

Course description

Course abbreviation:	KKE/JEV	Page:	1 / 3
Course name:	NPP Construction and Operation		
Academic Year:	2023/2024	Printed:	03.06.2024 08:53

Department/Unit /	KKE / JEV			Academic Year	2023/2024
Title	NPP Construction and Operation			Type of completion	Exam
Long Title	NPP Construction, Installation and Operation				
Accredited/Credits	Yes, 4 Cred.			Type of completion	Oral
Number of hours	Lecture 3 [Hours/Week] Tutorial 1 [Hours/Week]				
Occ/max	Status A	Status B	Status C	Course credit prior to	YES
Summer semester	0 / -	0 / -	0 / -	Counted into average	YES
Winter semester	2 / -	0 / -	1 / -	Min. (B+C) students	10
Timetable	Yes			Repeated registration	NO
Language of instruction	Czech			Semester taught	Winter semester
Optional course	Yes			Internship duration	0
Evaluation scale	1 2 3 4			Ev. sc. – cred.	S N
No. of hours of on-premise					
Auto acc. of credit	Yes in the case of a previous evaluation 4 nebo nic.				
Periodicity	K				
Substituted course	None				
Preclusive courses	N/A				
Prerequisite courses	N/A				
Informally recommended courses	N/A				
Courses depending on this Course	N/A				

Course objectives:

Basic physical description of a controlled fission reaction. Nuclear power plant block diagram. Nuclear power plant equipment guarantee operation and testing. Evaluation of guarantee tests. Unit start-up after a differently long stand-still. Nuclear unit safety equipment. Instrumentation & control system. Occupational safety during installation. Operating instructions. Causes and places of the most frequent failures of the primary and secondary equipment. Participation in the commissioning of unit (if possible). A set of lectures will provide information about the commissioning of a nuclear unit, about the main stages of testing and commissioning, complex testing, guarantee measurements, operation and maintenance of a nuclear unit, operational and commissioning documentation and about legislative relationship between individual stages of commissioning and operation. Familiarization with the most important tests and measurements during testing, their concept, realization and evaluation. The cycle of lectures will be based first of all on realized practice and knowledge from the commissioning and initial operation of the Temelín power plant

Requirements on student

Active participation in lectures and tutorials, final test and oral exam.

Content

- Topics of lectures according to weeks:
1. Introduction to problems of nuclear power plant operating.
 2. Preparation of nuclear power plant operating.
 3. Nonactive testings.
 4. Integrated hydraulic test.
 5. Physical start-up.
 6. Energetic start-up.
 7. Complex testing of nuclear power plant.
 8. Guarantees and guarantee measuring.
 9. Testing and industrial operation of nuclear power plant.
 10. Operating mode.

11. Maintenance of operation nuclear power plant.
12. Environmental impact of operation nuclear power plant.
13. Shut-down of operation nuclear power plant.

Fields of study

Guarantors and lecturers

- **Guarantors:** Doc. RNDr. Daniel Duda, Ph.D. (100%)
- **Lecturer:** Doc. RNDr. Daniel Duda, Ph.D. (50%), Doc. Ing. František Hezoucký, Ph.D. (100%), Ing. Vojtěch Janský (50%)
- **Tutorial lecturer:** Doc. RNDr. Daniel Duda, Ph.D. (50%), Doc. Ing. František Hezoucký, Ph.D. (100%), Ing. Vojtěch Janský (50%)

Literature

- **Extending:** *Atoms for Peace (A Pictorial History of the International Atomic Energy Agency).*
- **Extending:** *GSR Part 7 Preparedness and Response for a Nuclear or Radiological Emergency.*
- **Extending:** *GSR 7 Occupational Radiation Protection.*
- **Extending:** *IAEA NP-T-2.10 Commissioning guidelines for nuclear power plants.*
- **Extending:** *IAEA NP-T-2.7 Project management in nuclear power plants construction: Guidelines and construction 7.*
- **Extending:** *IAEA SRS-82 (Rev 1) Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned.*
- **Extending:** *IAEA TECDOC 1391 - Status of advanced light water reactors.*
- **Extending:** *IAEA-TECDOC-1590 Application of Reliability Centred Maintenance to Optimize Operation and Maintenance in Nuclear Power Plants.*
- **Extending:** *NG-T-3.2 (Rev 1) Evaluation of the Status of National Nuclear Infrastructure Development.*
- **Extending:** *NS-G-2 Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants.*
- **Extending:** Harold Kerzner. *Project management.*
- **Recommended:** Bečvář, Josef. *Jaderné elektrárny.* Praha : SNTL, 1981.
- **Recommended:** Heřmanský, Bedřich. *Jaderné reaktory.* Praha : SNTL, 1981.
- **Recommended:** Ronald Allen Knief. *Nuclear Engineering.* 2008. ISBN 978-0-89448-458-2.
- **Recommended:** Hejzlar, Radko. *Stroje a zařízení jaderných elektráren - Díl 1.* ČVUT Praha, 2000.
- **Recommended:** Hejzlar, Radko. *Stroje a zařízení jaderných elektráren - Díl 2.* ČVUT Praha, 2000.
- **Recommended:** Dubšek, F. *Základy teorie a stavby jaderných reaktorů.* VUT Brno, 1990.
- **Recommended:** Hezoucký, František, Štech, Svatobor. *Základy teorie normálních a abnormálních provozních režimů energetických bloků s tlakovodními reaktory.* V Plzni, 2015. ISBN 978-80-261-0548-0.

Time requirements

All forms of study

Activities	Time requirements for activity [h]
Contact hours	52
Preparation for comprehensive test (10-40)	22
Preparation for an examination (30-60)	30
Total:	104

assessment methods

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

Oral exam

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

Test

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

Oral exam

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

describe the atom structure, elementary particles and interactions
 describe the basic properties of neutrons, the basic quantities of reactor physics
 understand the fission reaction
 understand the neutron diffusion
 understand the four coefficients equation
 types of nuclear reactors according to the type of reactions, moderator and coolant
 independently use knowledge of the thermomechanics and fluid mechanics

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

synthesize partial knowledge acquired through studies in other areas

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

N/A

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

Lecture

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

Practicum

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

Lecture

learning outcomes**Knowledge - knowledge resulting from the course:**

basic concepts of nuclear energy
 describe the course of construction, assembly, and operation of nuclear power plants
 understand the transition modes associated with unit start-up and shut-down
 describe failures of basic equipment and associated transients and solution of their consequences

Skills - skills resulting from the course:

qualified communication with specialists in the field of construction planning and commissioning of nuclear units

Competences - competences resulting from the course:

N/A

Course is included in study programmes:

Study Programme	Type of	Form of	Branch	Stage	St. plan v.	Year	Block	Status	R.year	R.
Design of Power Machines and Equipment	Postgraduate Master	Full-time	Nuclear Power Equipment Design	1	2020	2023	Compulsory courses	A	2	ZS