Table S2.6.4. Form for the preparation of the course information sheets

Name of the subject	*Selected topics in electrical machines*			
Code of the subject	**Status of the subject**	**Semester**	**Number of ECTS credits**	**Class load**
	optional	II	10	

STUDY PROGRAMME FOR WHICH IT IS ORGANIZED:
PhD Program "Natural sciences and Technology for Sustainable Development",
Module Electrical and Computer Engineering, 3rd degree

DEPENDENCY BY OTHER SUBJECTS: No prerequisites

OBJECTIVES OF STUDYING THIS SUBJECT: The course objective is to introduce postgraduate students with the up to date trends in area of electrical machines, with the specific topics and tools that overcomes the frames of undergraduate studies.

Contents of the subject (teaching units, forms of students' individual work, forms of testing) presented per working weeks in the academic calendar:

Preparatory week	Introduction with PhD students, talks
I week	Turns function, winding function, polyphase AC winding Magnetomotive force space distribution.
II week	Spectral content of polyphase AC winding Magnetomotive force space distribution.
III week	Cage rotor winding Magnetomotive force: spectral content.
IV week	Rotor slot harmonics in induction machine stator current spectrum: rules for their existence regarding the rotor bar number and number of pole pairs.
V week	Pulsating torques, rules for their existence and frequencies at which they occur.
VI week	Self and mutual inductance calculation using winding function concept.
VII week	Skewing of rotor bars, significance of this measure, optimal skewing angle and manner of incorporating this effect into the dynamical induction machine model.
VIII week	Double-fed induction machine – principle of operation.
IX week	Double-fed induction machine – its use in the modern electric power system.
X week	Permanent magnets in electrical machines, their use and properties and manner of their modelling.
XI week	Synchronous motors with permanent magnets: different rotor structures regarding manner of its placement on the rotor, modelling and analysis
XII week	Phase shifting transformer – principle of operation and its use in modern electric power system.
XIII week	Basic elements and introductory terms of finite element modelling of electrical machines.
XIV week	Project definition
XV week	Project activities: discussions, consultations

METHODS OF EDUCATION: Lectures, project based teaching

STUDENTS' LOAD

Weekly	**In semester**
10 credits x 40/30 = **13.33 hours** Structure: **2** hours of lectures **2** hours of exercises **9.33** hours of individual work	Lectures and final exam: (13.33 hours) x 16 = 213.33 hours Necessary preparation before the start of the semester (administration, enrolment, verification): (13.33 hours) x 2 = 26.66 hours Total workload for the course: 10 x 30 = 300 hours Additional work for preparing correction of the final exam, including taking the exam: 0 - 60 hours (remaining time from the first and the second item to the total workload for the course of 300 hours) Structure of the workload: 213.33 hours (lectures and final exam) + 26.66 hours (preparation) + 60 hours (additional work)

STUDENTS' OBLIGATIONS DURING THE TEACHING:

Students are obliged to attend lectures, submit homework assignments and successfully complete the assigned project

LITERATURE:

1. G. Joksimović, *Asinhrone mašine*, Narodna knjiga / MIBA Books, Podgorica, Beograd, 2019, ISBN: 9789940251482

2. J. Faiz, V. Gorbanian, G. Joksimović, *Fault diagnosis of induction motors*, The Institution of Engineering and Technology, IET, UK, 2017, ISBN-13: 978-1-78561-328-9

3. T. A. Lipo, *Analysis of synchronous machines*, CRC Press, Taylor and Francis Group, 2017.

4. C. M. Ong, *Dynamic simulation of electric machinery*, Prentice Hall, 1997.

LEARNING OUTCOMES (COMPLIED WITH THE OUTCOMES FOR THE STUDY PROGRAMME):

On completion of this course the student will be able to:

- construct the magnetomotive force waveshape and analyse its spectral content,
- design primitive electrical machine with permanent magnets,
- describe double-fed induction machine principle of operation,
- understand and describe phase shifting transformer the principle of operation and its role in electric power system,
- make simple model of part of electric machine in software that is based on finite element method and derive basic conclusions from the obtained results.

FORMS OF TESTS AND EVALUATION:

Homeworks, 50%
Completed project assignement, 50%

NAME AND SURNAME OF TEACHER AND ASSOCIATE:

Prof. dr Gojko Joksimović

PARTICULARITIES NEEDED TO BE EMPHASIZED FOR THE SUBJECT:

NOTE (if needed):