

Course description

Course abbreviation:	KEV/NES	Page:	1 / 3
Course name:	Introduction to Design of El. Machines		
Academic Year:	2023/2024	Printed:	05.07.2025 17:27

Department/Unit /	KEV / NES			Academic Year	2023/2024
Title	Introduction to Design of El. Machines			Type of completion	Pre-Exam Credit
Long Title	Introduction to Design of Electric Machines			Type of completion	Combined
Accredited/Credits	Yes, 3 Cred.			Course credit prior to	No
Number of hours	Lecture 2 [Hours/Week] Tutorial 1 [Hours/Week]			Counted into average	NO
Occ/max	Status A	Status B	Status C	Min. (B+C) students	10
Summer semester	0 / -	0 / -	0 / -	Repeated registration	NO
Winter semester	0 / -	32 / -	0 / -	Semester taught	Winter semester
Timetable	Yes			Internship duration	0
Language of instruction	Czech, English				
Optional course	Yes				
Evaluation scale	S N				
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	None				
Preclusive courses	N/A				
Prerequisite courses	N/A				
Informally recommended courses	N/A				
Courses depending on this Course	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
Total:	38

Combined form of study

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

Full-time form of study

Activities	Time requirements for activity [h]
Contact hours	39
Total:	39

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