# Course description

Course abbreviation:	KKE/NPPA	Dlanta				Page:	1 / 4	
Academic Year:	2023/2024	Plants			Printed:	03.07.2025	06:51	
Department/Unit /	KKE / NPPA				Academic Year	2023/2024		
Title	Nuclear Power Plants				Type of completion	Pre-Exam Credit		
Accredited/Credits	No, 3 Cred.				Type of completion	Combined		
Number of hours	Lecture 1 [Ho	urs/Week] Tutor	rial 2 [Hours/V	/eek]				
Occ/max	Status A	Status B	Status C		Course credit prior to	No		
Summer semester	0 / -	0 / -	0 / -		Counted into average	YES		
Winter semester	0 / -	0 / -	0 / -		Min. (B+C) students	10		
Timetable	Yes				Repeated registration	NO		
Language of instruction	English				Semester taught	Winter ser	nester	
Optional course	Yes				Internship duration	0		
Evaluation scale	1 2 3 4							
No. of hours of on-premise								
Auto acc. of credit	Yes in the case of a previous evaluation 4 nebo nic.							
Periodicity	every year							
Specification periodicity								
Substituted course	KKE/CHPA							
Preclusive courses	N/A							
Prerequisite courses	N/A							
Informally recommended courses		N/A						
Courses depending on this Course		N/A						

## Course objectives:

The course is intended to give students of technical fields a good insight into the following areas of nuclear systems: History and evolution of nuclear systems, machinery and equipment for nuclear systems, materials for nuclear systems, application of nuclear chemistry and physics, fission chain reaction and equipment for its utilization, shielding theory, basics of nuclear physics, introduction to nuclear reactor thermodynamics, nuclear reactors of generation III and IV, nuclear fusion and fusion systems, other nuclear applications (healthcare, agriculture, transportation, material testing), nuclear safety - introduction, Probabilistic Safety Assessment, human factor, external events, decommissioning of nuclear power plants.

## Requirements on student

Self-study of the given topic and presentation.

## Content

- Contents of the lectures:
- 1. History and evolution of nuclear systems
- 2. Machinery and equipment for nuclear systems
- 3. Materials for nuclear systems
- 4. Application of nuclear chemistry and physics
- 5. Fission chain reaction and equipment for its utilization
- 6. Shielding theory
- 7. Basics of nuclear physics
- 8. Introduction to nuclear reactor thermodynamics
- 9. Nuclear reactors of generation III and IV
- 10. Nuclear fusion and fusion systems
- 11. Other nuclear applications (healthcare, agriculture, transportation, material testing)
- 12. Nuclear safety introduction, Probabilistic Safety Assessment, human factor, external events

## Fields of study

- 1. Reuss, P. : Reactor Physics, EDP Sciences, 2008.
- 2. Lamarsh, J. R.: Introduction to Nuclear Engineering, Prentice Hall, 2001.
- 3. Stacey, M. Weston : Nuclear Reactor Physics, Second Edition. Wiley-VCH Verlag, 2007.
- 4. E. E. Lewis, Fundamentals of Nuclear Reactor Physics, Academic Press, 2008.
- 5. Crossland, I.G. : Nuclear fuel cycle science and engineering, Woodhead Publishing, 2012.
- 6. Prince, R.: Radiation protection at light water reactors, Springer, 2012.
- 7. McCormick, N. J.: Risk and safety analysis of nuclear systems, John Wiley & Sons, 2011.

## Guarantors and lecturers

- Guarantors: Ing. Kateřina Bílá, Ph.D. (100%)
- Lecturer: Ing. Kateřina Bílá, Ph.D. (80%)
- Tutorial lecturer: Ing. Kateřina Bílá, Ph.D. (20%)

## Literature

• Basic:	Reuss, P. Reactor Physics. France, 2008. ISBN 978-2-7598-0041-4.
• Extending:	IAEA. Industrial Applications of Nuclear Energy. Vienna, 2017.
• Extending:	IAEA. Nuclear or radiological facility decommissioning. Vienna, 2011.
• Recommended:	Introduction to Nuclear Engineering (Lamarsh, J. R.)
• Recommended:	Nuclear fuel cycle science and engineering (Crossland, I.G)
• Recommended:	Nuclear Reactor Physics (Stacey, M. Weston)
• Recommended:	Radiation protection at light water reactors (Prince, R.)
• Recommended:	McCormick, N. J. Risk and safety analysis of nuclear systems. John Wiley & Sons, 2011.

## Time requirements

## Part-time form of study

Activities	Time requirements for activity [h]		
Presentation preparation (report in a language) (10-15)	25		
	Total:	25	

Full-time form of study		
Activities		Time requirements for activity [h]
Contact hours		50
	Total:	50

#### assessment methods

Knowledge - knowledge achieved by taking this course are verified by the following means:

## Kolokvium

Group presentation at a seminar

Skills - skills achieved by taking this course are verified by the following means:

## Competences - competence achieved by taking this course are verified by the following means:

Group presentation at a seminar

## prerequisite

#### Knowledge - students are expected to possess the following knowledge before the course commences to finish it successfully:

be able to explain basic principles of chemistry - atom structure, particles etc.

understand the basis of mathematics and physics (university knowledge level)

use independently theoretical knowledge in the field of mechanics, thermomechanics, elasticity and strength, material science and machine parts

be able of individual work and collaboration in group

Very good knowledge of English.

#### Skills - students are expected to possess the following skills before the course commences to finish it successfully:

Ability to work with PC and basic SW (Word, Excel, PowerPoint), ability to search for information using available information sources, the ability to put the obtained information into context and ability to interpret the information. ability to synthesize analytical knowledge acquired in the previous subjects

#### Competences - students are expected to possess the following competences before the course commences to finish it successfully:

N/A

N/A

používá s porozuměním odborný jazyk a symbolická a grafická vyjádření informací různého typu své učení a pracovní činnost si sám plánuje a organizuje

## teaching methods

#### Knowledge - the following training methods are used to achieve the required knowledge:

Lecture

Self-study of literature

Practicum

#### Skills - the following training methods are used to achieve the required skills:

Lecture

Lecture supplemented with a discussion

Practicum

## Competences - the following training methods are used to achieve the required competences:

Individual study

Students' portfolio

Discussion

## learning outcomes

## Knowledge - knowledge resulting from the course:

Knowledge of basic principles of nuclear energetics - neutron characteristics, principle of fission chain reaction, neutrons diffusion and four factor formula.

Is able to describe different nuclear systems and ways of nucler energy use.

Knowledge of thermodynamics basis.

Knowledge of nuclear reactor kinetics.

## Skills - skills resulting from the course:

Ability to describe different systems that use nuclear energy.

Ability to calculate energy gain from nuclear reactions

Apply basic approaches of probabilistic safety assessment.

#### Competences - competences resulting from the course:

Course is included in study programmes: