

# Course description

<b>Course abbreviation:</b>	KEV/NES	<b>Page:</b>	1 / 3
<b>Course name:</b>	Introduction to Design of El. Machines		
<b>Academic Year:</b>	2023/2024	<b>Printed:</b>	24.05.2024 21:47

<b>Department/Unit /</b>	KEV / NES			<b>Academic Year</b>	2023/2024
<b>Title</b>	Introduction to Design of El. Machines			<b>Type of completion</b>	Pre-Exam Credit
<b>Long Title</b>	Introduction to Design of Electric Machines			<b>Type of completion</b>	Combined
<b>Accredited/Credits</b>	Yes, 3 Cred.			<b>Course credit prior to</b>	NO
<b>Number of hours</b>	Lecture 2 [Hours/Week] Tutorial 1 [Hours/Week]			<b>Counted into average</b>	NO
<b>Occ/max</b>	Status A	Status B	Status C	<b>Min. (B+C) students</b>	10
<b>Summer semester</b>	0 / -	0 / -	0 / -	<b>Repeated registration</b>	NO
<b>Winter semester</b>	0 / -	32 / -	0 / -	<b>Semester taught</b>	Winter semester
<b>Timetable</b>	Yes			<b>Internship duration</b>	0
<b>Language of instruction</b>	Czech, English				
<b>Optional course</b>	Yes				
<b>Evaluation scale</b>	S N				
<b>No. of hours of on-premise</b>					
<b>Auto acc. of credit</b>	Yes in the case of a previous evaluation 4 nebo nic.				
<b>Periodicity</b>	K				
<b>Substituted course</b>	None				
<b>Preclusive courses</b>	N/A				
<b>Prerequisite courses</b>	N/A				
<b>Informally recommended courses</b>	N/A				
<b>Courses depending on this Course</b>	N/A				

## Course objectives:

Introduction to the design of the electrical machines. Introduction to the electric and the magnetic circuits of an electrical machines, their properties and design. Introduction to the ventilation systems and basics of the thermal calculation.

## Requirements on student

Pre-exam credit: Submission and acceptance of semestral project.

## Content

- 1) Design, construction and cooling of the electric machines IP, IM, IC,. Duty cycles.
- 2) Principles of design of the rotating electric machines, determination of the main dimensions, the power equation, Esson's factor
- 3) The winding of DC machines, calculation for specific parameters, documentation
- 4) The winding of AC machines, calculation for specific parameters, documentation
- 5) Tingley diagram, winding factor - calculation, short pitching - effect on induced voltage
- 6) Design of the magnetic circuits, calculation of magnetic voltage of a tooth, iron core, air gap, magnetizing current of the machine
- 7) Transformers: basic procedure of electromagnetic design, construction.
- 8) Asynchronous machines: Basic procedure of electromagnetic design, construction.
- 9) Synchronous machines: Basic procedure of electromagnetic design, construction.
- 10) DC machines: basic procedure of electromagnetic design, construction
- 11) Losses in electrical machines, calculation, localization, influence on machine operation, efficiency
- 12) Cooling of electric machines, ventilation calculation, basic relations, similarity with el. circuits.
- 13) Thermal phenomena in electrical machines, thermal calculation, basic relations, similarity with el. circuits.

## Fields of study

## Guarantors and lecturers

- **Guarantors:** Doc. Ing. Roman Pechánek, Ph.D.
- **Lecturer:** Doc. Ing. Roman Pechánek, Ph.D. (100%)
- **Tutorial lecturer:** Ing. Jan Laksar, Ph.D. (100%), Doc. Ing. Roman Pechánek, Ph.D. (25%), Ing. Lukáš Veg, Ph.D. (75%)

## Literature

- **Basic:** Kopylov, Igor Petrovič; Voženilek, Petr. *Stavba elektrických strojů*. 1. vyd. Praha : Státní nakladatelství technické literatury, 1988.
- **Extending:** Pyrhönen, Juha; Jokinen, Tapani.; Hrabovcová, Valéria. *Design of rotating electrical machines*. 2nd ed. Chichester : Wiley, 2014. ISBN 978-1-118-58157-5.

## Time requirements

## All forms of study

Activities	Time requirements for activity [h]
Presentation preparation (report) (1-10)	8
Undergraduate study programme term essay (20-40)	30
<b>Total:</b>	<b>38</b>

## Combined form of study

Activities	Time requirements for activity [h]
E-learning [dáno e-learningovým kurzem]	27
Contact hours	12
<b>Total:</b>	<b>39</b>

## Full-time form of study

Activities	Time requirements for activity [h]
Contact hours	39
<b>Total:</b>	<b>39</b>

## assessment methods

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

Seminar work

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

Seminar work

Project

## prerequisite

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

knowledge of the electrical machine

#### teaching methods

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

Lecture  
Practicum  
Individual study

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

Practicum  
Individual study  
Skills demonstration

#### learning outcomes

##### Knowledge - knowledge resulting from the course:

determinate the parameters of the electric machine  
explain the procedure for calculating the electrical, magnetic and thermal stress of the electric machine  
explain the relation of partial variables in the design of the electric machine

##### Skills - skills resulting from the course:

electromagnetic calculation of the electric machine  
clarify the basic procedure of designing electrical machines

#### Course is included in study programmes:

Study Programme	Type of	Form of	Branch	Stage	St. plan v.	Year	Block	Status	R.year	R.
Electrical Engineering and Information Technology	Bachelor	Full-time	Electrical Engineering and Information Technology	1	20	2023	block EIT5	B	3	ZS
Electrical Engineering and Information Technology	Bachelor	Combined	Electrical Engineering and Information Technology	1	20	2023	block EIT5	B	3	ZS
Electrical Engineering and Information Technology	Bachelor	Full-time	Electrical Engineering and Information Technology	1	20	2023	block EIT5	B	3	ZS