Course description

Department/Unit /	KKE / PTK			**Academic Year**	2023/2024
Title	Steam Turbines and Condensers			**Type of completion**	Exam
Accredited/Credits	Yes, 6 Cred.			**Type of completion**	Combined
Number of hours	Lecture 5 [Hours/Week] Tutorial 2 [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	4 / -	0 / -	0 / -	**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:

The aim of the course is to provide students with information about design of steam turbines, high-power turbines with reheating steam and saturated steam turbines for nuclear power plants. Also introduce students a various possible design solutions.

Requirements on student

Active participation in lectures and seminars, writing the final test and oral exam.

Content

The main content is composed of the influence of inlet parameters and steam reheatin on the cycle efficiency; limit power of the turbine; regenerative heating of feed water; detailed analysis of stage losses; condensation and condensers etc.

Fields of study

Guarantors and lecturers

- **Guarantors:** Ing. Marek Klimko, Ph.D. (100%)
- **Lecturer:** Ing. Marek Klimko, Ph.D. (50%), Ing. Petr Kollross, Ph.D. (50%), Dr. Ing. Jaroslav Synáč (100%)
- **Tutorial lecturer:** Ing. Marek Klimko, Ph.D. (50%), Ing. Petr Kollross, Ph.D. (50%)

Literature

- **Basic:** Ščegljajev, A. V. *Parní turbíny : teorie tepelného děje a konstrukce turbín*. Praha (SNTL - Nakladatelství technické literatury), 1983.
- **Basic:** Bečvář, Josef. *Tepelné turbíny*. 1. vyd. Praha : SNTL, 1968.
- **Extending:** Leizerovich, A. Sh. *Steam Turbines for Modern Fossil-Fuel Power Plants*. USA, 2017. ISBN 0-88173-548-5.

- **Recommended:** Škopek J. *Soubor konstrukčních tabulek.*

Time requirements

All forms of study

Activities	Time requirements for activity [h]
Preparation for an examination (30-60)	40
Preparation for comprehensive test (10-40)	25
Contact hours	91
Total:	**156**

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:

Skills demonstration during practicum

Individual presentation at a seminar

Written exam

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:

to know the general principles of design of machine components on the basis of theoretical knowledge of machine and equipment design, mechanics and elasticity and strength

to use independently theoretical knowledge of the theory of flow machines

to explain the theory of the simple thermal cycle of a steam turbine (Rankine cycle)

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

to perform basic stress calculations of machine parts based on the theory of mechanics and elasticity and strength

to be familiar with the water vapour property diagram (h-s diagram)

to calculate the simple heat cycle of a steam turbine (Rankine cycle)

to use the possibilities of computer tools (Exel)

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

Interactive lecture

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

Lecture

learning outcomes

Knowledge - knowledge resulting from the course:

to describe the physical processes associated with the flow and energy transformations in a steam turbine

to divide losses in the flow section of a steam turbine and know how to minimize them

to describe in detail the various components of a steam turbine including condensation and regeneration accessories and know how to their design and any design constraints

to explain the commissioning and servicing procedures for steam turbines

to describe the specifics of turbines designed for continuous operation with saturated steam, including erosion issues

Skills - skills resulting from the course:

to apply theoretical knowledge in the field of steam turbines in draft design, including the design of all their key components

to perform complex steam turbine cycle calculations in a spreadsheet environment (Excel)

to perform simplified computational design of condensation and regeneration equipment

to analyze individual solution to steam turbine design

to estimate further developments in steam turbine design

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	Design of Power Machines and Equipment	1	2020	2023	Compulsory courses	A	2	ZS
Design of Power Machines and Equipment	Postgraduate Master	Full-time	Nuclear Power Equipment Design	1	2020	2023	Compulsory courses	A	2	ZS