)

5.1	For the course	Video projector / online
5.2	For the applications	Onsite / online

6. Specific competences

Professional competences	After completing the subject students will be able to: - Recognize the basic elements of nuclear reactors; - Identify the different nuclear power plant technologies; - Understand the operating principles of modular nuclear power plants, SMR.
Cross competences	The correct choice and use of bibliographical sources, regulations, standards and specific methods, under conditions of restricted autonomy and qualified assistance, and support it by demonstrating the ability to evaluate qualitatively and quantitatively solutions for the production of electricity using SMR nuclear power plants.

7. Discipline objectives (based on specific competencies acquired)

7.1	General objective	Know the types and operating principles of nuclear power plants
7.2	Specific objectives	Know the description and operation of modular nuclear power plants

8. Contents

8.1. Course (Lectures)		Number of hours	Teaching methods	Additional remarks
1	Nuclear fission	2	The teaching will use the multimedia means available in the faculty's classrooms, and an interactive teaching style will aim to attract students into the teaching process in order to correctly understand the concepts taught. In case of online teaching, the facilities offered by the Teams platform will be used.	
2	Nuclear power plants	2		
3	CANDU nuclear power plant	4		
4	Modular nuclear power plants	8		
5	NUSCALE modular power plant	2		
6	Conversion of nuclear fusion energy into electricity	4		
7	Use of nuclear energy	2		
Bibliography				
[1.] Vădan, I, Cziker A. Modern energy conversion systems Editura UT Pres, Cluj-Napoca, 2017.				
[2.] I.Purica, I. Purica, Fizica reactoarelor nucleare, Editura AGIR, 2017				
[3.] D. T. Ingersoll, M. D. Carelli, Handbook of Small Modular Nuclear Reactors, Elsevier, 2021.				
[4.] D. T. Ingersoll, Small Modular Reactors. Nuclear Power Fad or Future? Elsevier, Woodhead Publishing, 2016				
[5.] https://www.iaea.org/				
8.2. Applications - Seminar /Laboratory/Project		Number of hours	Teaching methods	Additional remarks
1	Calculating the energy released in nuclear fission reactions	2	Exposure and applications. For online teaching, the facilities offered by the Teams platform will be used	
2	Thermal scheme design.	2		
3	Study of nuclear power plant equipment	4		
4	Study of SMR type NPP particularities	4		
5	Calculation of the energy released by nuclear fusion reactions	2		
Bibliography				
[1.] Vădan, I, Cziker A. Modern energy conversion systems Editura UT Pres, Cluj-Napoca, 2017.				

- [2.] I. Purica, I. Purica, Fizica reactoarelor nucleare, Editura AGIR, 2017
- [3.] D. T. Ingersoll, M. D. Carelli, Handbook of Small Modular Nuclear Reactors, Elsevier, 2021.
- [4.] D. T. Ingersoll, Small Modular Reactors. Nuclear Power Fad or Future? Elsevier, Woodhead Publishing, 2016
- [5.] <https://www.iaea.org/>

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

The skills obtained will be necessary for future graduates to identify the means of generating electricity in nuclear power plants.

10. Assessment

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade (%)
10.4 Course	Answer to two questions in the theory	Oral assessment	100%
10.5 Laboratory / Project			
10.6 Minimum standard of performance: The correct answer for at least 1 question of the oral examination.			

Date of completion	Lecturers	Title/ Surname/ Name:	Signature
September 2024	Course	Assoc. Prof. Eng. Andrei C. Cziker, PhD	
	Laboratory	Assoc. Prof. Eng. Andrei C. Cziker, PhD	

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

Head of Department:
Assoc. Prof. Eng. Horia G. BELEIU, PhD

Date of approval in the Faculty of Electrical Engineering Council

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